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United States
Environmental Protection
Agency

Office of Air Quality
Planning and Standards
Research Triangle Park, NC 27711

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Final Report - Volume I of III

Emissions Testing of Combustion Stack and Pushing Operations at Coke Battery No. 5/6 at ABC Coke in Birmingham, Alabama

Office of Air Quality
Clean Air
OAQPS
Planning and Standards

FINAL REPORT
EMISSIONS TESTING OF COMBUSTION STACK AND COKE PUSHING OPERATIONS AT COKE BATTERY NO. 5/6 AT ABC COKE IN BIRMINGHAM, ALABAMA

Volume I
Report Body and Appendices A, B and C

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1.0 INTRODUCTION

The United States Environmental Protection Agency (EPA) is investigating the coke manufacturing industry to characterize hazardous air pollutants (HAPs) emitted from coke oven pushing operations. This test report addresses pushing emissions from a coke oven and emissions from the combustion (underfire) stack that serves coke Battery No. 5/6 at ABC Coke in Birmingham, Alabama.

The purpose of this test program was to quantify emissions from the inlet and outlet of the baghouse controlling emissions from the coke oven pushing operation and to quantify emissions from the combustion stack outlet. The data may be used by EPA in the future to support a residual risk assessment for coke oven facilities.

The testing was performed to quantify uncontrolled and controlled air emissions of filterable particulate matter (PM), methylene chloride extractable matter (MCEM) and 19 polycyclic aromatic hydrocarbons (PAHs) [acenaphthene, acenapthylene, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(e)pyrene, benzo(k)fluoranthene, benzo(ghi)perylene, chrysene, dibenzo(a,h)anthracene, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, 2-methylnapthalene, napthalene, perylene, phenanthrene, and pyrene]. In addition, following the PM and MCEM analyses, the samples were analyzed to screen for the presence of 17 trace metals. Baghouse dust samples were also collected and analyzed for 16 trace metals. Simultaneous testing was performed at the inlet and outlet of the baghouse controlling emissions from the coke oven pushing operation. Outlet sampling was also performed on the combustion outlet stack during both coke pushing and non-pushing conditions. In addition to pollutant testing, oxygen (O_2) and carbon dioxide (CO_2) were measured at each location. During the sampling program, Research Triangle Institute (RTI), another EPA contractor, monitored and recorded process and emission control system operating parameters.

PES used three subcontractors for this effort: DEECO provided technical assistance in preparation of the Quality Assurance Project Plan (QAPP) and assisted in the field sampling, Eastern Research Group (ERG) prepared filter media and analyzed the EPA Method 315 samples for PM and EOM, and Atlantic Technical Services, Inc. (ATS) assisted PES in the custody and transport of the PAH samples from the field to Quanterra.

In addition, PES used three contract laboratories for analytical services: Quanterra Environmental Services (Quanterra) provided PAH analyses using California Air Resources Board (CARB) Method 429, First Analytical Laboratories (FAL) provided metals analyses of the PM/MCEM sample residues and baghouse dust samples, and Laboratory Corporation of America (LabCorp) provided PAH analyses using National Institute for Occupational Safety and Health (NIOSH) Method 5506. The test program organization and major lines of communication are presented in Figure 1.1.

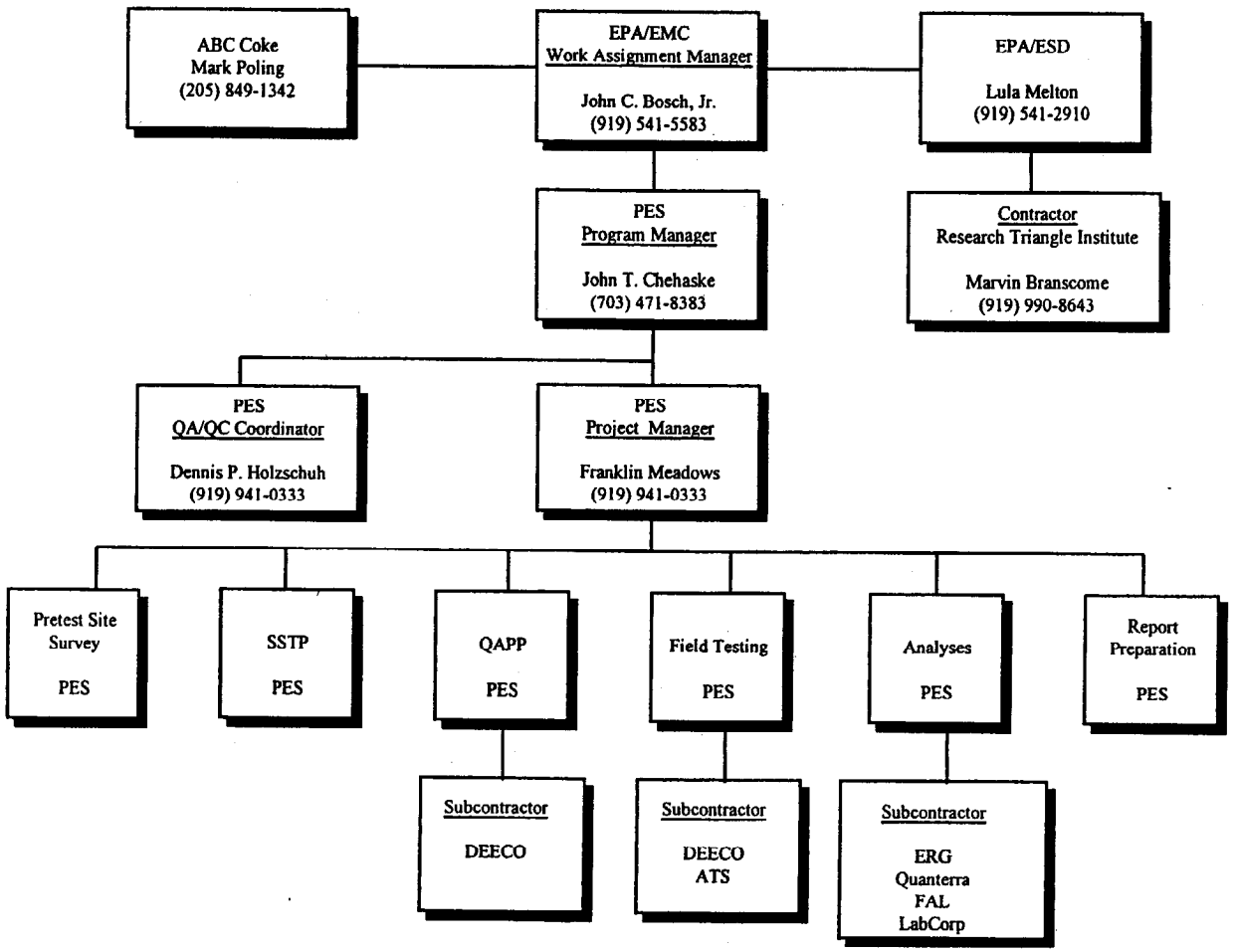


Figure 1.1 Key Personnel and Responsibility for Testing at ABC Coke, Birmingham, Alabama

2.0 SUMMARY OF RESULTS

This section provides test result summaries obtained from the ABC Coke testing. Included in this summary are results of the tests conducted for filterable particulate matter (PM), methylene chloride extractable matter (MCEM), multiple metals and polycyclic aromatic hydrocarbons (PAHs) at the baghouse inlet and outlet, and the outlet stack of the combustion (underfire) stack.

2.1 EMISSIONS TEST LOG

Sampling at the coke oven baghouse used to control pushing emissions was conducted on September 21, 22, and 23, 1998. Sampling on the combustion stack was conducted on September 24 and 25, 1998. Table 2.1 summarizes the emissions test log. Presented are the run numbers, test dates, pollutants, run times and downtime for filter and sampling port changes.

2.2 FILTERABLE PARTICULATE MATTER, METHYLENE CHLORIDE EXTRACTABLE MATTER (MCEM), AND METALS

EPA Method 315 procedures were used to determine PM, MCEM, and 17 metals at the baghouse inlet and outlet and underfire stack. The target metals included: antimony (Sb), arsenic (As), barium (Ba), beryllium (Be), cadmium (Cd), chromium (Cr), cobalt (Co), copper (Cu), lead (Pb), manganese (Mn), mercury (Hg), nickel (Ni), phosphorous (P), selenium (Se), silver (Ag), thallium (Tl), and zinc (Zn). PM and MCEM are withdrawn isokinetically from the source. The PM mass includes any material removed in the probe acetone rinse and material on the filter. The MCEM is determined by adding a methylene chloride rinse of the probe and filter holder, extracting the condensible hydrocarbons collected in the impinger water, adding an acetone rinse followed by a methylene chloride rinse of the sampling train components after the filter and before the silica gel impinger, and determining residue gravimetrically after separating the solvent. The metals analyses consisted of a nitric acid digestion of the filters and impinger residues described above. The metals analysis was by Direct Aspiration Flame Atomic Absorption Spectrophotometry (FLAAS), Graphite Furnace Atomic Absorption Spectrophotometry (GFAAS), and Inductively Coupled Plasma - Optical Emission (ICP). Mercury analysis was by Cold Vapor Atomic Adsorption Spectrophotometry (CVAAS). The baghouse inlet and outlet were sampled simultaneously to determine PM, MCEM, and metals. Sampling on the underfire stack was performed after the baghouse sampling effort.

TABLE 2.1

EMISSIONS TEST LOG
ABC COKE, BIRMINGHAM, ALABAMA

Run No.	Date	Pollutant	Run Time	Downtime, minutes
Coke Oven Battery No. 5/6 Baghouse Inlet				
A-I-M315-1	09/21/98	MCEM/Metals	1128-1911	5.0
A-I-M429-1	09/21/98	PAHs	1128-1912	6.0
A-I-M5506-1	09/21/98	PAHs	1147-1847	--
A-I-M315-2	09/22/98	MCEM/Metals	1018-1816	52.6
A-I-M429-2	09/22/98	PAHs	1018-1816	56.0
A-I-M5506-2	09/22/98	PAHs	1022-1753	--
A-I-M315-3	09/23/98	MCEM/Metals	1016-1800	29.0
A-I-M429-3	09/23/98	PAHs	1019-1810	36.0
A-I-M5506-3	09/23/98	PAHs	1022-1724	--
Coke Oven Battery No. 5/6 Baghouse Outlet				
A-O-M315-1	09/21/98	MCEM/Metals	1126-1911	53
A-O-M429-1	09/21/98	PAHs	1126-1911	53
A-O-M5506-1	09/21/98	PAHs	1138-1914	0
A-O-M315-2	09/22/98	MCEM/Metals	1028-1819	67
A-O-M429-2	09/22/98	PAHs	1028-1819	71
A-O-M5506-2	09/22/98	PAHs	1039-1747	1
A-O-M315-3	09/23/98	MCEM/Metals	1020-1806	46
A-O-M429-3	09/23/98	PAHs	1020-1806	46
A-O-M5506-3	09/23/98	PAHs	1020-1805	--
Coke Oven Battery No. 5/6 Combustion Stack				
A-U-M315-1	09/24/98	MCEM/Metals	1025-1344	19
A-U-M429-1	09/24/98	PAHs	1025-1345	20
A-U-M315-2	09/24/98	MCEM/Metals	1443-1806	23
A-U-M429-2	09/24/98	PAHs	1443-1812	29
A-U-M315-4	08/25/98	MCEM/Metals	1110-1428	18
A-U-M429-4	09/25/98	PAHs	1110-1427	17
A-U-M5506-1	09/25/98	PAHs	1444-1602	0

The pushing operation necessitated adjusting sampling rates for maximum air flow during the actual pushing of coke. The pushing process occurred roughly once every 15 minutes, and lasted approximately two minutes. This required a maximum sample rate during the two minute push and a much lower sample rate during the idle time. This sample approach was used for all the isokinetic sample systems. The isokinetics were based on time weighted averages of pressure drops (delta p), stack temperatures, and meter temperatures.

The following notes were recorded during the field sampling effort and analysis of samples. Events were discussed with the WAM and ESD personnel when modifications to the test plan were required.

- The ductwork at the baghouse inlet sampling site had to be patched prior to the start of sampling. There was a concern with dilution air entering the inlet duct upstream of the sampling location.

- Cyclonic flow checks were conducted and flow patterns were non-cyclonic.

- Scaffolding at the inlet location was strapped down to steel I-beams as a safety precaution. Mr. John Bosch requested securing the scaffolding due to the vibration caused by the process.

- Inlet sample run 1 had an inlet glass nozzle break during port change. Nozzle replaced and continued with sample run, no effect on sample run.

- Darkness became a safety issue at the end of the sample run 1. It was decided that all future sample runs would be stopped by 1830 so that personnel would be off platforms prior to darkness.

- Sampling continued at maximum flow rate for extended periods of time due to process problems. Normally a push lasted approximately 90 seconds with the fan operating at maximum flow from two to five minutes. When a push was "stuck", the fan remained at maximum flow as did our sampling system.

- Calculations of isokinetic sampling rates would be based on time weighted averages of velocity pressure (delta p), stack temperatures, and meter temperatures.

- The EPA WAM, Mr. John Bosch, requested a thorough review of laboratory sample handling and analyses procedures.

2.2.1 Coke Oven Battery No. 5/6 Baghouse Inlet

Table 2.2 summarizes the EPA Method 315 baghouse inlet sample times and flue gas parameters. The total sampling time varies for each test run with an average of 438 minutes. The average sampling rate was 0.313 dry standard cubic feet per minute (dscfm). The average sample volume was 138.139 dry standard cubic feet (dscf) or 3.912 dry standard cubic meters

TABLE 2.2

PARTICULATE MATTER/MCEM/METALS EMISSIONS SAMPLING AND FLUE GAS PARAMETERS - BAGHOUSE INLET ABC COKE, BIRMINGHAM, ALABAMA

Run No.	A-I-315-1	A-I-315-2	A-I-315-3	Average
Date	09/21/98	09/22/98	09/23/98	--
Total Sampling Time, minutes	458	421.4	435	438
Coke Oven Pushes	21	21	22	21
Tons of Coke Pushed per Hour	33.3	35.4	34.9	34.5
Avg. Sampling Rate, dscfm[a]	0.387	0.226	0.326	0.313
Sample Volume:				
dscf[b]	177.437	95.274	141.706	138.139
dscm[c]	5.024	2.698	4.013	3.912
Avg. Flue Gas Temp, °F	138	154	137	143
O_2 Conc., % by Volume	20.2	20.3	20.3	20.3
CO_2 Conc., % by Volume	0.2	0.2	0.2	0.2
Moisture, % by Volume	3.0	2.2	1.9	2.4
Flue Gas Volumetric Flow Rate:				
acfm[d]	74,526	44,982	63,350	60,953
dscfm[a]	62,426	37,181	53,989	51,199
dscmm[e]	1,768	1,053	1,529	1,450
Isokinetic Sampling Ratio, %	100.3	98.3	97.6	98.7

[a]Dry standard cubic feet per minute at 68°F (20°C) and 1 atm.
[b]Dry standard cubic feet at 68°F (20°C) and 1 atm.
[c]Dry standard cubic meters at 68°F (20°C) and 1 atm.
[d]Actual cubic feet per minute at flue gas conditions.
[e]Dry standard cubic meters per minute at 68°F (20°C) and 1 atm.

(dscm). The average flue gas temperature was 143 degrees Fahrenheit (°F). The flue gas contained 0.2 percent (%) carbon dioxide (CO_2), 20.3 % oxygen (O_2) and 2.4 % moisture. The average flue gas volumetric flow rate was 60,953 actual cubic feet per minute (acfm) or 51,199 dscfm, or 1,450 dry standard cubic meters per minute (dscmm).

Table 2.3 summarizes the flue gas PM concentrations and emission rates at the baghouse inlet. The average concentration was 0.122 grains per dry standard cubic foot (gr/dscf) or 1.74E-05 pounds per dry standard cubic foot (lb/dscf) or 2.78E+05 micrograms per dry standard cubic meter (μg/dscm). The average emission rate was 50.6 pounds per hour (lb/hr) or 2.30E+10 micrograms per hour (μg/hr) or 1.46 pounds per ton of coke pushed (lb/ton pushed).

Table 2.4 summarizes the flue gas MCEM concentrations and emission rates at the baghouse inlet. The average MCEM concentration was 8.33E-04 gr/dscf or 1.19E-07 lb/dscf or 1.90E+03 μg/dscm. The average MCEM emission rate was 0.356 lb/hr or 1.61E+08 μg/hr or 1.04E-02 lb/ton pushed.

Table 2.5 summarizes the flue gas metals concentrations and emission rates. The PM and MCEM residues were analyzed for 17 metals. Measured inlet metals concentrations were blank corrected based on the quartz filter blank results. Average concentrations ranged from 0.032μg/dscm for silver to 16.6 μg/dscm for phosphorous.

2.2.2 Coke Oven Battery No. 5/6 Baghouse Outlet

Table 2.6 summarizes the EPA Method 315 baghouse outlet sample times and flue gas parameters. The total test time varied for the three test runs, with an average time of 412 minutes. The average sampling rate was 0.330 dscfm. The average sampling volume was 136.209 dscf or 3.857 dscm. The average flue gas temperature was 124 °F, with average stack gas compositions of 20.4 % O_2 and 0.2 % CO_2. Moisture content of the flue gas averaged 2.5 %. Flue gas volumetric flow rates averaged 62,687 acfm or 55,107 dscfm or 1,561 dscmm. The isokinetic sampling rate averaged 94.9 %.

Table 2.7 summarizes the PM concentrations and emission rates for the baghouse outlet. The average PM concentration was 1.20E-03 gr/dscf or 1.71E-07 lb/dscf or 2.74E+03 μg/dscm. The average emission rate was 0.552 lb/hr or 2.50E+08 μg/hr or 1.59E-02 lb/ton pushed.

Table 2.8 summarizes the MCEM concentrations and emission rates for the baghouse outlet. Concentrations averaged 6.97E-04 gr/dscf or 9.96E-08 lb/dscf or 1.60E+03 μg/dscm. Emission rates averaged 0.350 lb/hr or 15.9E+07 μg/hr or 1.04E-02 lb/ton pushed.

Table 2.9 summarizes the multiple metals concentrations and emission rates for the combined PM and MCEM fractions collected with the EPA Method 315 sampling trains. Several of the 17 target metals were found to be non-detectable.

TABLE 2.3

FILTERABLE PARTICULATE MATTER CONCENTRATIONS AND EMISSION RATES - BAGHOUSE INLET ABC COKE, BIRMINGHAM, ALABAMA

Run No.	A-I-315-1	A-I-315-2	A-I-315-3	Average
Date	09/21/98	09/22/98	09/23/98	--
Clock Time, 24 hr Clock	1628-1911	1018-1816	1016-1800	--
Concentration:				
gr/dscf[a]	0.083	0.160	0.122	0.122
lb/dscf[b]	1.19E-05	2.29E-05	1.74E-05	1.74E-05
μg/dscm[c]	1.90E+05	3.66E+05	2.79E+05	2.78E+05
Emission Rate:				
lb/hr[d]	44.4	51.0	56.4	50.6
μg/hr[e]	2.01E+10	2.32E+10	2.56E+10	2.30E+10
lb/ton pushed[f]	1.33E+00	1.44E+00	1.62E+00	1.46E+00

[a]Grains per dry standard cubic foot at 68°F (20°C) and 1 atm.
[b]Pounds per dry standard cubic foot at 68°F (20°C) and 1 atm.
[c]Micrograms per dry standard cubic meter at 68°F (20°C) and 1 atm.
[d]Pounds per hour.
[e]Micrograms per hour.
[f]Pounds per ton of coke pushed.

TABLE 2.4

METHYLENE CHLORIDE EXTRACTABLE MATTER CONCENTRATIONS AND EMISSION RATES - BAGHOUSE INLET ABC COKE, BIRMINGHAM, ALABAMA

Run No.	A-I-315-1	A-I-315-2	A-I-315-3	Average
Date	09/21/98	09/22/98	09/23/98	--
Clock Time, 24 hr Clock	1128-1911	1018-1816	1016-1800	--
Concentration:				
gr/dscf[a]	9.74E-04	10.9E-04	4.36E-04	8.33E-04
lb/dscf[b]	1.39E-07	1.55E-07	0.62E-07	1.19E-07
μg/dscm[c]	2.23E+03	2.48E+03	1.00E+03	1.90E+03
Emission Rate:				
lb/hr[d]	0.521	0.346	0.202	0.356
μg/hr[e]	2.36E+08	1.57E+08	0.91E+08	1.61E+08
lb/ton pushed[f]	1.56E-02	0.98E-02	0.58E-02	1.04E-02

[a]Grains per dry standard cubic foot at 68°F (20°C) and 1 atm.
[b]Pounds per dry standard cubic foot at 68°F (20°C) and 1 atm.
[c]Micrograms per dry standard cubic meter at 68°F (20°C) and 1 atm.
[d]Pounds per hour.
[e]Micrograms per hour.
[f]Pounds per ton of coke pushed.

TABLE 2.5

MULTIPLE METALS CONCENTRATIONS AND EMISSION RATES
BAGHOUSE INLET
ABC COKE, BIRMINGHAM, ALABAMA

Run No.	A-I-315-1	A-I-315-2	A-I-315-3	Average
Date	09/21/98	09/22/98	09/23/98	--
Clock Time, 24 hr Clock	1128-1911	1018-1816	1016-1800	--
Antimony				
μg/dscm[a]	0.100	ND	ND	0.030
μg/hr[b]	10.6E+03	ND	ND	3.51E+03
lb/hr[c]	2.32E-05	ND	ND	0.77E-05
lb/ton pushed[d]	6.96E-07	ND	ND	2.32E-07
Arsenic				
μg/dscm[a]	3.3	4.3	2.4	3.3
μg/hr[b]	3.55E+05	2.69E+05	2.22E+05	2.82E+05
lb/hr[c]	7.80E-04	5.92E-04	4.88E-04	6.20E-04
lb/ton pushed[d]	2.34E-05	1.67E-05	1.40E-05	1.80E-05
Barium				
μg/dscm[a]	7.20	15.5	8.87	10.5
μg/hr[b]	7.64E+05	9.79E+05	8.14E+05	8.52E+05
lb/hr[c]	1.68E-03	2.15E-03	1.79E-03	1.87E-03
lb/ton pushed[d]	5.04E-05	6.09E-05	5.13E-05	5.42E-05
Beryllium				
μg/dscm[a]	0.070	0.174	0.120	0.121
μg/hr[b]	7.39E+03	11.0E+03	11.0E+03	9.79E+03
lb/hr[c]	1.63E-05	2.42E-05	2.41E-05	2.15E-05
lb/ton pushed[d]	4.87E-07	6.84E-07	6.92E-07	6.21E-07
Cadmium				
μg/dscm[a]	0.076	0.133	2.54	0.917
μg/hr[b]	8.02E+03	8.43E+03	233E+03	83.2E+03
lb/hr[c]	1.76E-05	1.85E-05	51.3E-05	18.3E-05
lb/ton pushed[d]	5.29E-07	5.24E-07	147E-07	52.5E-07
Chromium				
μg/dscm[a]	2.57	4.37	2.44	3.13
μg/hr[b]	2.72E+05	2.76E+05	2.24E+05	2.58E+05
lb/hr[c]	5.99E-04	6.08E-04	4.93E-04	5.67E-04
lb/ton pushed[d]	1.80E-05	1.72E-05	1.41E-05	1.64E-05
Cobalt				
μg/dscm[a]	0.498	0.741	0.399	0.546
μg/hr[b]	52.8E+03	46.8E+03	36.6E+03	45.4E+03
lb/hr[c]	1.16E-04	1.03E-04	0.805E-04	0.999E-04
lb/ton pushed[d]	3.48E-06	2.91E-06	2.31E-06	2.90E-06
Copper				
μg/dscm[a]	3.20	4.23	6.40	4.61
μg/hr[b]	3.40E+05	2.67E+05	5.87E+05	3.98E+05
lb/hr[c]	7.48E-04	5.87E-04	12.9E-04	8.76E-04
lb/ton pushed[d]	2.24E-05	1.66E-05	3.70E-05	2.54E-05

TABLE 2.5 (cont'd)

Run No.	A-I-315-1	A-I-315-2	A-I-315-3	Average
Lead				
μg/dscm[a]	4.1	6.5	4.3	5.0
μg/hr[b]	4.35E+05	4.12E+05	3.91E+05	4.13E+05
lb/hr[c]	9.57E-04	9.07E-04	8.60E-04	9.08E-04
lb/ton pushed[d]	2.87E-05	2.56E-05	2.46E-05	2.63E-05
Manganese				
μg/dscm[a]	6.7	5.9	4.5	5.7
μg/hr[b]	70.9E+04	37.5E+04	41.6E+04	50.0E+04
lb/hr[c]	15.6E-04	8.24E-04	9.15E-04	11.0E-04
lb/ton pushed[d]	4.68E-05	2.33E-05	2.62E-05	3.21E-05
Mercury				
μg/dscm[a]	ND	ND	ND	ND
μg/hr[b]	ND	ND	ND	ND
lb/hr[c]	ND	ND	ND	ND
lb/ton pushed[d]	ND	ND	ND	ND
Nickel				
μg/dscm[a]	3.9	5.2	6.1	5.0
μg/hr[b]	41.4E+04	32.8E+04	55.5E+04	43.2E+04
lb/hr[c]	9.10E-04	7.21E-04	12.2E-04	9.51E-04
lb/ton pushed[d]	2.73E-05	2.04E-05	3.50E-05	2.76E-05
Phosphorus				
μg/dscm[a]	11.7	20.8	17.4	16.6
μg/hr[b]	1.25E+06	1.31E+06	1.60E+06	1.39E+06
lb/hr[c]	2.74E-03	2.88E-03	3.52E-03	3.05E-03
lb/ton pushed[d]	8.22E-05	8.15E-05	10.1E-05	8.82E-05
Selenium				
μg/dscm[a]	0.88	1.33	1.07	1.09
μg/hr[b]	92.9E+03	84.3E+03	98.3E+03	91.8E+03
lb/hr[c]	2.04E-04	1.85E-04	2.16E-04	2.02E-04
lb/ton pushed[d]	6.13E-06	5.24E-06	6.20E-06	5.86E-06
Silver				
μg/dscm[a]	0.060	0.037	ND	0.032
μg/hr[b]	6,333	2,341	ND	2,891
lb/hr[c]	13.9E-06	5.15E-06	ND	6.36E-06
lb/ton pushed[d]	4.18E-07	1.46E-07	ND	1.88E-07
Thallium				
μg/dscm[a]	0.22	0.41	0.30	0.31
μg/hr[b]	23.2E+03	25.8E+03	27.4E+03	25.5E+03
lb/hr[c]	5.11E-05	5.67E-05	6.03E-05	5.60E-05
lb/ton pushed[d]	1.53E-06	1.60E-06	1.73E-06	1.62E-06

TABLE 2.5 (concluded)

Run No.	A-I-315-1	A-I-315-2	A-I-315-3	Average
Zinc				
μg/dscm[a]	12.9	15.6	12.2	13.6
μg/hr[b]	1.37E+06	0.983E+06	1.12E+06	1.16E+06
lb/hr[c]	3.02E-03	2.16E-03	2.46E-03	2.55E-03
lb/ton pushed[d]	9.05E-05	6.12E-05	7.06E-05	7.41E-05

[a]Micrograms per dry standard cubic meter.
[b]Micrograms per hour.
[c]Pounds per hour.
[d]Pounds per ton of coke pushed.
ND - non detected, counted as "zero".

TABLE 2.6

PARTICULATE MATTER/MCEM/METALS EMISSIONS SAMPLING AND FLUE GAS PARAMETERS - BAGHOUSE OUTLET ABC COKE, BIRMINGHAM, ALABAMA

Run No.	A-O-315-1	A-O-315-2	A-O-315-3	Average
Date	09/21/98	09/22/98	09/23/98	--
Total Sampling Time, minutes	412	404	420	412
Coke Oven Pushes	20	23	22	22
Tons of Coke Pushed per Hour	33.2	35.9	34.7	34.6
Avg. Sampling Rate, dscfm[a]	0.409	0.257	0.324	0.330
Sample Volume:				
dscf[b]	168.639	103.955	136.034	136.209
dscm[c]	4.775	2.944	3.852	3.857
Avg. Flue Gas Temp, °F	118	133	120	124
O_2 Conc., % by Volume	20.4	20.4	20.4	20.4
CO_2 Conc., % by Volume	0.2	0.2	0.1	0.2
Moisture, % by Volume	2.8	2.7	1.9	2.5
Flue Gas Volumetric Flow Rate:				
acfm[d]	73,527	47,139	67,395	62,687
dscfm[a]	64,792	40,579	59,951	55,107
dscmm[e]	1,835	1,149	1,698	1,561
Isokinetic Sampling Ratio, %	99.6	100.0	85.2	94.9

[a]Dry standard cubic feet per minute at 68°F (20°C) and 1 atm.
[b]Dry standard cubic feet at 68°F (20°C) and 1 atm.
[c]Dry standard cubic meters at 68°F (20°C) and 1 atm.
[d]Actual cubic feet per minute at flue gas conditions.
[e]Dry standard cubic meters per minute at 68°F (20°C) and 1 atm.

TABLE 2.7

FILTERABLE PARTICULATE MATTER CONCENTRATIONS AND EMISSION RATES - BAGHOUSE OUTLET ABC COKE, BIRMINGHAM, ALABAMA

Run No.	A-O-315-1	A-O-315-2	A-O-315-3	Average
Date	09/21/98	09/22/98	09/23/98	--
Clock Time, 24 hr Clock	1126-1911	1028-1819	1020-1806	--
Concentration:				
gr/dscf[a]	0.567E-03	1.28E-03	1.75E-03	1.20E-03
lb/dscf[b]	0.81E-07	1.82E-07	2.50E-07	1.71E-07
μg/dscm[c]	1.30E+03	2.92E+03	4.0E+03	2.74E+03
Emission Rate:				
lb/hr[d]	0.315	0.444	0.898	0.552
μg/hr[e]	1.43E+08	2.01E+08	4.07E+08	2.51E+08
lb/ton pushed[f]	0.95E-02	1.24E-02	2.59E-02	1.59E-02

[a]Grains per dry standard cubic foot at 68°F (20°C) and 1 atm.
[b]Pounds per dry standard cubic foot at 68°F (20°C) and 1 atm.
[c]Micrograms per dry standard cubic meter at 68°F (20°C) and 1 atm.
[d]Pounds per hour.
[e]Micrograms per hour.
[f]Pounds per ton of coke pushed.

TABLE 2.8

METHYLENE CHLORIDE EXTRACTABLE MATTER CONCENTRATIONS AND EMISSION RATES - BAGHOUSE OUTLET ABC COKE, BIRMINGHAM, ALABAMA

Run No.	A-O-315-1	A-O-315-2	A-O-315-3	Average
Date	09/21/98	09/22/98	09/23/98	--
Clock Time, 24 hr Clock	1126-1911	1028-1819	1020-1806	--
Concentration:				
gr/dscf[a]	14.3E-04	5.05E-04	1.59E-04	6.97E-04
lb/dscf[b]	20.4E-08	7.21E-08	2.27E-08	9.96E-08
μg/dscm[c]	3.27E+03	1.16E+03	0.36E+03	1.60E+03
Emission Rate:				
lb/hr[d]	0.793	0.176	0.082	0.350
μg/hr[e]	36.0E+07	7.96E+07	3.70E+07	15.9E+07
lb/ton pushed[f]	2.39E-02	0.49E-02	0.24E-02	1.04E-02

[a]Grains per dry standard cubic foot at 68°F (20°C) and 1 atm.
[b]Pounds per dry standard cubic foot at 68°F (20°C) and 1 atm.
[c]Micrograms per dry standard cubic meter at 68°F (20°C) and 1 atm.
[d]Pounds per hour.
[e]Micrograms per hour.
[f]Pounds per ton of coke pushed.

TABLE 2.9

MULTIPLE METALS CONCENTRATIONS AND EMISSION RATES - BAGHOUSE OUTLET ABC COKE, BIRMINGHAM, ALABAMA

Run No.	A-O-315-1	A-O-315-2	A-O-315-3	Average
Date	09/21/98	09/22/98	09/23/98	--
Clock Time, 24 hr Clock	1126-1911	1028-1819	1020-1806	--
Antimony				
μg/dscm[a]	ND	ND	ND	ND
μg/hr[b]	ND	ND	ND	ND
lb/hr[c]	ND	ND	ND	ND
lb/ton pushed[d]	ND	ND	ND	ND
Arsenic				
μg/dscm[a]	0.63E-01	1.36E-01	1.30E-01	1.10E-01
μg/hr[b]	6,916	9,369	13,221	9,835
lb/hr[c]	1.52E-05	2.06E-05	2.91E-05	2.15E-05
lb/ton pushed[d]	4.58E-07	5.74E-07	8.38E-07	6.23E-07
Barium				
μg/dscm[a]	1.03	2.34	2.02	1.80
μg/hr[b]	1.13E+05	1.61E+05	2.06E+05	1.60E+05
lb/hr[c]	2.49E-04	3.56E-04	4.54E-04	3.53E-04
lb/ton pushed[d]	7.48E-06	9.90E-06	13.1E-06	10.1E-06
Beryllium				
μg/dscm[a]	ND	1.02E-02	1.04E-02	0.682E-02
μg/hr[b]	ND	703	1,058	587
lb/hr[c]	ND	1.55E-06	2.33E-06	1.29E-06
lb/ton pushed[d]	ND	4.30E-08	6.70E-08	3.67E-08
Cadmium				
μg/dscm[a]	1.88E-02	4.08E-02	1.82E-02	2.59E-02
μg/hr[b]	2,075	2,811	1,851	2,245
lb/hr[c]	4.56E-06	6.18E-06	4.07E-06	4.94E-06
lb/ton pushed[d]	1.37E-07	1.72E-07	1.17E-07	1.42E-07
Chromium				
μg/dscm[a]	0.398	1.019	0.909	0.775
μg/hr[b]	4.38E+04	7.03E+04	9.25E+04	6.89E+04
lb/hr[c]	0.96E-04	1.55E-04	2.04E-04	1.52E-04
lb/ton pushed[d]	2.90E-06	4.30E-06	5.87E-06	4.36E-06
Cobalt				
μg/dscm[a]	ND	ND	ND	ND
μg/hr[b]	ND	ND	ND	ND
lb/hr[c]	ND	ND	ND	ND
lb/ton pushed[d]	ND	ND	ND	ND
Copper				
μg/dscm[a]	0.586	1.22	1.14	0.984
μg/hr[b]	6.45E+04	8.43E+04	11.63E+04	8.84E+04
lb/hr[c]	1.42E-04	1.85E-04	2.56E-04	1.94E-04
lb/ton pushed[d]	4.27E-06	5.16E-06	7.37E-06	5.60E-6

TABLE 2.9 (cont'd)

Run No.	A-O-315-1	A-O-315-2	A-O-315-3	Average
Lead				
μg/dscm[a]	0.251	0.849	0.415	0.505
μg/hr[b]	2.77E+04	5.86E+04	4.23E+04	4.28E+04
lb/hr[c]	6.09E-05	12.9E-05	9.31E-05	9.43E-05
lb/ton pushed[d]	1.83E-06	3.59E-06	2.68E-06	2.70E-06
Manganese				
μg/dscm[a]	0.524	1.53	1.40	1.15
μg/hr[b]	0.576E+05	1.05E+05	1.43E+05	1.02E+05
lb/hr[c]	1.27E-04	2.32E-04	3.14E-04	2.24E-04
lb/ton pushed[d]	3.82E-06	6.46E-06	9.05E-06	6.44E-06
Mercury				
μg/dscm[a]	ND	ND	ND	ND
μg/hr[b]	ND	ND	ND	ND
lb/hr[d]	ND	ND	ND	ND
lb/ton pushed[d]	ND	ND	ND	ND
Nickel				
μg/dscm[a]	ND	0.611	0.312	0.308
μg/hr[b]	ND	4.22E+04	3.17E+04	2.46E+04
lb/hr[c]	ND	9.27E-05	6.98E-05	5.42E-05
lb/ton pushed[d]	ND	2.58E-06	2.01E-06	1.53E-06
Phosphorus				
μg/dscm[a]	3.35	5.10	5.19	4.55
μg/hr[b]	3.69E+05	3.51E+05	5.29E+05	4.16E+05
lb/hr[c]	8.11E-04	7.73E-04	11.6E-04	9.16E-04
lb/ton pushed[d]	2.44E-05	2.15E-05	3.35E-05	2.65E-05
Selenium				
μg/dscm[a]	ND	0.204	ND	0.068
μg/hr[b]	ND	1.41E+04	ND	0.468E+04
lb/hr[c]	ND	3.09E-05	ND	1.03E-05
lb/ton pushed[d]	ND	8.61E-07	ND	2.87E-07
Silver				
μg/dscm[a]	ND	ND	ND	ND
μg/hr[b]	ND	ND	ND	ND
lb/hr[c]	ND	ND	ND	ND
lb/ton pushed[d]	ND	ND	ND	ND
Thallium				
μg/dscm[a]	ND	ND	ND	ND
μg/hr[b]	ND	ND	ND	ND
lb/hr[c]	ND	ND	ND	ND
lb/ton pushed[d]	ND	ND	ND	ND

TABLE 2.9 (concluded)

Run No.	A-O-315-1	A-O-315-2	A-O-315-3	Average
Zinc				
μg/dscm[a]	2.30	4.42	3.89	3.54
μg/hr[b]	2.54E+05	3.04E+05	3.97E+05	3.18E+05
lb/hr[c]	5.58E-04	6.70E-04	8.73E-04	7.00E-04
lb/ton pushed[d]	1.68E-05	1.86E-05	2.51E-05	2.02E-05

[a]Micrograms per dry standard cubic meter.
[b]Micrograms per hour.
[c]Pounds per hour.
[d]Pounds per ton of coke pushed.
ND - non detected, counted as "zero".

Table 2.10 summarizes the multiple metals concentrations from the baghouse dust samples collected during each baghouse sample run. Baghouse samples were collected from the dust hoppers at the beginning, middle, and end of each run.

Table 2.11 summarizes the PM and MCEM removal efficiencies for the Coke Oven Battery No. 5/6 baghouse. PM removal efficiencies averaged 98.9 %. The MCEM data showed a negative removal efficiency for Run 1 and an average removal efficiency of 54.3% for Runs 2 and 3.

The following notes were recorded during the field sampling effort and analyses of samples. Events were discussed with the WAM and ESD personnel when modifications to the test plan were required.

- Cyclonic flow checks were conducted and flow patterns were non-cyclonic.
- As discussed previously, maximum process air flow rates continued for extended periods as did the sampling train sample rates.
- Calculation of isokinetics, as discussed previously, also applies to the outlet location.
- Darkness became a safety issue at the end of sample run 1. It was decided that all future sample runs would be stopped by 1830 so that personnel would be off platforms prior to darkness.

2.2.3 Underfire Stack

The combustion or underfire stack was sampled for PM and MCEM concentrations and emission rates, as well as multiple metals analysis on the MCEM filters and residue. A total of four, 180 minute sample runs were conducted at this test location.

Table 2.12 summarizes the EPA Method 315 underfire stack sample times and flue gas parameters measured. Four sample runs were conducted over the course of two days. Run No. A-U-315-3 was conducted during an operational period that did not include any coke oven charging or pushing. Data presented in the following tables is from periods of coke oven charging and pushing (test Run Nos. A-U-315-1, 2, and 4). The average sampling time was 180 minutes. The average sampling rate was 0.628 dscfm. The average sample volume was 113.032 dscf or 3.201 dscm. Flue gas temperatures averaged 454 °F, with an average stack gas composition of 2.8 % CO_2 and 14.4 % O_2. Flue gas moisture content averaged 14.1 %. The flue gas volumetric flow rate averaged 81,155 acfm or 40,071 dscfm or 1,135 dscmm. Isokinetic sampling rates for the sample runs averaged 100 %.

Table 2.13 summarizes the PM concentrations and emission rates for the underfire stack. Concentrations averaged 1.94E-02 gr/dscf or 2.77E-06 dscf or 4.45E+04 μg/dscm. Emission

TABLE 2.10

BAGHOUSE DUST MULTIPLE METALS CONCENTRATIONS ABC COKE, BIRMINGHAM, ALABAMA

Run No.	BD-AC-1	BD-AC-2	BD-AC-3	Average
Date	09/21/98	09/22/98	09/23/98	--
Antimony, $\mu g/g$[a]	ND	ND	ND	ND
Arsenic, $\mu g/g$	13.4	11.2	9.1	11.2
Barium, $\mu g/g$	27.6	37.1	27.6	30.8
Beryllium, $\mu g/g$	0.33	0.36	0.35	0.35
Cadmium, $\mu g/g$	1.2	1.0	1.2	1.1
Chromium, $\mu g/g$	16.3	10.2	10.0	12.2
Copper, $\mu g/g$	10.6	9.5	9.4	9.8
Lead, $\mu g/g$	21	16	16	18
Manganese, $\mu g/g$	24.1	16.1	16.6	18.9
Mercury, $\mu g/g$	ND	ND	ND	ND
Nickel, $\mu g/g$	20	13	13	15
Phosphorus, $\mu g/g$	39	41	36	39
Selenium, $\mu g/g$	3.8	3.2	3.7	3.6
Silver, $\mu g/g$	ND	ND	ND	ND
Thallium, $\mu g/g$	0.84	0.73	0.61	0.73
Zinc, $\mu g/g$	50.0	33.2	34.5	39.2

[a]$\mu g/g$ - Microgram per gram of dust sample.
ND - non detected, counted as "zero".

TABLE 2.11

FILTERABLE PARTICULATE MATTER AND METHYLENE CHLORIDE EXTRACTABLE MATTER REMOVAL EFFICIENCIES COKE OVEN BATTERY NO. 5/6 BAGHOUSE ABC COKE, BIRMINGHAM, ALABAMA

Test Set No.	M315-1	M-315-2	M315-3	Average
Date	09/21/98	09/22/98	09/23/98	--
Filterable Particulate Matter				
Emission Rate, lb/hr[a] Inlet Outlet	 44.4 0.315	 51.0 0.444	 56.4 0.898	 50.6 0.552
Removal Efficiency, %[b]	99.3	99.1	98.4	98.9
Extractable Organic Matter				
Emission Rate, lb/hr[a] Inlet Outlet	 0.521 0.793	 0.346 0.176	 0.202 0.082	 0.356 0.350
Removal Efficiency, %[b]	0	49.1	59.4	36.2

[a]Pounds per hour.

[b]Removal Efficiency, % = $\frac{\text{Inlet, lb/hr - Outlet, lb/hr}}{\text{Inlet, lb/hr}} \times 100$

TABLE 2.12

PARTICULATE MATTER/MCEM/METALS EMISSIONS SAMPLING AND FLUE GAS PARAMETERS - UNDERFIRE STACK ABC COKE, BIRMINGHAM, ALABAMA

Run No.	A-U-315-1	A-U-315-2	A-U-315-4	Average
Date	09/24/98	09/24/98	09/25/98	--
Total Sampling Time, minutes	180	180	180	180
Tons of Coal Charged per Hour	50.8	54.4	37.2	47.5
Avg. Sampling Rate, dscfm[a]	0.638	0.631	0.615	0.628
Sample Volume:				
dscf[b]	114.814	113.638	110.643	113.032
dscm[c]	3.251	3.218	3.133	3.201
Avg. Flue Gas Temp, °F	449	437	476	454
O_2 Conc., % by Volume	14.7	15.0	13.5	14.4
CO_2 Conc., % by Volume	2.7	3.0	2.8	2.8
Moisture, % by Volume	13.9	15.0	13.3	14.1
Flue Gas Volumetric Flow Rate:				
acfm[d]	77,737	82,178	83,514	81,155
dscfm[a]	38,682	40,898	40,634	40,071
dscmm[e]	1,095	1,158	1,151	1,135
Isokinetic Sampling Ratio, %	105	98.6	96.6	100

[a]Dry standard cubic feet per minute at 68°F (20°C) and 1 atm.
[b]Dry standard cubic feet at 68°F (20°C) and 1 atm.
[c]Dry standard cubic meters at 68°F (20°C) and 1 atm.
[d]Actual cubic feet per minute at flue gas conditions.
[e]Dry standard cubic meters per minute at 68°F (20°C) and 1 atm.

TABLE 2.13

FILTERABLE PARTICULATE MATTER CONCENTRATIONS AND EMISSION RATES - UNDERFIRE STACK ABC COKE, BIRMINGHAM, ALABAMA

Run No.	A-U-315-1	A-U-315-2	A-U-315-4	Average
Date	09/24/98	09/24/98	09/25/98	--
Clock Time, 24 hr Clock	1025-1344	1443-1806	1110-1428	--
Concentration:				
gr/dscf[a]	1.55E-02	1.91E-02	2.36E-02	1.94E-02
lb/dscf[b]	2.21E-06	2.73E-06	3.38E-06	2.77E-06
μg/dscm[c]	3.55E+04	4.38E+04	5.41E+04	4.45E+04
Emission Rate:				
lb/hr[d]	5.1	6.7	8.2	6.7
μg/hr[e]	2.33E+09	3.04E+09	3.73E+09	3.03E+09
lb/ton charged[f]	1.01E-01	1.23E-01	2.21E-01	1.49E-01

[a]Grains per dry standard cubic foot at 68°F (20°C) and 1 atm.
[b]Pounds per dry standard cubic foot at 68°F (20°C) and 1 atm.
[c]Micrograms per dry standard cubic meter at 68°F (20°C) and 1 atm.
[d]Pounds per hour.
[e]Micrograms per hour.
[f]Pounds per ton of coal charged.

rates averaged 6.7 lb/hr or 3.03E+09 μg/hr or 1.49E-01 pounds per ton of coal charged (lb/ton charged).

Table 2.14 summarizes the MCEM concentrations and emission rates for the three sample runs. Concentrations averaged 5.02E-04 gr/dscf or 7.18E-08 lb/dscf or 1.15E+03 μg/dscm. Emission rates averaged 0.17 lb/hr or 7.78E+07 μg/hr or 3.50E-03 lb/ton charged.

Table 2.15 summarizes the multiple metal concentrations and emission rates from the PM and MCEM residues of the EPA Method 315 samples. Measured underfire metals concentrations were blank corrected based on the blank quartz filter results. Several of the target analytes were below detectable quantities for most of the test runs.

The following notes were recorded during the field sampling effort and analysis of samples. Events were discussed with the WAM and ESD personnel when modifications to the test plan were required.

- Cyclonic flow checks were conducted and flow patterns were non-cyclonic.
- Scaffolding at the underfire location was strapped to the stack and additional tie downs were used to insure safety. Special brackets were fabricated onsite to allow for sampling with a 11 foot glass lined probe.
- Preliminary flows were measured all the way across both traverse cross-sections to insure laminar-consistent flow throughout the full traverse. A specially designed traverse system was used to measure these flows. The result of the traverses showed consistent measurements throughout the traverse.
- The official sample was traversed ½ of the stack through the two available sample ports. It was not possible to sample the other two ports due to physical constraints and safety concerns.
- Mark Poling of ABC Coke requested an additional sample run be performed on the Underfire Stack during nonpushing and noncharging process operations. EMC and ESD discussed this recommendation and it was agreed to. The non-pushing and non-charging run was sample run 3.
- Ports were thoroughly cleaned out by plant personnel and CCC Group (facility contractor) prior to our sampling efforts.
- The Method 429 sample system measured flow rate inaccurately during the first part of sample run 1. Flows were biased low due to misreading the manometer. This caused isokinetics to be slightly low at 87.6 %.

TABLE 2.14

METHYLENE CHLORIDE EXTRACTABLE MATTER CONCENTRATIONS AND EMISSION RATES - UNDERFIRE STACK ABC COKE, BIRMINGHAM, ALABAMA

Run No.	A-U-315-1	A-U-315-2	A-U-315-4	Average
Date	09/24/98	09/24/98	09/25/98	--
Clock Time, 24 hr Clock	1025-1344	1443-1806	1110-1428	--
Concentration:				
gr/dscf[a]	6.85E-04	5.70E-04	2.51E-04	5.02E-04
lb/dscf[b]	9.79E-08	8.15E-08	3.59E-08	7.18E-08
μg/dscm[c]	1.57E+03	1.31E+03	0.58E+03	1.15E+03
Emission Rate:				
lb/hr[d]	0.23	0.20	0.09	0.17
μg/hr[e]	10.3E+07	9.07E+07	3.97E+07	7.78E+07
lb/ton charged[f]	4.47E-03	3.67E-03	2.35E-03	3.50E-03

[a]Grains per dry standard cubic foot at 68°F (20°C) and 1 atm.
[b]Pounds per dry standard cubic foot at 68°F (20°C) and 1 atm.
[c]Micrograms per dry standard cubic meter at 68°F (20°C) and 1 atm.
[d]Pounds per hour.
[e]Micrograms per hour.
[f]Pounds per ton of coal charged.

TABLE 2.15

MULTIPLE METALS CONCENTRATIONS AND EMISSION RATES - UNDERFIRE STACK ABC COKE, BIRMINGHAM, ALABAMA

Run No.	A-U-315-1	A-U-315-2	A-U-315-4	Average
Date	09/24/98	09/24/98	09/25/98	--
Clock Time, 24 hr Clock	1025-1344	1443-1806	1110-1428	--
Antimony				
μg/dscm[a]	ND	ND	ND	ND
μg/hr[b]	ND	ND	ND	ND
lb/hr[c]	ND	ND	ND	ND
lb/ton charged[d]	ND	ND	ND	ND
Arsenic				
μg/dscm[a]	2.56E-03	4.40E-03	4.08E-03	3.68E-03
μg/hr[b]	18.4E+04	35.4E+04	32.4E+04	28.8E+04
lb/hr[c]	3.70E-07	6.73E-07	6.20E-07	5.54E-07
lb/ton charged[d]	0.73E-08	1.24E-08	1.67E-08	1.21E-08
Barium				
μg/dscm[a]	4.93E-03	10.4E-03	7.21E-03	7.53E-03
μg/hr[b]	35.5E+04	84.1E+04	57.3E+04	58.9E+04
lb/hr[c]	0.71E-06	1.60E-06	1.10E-06	1.14E-06
lb/ton charged[d]	1.40E-08	2.93E-08	2.95E-08	2.43E-08
Beryllium				
μg/dscm[a]	1.83E-05	6.04E-05	2.61E-05	3.49E-05
μg/hr[b]	1,314	4,864	2,071	2,750
lb/hr[c]	2.64E-09	9.24E-09	3.96E-09	5.28E-09
lb/ton charged[d]	0.52E-10	1.70E-10	1.07E-10	1.09E-10
Cadmium				
μg/dscm[a]	2.83E-04	3.02E-04	4.08E-04	3.31E-04
μg/hr[b]	20.3E+03	24.3E+03	32.4E+03	25.7E+03
lb/hr[c]	4.09E-08	4.62E-08	6.20E-08	4.97E-08
lb/ton charged[d]	8.06E-10	8.49E-10	16.7E-10	11.1E-10
Chromium				
μg/dscm[a]	4.75E-03	9.24E-03	5.04E-03	6.34E-03
μg/hr[b]	34.2E+04	74.3E+04	40.0E+04	49.5E+04
lb/hr[c]	6.86E-07	14.1E-07	7.66E-07	9.55E-07
lb/ton charged[d]	1.35E-08	2.60E-08	2.06E-08	2.00E-08
Cobalt				
μg/dscm[a]	ND	ND	ND	ND
μg/hr[b]	ND	ND	ND	ND
lb/hr[c]	ND	ND	ND	ND
lb/ton charged[d]	ND	ND	ND	ND
Copper				
μg/dscm[a]	4.47E-03	4.40E-03	4.95E-03	4.61E-03
μg/hr[b]	32.2E+04	35.4E+04	39.4E+04	35.7E+04
lb/hr[c]	6.47E-07	6.73E-07	7.52E-07	6.91E-07
lb/ton charged[d]	1.27E-08	1.24E-08	2.02E-08	1.51E-08

TABLE 2.15 (continued)

Run No.	A-U-315-1	A-U-315-2	A-U-315-4	Average
Lead				
μg/dscm[a]	7.39E-03	7.25E-03	4.61E-03	6.42E-03
μg/hr[b]	53.2E+04	58.4E+04	36.6E+04	49.4E+04
lb/hr[c]	10.7E-07	11.1E-07	7.00E-07	9.59E-07
lb/ton charged[d]	2.11E-08	2.04E-08	1.88E-08	2.01E-08
Manganese				
μg/dscm[a]	2.19E-03	4.84E-03	5.39E-03	4.14E-03
μg/hr[b]	15.8E+04	38.9E+04	42.8E+04	32.5E+04
lb/hr[c]	3.17E-07	7.39E-07	8.18E-07	6.25E-07
lb/ton charged[d]	0.62E-08	1.36E-08	2.20E-08	1.39E-08
Mercury				
μg/dscm[a]	ND	ND	ND	ND
μg/hr[b]	ND	ND	ND	ND
lb/hr[c]	ND	ND	ND	ND
lb/ton charged[d]	ND	ND	ND	ND
Nickel				
μg/dscm[a]	1.00E-03	2.50E-03	1.39E-03	1.63E-03
μg/hr[b]	7.22E+04	20.2E+04	11.0E+04	12.8E+04
lb/hr[c]	1.45E-07	3.83E-07	2.11E-07	2.46E-07
lb/ton charged[d]	2.86E-09	7.03E-09	5.68E-09	5.19E-09
Phosphorus				
μg/dscm[a]	1.37E-02	3.11E-02	2.61E-02	2.36E-02
μg/hr[b]	9.85E+05	25.0E+05	20.7E+05	18.5E+05
lb/hr[c]	1.98E-06	4.75E-06	3.96E-06	3.56E-06
lb/ton charged[d]	3.90E-08	8.73E-08	10.7E-08	7.76E-08
Selenium				
μg/dscm[a]	1.83E-03	3.71E-03	4.52E-03	3.35E-03
μg/hr[b]	13.1E+04	29.9E+04	35.9E+04	26.3E+04
lb/hr[c]	2.64E-07	5.68E-07	6.86E-07	5.06E-07
lb/ton charged[d]	0.52E-08	1.04E-08	1.85E-08	1.14E-08
Silver				
μg/dscm[a]	ND	ND	ND	ND
μg/hr[b]	ND	ND	ND	ND
lb/hr[c]	ND	ND	ND	ND
lb/ton charged[d]	ND	ND	ND	ND
Thallium				
μg/dscm[a]	8.22E-04	8.63E-04	6.95E-04	7.93E-04
μg/hr[b]	59.2E+03	69.5E+03	55.2E+03	61.3E+03
lb/hr[c]	1.19E-07	1.32E-07	1.06E-07	1.19E-07
lb/ton charged[d]	2.34E-09	2.43E-09	2.84E-09	2.54E-09

TABLE 2.15 (concluded)

Run No.	A-U-315-1	A-U-315-2	A-U-315-4	Average
Zinc				
μg/dscm[a]	2.37E-02	2.76E-02	2.61E-02	2.58E-02
μg/hr[b]	1.71E+06	2.22E+06	2.07E+06	2.00E+06
lb/hr[c]	3.43E-06	4.22E-06	3.96E-06	3.87E-06
lb/ton charged[d]	6.76E-08	7.76E-08	10.7E-08	8.39E-08

[a]Micrograms per dry standard cubic meter.
[b]Micrograms per hour.
[c]Pounds per hour.
[d]Pounds per ton of coal charged.

- It was not possible to run the NIOSH Method 5506 sample system due to the limited number of ports (2). One NIOSH method 5506 sample was performed at the end of the Method 429 and 315 sampling.

2.3 POLYCYCLIC AROMATIC HYDROCARBONS (PAHs)

The polycyclic aromatic hydrocarbons (PAHs) were collected using CARB Method 429, "Determination of Polycyclic Aromatic Hydrocarbons from Stationary Sources." This method was used to determine 19 individual PAHs. Particulate and gaseous phase PAHs were extracted isokinetically from each source and collected in the probe, Teflon® filter, XAD® resin and impinger portions of the sampling train. The baghouse inlet and outlet were sampled simultaneously for the measurement of PAHs. The underfire stack PAHs were sampled concurrently with the EPA Method 315 sampling train, and was performed after the baghouse sampling effort. The concentrations at all three sample locations were corrected for the method blank.

A NIOSH Method 5506 sample system was used to scan for gaseous phase PAHs at the baghouse inlet/outlet and underfire stack. The NIOSH approach was used as a backup approach to the CARB Method 429 sampling system. The PAHs had never been sampled at these sample locations and there was no previous records of PAH detectable limits or quantities. The NIOSH analytical results are presented in Appendix C. The majority of the NIOSH Method 5506 PAH results were at the method detection limits.

2.3.1 Coke Oven Battery No. 5/6 Baghouse Inlet

Table 2.16 summarizes the CARB Method 429 sample times and flue gas parameters at the baghouse inlet. One sample run was conducted per day. The average length of the sample runs was 438 minutes. The average sampling rate was 0.305 dscfm. The average sample volume was 134.585 dscf or 3.811 dscm.

The average flue gas temperature was 130 °F, with a stack gas composition of 0.2 % CO_2 and 20.3 % O_2. Moisture content averaged 3.1 %. Flue gas volumetric flow rates averaged 62,574 acfm or 53,246 dscfm or 1,508 dscmm. The isokinetic sampling rate averaged 101 %.

Table 2.17 summarizes the PAH concentrations and emission rates for the baghouse inlet. All compounds were found in detectable levels for the three test runs. Naphthalene was found in the highest concentrations, at an average of 53.7 μg/dscm. Acenphthylene and 2-methylnaphthalene were the other two compounds occurring in high concentrations (relative to the other compounds).

TABLE 2.16

PAH EMISSIONS SAMPLING AND FLUE GAS PARAMETERS - BAGHOUSE INLET ABC COKE, BIRMINGHAM, ALABAMA

Run No.	A-I-429-1	A-I-429-2	A-I-429-3	Average
Date	09/21/98	09/22/98	09/23/98	--
Total Sampling Time, minutes	458	422	435	438
Coke Oven Pushes	21	21	21	21
Tons of Coke Pushed Per Hour	33.3	35.4	34.4	34.3
Avg. Sampling Rate, dscfm[a]	0.363	0.219	0.333	0.305
Sample Volume:				
dscf[b]	166.098	92.605	145.053	134.585
dscm[c]	4.703	2.622	4.107	3.811
Avg. Flue Gas Temp, °F	120	136	135	130
O_2 Conc., % by Volume	20.3	20.3	20.3	20.3
CO_2 Conc., % by Volume	0.2	0.2	0.2	0.2
Moisture, % by Volume	3.3	3.1	2.9	3.1
Flue Gas Volumetric Flow Rate:				
acfm[d]	75,215	52,375	60,131	62,574
dscfm[a]	64,724	44,174	50,842	53,246
dscmm[e]	1,833	1,251	1,440	1,508
Isokinetic Sampling Ratio, %	99.7	88.4	116	101

[a]Dry standard cubic feet per minute at 68°F (20°C) and 1 atm.
[b]Dry standard cubic feet at 68°F (20°C) and 1 atm.
[c]Dry standard cubic meters at 68°F (20°C) and 1 atm.
[d]Actual cubic feet per minute at flue gas conditions.
[e]Dry standard cubic meters per minute at 68°F (20°C) and 1 atm.

TABLE 2.17

PAH CONCENTRATIONS AND EMISSION RATES
BAGHOUSE INLET
ABC COKE, BIRMINGHAM, ALABAMA

Run No.	A-I-429-1	A-I-429-2	A-I-429-3	Average
Date	09/21/98	09/22/98	09/23/98	--
Clock Time, 24 hr Clock	1128-1912	1018-1816	1019-1810	--
Naphthalene				
μg/dscm[a]	76.5	45.6	38.9	53.7
μg/hr[b]	8.41E+06	3.42E+06	3.36E+06	5.06E+06
lb/hr[c]	18.5E-03	7.55E-03	7.40E-03	11.2E-03
lb/ton pushed[d]	5.57E-04	2.13E-04	2.15E-04	3.28E-04
2-Methyl naphthalene				
μg/dscm[a]	16.2	9.14	9.98	11.8
μg/hr[b]	1.78E+06	0.686E+06	0.862E+06	1.11E+06
lb/hr[c]	3.92E-03	1.51E-03	1.90E-03	2.44E-03
lb/ton pushed[d]	11.8E-05	4.28E-05	5.53E-05	7.19E-05
Acenaphthylene				
μg/dscm[a]	18.7	13.7	8.03	13.5
μg/hr[b]	2.06E+06	1.03E+06	0.694E+06	1.26E+06
lb/h[c]	4.54E-03	2.27E-03	1.53E-03	2.78E-03
lb/ton pushed[d]	13.6E-05	6.42E-05	4.45-E05	8.16E-05
Acenaphthene				
μg/dscm[a]	3.19	1.64	1.53	2.12
μg/hr[b]	35.1E+04	12.3E+04	13.2E+04	20.2E+04
lb/hr[c]	7.73E-04	2.71E-04	2.92E-04	4.46E-04
lb/ton pushed[d]	23.2E-06	7.67E-06	8.50E-06	13.1E-06
Fluorene				
μg/dscm[a]	0.72	6.10	4.38	3.74
μg/hr[b]	7.95E+04	45.8E+04	37.9E+04	30.5E+04
lb/hr[c]	1.75E-04	10.1E-04	8.35E-04	6.73E-04
lb/ton pushed[d]	0.53E-05	2.85E-05	2.43E-05	1.94E-05
Phenanthrene				
μg/dscm[a]	34.0	20.2	16.1	23.4
μg/hr[b]	3.74E+06	1.51E+06	1.39E+06	2.21E+06
lb/hr[c]	8.25E-03	3.34E-03	3.06E-03	4.88E-03
lb/ton pushed[d]	24.8E-05	9.45E-05	8.90E-05	14.4E-05
Anthrancene				
μg/dscm[a]	3.40	1.64	2.22	2.42
μg/hr[b]	3.74E+05	1.23E+05	1.91E+05	2.30E+05
lb/hr[c]	8.25E-04	2.71E-04	4.22E-04	5.06E-04
lb/ton pushed[d]	2.48E-05	0.77E-05	1.23E-05	1.49E-05
Fluoranthene				
μg/dscm[a]	10.6	6.86	6.09	7.86
μg/hr[b]	11.7E+05	5.15E+05	5.26E+05	7.37E+05
lb/hr[c]	2.58E-03	1.14E-03	1.16E-03	1.62E-03
lb/ton pushed[d]	7.74E-05	3.21E-05	3.37E-05	4.77E-05

TABLE 2.17 (continued)

Run No.	A-I-429-1	A-I-429-2	A-I-429-3	Average
Pyrene				
μg/dscm[a]	7.02	4.96	4.38	5.45
μg/hr[b]	7.72E+05	3.72E+05	3.79E+05	5.07E+05
lb/hr[c]	17.0E-04	8.20E-04	8.35E-04	11.2E-04
lb/ton pushed[d]	5.11E-05	2.32E-05	2.43E-05	3.28E-05
Benzo(a) Anthrancene				
μg/dscm[a]	3.19	2.67	2.68	2.85
μg/hr[b]	3.51E+05	2.00E+05	2.31E+05	2.61E+05
lb/hr[c]	7.73E-04	4.42E-04	5.10E-04	5.75E-04
lb/ton pushed[d]	2.32E-05	1.25E-05	1.48E-05	1.68E-05
Chrysene				
μg/dscm[a]	5.53	4.58	4.38	4.83
μg/hr[b]	60.8E+04	34.3E+04	37.9E+04	44.3E+04
lb/hr[c]	13.4E-04	7.57E-04	8.35E-04	9.77E-04
lb/ton pushed[d]	4.02E-05	2.14E-05	2.43E-05	2.86E-05
Benzo(b) Fluoranthene				
μg/dscm[a]	3.61	1.98	1.49	2.36
μg/hr[b]	39.7E+04	14.9E+04	12.8E+04	22.5E+04
lb/hr[c]	8.76E-04	3.28E-04	2.83E-04	4.96E-04
lb/ton pushed[d]	26.3E-06	9.27E-06	8.23E-06	14.6E-06
Benzo(k) Fluoranthene				
μg/dscm[a]	1.96	1.41	0.876	1.41
μg/hr[b]	21.5E+04	10.6E+04	7.57E+04	13.2E+04
lb/hr[c]	4.74E-04	2.33E-04	1.67E-04	2.92E-04
lb/ton pushed[d]	14.2E-06	6.60E-06	4.86E-06	8.56E-06
Benzo(e) Pyrene				
μg/dscm[a]	1.38	0.992	0.803	1.06
μg/hr[b]	15.2E+04	7.44E+04	6.94E+04	9.86E+04
lb/hr[c]	3.35E-04	1.64E-04	1.53E-04	2.17E-04
lb/ton pushed[d]	10.1E-06	4.64E-06	4.45E-06	6.38E-06
Benzo(a) Pyrene				
μg/dscm[a]	1.34	0.725	0.438	0.834
μg/hr[b]	14.7E+04	5.44E+04	3.79E+04	7.98E+04
lb/hr[c]	3.25E-04	1.20E-04	0.84E-04	1.76E-04
lb/ton pushed[d]	9.75E-06	3.39E-06	2.43E-06	5.19E-06
Perylene				
μg/dscm[a]	0.234	0.110	0.070	0.136
μg/hr[b]	25.7E+03	8.01E+03	5.89E+03	13.2E+03
lb/hr[c]	5.67E-05	1.77E-05	1.30E-05	2.91E-05
lb/ton pushed[d]	17.0E-07	4.99E-07	3.78E-07	8.60E-07
Indeno(1,2,3-cd) Pyrene				
μg/dscm[a]	2.34	1.64	0.949	1.64
μg/hr[b]	25.7E+04	12.3E+04	8.20E+04	15.4E+04
lb/hr[c]	5.67E-04	2.71E-04	1.81E-04	3.40E-04
lb/ton pushed[d]	17.0E-06	7.67E-06	5.26E-06	9.98E-06

TABLE 2.17 (concluded)

Run No.	A-I-429-1	A-I-429-2	A-I-429-3	Average
Dibenz(a,h) Anthracene				
μg/dscm[a]	0.532	0.419	0.239	0.397
μg/hr[b]	58.5E+03	31.5E+03	20.6E+03	36.8E+06
lb/hr[c]	12.9E-05	6.49E-05	4.54E-05	8.12E-05
lb/ton pushed[d]	3.87E-06	1.96E-06	1.32E-06	2.38E-06
Benzo(g,h,i) Perylene				
μg/dscm[a]	2.34	1.45	0.974	1.59
μg/hr[b]	25.7E+04	10.9E+04	8.41E+04	15.0E+04
lb/hr[c]	5.67E-04	2.40E-04	1.85E-04	3.31E-04
lb/ton pushed[d]	17.0E-06	6.78E-06	5.40E-06	9.73E-06

[a]Micrograms per dry standard cubic meter.
[b]Micrograms per hour.
[c]Pounds per hour.
[d]Pounds per ton of coke pushed.

2.3.2 Coke Oven Battery No. 5/6 Baghouse Outlet

The baghouse outlet was sampled simultaneously with the baghouse inlet. Table 2.18 summarizes the Method 429 sample times and flue gas parameters measured at the baghouse outlet. The average sampling length of the three tests was 411 minutes. The average sampling rate was 0.323 dscfm. Sampling volumes averaged 133.174 dscf or 3.771 dscm.

Flue gas temperatures averaged 123 °F, with an average stack gas composition of 0.2 % CO_2 and 20.4 % O_2. Moisture content averaged 2.5 %. Flue gas volumetric flow rates averaged 62,193 acfm or 54,620 dscfm or 1,547 dscmm. The isokinetic sampling rate averaged 95.6 %.

Table 2.19 summarizes the PAH concentrations and emission rates for the baghouse outlet. Naphthalene and phenathrene were the compounds found in the highest concentration of the 19 compounds analyzed for, at 42.1 μg/dscm and 9.95 μg/dscm, respectively. All of the other compounds were detected in lower concentrations than naphthalene and 2-methyl naphthalene. Several of the compounds were non detectable.

2.3.3 Underfire Stack

The underfire or combustion stack was sampled over the course of two days. Sample runs were 180 minutes in length. Four sample runs were conducted, of which three were during coke oven charging and pushing operations. One run was conducted during non-charging and pushing operations. Table 2.20 summarizes the CARB Method 429 sample times and flue gas parameters measured at the underfire stack. The average sampling rate was 0.604 dscfm, with an average sampling volume of 108.740 dscf or 3.079 dscm. Flue gas temperatures averaged 450 °F. Flue gas composition averaged 2.8 % CO_2 and 14.4 %O_2, with an average moisture content of 14.9 %. Flue gas volumetric flow rates averaged 82,704 acfm or 40,655 dscfm or 1,151 dscmm. Isokinetic sampling rate averaged 95.1 %.

Table 2.21 summarizes the PAH concentrations and emission rates for the underfire stack. Many of the target PAH analytes were detected in the analyzed samples with the exception of perylene, indeno (1,2,3-cd), benzo(g,h,i) perylene, and dibenz(a,h) anthracene. Naphthalene and acenaphthylene were present in the highest concentrations.

2.4 NON-PUSHING AND NON-CHARGING COKE OVEN BATTERY OPERATION - UNDERFIRE STACK

On September 25, 1998, one sample run was conducted at the underfire stack for particulate, MCEM/metals and PAHs prior to the start of coke oven pushing and charging operations. Sampling was conducted for comparative purposes to emissions measured during coke oven pushing and charging operations. Currently there is no known emission data for the non-pushing and non-charging condition. It was attempted to conduct sampling at the underfire stack for the same length of time as during the other underfire stack sampling runs.

TABLE 2.18

PAH EMISSIONS SAMPLING AND FLUE GAS PARAMETERS - BAGHOUSE OUTLET ABC COKE, BIRMINGHAM, ALABAMA

Run No.	A-O-429-1	A-O-429-2	A-O-429-3	Average
Date	09/21/98	09/22/98	09/23/98	--
Total Sampling Time, minutes	412	400	420	411
Coke Oven Pushes	20	23	23	22
Tons of Coke Pushed Per Hour	33.2	35.9	34.7	34.6
Avg. Sampling Rate, dscfm[a]	0.381	0.241	0.347	0.323
Sample Volume:				
dscf[b]	157.065	96.553	145.903	133.174
dscm[c]	4.448	2.734	4.132	3.771
Avg. Flue Gas Temp, °F	117	128	125	123
O_2 Conc., % by Volume	20.4	20.4	20.4	20.4
CO_2 Conc., % by Volume	0.20	0.20	0.10	0.20
Moisture, % by Volume	3.2	2.7	1.7	2.5
Flue Gas Volumetric Flow Rate:				
acfm[d]	72,960	46,062	67,558	62,193
dscfm[a]	64,153	39,996	59,710	54,620
dscmm[e]	1,817	1,133	1,691	1,547
Isokinetic Sampling Ratio, %	96.3	97.8	92.6	95.6

[a]Dry standard cubic feet per minute at 68°F (20°C) and 1 atm.
[b]Dry standard cubic feet at 68°F (20°C) and 1 atm.
[c]Dry standard cubic meters at 68°F (20°C) and 1 atm.
[d]Actual cubic feet per minute at flue gas conditions.
[e]Dry standard cubic meters per minute at 68°F (20°C) and 1 atm.

TABLE 2.19

PAH CONCENTRATIONS AND EMISSION RATES
BAGHOUSE OUTLET
ABC COKE, BIRMINGHAM, ALABAMA

Run No.	A-O-429-1	A-O-429-2	A-O-429-3	Average
Date	09/21/98	09/22/98	09/23/98	--
Clock Time, 24 hr Clock	1126-1911	1028-1819	1020-1806	--
Naphthalene				
μg/dscm[a]	65.1	34.6	26.5	42.1
μg/hr[b]	7.10E+06	2.35E+06	2.69E+06	4.05E+06
lb/hr[c]	15.6E-03	5.19E-03	5.94E-03	8.92E-03
lb/ton pushed[d]	4.71E-04	1.44E-04	1.71E-04	2.62E-04
2-Methyl naphthalene				
μg/dscm[a]	12.4	8.77	8.71	9.95
μg/hr[b]	13.5E+05	5.96E+05	8.83E+05	9.42E+05
lb/hr[c]	2.97E-03	1.31E-03	1.95E-03	2.08E-03
lb/ton pushed[d]	8.94E-05	3.66E-05	5.61E-05	6.07E-05
Acenaphthylene				
μg/dscm[a]	11.2	8.05	4.11	7.80
μg/hr[b]	12.3E+05	5.47E+05	4.17E+05	7.30E+05
lb/hr[c]	2.70E-03	1.21E-03	0.92E-03	1.61E-03
lb/ton pushed[d]	8.13E-05	3.36E-05	2.65E-05	4.71E-05
Acenaphthene				
μg/dscm[a]	1.57	0.914	0.847	1.11
μg/hr[b]	17.2E+04	6.21E+04	8.59E+04	10.7E+04
lb/hr[c]	3.78E-04	1.37E-04	1.89E-04	2.35E-04
lb/ton pushed[d]	11.4E-06	3.81E-06	5.46E-06	6.89E-06
Fluorene				
μg/dscm[a]	4.72	2.74	2.13	3.20
μg/hr[b]	5.15E+05	1.86E+05	2.16E+05	3.06E+05
lb/hr[c]	11.3E-04	4.11E-04	4.76E-04	6.74E-04
lb/ton pushed[d]	3.42E-05	1.14E-05	1.37E-05	1.98E-05
Phenanthrene				
μg/dscm[a]	14.8	16.5	6.50	12.6
μg/hr[b]	1.62E+06	1.12E+06	0.662E+06	1.13E+06
lb/hr[c]	3.56E-03	2.46E-03	1.46E-03	2.50E-03
lb/ton pushed[d]	10.7E-05	6.86E-05	4.21E-05	7.27E-05
Anthrancene				
μg/dscm[a]	4.50	1.21	1.23	2.31
μg/hr[b]	49.0E+04	8.20E+04	12.5E+04	23.2E+04
lb/hr[c]	10.8E-04	1.81E-04	2.76E-04	5.12E-04
lb/ton pushed[d]	32.5E-06	5.03E-06	7.95E-06	15.2E-06
Fluoranthene				
μg/dscm[a]	4.50	1.21	1.23	2.31
μg/hr[b]	49.0E+04	82.0E+04	12.5E+04	23.2E+04
lb/hr[c]	10.8E-04	1.81E-04	2.76E-04	5.12E-04
lb/ton pushed[d]	32.5E-06	5.03E-06	7.95E-06	15.2E-06

TABLE 2.19 (continued)

Run No.	A-O-429-1	A-O-429-2	A-O-429-3	Average
Pyrene				
μg/dscm[a]	3.60	2.96	1.55	2.70
μg/hr[b]	3.92E+05	2.01E+05	1.57E+05	2.50E+05
lb/hr[c]	8.64E-04	4.44E-04	3.46E-04	5.52E-04
lb/ton pushed[d]	2.60E-05	1.24E-05	1.00E-05	1.61E-05
Benzo(a) Anthrancene				
μg/dscm[a]	0.07	0.09	0.06	0.07
μg/hr[b]	7.11E+03	5.97E+03	5.89E+03	6.32E+03
lb/hr[c]	1.57E-05	1.32E-05	1.30E-05	1.39E-05
lb/ton pushed[d]	4.72E-07	3.66E-07	3.74E-07	4.04E-07
Chrysene				
μg/dscm[a]	0.166	0.234	0.167	0.189
μg/hr[b]	18.1E+03	15.9E+03	16.9E+03	17.0E+03
lb/hr[c]	4.00E-05	3.51E-05	3.74E-05	3.75E-05
lb/ton pushed[d]	1.20E-06	0.98E-06	1.08E-06	1.09E-06
Benzo(b) Fluoranthene				
μg/dscm[a]	0.045	0.066	0.051	0.054
μg/hr[b]	4,901	4,474	5,156	4,844
lb/hr[c]	1.08E-05	0.99E-05	1.14E-05	1.07E-05
lb/ton pushed[d]	3.25E-07	2.75E-07	3.27E-07	3.09E-07
Benzo(k) Fluoranthene				
μg/dscm[a]	0.045	0.059	0.034	0.046
μg/hr[b]	4,901	3,977	3,438	4,105
lb/hr[c]	10.8E-06	8.77E-06	7.58E-06	9.05E-06
lb/ton pushed[d]	3.25E-07	2.44E-07	2.18E-07	2.63E-07
Benzo(e) Pyrene				
μg/dscm[a]	0.029	ND	0.027	0.019
μg/hr[b]	3,186	ND	2,701	1,962
lb/hr[c]	7.02E-06	ND	5.95E-06	4.33E-06
lb/ton pushed[d]	2.11E-07	ND	1.72E-07	1.28E-07
Benzo(a) Pyrene				
μg/dscm[a]	ND	ND	ND	ND
μg/hr[b]	ND	ND	ND	ND
lb/hr[c]	ND	ND	ND	ND
lb/ton pushed[d]	ND	ND	ND	ND
Perylene				
μg/dscm[a]	ND	ND	ND	ND
μg/hr[b]	ND	ND	ND	ND
lb/hr[c]	ND	ND	ND	ND
μg/push[d]	ND	ND	ND	ND
Indeno(1,2,3-cd) Pyrene				
μg/dscm[a]	ND	ND	ND	ND
μg/hr[b]	ND	ND	ND	ND
lb/hr[c]	ND	ND	ND	ND
lb/ton pushed[d]	ND	ND	ND	ND

TABLE 2.19 (concluded)

Run No.	A-O-429-1	A-O-429-2	A-O-429-3	Average
Dibenz(a,h) Anthracene				
μg/dscm[a]	ND	ND	ND	ND
μg/hr[b]	ND	ND	ND	ND
lb/hr[c]	ND	ND	ND	ND
μg/push[d]	ND	ND	ND	ND
Benzo(g,h,i) Perylene				
μg/dscm[a]	ND	ND	ND	ND
μg/hr[b]	ND	ND	ND	ND
lb/hr[c]	ND	ND	ND	ND
μg/push[d]	ND	ND	ND	ND

[a]Micrograms per dry standard cubic meter.
[b]Micrograms per hour.
[c]Pounds per hour.
[d]Pounds per ton of coke pushed.
ND - nonected, counted as "zero".

TABLE 2.20

PAH EMISSIONS SAMPLING AND FLUE GAS PARAMETERS - UNDERFIRE STACK ABC COKE, BIRMINGHAM, ALABAMA

Run No.	A-U-429-1	A-U-429-2	A-U-429-4	Average
Date	09/24/98	09/24/98	09/25/98	--
Total Sampling Time, minutes	180	180	180	180
Tons of Coal Charged Per Hour	50.6	52.9	37.4	47.0
Avg. Sampling Rate, dscfm[a]	0.579	0.616	0.618	0.604
Sample Volume: dscf[b] dscm[c]	 104.145 2.949	 110.807 3.138	 111.269 3.151	 108.740 3.079
Avg. Flue Gas Temp, °F	435	454	460	450
O_2 Conc., % by Volume	14.7	15.0	13.5	14.4
CO_2 Conc., % by Volume	2.7	3.0	2.8	2.8
Moisture, % by Volume	16.3	14.8	13.5	14.9
Flue Gas Volumetric Flow Rate: acfm[d] dscfm[a] dscmm[e]	 85,825 42,176 1,194	 80,320 39,328 1,114	 81,996 40,461 1,146	 82,704 40,655 1,151
Isokinetic Sampling Ratio, %	87.6	100	97.6	95.1

[a]Dry standard cubic feet per minute at 68°F (20°C) and 1 atm.
[b]Dry standard cubic feet at 68°F (20°C) and 1 atm.
[c]Dry standard cubic meters at 68°F (20°C) and 1 atm.
[d]Actual cubic feet per minute at flue gas conditions.
[e]Dry standard cubic meters per minute at 68°F (20°C) and 1 atm.

TABLE 2.21

PAH CONCENTRATIONS AND EMISSION RATES
UNDERFIRE STACK
ABC COKE, BIRMINGHAM, ALABAMA

Run No.	A-U-429-1	A-U-429-2	A-U-429-4	Average
Date	09/24/98	09/24/98	09/25/98	--
Clock Time, 24 hr Clock	1025-1345	1443-1812	1110-1427	--
Naphthalene				
μg/dscm[a]	33.8	41.3	31.3	35.5
μg/hr[b]	2.42E+06	2.76E+06	2.15E+06	2.44E+06
lb/hr[c]	5.34E-03	6.09E-03	4.75E-03	5.39E-03
lb/ton charged[d]	1.05E-04	1.15E-04	1.27E-04	1.16E-04
2-Methyl naphthalene				
μg/dscm[a]	0.970	0.725	1.39	1.03
μg/hr[b]	69.9E+03	48.4E+03	95.5E+03	71.3E+03
lb/hr[c]	1.54E-04	1.07E-04	2.10E-04	1.57E-04
lb/ton charged[d]	3.04E-06	2.02E-06	5.63E-06	3.56E-06
Acenaphthylene				
μg/dscm[a]	5.43	21.7	ND	13.5
μg/hr[b]	3.89E+05	14.5E+05	ND	9.18E+05
lb/hr[c]	8.57E-04	31.9E-04	ND	20.2E-04
lb/ton charged[d]	1.69E-05	6.04E-05	ND	2.58E-05
Acenaphthene				
μg/dscm[a]	0.09	0.08	0.08	0.08
μg/hr[b]	6.80E+03	5.11E+03	5.24E+03	5.72E+03
lb/hr[c]	1.50E-05	1.13E-05	1.15E-05	1.26E-05
lb/ton charged[d]	2.96E-07	2.13E-07	3.09E-07	2.73E-07
Fluorene				
μg/dscm[a]	0.315	0.220	0.413	0.316
μg/hr[b]	22.6E+03	14.7E+03	28.4E+03	21.9E+03
lb/hr[c]	4.98E-05	3.24E-05	6.25E-05	4.82E-05
lb/ton charged[d]	9.84E-07	6.13E-07	16.7E-07	10.9E-07
Phenanthrene				
μg/dscm[a]	3.72	6.37	0.564	3.55
μg/hr[b]	26.7E+04	42.5E+04	3.87E+04	24.4E+04
lb/hr[c]	5.88E-04	9.38E-04	0.85E-04	5.37E-04
lb/ton charged[d]	1.16E-05	1.77E-05	0.23E-05	1.05E-05
Anthrancene				
μg/dscm[a]	0.105	0.147	0.089	0.114
μg/hr[b]	7.53E+03	9.80E+03	6.11E+03	7.81E+03
lb/hr[c]	1.66E-05	2.16E-05	1.35E-05	1.72E-05
lb/ton charged[d]	3.28E-07	4.09E-07	3.60E-07	3.66E-07
Fluoranthene				
μg/dscm[a]	1.83	3.82	2.25	2.64
μg/hr[b]	13.1E+04	25.6E+04	15.5E+04	18.1E+04
lb/hr[c]	2.89E-04	5.63E-04	3.42E-04	3.98E-04
lb/ton charged[d]	5.71E-06	10.7E-06	9.13E-06	8.50E-06

TABLE 2.21 (continued)

Run No.	A-U-429-1	A-U-429-2	A-U-429-4	Average
Pyrene				
μg/dscm[a]	0.916	6.69	1.46	3.02
μg/hr[b]	0.66E+05	4.47E+05	1.00E+05	2.04E+05
lb/hr[c]	1.45E-04	9.86E-04	2.21E-04	4.51E-04
lb/ton charged[d]	2.86E-06	18.7E-06	5.92E-06	9.14E-06
Benzo(a) Anthrancene				
μg/dscm[a]	5.43E-02	3.19E-02	4.76E-02	4.46E-02
μg/hr[b]	3.89E+03	2.13E+03	3.27E+03	3.10E+03
lb/hr[c]	8.57E-06	4.69E-06	7.22E-06	6.83E-06
lb/ton charged[d]	1.69E-07	0.89E-07	1.93E-07	1.50E-07
Chrysene				
μg/dscm[a]	0.129	0.147	0.165	0.147
μg/hr[b]	9.23E+03	9.80E+03	11.3E+03	10.1E+03
lb/hr[c]	2.04E-05	2.16E-05	2.50E-05	2.23E-05
lb/ton charged[d]	4.02E-07	4.09E-07	6.69E-07	4.93E-07
Benzo(b) Fluoranthene				
μg/dscm[a]	0.09	0.13	0.08	0.10
μg/hr[b]	6.56E+03	8.94E+03	5.67E+03	7.06E+03
lb/hr[c]	1.45E-05	1.97E-05	1.25E-05	1.56E-05
lb/ton charged[d]	2.86E-07	3.73E-07	3.34E-07	3.31E-07
Benzo(k) Fluoranthene				
μg/dscm[a]	ND	4.14E-02	3.49E-02	2.54E-02
μg/hr[b]	ND	2.77E+03	2.40E+03	1.72E+03
lb/hr[c]	ND	6.10E-06	5.29E-06	3.80E-06
lb/ton charged[d]	ND	1.15E-07	1.42E-07	0.86E-07
Benzo(e) Pyrene				
μg/dscm[a]	0.10	0.45	0.10	0.21
μg/hr[b]	7.05E+03	29.8E+03	6.55E+03	14.5E+03
lb/hr[c]	1.55E-05	6.57E-05	1.44E-05	3.19E-05
lb/ton charged[d]	3.07E-07	12.4E-07	3.86E-07	6.45E-07
Benzo(a) Pyrene				
μg/dscm[a]	0.08	0.07	0.05	0.07
μg/hr[b]	5.59E+03	4.47E+03	3.49E+03	4.51E+03
lb/hr[c]	12.3E-06	9.86E-06	7.70E-06	9.96E-06
lb/ton charged[d]	2.43E-07	1.87E-07	2.06E-07	2.12E-07
Perylene				
μg/dscm[a]	ND	ND	ND	ND
μg/hr[b]	ND	ND	ND	ND
lb/hr[c]	ND	ND	ND	ND
lb/ton charged[d]	ND	ND	ND	ND
Indeno(1,2,3-cd) Pyrene				
μg/dscm[a]	ND	ND	ND	ND
μg/hr[b]	ND	ND	ND	ND
lb/hr[c]	ND	ND	ND	ND
lb/ton charged[d]	ND	ND	ND	ND

TABLE 2.21 (concluded)

Run No.	A-U-429-1	A-U-429-2	A-U-429-4	Average
Dibenz(a,h) Anthracene				
μg/dscm[a]	ND	ND	ND	ND
μg/hr[b]	ND	ND	ND	ND
lb/hr[c]	ND	ND	ND	ND
lb/ton charged[d]	ND	ND	ND	ND
Benzo(g,h,i) Perylene				
μg/dscm[a]	ND	ND	ND	ND
μg/hr[b]	ND	ND	ND	ND
lb/hr[c]	ND	ND	ND	ND
lb/ton charged[d]	ND	ND	ND	ND

[a]Micrograms per dry standard cubic meter.
[b]Micrograms per hour.
[c]Pounds per hour.
[d]Pounds per ton of coal charged.
ND - non detected, counted as "zero".

Table 2.22 summarizes the EPA Method 315 and CARB Method 429 flue gas parameters for the sample runs. The tests were run for a minimum of 171 minutes for both sampling trains. One sampling port was traversed with each sample train to maximize length of time for sampling prior to the start of coke oven pushing and charging for the day.

Table 2.23 summarizes the results of the particulate matter/MCEM concentrations and emission rates for the EPA Method 315 sampling train. Particulate matter concentrations were 0.020 gr/dscf or 2.86E-06 lb/dscf or 4.59E+04 μg/dscm. Emission rate of particulate matter was 7.20 lb/hr or 3.28E+09 μg/hr. MCEM concentrations averaged 0.001 gr/dscf or 0.14E-06 lb/dscf or 0.23E+04 μg/dscm. Emission rate of MCEM was 0.36 lb/hr or 0.17E+09 μg/hr.

Table 2.24 summarizes the metals concentrations and emission rates from the EPA Method 315 particulate/MCEM analysis. Antimony, cobalt, mercury, and silver were not detected in this sample. Zinc, phosphorus, and chromium were present in the greatest quantities.

Table 2.25 summarizes the PAH concentrations and emission rates for the CARB Method 429 sample run. The majority of the compounds were detected in the sample, with naphthalene, acenaphthylene and penanthrene in the greatest quantity. Seven of the target analytes of 19 total were not detected in the sample.

TABLE 2.22

PARTICULATE MATTER/MCEM/METALS AND PAH EMISSIONS SAMPLING AND FLUE GAS PARAMETERS - UNDERFIRE STACK NON-PUSHING AND NON-CHARGING OPERATION ABC COKE, BIRMINGHAM, ALABAMA

Run No.	A-U-315-3	A-U-429-3
Date	09/25/98	09/25/98
Total Sampling Time, minutes	171.4	172.5
Avg. Sampling Rate, dscfm[a]	0.642	0.545
Sample Volume:		
dscf[b]	110.010	93.963
dscm[c]	3.115	2.661
Avg. Flue Gas Temp, °F	480	465
O_2 Conc., % by Volume	13.2	13.2
CO_2 Conc., % by Volume	2.7	2.7
Moisture, % by Volume	14.4	14.0
Flue Gas Volumetric Flow Rate:		
acfm[d]	87,884	72,571
dscfm[a]	42,039	35,427
dscmm[e]	1,190	1,003
Isokinetic Sampling Rates, %	97.5	98.2

[a]Dry standard cubic feet per minute at 68°F (20°C) and 1 atm.
[b]Dry standard cubic feet at 68°F (20°C) and 1 atm.
[c]Dry standard cubic meters at 68°F (20°C) and 1 atm.
[d]Actual feet per minute at flue gas conditions.
[e]Dry standard cubic meters per minute at 68°F (20°C) and 1 atm.

TABLE 2.23

PARTICULATE MATTER/MCEM CONCENTRATIONS AND EMISSION RATES
UNDERFIRE STACK
NON-PUSHING AND NON-CHARGING OPERATION
ABC COKE, BIRMINGHAM, ALABAMA

	Filterable Particulate Matter	MCEM
Run No.	**A-U-315-3**	
Date	09/25/98	
Clock Time, 24 hr Clock	0738-1029	
Concentration:		
gr/dscf[a]	0.020	0.001
lb/dscf[b]	2.86E-06	0.14E-06
μg/dscm[c]	4.59E+04	0.23E+04
Emission Rate:		
lb/hr[d]	7.20	0.36
μg/hr[e]	3.28E+09	0.17E+09

[a]Grains per dry standard cubic feet at 68°F (20°C) and 1 atm.
[b]Pounds per dry standard cubic foot at 68°F(20°C) and 1 atm.
[c]Micrograms per dry standard cubic meter at 68°F (20°C) and 1 atm.
[d]Pounds per hour.
[e]Micrograms per hour.

TABLE 2.24

MULTIPLE METALS CONCENTRATIONS AND EMISSION RATES
UNDERFIRE STACK
NON-PUSHING AND NON-CHARGING OPERATION
ABC COKE, BIRMINGHAM, ALABAMA

Run No.	A-U-315-3
Date	9/25/98
Clock Time, 24 hr Clock	0738-1029
Antimony	
μg/dscm[a]	ND
μg/hr[b]	ND
lb/hr[c]	ND
Arsenic	
μg/dscm[a]	3.44E-03
μg/hr[b]	29.3E+04
lb/hr[c]	5.41E-07
Barium	
μg/dscm[a]	6.55E-03
μg/hr[b]	55.7E+04
lb/hr[c]	1.03E-06
Beryllium	
μg/dscm[a]	2.52E-05
μg/hr[b]	2,143
lb/hr[c]	3.96E-09
Cadmium	
μg/dscm[a]	3.78E-04
μg/hr[b]	3.21E+04
lb/hr[c]	5.94E-08
Chromium	
μg/dscm[a]	5.63E-03
μg/hr[b]	47.9E+04
lb/hr[c]	8.84E-07
Cobalt	
μg/dscm[a]	ND
μg/hr[b]	ND
lb/hr[c]	ND
Copper	
μg/dscm[a]	3.86E-03
μg/hr[b]	32.9E+04
lb/hr[c]	6.07E-04
Lead	
μg/dscm[a]	3.61E-03
μg/hr[b]	30.7E+04
lb/hr[c]	5.68E-07
Manganese	
μg/dscm[a]	2.35E-03
μg/hr[b]	20.0E+04
lb/hr[c]	3.70E-07
Mercury	
μg/dscm[a]	ND
μg/hr[b]	ND
lb/hr[c]	ND
Nickel	
μg/dscm[a]	1.60E-03
μg/hr[b]	13.6E+04
lb/hr[c]	2.51E-07
Phosphorus	
μg/dscm[a]	1.51E-02
μg/hr[b]	128.6E+04
lb/hr[c]	2.38E-06
Selenium	
μg/dscm[a]	3.78E-03
μg/hr[b]	32.1E+04
lb/hr[c]	5.94E-07
Silver	
μg/dscm[a]	ND
μg/hr[b]	ND
lb/hr[c]	ND
Thallium	
μg/dscm[a]	5.04E-04
μg/hr[b]	4.29E+04
lb/hr[c]	7.92E-08
Zinc	
μg/dscm[a]	2.44E-02
μg/hr[b]	207.1E+04
lb/hr[c]	3.83E-06

[a]Micrograms per dry standard cubic meter.
[b]Micrograms per hour.
[c]Pounds per hour.
ND - non detected, counted as "zero".

TABLE 2.25

PAH CONCENTRATIONS AND EMISSION RATESUNDERFIRE STACK NON-PUSHING AND NON-CHARGING OPERATION ABC COKE, BIRMINGHAM, ALABAMA

Run No.	A-U-429-3
Date	9/25/98
Clock Time, 24 hr Clock	0738-1029
Naphthalene	
μg/dscm[a]	28.44
μg/hr[b]	171.1E+04
lb/hr[c]	3.77E-03
2-Methylnaphthalene	
μg/dscm[a]	0.59
μg/hr[b]	3.56E+04
lb/hr[c]	7.85E-05
Acenaphthylene	
μg/dscm[a]	4.89
μg/hr[b]	29.4E+04
lb/hr[c]	6.48E-04
Acenaphthene	
μg/dscm[a]	0.05
μg/hr[b]	2,715
lb/hr[c]	5.98E-06
Fluorene	
μg/dscm[a]	0.14
μg/hr[b]	8,144
lb/hr[c]	1.80E-05
Phenanthrene	
μg/dscm[a]	3.71
μg/hr[b]	22.3E+04
lb/hr[c]	4.93E-04
Anthrancene	
μg/dscm[a]	0.08
μg/hr[b]	4,977
lb/hr[c]	1.10E-05
Fluoranthene	
μg/dscm[a]	1.80
μg/hr[b]	10.9E+04
lb/hr[c]	2.39E-04
Pyrene	
μg/dscm[a]	1.24
μg/hr[b]	7.47E+04
lb/hr[c]	1.65E-04

Benzo(a) Anthrancene	
μg/dscm[a]	ND
μg/hr[b]	ND
lb/hr[c]	ND
Chrysene	
μg/dscm[a]	0.11
μg/hr[b]	6,560
lb/hr[c]	1.45E-05
Benzo(b) Fluoranthene	
μg/dscm[a]	0.08
μg/hr[b]	4,751
lb/hr[c]	1.05E-05
Benzo(k) Fluoranthene	
μg/dscm[a]	ND
μg/hr[b]	ND
lb/hr[c]	ND
Benzo(e) Pyrene	
μg/dscm[a]	0.13
μg/hr[b]	7,918
lb/hr[c]	1.75E-05
Benzo(a) Pyrene	
μg/dscm[a]	ND
μg/hr[b]	ND
lb/hr[c]	ND
Perylene	
μg/dscm[a]	ND
μg/hr[b]	ND
lb/hr[c]	ND
Indo(1,2,3-cd) Pyrene	
μg/dscm[a]	ND
μg/hr[b]	ND
lb/hr[c]	ND
Dibenz(a,h) Anthracene	
μg/dscm[a]	ND
μg/hr[b]	ND
lb/hr[c]	ND
Benzo(g,h,i) Perylene	
μg/dscm[a]	ND
μg/hr[b]	ND
lb/hr[c]	ND

[a]Micrograms per dry standard cubic meter.
[b]Micrograms per hour.
[c]Pounds per hour.
ND - non detected, counted as "zero".

3.0 PROCESS AND CONTROL EQUIPMENT OPERATION

3.1 INTRODUCTION

ABC Coke in Birmingham, Alabama produces foundry coke from three coke oven batteries. Battery No. 1A is a 5-meter Wilputte battery with 78 ovens built in 1967. Batteries No. 5 and No. 6 are 4-meter Koppers-Becker batteries with 25 and 29 ovens, respectively. Battery No. 5 was built in 1941, and Battery No. 6 was built in 1951. Both use coke oven gas (COG) to fuel a gun flue underfiring system. The batteries are end-to-end and are operated as one battery (Battery No. 5/6). They share a baghouse and combustion stack and are served by a common rail.

Batteries No. 1A and No. 5/6 each capture pushing emissions with a moveable Trav-L-Vent Flakt hood and fixed duct capture system vented to a baghouse. ABC Coke was selected for testing from the foundry coke producers because the hoods used to capture pushing emissions have good capture efficiency and the pushing emission control system is representative of the industry. Battery No. 5/6 was selected because it reportedly has better capture efficiency than Battery No. 1A, and when the site was selected for testing, repairs (which could interfere with testing) were anticipated on Battery No. 1A.

3.2 PROCESS DESCRIPTION

3.2.1 Pushing

The pushing sequence used at ABC Coke is the "Koppers" system, in which ovens 1, 11, 21... are pushed, followed by ovens 3, 13, 23.... The even-numbered ovens, 2, 22, 32...through 8, 18, 28...are pushed after the odd-numbered ovens. Since there are no zeros in any of the oven numbers, the battery's 54 ovens number from 1 to 59, with oven No. 1 being farthest from the quench tower. At the time of testing ovens No. 51 - No. 54 were empty as a result of a through-wall being replaced between ovens No. 52 and No. 53.

An average of 15.33 tons of coal is charged into each oven, and an average of 12.26 tons of coke is produced per coking cycle. Two crews work to push and charge ovens from 10:00 a.m. to 6:00 p.m. and from 10:00 p.m. to 6:00 a.m., 7 days a week.

Pushing emissions are captured by a moveable hood attached to a fixed duct system. The hood is connected to a tripper car which moves under the belt that seals the top of the duct. The hood lines up with the hooded coke guide and covers the quench car during pushing. When the dampers are open, the duct is open to the baghouse where a fan evacuates emissions from the hood.

Typically two ovens in advance of the oven being pushed are dampered off the collecting main. The standpipe cap and mini-standpipe cap are then opened to relieve pressure and vent coke oven gas. The coke oven gas is lighted if it does not self ignite. Just prior to pushing, the oven doors are removed, the coke guide is positioned, the capture hood is aligned, and the exhaust fan on the baghouse is activated. The pushing ram pushes the coke from the push side of the battery out the coke side into a traditional quench car which slowly moves along the rail during the push to catch the falling coke. The time from the removal of the doors to the completion of the push is typically two minutes; however, on occasions when the quench car is not immediately available, this period is longer. The quench car remains stationary under the hood for about 30 seconds, then travels to the quench tower without the hood. The fan on the baghouse is placed on idle between pushes. A push typically occurs every 15 to 20 minutes. After an oven is pushed, the door jambs are cleaned on both the pusher and coke sides, and the doors are replaced. The ovens are charged in the order in which they were pushed. Typical coking time (from coal charge to coke push) is 24 hours.

Pushing emissions captured by the hood travel through the fixed duct to a 4-compartment pulse jet baghouse. The baghouse was installed in 1986 and has a design volumetric flow rate of 130,000 acfm. Each compartment houses 352 singed polyester bags. Pressure drop (delta P) is measured across each compartment and across the baghouse and equals (-8) inches of water. Air temperature in the baghouse does not exceed 275 °F. The air-to-cloth ratio is 6.46 acfm/ft^2.

3.2.2 Underfiring

The combustion, or underfiring, system regulates COG, air, and waste gas. Prior to being used for combustion, raw COG is processed in a by-product recovery plant where tar and naphthalene are removed and ammonia is recovered as ammonium sulfate. COG is not desulfurized prior to being used for underfiring.

Battery No. 5/6 is equipped with a gun flue combustion system. Draft created by the battery stack is drawn into the battery, where it is warmed and introduced at the base of the alternating flues. A gas nozzle at the flue base injects fuel gas which combusts when it contacts the introduced air. Waste gas is formed as a product of combustion and flows downward in every other pair of heating flues through the regenerators and out the battery stack. Gas flow is automatically reversed between adjacent flues every 20 minutes to promote even heating and prevent damage to the brickwork. Once stack draft is set, individual oven drafts can be manually adjusted at the air-intake box as needed. The average flue temperature is 2,080 °F.

Several factors can affect emissions from the combustion stack, including incomplete combustion in the flues or cracks in the brickwork between an oven chamber and flue. Incomplete combustion is typically the result of excess gas and/or insufficient air in the system. Excess emissions from damaged brickwork or overly decarbonized ovens is most notable just after an oven is charged because gases from combusted coal dust are forced through cracks during charging.

ABC Coke practices periodic silica dusting - the spraying of a silica-containing dust inside an oven before charging it with coal. The dust fuses to the silica brick which lines the

oven, sealing small cracks. In addition, fuel gas nozzles and piping are cleaned regularly. Repairs to brickwork, jambs, through-walls and end flues are conducted as needed.

3.3 PROCESS AND CONTROL DEVICE MONITORING

3.3.1 Pushing

Several parameters were monitored during each test run. Process parameters monitored included the identification of each oven being pushed and the total quantity of coke pushed during each run. Approximately 15.06 tons of coal was charged to each oven after pushing. Control parameters monitored included: percentage fan damper was open, inlet pressure, duct velocity, fan amps, change in pressure (delta P) for each compartment, and delta P over the entire baghouse. The chart recorder for change in pressure over the baghouse was not operating during Run No. 1. Fan amp readings were also unavailable at the very start of testing.

Approximately 15.06 tons of coke were charged to each oven. Coking time for all ovens was approximately 24 hours. The following summarizes readings taken when the fan damper was 100% open: inlet pressure ranged from 10 to 22 inches of water, duct velocity ranged from 48 to 72, pressure drop over the entire baghouse ranged from 6.75 to 8 inches of water, fan amps ranged from 31 to 48. Control parameters recorded during testing are presented on Tables 3.1a through 3.1c.

Visual observations of pushes were made during all three test runs to assess opacity and capture efficiency of the hood and to note any differences in uncontrolled emissions. See field observations in Appendix A on pages labeled "Pushing Parameters - Capture Observations: Alabama By-Product Coke, Birmingham, AL". Pushing opacity was relatively low during most pushes. However, after 7 (out of 64 total) monitored pushes, thick, dark emissions were observed indicative of undercoking, at least in spots. One of these pushes involved an oven adjacent to an oven that was cold due to through-wall repair. Very good capture efficiency of the hood was observed. Most fugitive emissions escaped the capture system via two gaps - one between the coke guide and the hood and one between the coke guide and the battery.

3.3.2 Underfiring

Control parameters monitored during combustion stack testing included: opacity, stack draft, fuel gas flow rate, fuel gas pressure and waste heat temperature. All of these parameters except opacity are continuously monitored at the plant. Opacity from the stack is read manually at least once a month for an hour by a certified opacity reader. Process parameters monitored during testing included the number of each oven charged and the approximate quantities of coal charged and coke produced during each run. Maintenance was performed during the week of testing which may have affected stack opacity. Maintenance included oven dusting, through-wall replacement, gun flue repair, nozzle punching and swabbing of gas piping.

TABLE 3.1A

PUSHING CONTROL DEVICE PARAMETERS: TEST RUN NO. 1, 9/21/98

Time	Oven No.	Fan Damper (% open)	Inlet Pressure (in. of water)	Duct Velocity	Delta P for Entire Bag-house	Pressure Drop (Delta P) for Compartments 1 - 4 (inches of H_2O)				Fan Amps
						1	2	3	4	
11:34	U	—	22	—	—	—	—	—	—	—
12:04	U	100	18	65	—	—	—	—	—	—
12:16	U	100	19	63	—	—	—	—	—	—
12:31	U	100	19	64	—	4.5	5	4.75	4.5	—
12:42	U	100	19	60	—	4.5	5	4.75	4.5	—
12:51	U	100	19	57	—	4.5	5	4.75	4.5	—
1:11	U	100	19	58	—	4.75	5	4.75	4.5	—
1:43	31	100	14	69	—	4.5	5	4.75	5	—
2:09	41	100	18	54	—	5	5.5	5	5	—
2:19	3	100	19	58	—	4.5	5	4.5	5	48
2:36	13	100	18	62	—	4.25	5	4.25	5	46
3:36	23	100	16	56	—	4.25	4.25	4	4	31
3:50	33	100	20	54	—	4	4.25	4.25	4.25	48
4:04	5	100	20	54	—	4.25	4.5	4	4	46
4:19	15	100	18	62	—	4.25	5	4.5	4.5	48
4:27	25	100	20	58	—	5.5	6	6	6	46
4:42	35	100	14	66	—	4.5	5	5	4.25	48
4:59	45	100	14	66	—	5.5	6	5.5	5	40
5:15	55	100	12	64	—	4.5	5	4.5	5	45
5:34	7	100	20	54	—	5	5.5	5	5	46
5:45	17	100	18	58	—	4.5	5	4.5	4.5	48
6:06	27	100	18	62	—	4.5	5	5	4.5	48
6:23	37	100	16	68	—	5.5	6	5.5	5.5	46
6:43	47	100	14	72	—	5.5	6	5.5	5.5	46
6:58	57	100	12	72	—	4.5	5	5	5	48

U = unknown; from approximately 11:50 A.M. to 1:14 P.M. there were no pushes due to the derailment of the door luting machine on the push side of the battery.

TABLE 3.1B

PUSHING CONTROL DEVICE PARAMETERS: TEST RUN NO. 2, 9/22/98

Time	Oven No.	Fan Damper (% open)	Inlet Pressure (in. of water)	Duct Velocity	Delta P for Entire Bag-house	Pressure Drop (Delta P) for Compartments 1 - 4 (inches of H_2O)				Fan Amps
						1	2	3	4	
11:21	28	4	0	2	0	1	1	0	0	20
11:50	38	100	14	62	7	4.5	5	4.5	4.5	48
12:39	58	60	16	42	5	4	4.5	4.5	4.5	45
12:41	58	50	8	22	3.8	2	2	2	1.8	20
12:52	1	100	20	54	7	5	5	5	5	46
1:05	11	100	18	54	7	4.5	5	4.75	4.5	48
1:07	21	100	16	52	8	5	5	5.75	5.5	38
2:09	31	100	14	56	8	5	5	4.75	4.75	40
2:19	41	100	14	56	8	5.5	6	6	6	43
2:35	3	100	22	48	7	7	5	5.5	5.75	45
2:50	13	100	20	48	7	5	5.75	5.5	5.5	46
3:06	23	100	18	50	7	7	5	5.75	5.5	45
3:33	33	100	14	60	7.5	5.25	5.5	5	5.25	40
3:49	5	100	20	52	7	4.75	5	4.5	4.5	38
4:00	15	100	18	50	7.5	5.25	5.75	5.5	5.5	46
4:36	25	100	16	52	7.75	5.5	6	5.5	5.5	38
4:50	35	100	14	62	7	5	5.5	5.25	5.5	45
5:02	45	100	14	72	7.25	5	5.5	5.25	5.5	45
5:35	55	100	10	60	8	5.5	5.75	5	5	38
6:06	17	100	18	60	7	4.5	4.75	4.5	4.75	48
6:14	27	100	19	58	7.25	4.75	5	5	5	46

TABLE 3.1C

PUSHING CONTROL DEVICE PARAMETERS: TEST RUN NO. 3, 9/23/98

Time	Oven No.	Fan Damper (% open)	Inlet Pressure (in. of water)	Duct Velocity	Delta P for Entire Bag-house	Pressure Drop (Delta P) for Compartments 1 - 4 (inches of H_2O)				Fan Amps
						1	2	3	4	
10:30	36	100	16	66	7	4.25	4.5	4.25	4.25	50
10:54	56	100	10	50	8	5	5	5	4.5	38
11:21	8	100	20	52	7.75	4.5	4.75	4.75	4.5	46
11:40	18	100	20	54	8	6	6.5	6	6.25	46
11:57	28	100	16	56	8	5.5	6	6	6	46
12:14	38	100	14	62	7	4.75	5	4.5	5	48
12:30	58	100	12	56	8	5	5.75	5.5	5.75	46
12:45	1	100	21	50	7	4.25	5	4.25	4.25	48
1:20	11	100	20	51	7	5.25	5.75	5.75	6	45
1:59	21	100	16	80	7.75	5	5.25	5.5	5.5	48
2:12	31	100	16	60	7.75	5	5.5	5.25	5.5	48
2:39	41	100	16	62	7.5	5.5	5	6	6	46
2:59	3	100	22	52	7	5	5.5	5.5	5.5	46
3:12	13	100	20	58	7	5	5.5	5.25	5.5	46
3:26	23	100	18	60	7	5	5.5	5.25	5.5	46
3:41	33	100	16	64	7	4.5	5	4.75	5	48
4:09	5	100	22	56	7	4.75	5.25	5	5.25	45
4:24	15	100	20	58	7	4.75	5.5	5.25	5.5	46
4:41	25	100	18	62	6.75	4.25	4.5	4.5	4.5	48
5:01	35	100	16	66	7	4.5	5	5	5	46
5:13	45	100	12	64	7.75	5.5	5.75	5.5	5.5	41
5:25	55	100	12	68	7	4.5	5	4.5	4.75	48
5:32	7	100	12	70	7.75	5	5.25	5	5	48

Three 3-hour test runs (Runs No. 1, 2, & 4) were conducted while ovens were being pushed and charged. An additional run (Run No. 3) was conducted before pushing operations began for the day, while all ovens in operation were full and coking. During each run, control parameter values were recorded during each push, or if push times were unknown, approximately every 10 to 15 minutes; these values are presented in Tables 3.2a through 3.2d.

For all four test runs, stack draft ranged from 24 to 25 millimeters of water, and the waste heat temperature ranged from 560 to 650°F; underfire gas pressure ranged from 82 to 91 millimeters of water. The underfire gas flow rate was recorded during Runs No. 2 and No. 4, and ranged from 78,100 to 99,100 kscfh (1,000 standard cubic feet per hour). The amount of dry coal charged per oven was approximately 15.33 tons (coal charge is not weighed). The approximate amount of coke produced per oven was 12.26 tons. A total of 134.86 tons of coke was produced from the ovens charged during Run No. 1, 159.38 tons during Run No. 2, and 147.12 tons during Run No. 4 (no ovens were pushed during Run No. 3), for a total of 441.36 tons of coke produced during all four test runs.

Stack opacity during testing ranged from 0 to 30%, with the majority of readings ranging from 0 - 5%. A summary of opacity readings for all 4 test runs is presented in Table 3.3. The actual opacity readings recorded by individual observers using EPA Method 9 are shown in Appendix A on pages labeled Visible Emissions Observation Report.

TABLE 3.2A

COMBUSTION STACK PARAMETERS TEST RUN NO. 1, 9/24/98

Time	Oven	Underfire Gas Flow Rate (kscfh)		Underfire Gas Pressure (mm H_2O)		Stack Draft (mm H_2O)	Waste Heat Temperature (°F)	
		Battery #5	Battery #6	Battery #5	Battery #6		Battery #5	Battery #6
10:20	6	—	—	57	78	25	620	560
10:30	—	—	—	60	79	25	630	580
10:45	—	—	—	60	76	25	610	560
11:00	16	—	—	64	57	25	640	570
11:15	26	—	—	60	56	25	600	560
11:25	36	—	—	62	56	25	620	560
11:45	—	—	—	61	56	24	610	560
12:05	18	—	—	65	57	25	650	570
12:15	—	—	—	58	57	25	580	570
12:35	—	—	—	64	58	25	640	580
12:45	—	—	—	61	56	24	610	560
01:05	58	—	—	60	58	25	600	580
01:15	1	—	—	59	79	25	600	570
01:30	—	—	—	56	76	25	630	580
01:45	—	—	—	60	75	25	610	560

TABLE 3.2B

COMBUSTION STACK PARAMETERS: TEST RUN NO. 2, 9/24/98

Time	Oven Pushed	Underfire Gas Flow Rate (kscfh)		Underfire Gas Pressure (mm H_2O)		Stack Draft (mm H_2O)	Waste Heat Temperature (°F)	
		Battery #5	Battery #6	Battery #5	Battery #6		Battery #5	Battery #6
2:45	31	94,000	91,600	57	78	25	620	560
3:00	41	94,100	91,700	60	79	25	630	580
3:15	3	94,700	90,600	60	76	25	610	560
3:30	13	95,000	84,400	64	57	25	640	570
3:54	23	88,700	91,600	60	56	25	600	560
4:09	33	86,900	94,600	62	56	25	620	560
4:27	5	87,700	94,900	61	56	24	610	560
4:37	15	94,000	87,100	65	57	25	650	570
5:03	25	94,600	92,100	58	57	25	580	570
5:19	35	89,100	95,000	64	58	25	640	580
5:43	—	93,400	84,500					
5:45	45	—	—	—	—	—	—	--
5:59	55	93,400	78,800	60	58	25	600	580

TABLE 3.2C

COMBUSTION STACK PARAMETERS: TEST RUN NO. 3, 9/25/98
(NO PUSHING OR CHARGING)

Time	Underfire Gas Flow Rate (kscfh)		Underfire Gas Pressure (mm H_2O)		Stack Draft (mm H_2O)	Waste Heat Temperature (°F)	
	Battery #5	Battery #6	Battery #5	Battery #6		Battery #5	Battery #6
7:35	—	—	61	76	25	640	590
7:45	—	—	60	78	25	600	570
8:05	—	—	60	65	25	650	580
8:15	—	—	69	78	25	600	570
8:35	—	—	63	77	25	640	590
8:45	—	—	60	77	25	610	570
9:00	—	—	61	78	25	640	580
9:15	—	—	63	78	25	600	570
9:30	—	—	63	76	25	630	590
9:45	—	—	62	80	25	610	570
10:00	—	—	61	78	25	640	570
10:15	—	—	66	79	25	600	570
10:30	—	—	63	77	25	630	580

TABLE 3.2D

COMBUSTION STACK PARAMETERS: TEST RUN NO. 4, 9/25/98

Time	Oven Pushed	Underfire Gas Flow Rate (kscfh)		Underfire Gas Pressure (mm H_2O)		Stack Draft (mm H_2O)	Waste Heat Temperature (°F)	
		Battery #5	Battery #6	Battery #5	Battery #6		Battery #5	Battery #6
11:22	26	—	—	60	80	25	620	570
11:30	36	—	—	64	76	25	640	590
11:40	56	—	—	73	78	25	600	580
12:00	8	90,900	78,100	70	87	25	650	580
12:20	18	94,100	94,100	63	69	25	620	580
12:40	28	81,200	90,300	65	84	25	600	590
1:00	38	99,000	85,800	71	91	25	650	570
1:20	—	97,700	84,500	62	85	25	610	570
1:40	11	99,100	79,900	62	80	25	600	590
2:00	21	98,900	84,300	68	87	25	650	570
2:10	—	90,300	94,800	64	82	25	600	570
2:30	31	95,100	88,800	62	79	25	640	590

TABLE 3.3

COMBUSTION STACK OPACITY READINGS

Test Run	Number of Opacity Readings:							
	0%	5%	10%	15%	20%	25%	30%	Total
#1 9/24/98	609	87	48	13	15	0	0	772
#2 9/24/98	443	117	37	0	0	0	0	597
#3 9/25/98	447	144	33	20	13	5	5	667
#4 9/25/98	519	83	0	0	0	0	0	602

4.0 SAMPLING LOCATIONS

Source sampling was be conducted at Coke Oven Battery No. 5/6 at the ABC Coke facility in Birmingham, Alabama. Prior to sampling all locations were checked for the presence of non-parallel or cyclonic flow as outlined in Section 2.4 of EPA Method 1. At all three sampling locations, the average rotation angle for a null reading was well below the EPA Method 1 criteria of 20°. Therefore, sampling at each location was conducted without site modifications. Brief descriptions and schematic diagrams of the sampling locations are presented below.

4.1 COKE OVEN BATTERY NO. 5/6

4.1.1 Baghouse Inlet

The baghouse inlet test location was be located in a 96-1/2 inch wide x 48-1/2 inch deep rectangular horizontal duct which leads from the coke oven pushing operation to the inlet of the baghouse. This location was upstream of the dilution air damper. This duct had an equivalent diameter of 64.6 inches. Two sets of five sample ports were positioned as shown in Figure 4.1. One set was used for the EPA Method 315 sampling and the other set was used for the CARB Method 429 sampling. The EPA Method 315 sample ports were located 300 inches (4.6 equivalent duct diameters) downstream of the nearest flow disturbance (45 degree elbow) and 70.5 inches (1.1 equivalent duct diameters) upstream of the nearest flow disturbance (45 degree elbow). The CARB Method 429 sample ports were located 324 inches (5.0 equivalent duct diameters) downstream and 46.5 inches (0.7 equivalent duct diameter) upstream of the same flow disturbances. For isokinetic testing, EPA Method 1 required 25 sample traverse points using a 5x5 traverse-point matrix. The results of the EPA Method 1 calculations and the locations of the sample traverse points are showed in Figures 4.2 and 4.3, respectively.

4.1.2 Baghouse Outlet

The baghouse outlet sampling location was located in a 89-3/8 inch inside diameter (ID) round vertical stack which was downstream of the baghouse. Four sampling ports were located on the duct as shown in Figure 4.4. The sample ports were located 300 inches (3.4 stack diameters) downstream of the nearest flow disturbance (duct intersection) and 58 inches (0.7 stack diameter) upstream of the atmosphere. For isokinetic sampling, EPA Method 1 required 24 sample traverse points, six in each of the four sample ports. The results of the EPA Method 1 calculations and the locations of the traverse points are presented in Figure 4.5.

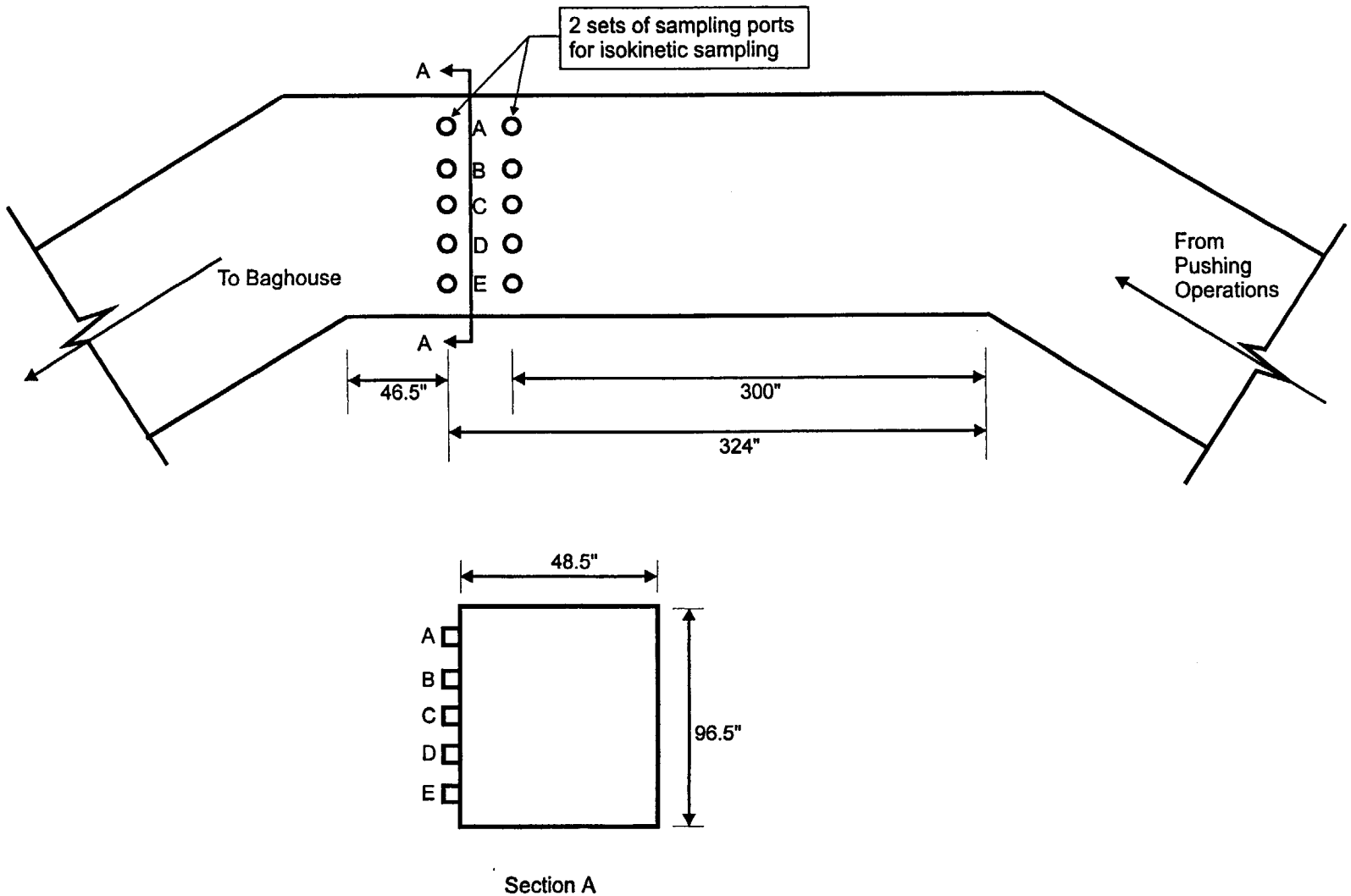


Figure 4.1 Baghouse Inlet Sampling Location, ABC Coke, Birmingham, Alabama

Rectangular Stack Method 1 Calculation Results

Date: 12/09/98 Time: 13:33:00

Facility:	ABC COKE
Source ID:	BH Inlet "A"
Source Name:	BH Inlet Batt. #5/6 "A" Ports
Date:	12/07/98
Calculated By:	F. Meadows

Input Values

Traverse Point Type:	Sample - M5	
Inside of far wall to outside of nipple:	52 even	(inches)
Nipple Length:	3 1/2	(inches)
Distance from Upstream Disturbance:	300 even	(inches)
Distance from Downstream Disturbance:	70 1/2	(inches)
Duct Width:	96 1/2	(inches)

Calculated Values

Equivalent Diameter:	64.555172	(inches)
Upstream Duct Diameters:	4.64	
Downstream Duct Diameters:	1.09	
Mininum Traverse Points:	25	
Resultant Matrix:	5 Ports X 5 Points	

Port	Fraction of Width	Width (inches)	Recommended Port Location Product of Columns 2 & 3
A	0.100	96 1/2	9 5/8
B	0.300	96 1/2	28 15/16
C	0.500	96 1/2	48 1/4
D	0.700	96 1/2	67 9/16
E	0.900	96 1/2	86 7/8

Traverse Point Number	Fraction of Length	Length (inches)	Product of Columns 2 & 3	Nipple Length (inches)	Traverse Point Location Sum of Col. 4 & 5
1	0.100	48 1/2	4 7/8	3 1/2	8 3/8
2	0.300	48 1/2	14 9/16	3 1/2	18 1/16
3	0.500	48 1/2	24 1/4	3 1/2	27 3/4
4	0.700	48 1/2	33 15/16	3 1/2	37 7/16
5	0.900	48 1/2	43 5/8	3 1/2	47 1/8

Figure 4.2 Method 1 Calculation Sheet, Baghouse Inlet, Method 315, ABC Coke, Birmingham, Alabama

Rectangular Stack Method 1 Calculation Results

Date: 12/09/98 Time: 13:33:37

Facility:	ABC COKE
Source ID:	BH Inlet B
Source Name:	BH Inlet Batt.#5/6 B Ports
Date:	12/07/98
Calculated By:	F. Meadows

Input Values

Traverse Point Type:	Sample - M5	
Inside of far wall to outside of nipple:	52 even	(inches)
Nipple Length:	3 1/2	(inches)
Distance from Upstream Disturbance:	324 even	(inches)
Distance from Downstream Disturbance:	46 1/2	(inches)
Duct Width:	96 1/2	(inches)

Calculated Values

Equivalent Diameter:	64.555172	(inches)
Upstream Duct Diameters:	5.01	
Downstream Duct Diameters:	0.72	
Mininum Traverse Points:	25	
Resultant Matrix:	5 Ports X 5 Points	

Port	Fraction of Width	Width (inches)	Recommended Port Location Product of Columns 2 & 3
A	0.100	96 1/2	9 5/8
B	0.300	96 1/2	28 15/16
C	0.500	96 1/2	48 1/4
D	0.700	96 1/2	67 9/16
E	0.900	96 1/2	86 7/8

Traverse Point Number	Fraction of Length	Length (inches)	Product of Columns 2 & 3	Nipple Length (inches)	Traverse Point Location Sum of Col. 4 & 5
1	0.100	48 1/2	4 7/8	3 1/2	8 3/8
2	0.300	48 1/2	14 9/16	3 1/2	18 1/16
3	0.500	48 1/2	24 1/4	3 1/2	27 3/4
4	0.700	48 1/2	33 15/16	3 1/2	37 7/16
5	0.900	48 1/2	43 5/8	3 1/2	47 1/8

Figure 4.3 Method 1 Calculation Sheet, Baghouse Inlet, CARB 429, ABC Coke, Birmingham, Alabama

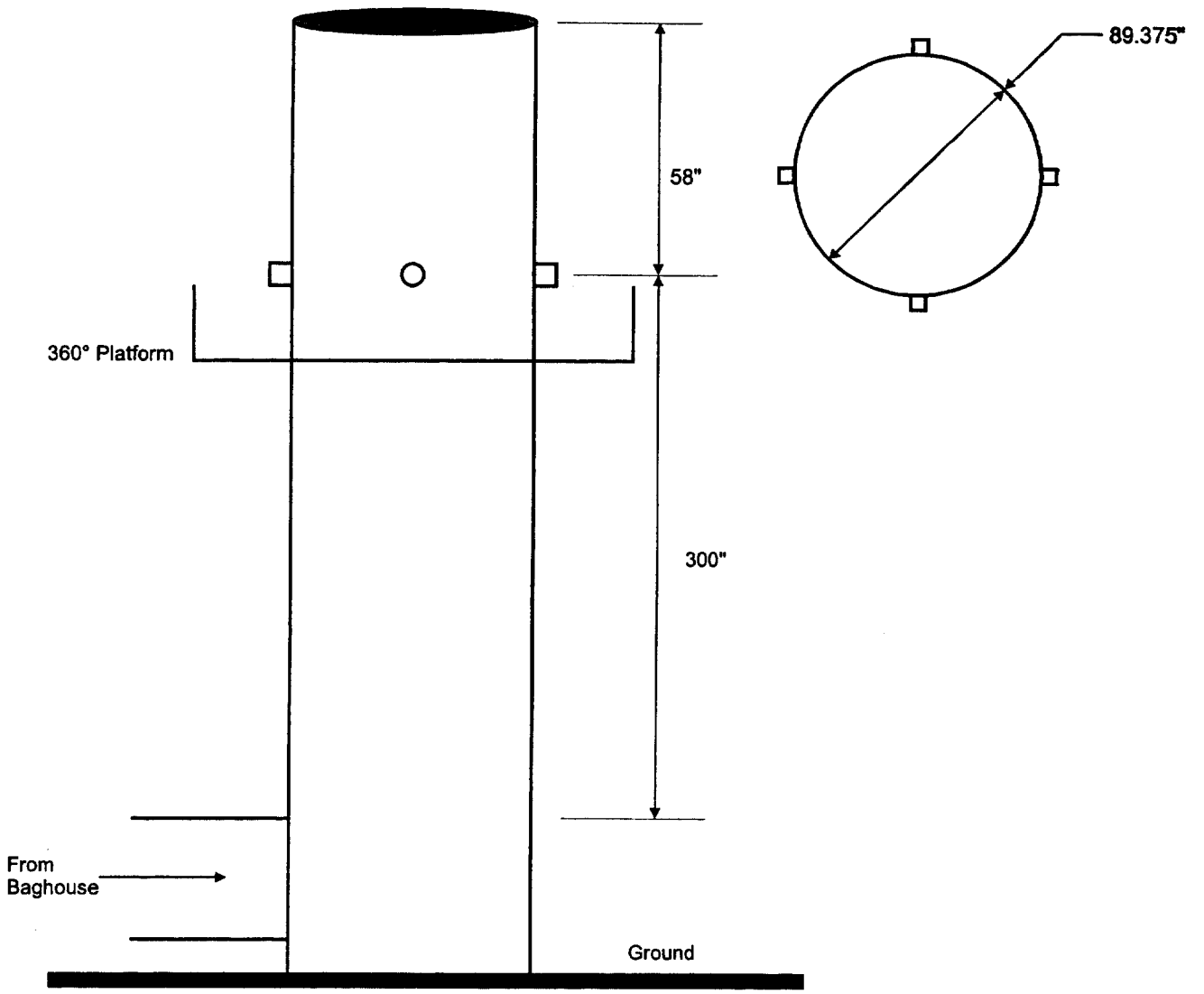


Figure 4.4 Baghouse Outlet Sampling Location, ABC Coke, Birmingham, Alabama

Circular Stack Method 1 Calculation Results

Date: 12/07/98 Time: 15:57:34

Facility:	ABC COKE
Source ID:	BH Outlet
Source Name:	BH Out. Batt. #5/6
Date:	12/07/98
Calculated By:	F. Meadows

Input Values

Traverse Point Type:	Sample - M5	
Inside of far wall to outside of nipple:	89 3/8	(inches)
Nipple Length:	3 5/8	(inches)
Distance from Upstream Disturbance:	300 even	(inches)
Distance from Downstream Disturbance:	58 even	(inches)
Number of ports:	4 ports at 90 degrees	

Calculated Values

Inside Diameter:	85.7500	(inches)
Upstream Duct Diameters:	3.49	
Downstream Duct Diameters:	0.67	
Mininum Traverse Points:	24	

Traverse Point Number	Fraction of Length	Length (inches)	Product of Columns 2 & 3	Nipple Length (inches)	Traverse Point Location Sum of Col. 4 & 5
1	0.021	85 3/4	1 13/16	3 5/8	5 7/16
2	0.067	85 3/4	5 3/4	3 5/8	9 3/8
3	0.118	85 3/4	10 1/8	3 5/8	13 3/4
4	0.177	85 3/4	15 3/16	3 5/8	18 13/16
5	0.250	85 3/4	21 7/16	3 5/8	25 1/16
6	0.356	85 3/4	30 1/2	3 5/8	34 1/8

Figure 4.5 Method 1 Calculation Sheet, Baghouse Outlet, ABC Coke, Birmingham, Alabama

4.1.3 Combustion (Underfire) Stack

The combustion (underfire) stack test location was on a 187-inch ID round vertical stack at the sample port location. This was a double wall stack with a slightly decreasing diameter with the increase of vertical stack height. Four sampling ports were positioned as shown in Figure 4.6. These sample ports were located 720 inches (3.9 stack diameters) downstream of the nearest flow disturbance (elbow) and 2,040 inches (10.9 stack diameters) upstream of the atmosphere. For isokinetic sampling, EPA Method 1 required 24 sample traverse points, six in each of the four sample ports. The results of the EPA Method 1 calculations and the locations of the sample traverse points are presented in Figure 4.7.

Due to safety issues, only two of the four sample ports could be used for sampling. Also, it was not possible to sample across the entire stack cross-section because the required sample probe lengths were too long for using glass liners. Therefore, it was decided to conduct velocity measurements at each of the 24 traverse points and if the velocity profile was found to be uniform (within 10%), then sampling would be conducted at six traverse points in each of the two sample ports. The average square root of the velocity pressure for the 24 points was 0.085 with a standard deviation of 0.017 compared to 0.091 (+7%) and a standard deviation of 0.016 for the 12 points selected for testing.

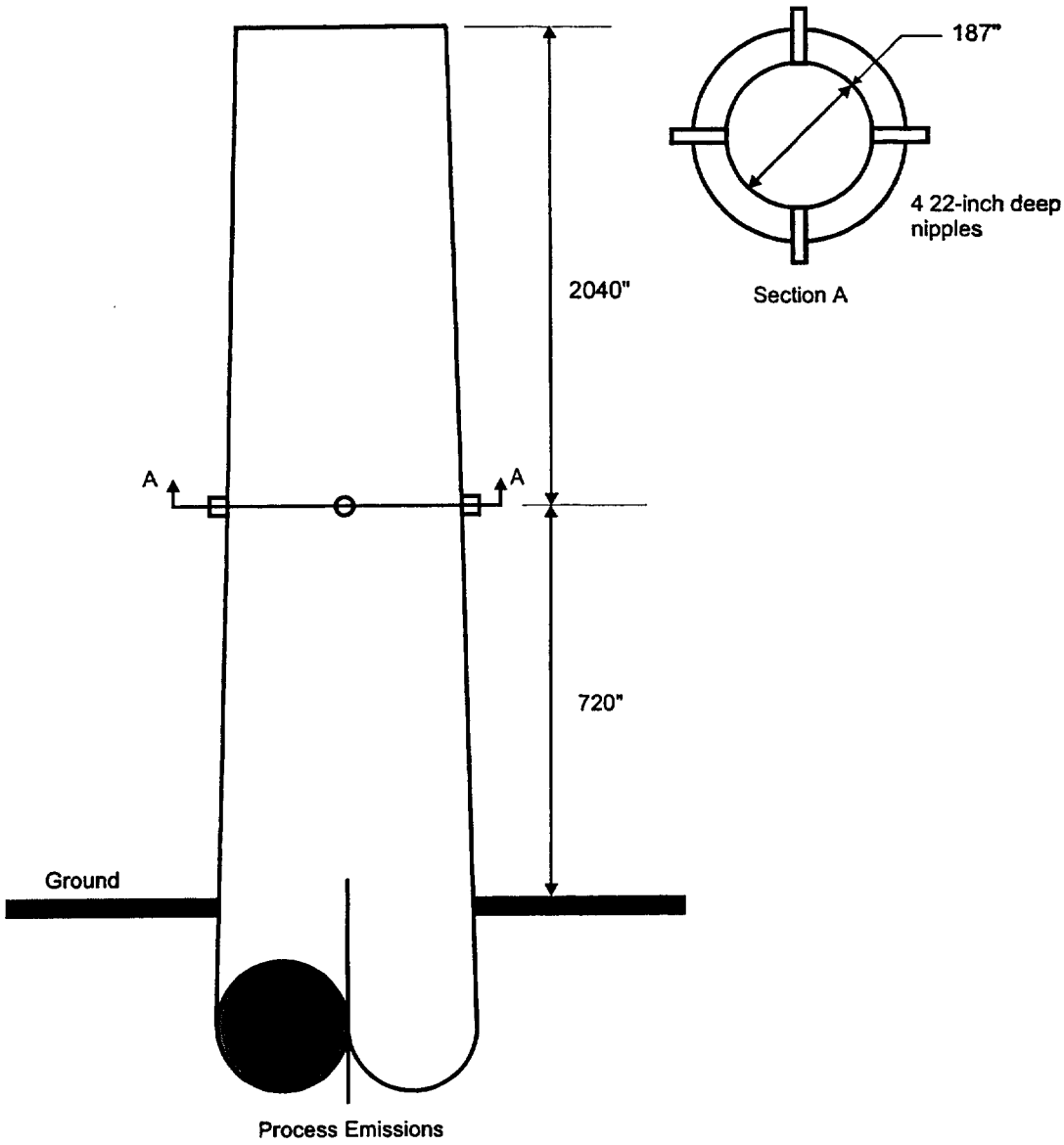


Figure 4.6 Combustion (Underfire) Stack Sampling Location, ABC Coke, Birmingham, Alabama

Circular Stack Method 1 Calculation Results

Date: 12/07/98 Time: 16:49:47

Facility:	ABC COKE
Source ID:	UF Stack "B"
Source Name:	Beckers Underfire Stack Port B
Date:	12/07/98
Calculated By:	F. Meadows

Input Values

Traverse Point Type:	Sample - M5	
Inside of far wall to outside of nipple:	212 even	(inches)
Nipple Length:	25 even	(inches)
Distance from Upstream Disturbance:	720 even	(inches)
Distance from Downstream Disturbance:	2040 even	(inches)
Number of ports:	4 ports at 90 degrees	

Calculated Values

Inside Diameter:	187	(inches)
Upstream Duct Diameters:	3.85	
Downstream Duct Diameters:	10.90	
Mininum Traverse Points:	24	

Traverse Point Number	Fraction of Length	Length (inches)	Product of Columns 2 & 3	Nipple Length (inches)	Traverse Point Location Sum of Col. 4 & 5
1	0.021	187 even	3 15/16	25 even	28 15/16
2	0.067	187 even	12 1/2	25 even	37 1/2
3	0.118	187 even	22 1/16	25 even	47 1/16
4	0.177	187 even	33 1/8	25 even	58 1/8
5	0.250	187 even	46 3/4	25 even	71 3/4
6	0.356	187 even	66 9/16	25 even	91 9/16

Figure 4.7 Method 1 Calculaton Sheet, Combustion Stack, ABC Coke, Birmingham, Alabama

5.0 SAMPLING AND ANALYTICAL PROCEDURES

Source sampling was performed at the locations described in the preceding section to determine the concentrations and mass emission rates of filterable particulate matter (PM), methylene chloride extractable matter (MCEM), and polycyclic aromatic hydrocarbons (PAHs). In addition, once the MCEM analyses were completed, the MCEM samples were also analyzed to determine 17 trace metals. Three test runs were conducted at each of the locations (the baghouse inlet and outlet testing was conducted simultaneously). Four test runs were conducted at the underfire stack, one test run during a period of non-charging and non-pushing operations. The underfire stack test was conducted separately from the baghouse test.

Each test run covered approximately an 8-hour period for the baghouse sampling, one test run per day. Due to the frequency and duration of each coke oven pushing event, isokinetic sampling was conducted as follows:

- During each oven push, a maximum air flow to and from the baghouse is achieved when dampers are opened for a period of approximately 90 seconds, resulting in significantly higher stack gas differential pressures than at idle periods. Maximum air volumes were metered through the sample trains during each oven push. During idle periods, isokinetic sampling was maintained at a much lower sampling rate. The dampers on the baghouse remain open at approximately 10% during idle periods.

Sampling on the underfire stack resulted in test runs of approximately three hours duration. Testing was conducted over two days.

In Table 5.1, the parameters measured, the sampling methods, the number of tests performed, and the duration of each test are summarized. Brief descriptions of the sampling and analysis procedures used are presented below.

5.1 LOCATION OF MEASUREMENT SITES AND SAMPLE/VELOCITY TRAVERSE POINTS

EPA Method 1, "Sample and Velocity Traverses for Stationary Sources," was used to establish velocity and sample traverse point locations. The process ductwork, and the locations of measurement sites and sample traverse points are discussed in Section 4.0 of this document.

TABLE 5.1

SUMMARY OF SAMPLING LOCATIONS, TEST PARAMETERS, SAMPLING METHODS, AND NUMBER AND DURATION OF TESTS, ABC COKE, BIRMINGHAM, ALABAMA

Sampling Location	Test Parameter	Sampling Methods	Number of Tests	Avg. Duration Per Test (min.)
Coke Oven Battery No. 5/6 Baghouse Inlet	Exhaust gas flow rate	EPA Method 2	3	438
	CO_2 and O_2 content	EPA Method 3B	3	438
	Moisture content	EPA Method 4	3	438
	Particulate/MCEM/metals	EPA Method 315	3	438
	PAHs	CARB Method 429	3	438
		NIOSH Method 5506	3	438
Coke Oven Battery No. 5/6 Baghouse Outlet	Exhaust gas flow rate	EPA Method 2	3	412
	CO_2 and O_2 content	EPA Method 3B	3	412
	Moisture content	EPA Method 4	3	412
	Particulate/MCEM/metals	EPA Method 315	3	412
	PAHs	CARB Method 429	3	411
		NIOSH Method 5506	3	424
Beckers Underfire Stack	Exhaust gas flow rate	EPA Method 2	4	180
	CO_2 and O_2 content	EPA Method 3B	4	180
	Moisture content	EPA Method 4	4	180
	Particulate/MCEM/metals	EPA Method 315	4	180
	PAHs	CARB Method 429	4	180
		NIOSH Method 5506	1	76

5.2 DETERMINATION OF STACK GAS VOLUMETRIC FLOW RATE

EPA Method 2, "Determination of Stack Gas Velocity and Volumetric Flow Rate (Type S Pitot Tube)," was used to determine exhaust gas velocity. A Type S Pitot tube, constructed according to Method 2 criteria and having an assigned coefficient of 0.84, is connected to an inclined-vertical manometer. The pitot tube was inserted into the duct and the velocity pressure (Δp) was recorded at each traverse point. The effluent gas temperature was also recorded at each traverse point using a Type K thermocouple. The average exhaust gas velocity was calculated from the average square roots of the velocity pressure, average exhaust gas temperature, exhaust gas molecular weight, and absolute stack pressure. The baghouse sampling required using time weighted averages of velocity pressure, exhaust gas temperatures, and meter temperatures to calculate volumetric flow rates. The volumetric flow rate is the product of velocity and the stack cross-sectional area of the duct at the sampling location. Because of limited accessibility with the proximity of the coke oven battery pushing mechanism, only two of four sampling ports were sampled on the combustion stack. A specially constructed pitot tube was used to conduct a complete velocity traverse across the underfire stack diameter to verify that stack gas differential pressures were similar for all four sampling ports.

5.3 DETERMINATION OF STACK GAS EMISSION RATE CORRECTION FACTORS, DRY MOLECULAR WEIGHT, AND EXCESS AIR

EPA Method 3B, "Gas Analysis for the Determination of Emission Rate Correction Factor or Excess Air," was used to determine stack gas emission rate correction factors and molecular weight. Bag samples were collected and analyzed for each measurement run using an Orsat® combustion gas analyzer which read ± 0.1% concentrations of carbon dioxide and oxygen. One integrated bag sample was collected per each 120 minutes of sampling time at the baghouse inlet and outlet, as well as the underfire stack.

5.4 DETERMINATION OF STACK GAS MOISTURE CONTENT

EPA Method 4, "Determination of Moisture Content in Stack Gases," was used to determine the flue gas moisture content. EPA Method 4 was performed in conjunction with each EPA Method 315 and CARB Method 429 test run. Integrated, multi-point, isokinetic sampling was performed. Condensed moisture was determined by recording pre-test and post-test weights of the impingers, reagents, and silica gel. XAD® adsorbent traps were also pre- and post-test weighed and included in the CARB Method 429 moisture determination.

5.5 DETERMINATION OF PARTICULATE MATTER/METHYLENE CHLORIDE EXTRACTABLE MATTER/METALS

EPA Method 315, "Determination of Particulate and Methylene Chloride Extractable Matter (MCEM) from Selected Sources at Primary Aluminum Production Facilities" was used to determine PM, MCEM, and metals.

This method is applicable for the simultaneous determination of PM and MCEM. PM and MCEM are withdrawn isokinetically from the source. PM is collected in the probe and on a tared glass fiber filter at 248 ± 25 °F. A schematic of the MCEM sample train is shown in Figure 5.1. The sampling train consisted of a glass nozzle, a heated glass lined probe, a heated tared quartz fiber filter, two impingers each containing 100 milliliters of Type II distilled, de-ionized water, an empty impinger, and an impinger containing approximately 250 grams of indicating silica gel. The glass nozzle was joined to the probe using a Teflon®-coated stainless steel union and Teflon® or graphite ferrules. At the underfire stack sampling location, two of four sampling ports were utilized because of limited sampling access. The sampling probes traversed half of the stack diameter. ERG submitted tared, quartz fiber filters to PES for sampling, which were returned after the test program for PM and MCEM analysis. The PM mass was determined gravimetrically after removal of combined water. MCEM was then determined by performing a methylene chloride extraction of the sample train fractions and determining the residue gravimetrically after evaporating the solvents.

Following completion of the MCEM analyses by ERG, the PM and MCEM samples were submitted to FAL where they were digested and analyzed for the presence of 17 trace metals using three different analytical techniques. This analysis provided an approximation of the trace metals present in the stack gases. The target metals include antimony (Sb), arsenic (As), barium (Ba), beryllium (Be), cadmium (Cd), chromium (Cr), cobalt (Co), copper (Cu), lead (Pb), manganese (Mn), mercury (Hg), nickel (Ni), phosphorous (P), selenium (Se), silver (Ag), thallium (Tl), and zinc (Zn). Cadmium, manganese, lead (inlet), and zinc were determined by Direct Aspiration Flame Atomic Absorption Spectrophotometry (FLAAS). Antimony, arsenic, beryllium, lead (other sources and blanks), nickel, selenium, silver, and thallium were determined by Graphite Furnace Atomic Absorption Spectrophotometry (GFAAS). Barium, chromium, cobalt, copper and phosphorus were determined by Inductively Coupled Plasma - Optical Emission (ICP). Mercury was determined by Cold Vapor Atomic Adsorption Spectrophotometry (CVAAS).

Baghouse dust samples were collected and composited in sample containers for each test run. Composites were collected at the beginning, middle, and end of the individual sample runs. FAL analyzed the three samples for the same number and type of analytes as for the EPA Method 315 samples with the exception of cobalt which was inadvertantly omitted from the analyte list provided to the analytical laboratory. Samples were prepared by nitric acid digestion, followed by analysis by FLAAS, GFAAS, ICP and CVAAS.

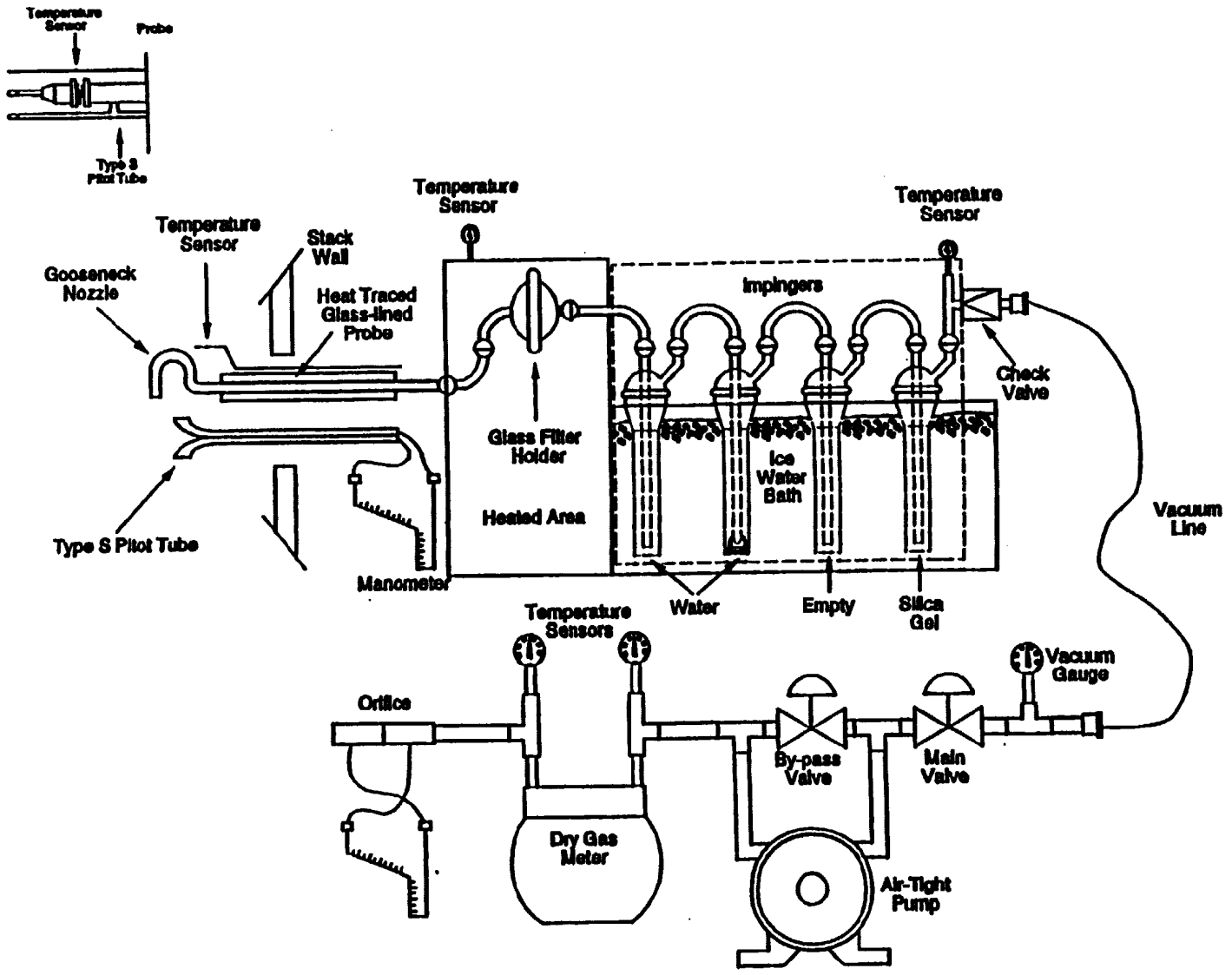


Figure 5.1 Sampling Train Schematic for EPA Method 315

5.6 POLYCYCLIC AROMATIC HYDROCARBONS

CARB Method 429, "Determination of Polycyclic Aromatic Hydrocarbon (PAH) Emissions from Stationary Sources," was used to determine PAHs. This method is applicable for the determination of 19 PAHs. Quanterra submitted solvent extracted XAD-2® resin sorbent cartridges and untared Teflon® filters for sampling purposes. The sampling train consisted of a glass nozzle, a heated glass lined or Teflon® probe, a heated precleaned, untared Teflon® mat filter, a water-cooled coil condenser, and an adsorbent trap containing approximately 40 grams of XAD-2® adsorbent resin. The first impinger was empty, the next two each contained 100 milliliters of 3 mM sodium bicarbonate and 2.4 mM sodium carbonate. The next impinger was empty, followed by the last impinger which contained approximately 250 grams of indicating silica gel. At the underfire stack sampling location, two of four sampling ports were utilized because of limited sampling access. The sampling probes traversed half of the stack diameter. Particulate and gaseous phase PAHs were extracted isokinetically from the source and collected in the probe and filter, XAD® resin, and impinger portions of the sample train. A schematic of CARB Method 429 is shown in Figure 5.2. Figure 5.3 is a schematic of the CARB Method 429 sample recovery process. Analysis was accomplished by isotope dilution mass spectrometry combined with high resolution gas chromatography. Figure 5.4 is a schematic of the CARB Method 429 analytical process.

NIOSH Method 5506 was also used to scan for gaseous phase PAHs at the baghouse inlet, outlet, and underfire stack. Only one sample run was conducted at the underfire stack sampling location due to limited accessibility of the sampling ports. The samples were collected at each location using an in-stack filter followed by a series of three out-of-stack XAD-2® sorbent tubes. Sampling was performed continuously throughout the pushing operations and during idle periods at a sample rate of 1.5-2 liters per minute. The samples were analyzed using high performance liquid chromatography and fluorescence/UV detection. The NIOSH 5506 method was used to scan for PAHs in the event CARB Method 429 results were below analytical detection limits. The NIOSH results were not intended to be compared to CARB 429 results.

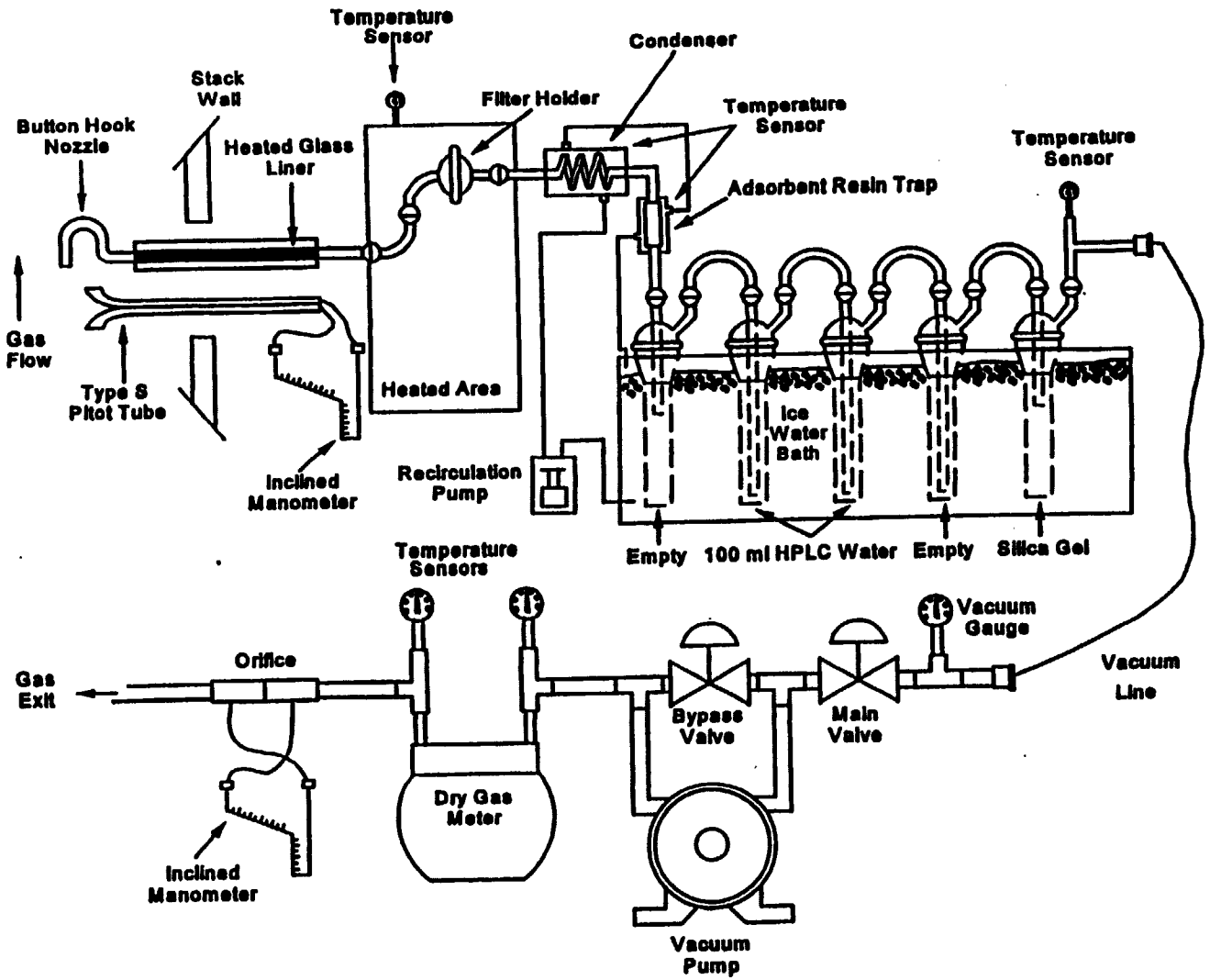


Figure 5.2 Sampling Train Schematic for CARB Method 429

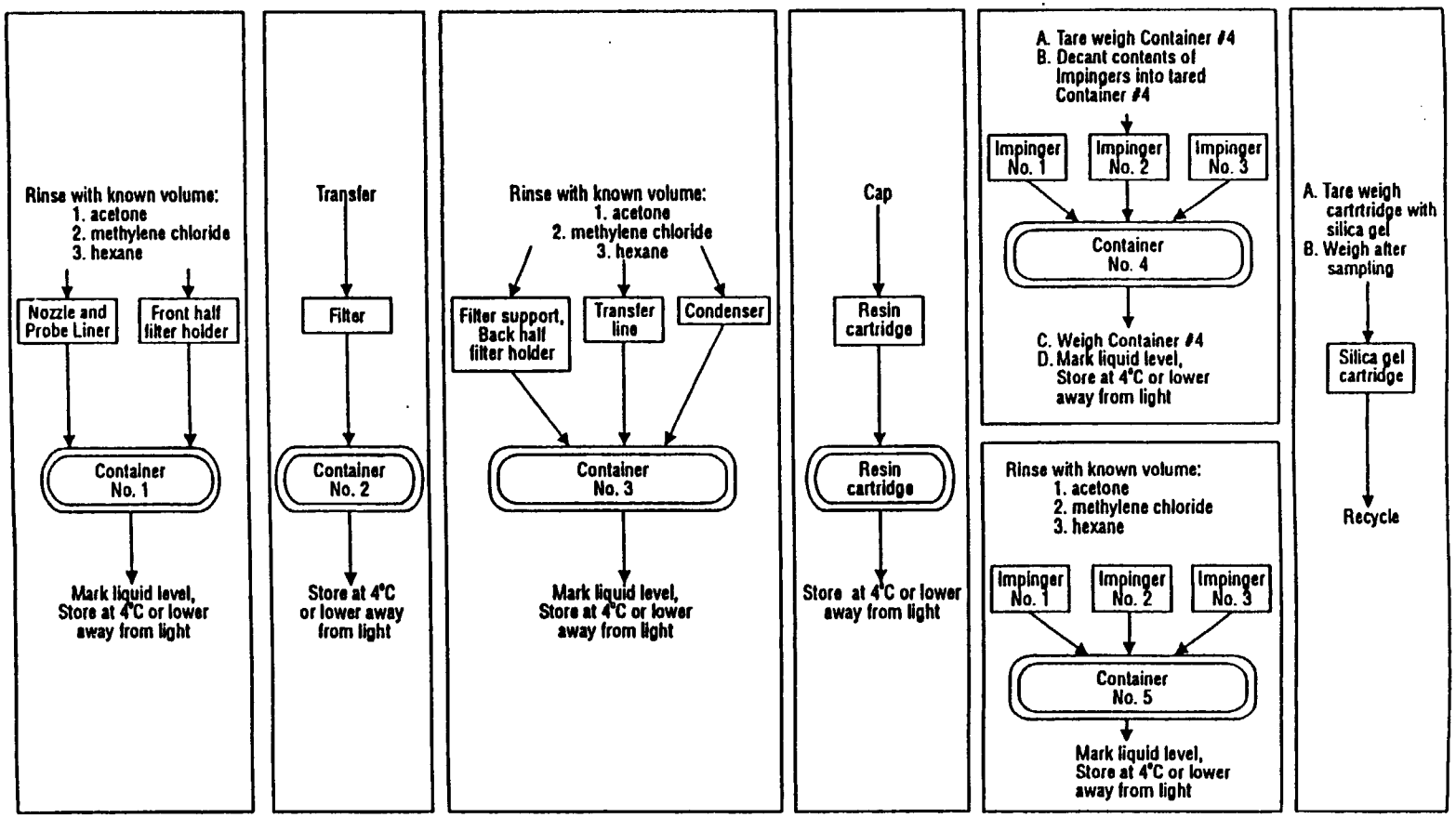


Figure 5.3 CARB Method 429 Sample Recovery Schematic

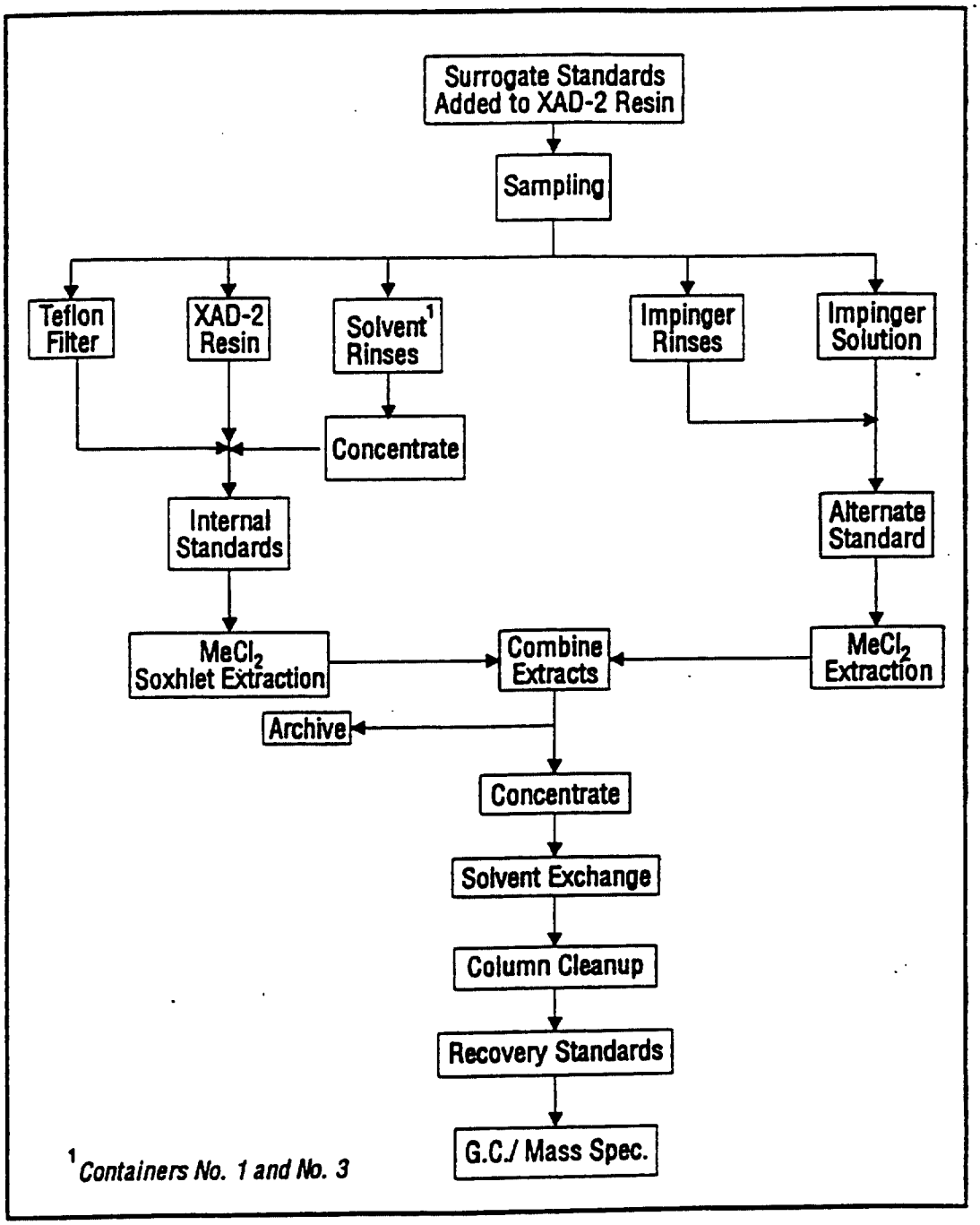


Figure 5.4 CARB Method 429 Analytical Schematic

6.0 QUALITY ASSURANCE/QUALITY CONTROL PROCEDURES AND RESULTS

This section describes the specific QA/QC procedures employed by PES in performing this series of tests. The procedures contained in the "Quality Assurance Handbook for Air Pollution Measurement Systems, Volume III, Stationary Source Specific Methods," EPA/600/R-94/038c, and in the reference test methods served as the basis for performance for all testing and related work activities in this project.

6.1 CALIBRATION OF APPARATUS

The preparation and calibration of source sampling equipment is essential in maintaining data quality. Brief descriptions of the calibration procedures used by PES follow.

6.1.1 Barometers

PES used aneroid barometers which are calibrated against a station pressure value reported by a nearby National Weather Service Station corrected for elevation.

6.1.2 Temperature Sensors

Bimetallic dial thermometers and Type K thermocouples were calibrated using the procedure described in Section 3.4.2 of the Quality Assurance Handbook, Volume III, 1994. Each temperature sensor was calibrated over the expected range of use against an ASTM 3C or 3F thermometer. Table 6.1 summarizes the type of calibrations performed, the acceptable levels of variance, and the results. Digital thermometers were calibrated using a thermocouple simulator having a range of 0-2400°F.

6.1.3 Pitot Tubes

Type S pitot tubes constructed to EPA Method 2 specifications were used. Pitot tubes meeting these specifications are assigned a baseline coefficient of 0.84 and need not be calibrated. The dimensional criteria and results for each pitot tube used are summarized in Table 6.2.

TABLE 6.1

SUMMARY OF TEMPERATURE SENSOR CALIBRATION DATA

Temp. Sensor I.D.	Usage	Temperature, °F		Temperature Difference, %	Calibration Tolerances
		Reference	Sensor		
4A	Stack Gas	72	72	0.0	<±1.5%
		52	51	0.2	<±1.5%
		195	194	0.15	<±1.5%
		284	283	0.13	<±1.5%
4B	Stack Gas	74	74	0.0	<±1.5%
		36	42	0.0	<±1.5%
		208	204	0.0	<±1.5%
		307	309	0.0	<±1.5%
4E	Stack Gas	74	74	0.0	<±1.5%
		38	38	0.0	<±1.5%
		203	202	0.15	<±1.5%
		339	340	0.13	<±1.5%
5E	Stack Gas	74	74	0.0	<±1.5%
		46	46	0.0	<±1.5%
		200	200	0.0	<±1.5%
		318	318	0.0	<±1.5%
12A	Stack Gas	72	72	0.0	<±1.5%
		31	32	0.2	<±1.5%
		205	206	0.15	<±1.5%
		352	352	0.0	<±1.5%
RP20	Stack Gas	72	69	0.7	<±1.5%
		32	32	0.0	<±1.5%
		210	208	0.3	<±1.5%
		--	--	--	--
RP21	Stack Gas	74	75	0.2	<±1.5%
		32	32	0.0	<±1.5%
		208	209	0.2	<±1.5%
		--	--	--	--
MB-1	Gas Meter Inlet	75	75	0.0	<±1%
		38	38	0.0	<±1%
		190	190	0.0	<±1%
	Gas Meter Outlet	75	74	0.2	<±1%
		37	37	0.0	<±1%
		190	190	0.0	<±1%
MB-2	Gas Meter Inlet	70	69	0.2	<±1%
		34	34	0.0	<±1%
		160	159	0.2	<±1%
	Gas Meter Outlet	70	70	0.0	<±1%
		34	33	0.2	<±1%
		160	160	0.0	<±1%

TABLE 6.1 (concluded)

Temp. Sensor I.D.	Usage	Temperature, °F		Temperature Difference, %	Calibration Tolerances
		Reference	Sensor		
MB-3	Gas Meter Inlet	74	74	0.0	<±1%
		30	31	0.2	<±1%
		190	190	0.0	<±1%
	Gas Meter Outlet	73	72	0.2	<±1%
		32	31	0.2	<±1%
		190	190	0.0	<±1%
MB-5	Gas Meter Inlet	70	69	0.2	<±1%
		34	34	0.0	<±1%
		160	159	0.2	<±1%
	Gas Meter Outlet	70	71	0.2	<±1%
		34	33	0.2	<±1%
		160	161	0.2	<±1%
MB-6	Gas Meter Inlet	68	67	0.2	<±1%
		33	34	0.2	<±1%
		155	155	0.0	<±1%
	Gas Meter Outlet	68	68	0.0	<±1%
		33	34	0.2	<±1%
		155	156	0.2	<±1%

TABLE 6.2

SUMMARY OF PITOT TUBE DIMENSIONAL DATA

Measurement	Criteria	Results							
		Pitot Tube Identification							
		4A	4B	4E	5C	5E	12A	RP20	RP21
$\alpha 1$	<10°	1.1	3	0	0	1	4	0	0
$\alpha 2$	<10°	0.8	2	1	1	1	5	1	1
$\beta 1$	<5°	0.5	0	1	1	1	3	1	1
$\beta 2$	<5°	0.3	1	3	1	3	0	0	0
γ	-	0.8	1	0	1	0	2	1	1
1	-	0.7	1	1	1	1	1	0	0
A	-	0.967	0.949	0.973	0.948	1.122	0.936	1.023	1.023
Z	≤ 0.125 in.	0.014	0.017	0	0.017	0	0.033	0.017	0.017
W	≤ 0.03125 in.	0.012	0.017	0.017	0.017	0.020	0.016	0	0
D_t	0.1875" ≤ D_t ≤ 0.375"	0.375	0.375	0.375	0.375	0.375	0.375	0.375	0.375
$A/2/D_t$	1.05 D_t ≤ A ≤ 1.50 D_t	1.29	1.27	1.30	1.26	1.49	1.25	1.36	1.36
	Acceptable	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Assigned Coefficient	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84

6.1.4 Differential Pressure Gauges

PES used Dwyer inclined/vertical manometers to measure differential pressures. The differential pressures measurements included velocity pressure, static pressure, and meter orifice pressure. Manometers are selected with sufficient sensitivity to accurately measure pressures over the entire range of expected values. Manometers are primary standards and require no calibration.

6.1.5 Dry Gas Meters and Orifices

The EPA Method 315 and CARB Method 429 dry gas meters and orifices were calibrated in accordance with Sections 5.3.1 and 5.3.2 of EPA Method 5. This procedure involves direct comparison of the dry gas meter to a reference dry test meter. The reference dry test meter is calibrated annually using a wet test meter. Before its initial use in the field, the metering system was calibrated over the entire range of operation as specified in EPA Method 5. After field use, the metering system was calibrated at a single intermediate setting based on the previous field test. Acceptable tolerances for the initial and final dry gas meter factors and orifice calibration factors are ± 0.05 and ± 0.20 from average, respectively. The calibration results for the gas meters and orifices used in this test program are summarized in Table 6.3. In all cases, the dry gas meter and orifice calibrations met the method requirements.

6.2 ON-SITE MEASUREMENTS

The on-site QA/QC activities include:

6.2.1 Measurement Sites

Prior to sampling, the stack and inlet duct were checked dimensionally to determine measurement site locations, location of velocity and sample test ports, inside stack/duct dimensions, and sample traverse point locations. Inside stack/duct dimensions were checked through both traverse axis to ensure uniformity of the stack/duct inside diameter. The inside stack/duct dimensions, wall thickness, and sample port depths were measured to the nearest 1/8 inch.

6.2.2 Velocity Measurements

All velocity measurement apparatus were assembled, leveled, zeroed, and leak-checked prior to use and at the end of each determination. The static pressure was determined at a single point near the center of the stack or duct cross-section.

TABLE 6.3

SUMMARY OF DRY GAS METER AND ORIFICE CALIBRATION DATA

Meter No.	Gamma				Orifice Coefficient		
	Pre-test	Post-test	% Diff.	EPA Criteria	Average	Range	EPA Criteria
MB-1	1.012	1.003	0.9	± 5%	1.954	1.916-2.013	1.954 ± 0.20
MB-2	1.002	0.986	1.6	± 5%	1.797	1.719-1.852	1.797 ± 0.20
MB-3	1.004	0.997	0.7	± 5%	1.784	1.749-1.835	1.784 ± 0.20
MB-5	0.981	0.994	1.3	± 5%	1.770	1.719-1.830	1.770 ± 0.20
MB-6	1.005	0.992	1.3	± 5%	1.778	1.680-1.850	1.778 ± 0.20

6.2.3 Flue Gas Composition

Integrated, multi-point, flue gas samples were collected in Tedlar® gas bags from the baghouse inlet and outlet and underfire stack. Prior to use the bags were leak checked and purged with nitrogen to ensure cleanliness. Prior to and after completion of each sampling run, the entire sampling system was leak checked from the tip of the probe. The bag samples were analyzed on-site using an Orsat® analyzer within four hours after sample collection, in accordance with EPA Method 3B. Prior to use the Orsat® analyzer was assembled and replenished with fresh reagents and leak checked using the manufacturer's procedures.

6.2.4 Moisture

The EPA Method 315 and CARB Method 429 sampling trains were used to determine the flue gas moisture content. During sampling, the exit gas of the last impinger was maintained below 68°F to ensure complete condensation of flue gas water vapor. The total moisture was determined gravimetrically using an electronic platform balance with 0.1 gram sensitivity. The XAD® adsorbent modules from the CARB Method 429 sampling trains were also weighed and their weights included in the moisture catch.

6.2.5 EPA Method 315 and CARB Method 429

The field sampling QA/QC for the EPA Method 315 and CARB Method 429 sampling trains were similar. Table 6.4 summarizes the critical measurements made and EPA's critical acceptability criteria. All pre- and post-test sample train leak checks met the acceptance criteria. Most of the isokinetic sampling rates deviated by no more than ±10% thereby meeting the method criteria of 90-110%. There were four sample runs slightly outside of this range, two at the baghouse inlet and one at the baghouse outlet. These are not believed to have had an impact on sample results.

The EPA Method 315 and CARB Method 429 field blanks were collected near each of the sampling locations to check for any sample contamination at the sites. Sample trains were assembled and pre- and post-test leak checks were conducted. The sample trains were recovered in the same manner as the actual sample runs. Each field blank train was subjected to a minimum of one leak check in the laboratory (filter holder assembly) and a minimum of three at the sampling site.

An acetone and methylene chloride blank and tared quartz fiber filter were taken as control samples for the particulate/MCEM analysis and subsequent analysis for metals. Blanks were taken of the impinger and recovery reagents.

TABLE 6.4

SUMMARY OF EPA METHOD 315 AND CARB METHOD 429 FIELD SAMPLING QA/QC DATA

Date	Site	Run No.	Pre-Test Leak Rate acfm	Post-Test Leak Rate acfm	EPA Criteria acfm	Percent Isokinetic	EPA Criteria
09/21/98	Baghouse Inlet	A-I-315-1 A-I-429-1	0.005 @ 15" Hg 0.003 @ 15" Hg	0.002 @ 10" Hg 0.002 @ 10" Hg	≤0.020 ≤0.020	100.3 99.7	90-110% 90-110%
	Baghouse Outlet	A-O-315-1 A-O-429-1	0.002 @ 15" Hg 0.004 @ 15" Hg	0.001 @ 6" Hg 0.005 @ 15" Hg	≤0.020 ≤0.020	99.6 96.3	90-110% 90-110%
09/22/98	Baghouse Inlet	A-I-315-2 A-I-429-2	0.004 @ 15" Hg 0.006 @ 14" Hg	0.001 @ 10" Hg 0.001 @ 8" Hg	≤0.020 ≤0.020	98.3 88.4	90-110% 90-110%
	Baghouse Outlet	A-O-315-2 A-O-429-2	0.004 @ 15" Hg 0.006 @ 15" Hg	0.005 @ 14" Hg 0.002 @ 15" Hg	≤0.020 ≤0.020	100.0 97.8	90-110% 90-110%
09/23/98	Baghouse Inlet	A-I-315-3 A-I-429-3	0.002 @ 15" Hg 0.003 @ 15" Hg	0.001 @ 6" Hg 0.001 @ 8" Hg	≤0.020 ≤0.020	97.6 116.7	90-110% 90-110%
	Baghouse Outlet	A-O-315-3 A-O-429-3	0.009 @ 15" Hg 0.004 @ 15" Hg	0.003 @ 15" Hg 0.002 @ 16" Hg	≤0.020 ≤0.020	85.2 92.6	90-110% 90-110%
09/24/98	Underfire Stack	A-U-315-1 A-U-315-2 A-U-429-1 A-U-429-2	0.005 @ 15" Hg 0.002 @ 15" Hg 0.003 @ 15" Hg 0.009 @ 15" Hg	0.007 @ 8" Hg 0.004 @ 8" Hg 0.001 @ 14" Hg 0.002 @ 8" Hg	≤0.020 ≤0.020 ≤0.020 ≤0.020	105.3 98.6 87.6 100.0	90-110% 90-110% 90-110% 90-110%
09/25/98		A-U-315-3 A-U-315-4 A-U-429-3 A-U-429-4	0.002 @ 15" Hg 0.002 @ 15" Hg 0.006 @ 15" Hg 0.002 @ 12" Hg	0.007 @ 7" Hg 0.002 @ 9" Hg 0.001 @ 7" Hg 0.002@12" Hg	≤0.020 ≤0.020 ≤0.020 ≤0.020	97.5 96.6 98.2 97.6	90-110% 90-110% 90-110% 90-110%

CARB 429 control samples consisted of acetone, methylene chloride and hexane, as well as an untared Teflon® filter and XAD® resin trap.

6.3 LABORATORY ANALYSES

The EPA Method 315 and CARB Method 315 samples were hand delivered to PES' contract laboratories for analyses. Upon delivery, the samples were transferred to the laboratory sample custodian, where they were unpacked and inspected for damage, status, and chain-of-custody documentation. All samples were received by the laboratories in good condition. The PES Project Manager and Field Team Leader then contacted the laboratory analysts and discussed the samples and the analyses required.

PES also conducted a follow-up visit to three of the four laboratories to review procedures for sample handling and tracking, sample preparation and analyses, data reporting, and quality control. Visits were made to ERG, FAL and Quanterra. A visit was not made to LabCorp. The results of these visits are summarized in Appendix E. It is the opinion of PES that the analytical laboratories selected to support this assignment were well staffed, used state-of-the-art equipment, followed rigorous QA/QC procedures, and submitted accurate reports of the anlaytical results.

6.3.1 EPA Method 315 Filterable Particulate and Methylene Chloride Extractable Matter

Filterable PM and MCEM analysis consisted of front half acetone and methylene chloride sample rinses and quartz fiber filters. Back half MCEM analysis consisted of acetone and methylene chloride rinses of impingers containing distilled, deionized water. Prior to the field testing program, the filters were tared in the ERG laboratory, stored in glass petri dishes and sealed with Teflon® tape. Upon receipt of the samples in the ERG laboratory, the acetone rinses were placed in tared beakers and evaporated to dryness at room temperature. The filters and beakers were dessicated and weighed to a constant weight. Table 6.5 summarizes the EPA Method 315 lab blank QC data results. Table 6.6 summarizes the EPA Method 315 field blank QC data results.

The front half samples were re-dissolved in methylene chloride, filtered, and the filtered liquid dessicated to dryness for MCEM determination. The backhalf impinger fraction was extracted with several portions of methylene chloride and placed in a beaker. The solvent is evaporated and dessicated to dryness for weighing. Criteria of acceptance of gravimetric analysis is ± 0.5 milligrams between two weights, taken at least six hours apart.

6.3.2 EPA Method 29 - Multiple Metals

FAL analyzed the filterable particulate catch of the quartz filters and also the particulate and extracted organic matter residue of the EPA Method 315 samples. A total of 17 metals were analyzed for. Analysis followed EPA Method 29 analytical procedures. A total of 13 samples

TABLE 6.5

SUMMARY OF EPA METHOD 315 ANALYTICAL QC DATA
LAB BLANK ANALYSIS

Sample Fraction	Particulate, grams	MCEM, grams
Quartz Filter	0.0002	0.0001
Acetone	0.0003	--
Methylene Chloride	0.0001	--
Distilled Water	0.0003	--

TABLE 6.6

SUMMARY OF EPA METHOD 315 ANALYTICAL QC DATA
FIELD BLANK ANALYSIS

Sample Fraction	Baghouse Inlet B-I-315-FB, grams	Baghouse Outlet B-O-315-FB, grams	Underfire Stack B-U-315-FB, grams
Filter - PM MCEM	0.0001 0.0000	0.0000 0.0000	0.0000 0.0000
Acetone FHR, PM	0.0002	0.0001	0.0002
Methylene Chloride FHR, MCEM	0.0000	0.0000	0.0000
Acetone BHR, MCEM	0.0000	0.0012	0.0001
Methylene Chloride BHR, MCEM	0.0001	0.0077	0.0003
H_2O Impinger Rinses, MCEM	0.0001	0.0001	0.0002

were analyzed. Nine were stack gas samples, three were field blanks and one was a reagent blank. Cadmium, manganese, lead (inlet samples) and zinc were analyzed by Direct Aspiration Flame Atomic Absorption Spectrophotometry (FLAAS). Antimony, arsenic, beryllium, lead, nickel, selenium, silver, and thallium were determined by Graphite Furnace Atomic Absorption Spectrophotometry (GFAAS). Barium, chromium, cobalt, copper, and phosphorus were determined by Inductively Coupled Plasma - Optical Emission (ICP). Specific QA and QC activities for the analyses consisted of a reagent blank (quartz filter and pan) and spike recoveries of 16 of the analytes. Recoveries ranged from 83 to 113%. Duplicate analysis on several metals were within the acceptable limit of 20%. Table 6.7 summarizes the EPA Method 29 analytical recovery and duplicate analyses QC results.

6.3.3 CARB Method 429

PAHs were analyzed following the procedures of CARB Method 429. All fractions of the sampling train were combined for a single extract which was analyzed by high resolution gas chromatography/high resolution mass spectrophotometry (HRGC/HRMS). Nine stack gas samples were analyzed, along with three field blanks, a method blank and lab blank. The XAD® resin cartridges were spiked with surrogate standards prior to use for field sampling to demonstrate overall sampling and analytical recovery efficiency. After samples were received in the laboratory and prior to sample extraction, a laboratory control sample was prepared with two levels of surrogate standards to monitor the precision and accuracy of the analytical process independently of sample matrix effects. Table 6.8 summarizes the CARB Method 429 field blank QC results. Table 6.9 summarizes the CARB Method 429 lab control sample QC results. Table 6.10 summarizes the CARB Method 429 surrogate standards recoveries for 17 analytes for all nine field sample runs.

TABLE 6.7

SUMMARY OF EPA METHOD 29 ANALYTICAL QC DATA
LAB CONTROL SAMPLE (LCS) RECOVERY AND DUPLICATE ANALYSIS

Analyte	Spike Amount, μg/l	LCS Recovery, %	Recovery Limit, %	Duplicate RPD, %	RPD Limit, %
Antimony	92.7	92.7	70-130	--	--
Arsenic	116.5	113.4	70-130	--	--
Barium	518	93.8	70-130	6.0	± 20%
Beryllium	4.2	83.2	70-130	--	--
Cadmium	6.4	92.2	70-130	--	--
Chromium	64.7	92.4	70-130	--	--
Cobalt	873	87.3	70-130	3.0	± 20%
Copper	492	92.8	70-130	37	± 20%
Manganese	434	95.5	70-130	10.2	± 20%
Mercury	5.2	103.7	70-130	--	--
Lead	104.9	93.0	70-130	--	--
Nickel	105.1	105.1	70-130	--	--
Phosphorus	1902	87.0	70-130	8.8	± 20%
Selenium	52.1	104.2	70-130	--	--
Silver	9.2	91.7	70-130	--	--
Thallium	50.1	100.2	70-130	--	--
Zinc	518	90.8	70-130	7.0	± 20%

TABLE 6.8

SUMMARY OF CARB METHOD 429 ANALYTICAL QC DATA
FIELD BLANK RESULTS

Analyte	Baghouse Inlet µg/sample	Baghouse Outlet µg/sample	Underfire Stack µg/sample
Naphthalene	1.600	1.000	0.980
2-Methylnaphthalene	0.200	ND	ND
Acenaphthylene	ND	ND	ND
Acenaphthene	ND	ND	ND
Fluorene	ND	ND	ND
Phenanthrene	0.210	0.270	0.120
Anthracene	ND	ND	ND
Fluoranthene	ND	0.190	ND
Pyrene	ND	0.150	ND
Benzo(a) anthracene	ND	ND	ND
Chrysene	ND	ND	ND
Benzo(b) fluoranthene	ND	ND	ND
Benzo(k) fluoranthene	ND	ND	ND
Benzo(e) pyrene	ND	ND	ND
Benzo(a) pyrene	ND	ND	ND
Perylene	ND	ND	ND
Indeno(1,2,3-cd) pyrene	ND	ND	ND
Dibenz(a,h) anthracene	ND	ND	ND
Benzo(g,h,i) perylene	ND	ND	ND

TABLE 6.9

SUMMARY OF CARB METHOD 429 ANALYTICAL QC DATA
LAB CONTROL SAMPLE (LCS)

Analyte	Spike Amounts, μg/sample	LCS Recovery, %	Recovery Limits, %
Naphthalene	100	90	50-150
2-Methylnapthalene	100	100	50-150
Acenaphthylene	100	100	50-150
Acenaphthene	100	92	50-150
Fluorene	100	77	50-150
Phenanthrene	100	81	50-150
Anthracene	100	78	50-150
Fluoranthene	100	80	50-150
Pyrene	100	64	50-150
Benzo(a)anthracene	100	87	50-150
Chrysene	100	77	50-150
Benzo(b)fluoranthene	100	76	50-150
Benzo(k)fluoranthene	100	66	50-150
Benzo(e)pyrene	100	73	50-150
Benzo(a)pyrene	100	68	50-150
Perylene	100	79	50-150
Indeno(1,2,3-cd)pyrene	100	90	50-150
Dibenz(a,h)anthracene	100	76	50-150
Benzo(g,h,i)perylene	100	88	50-150
Naphthalene-d8	50	27	50-150
Acenaphthylene-d8	50	31	50-150
Acenaphthene-d10	50	31	50-150
Fluorene-d10	50	28	50-150
Phenanthrene-d10	50	38	50-150
Fluoranthene-d10	50	24	50-150
Pyrene-d10	50	26	50-150
Benzo(a)anthracene-d12	50	31	50-150

TABLE 6.9 (concluded)

Analyte	Spike Amounts, μg/sample	LCS Recovery, %	Recovery Limits, %
Chrysene-d12	50	43	50-150
Benzo(b)fluoranthene-d12	50	36	50-150
Benzo(k) fluoranthene-d12	50	44	50-150
Benzo(a)pyrene-d12	50	45	50-150
Perylene-d12	50	32	50-150
Indeno(123-cd)pyrene-d12	50	59	50-150
Dibenz(a,h) anthracene-d14	50	56	50-150
Benzo(g,h,i) perylene-d12	50	54	50-150

TABLE 6.10

SUMMARY OF CARB METHOD 429 ANALYTICAL QC DATA
SURROGATE STANDARD RECOVERIES

Analyte	A-I-429-1, %	A-I-429-2, %	A-I-429-3, %	A-O-429-1, %	A-O-429-2, %	A-O-429-3, %	A-U-429-1, %	A-U-429-2, %	A-U-429-3, %	Recovery Limits, %
13C-Fluorene	82	103	94	124	112	117	119	99	104	50-150
Naphthalene-d8	58	75	77	92	46	65	46	42	52	50-150
Acenaphthylene-d8	50	58	58	90	75	85	5	4	9	50-150
Acenaphthene-d10	45	64	70	74	72	82	50	49	59	50-150
Fluorene-d10	53	43	50	69	75	75	81	78	73	50-150
Phenanthrene-d10	81	98	99	99	88	107	94	95	88	50-150
Fluoranthene-d10	48	62	49	69	58	69	70	65	77	50-150
Pyrene-d10	51	73	80	70	56	63	57	55	64	50-150
Benzo(a)anthracene-d12	61	64	75	81	75	80	52	61	75	50-150
Perylene-d12	58	53	54	60	58	58	14	12	20	50-150
Indeno(123cd)pyrene-d12	91	95	90	81	73	80	70	52	77	50-150
Chrysene-d12	72	66	68	79	80	85	80	76	95	50-150
Benzo(b)fluoranthene-d12	87	103	99	88	94	88	79	74	93	50-150
Benzo(k)fluoranthene-d12	86	70	73	87	88	87	80	66	90	50-150
Benzo(a)pyrene-d12	78	75	68	77	76	73	18	17	22	50-150
Dibenz(a,h)anthracene-d14	83	91	87	77	64	81	77	56	79	50-150
Benzo(g,h,i)perylene-d12	64	80	68	69	76	66	58	40	57	50-150

APPENDIX A

PROCESS DATA

ABC Coke

Run No.	Date	Run Time	No. Of Ovens Charged	Total Coal Charged (tons)	Total Coke Pushed (tons)
A-I-M315-1	09/21/98	1128-1911	21	316.26	257.46
A-I-M429-1	09/21/98	1128-1912	21	316.26	257.46
A-I-M5506-1	09/21/98	1147-1847	19	286.14	232.94
A-I-M315-2	09/22/98	1018-1816	23	346.38	281.98
A-I-M429-2	09/22/98	1018-1816	23	346.38	281.98
A-I-M5506-2	09/22/98	1022-1753	22	331.32	269.72
A-I-M315-3	09/23/98	1016-1800	22	331.32	269.72
A-I-M429-3	09/23/98	1019-1810	22	331.32	269.72
A-I-M5506-3	09/23/98	1022-1724	21	316.26	257.46
A-O-M315-1	09/21/98	1126-1911	21	316.26	257.46
A-O-M429-1	09/21/98	1126-1911	21	316.26	257.46
A-O-M5506-1	09/21/98	1138-1914	21	316.26	257.46
A-O-M315-2	09/22/98	1028-1819	23	346.38	281.98
A-O-M429-2	09/22/98	1028-1819	23	346.38	281.98
A-O-M5506-2	09/22/98	1039-1747	21	316.26	257.46
A-O-M315-3	09/23/98	1020-1806	22	331.32	269.72
A-O-M429-3	09/23/98	1020-1806	22	331.32	269.72
A-O-M5506-3	09/23/98	1020-1805	22	331.32	269.72
A-U-M315-1	09/24/98	1025-1344	11	168.63	134.86
A-U-M429-1	09/24/98	1025-1345	11	168.63	134.86
A-U-M315-2	09/24/98	1443-1806	12	183.96	147.12
A-U-M429-2	09/24/98	1443-1812	12	183.96	147.12
A-U-M315-4	09/25/98	1110-1428	8	122.64	98.08
A-U-M429-4	09/25/98	1110-1427	8	122.64	98.08
A-U-M5506-1	09/25/98	1444-1602			

The number of coal charged for the last run (A-U-M-5506-1) was 15.33 tons per oven, and the amount of coke produced was 12.26 tons per oven.

JEFFERSON COUNTY DEPARTMENT OF HEALTH
ENVIRONMENTAL HEALTH
AIR POLLUTION CONTROL PROGRAM

VISIBLE EMISSIONS OBSERVATION REPORT

Company Name: ABC Coke Plant — Plant ID #: 000001

Source/Control Equipment: Underfiring Stack 5 & 6 — Point ID #: 007

Date: 072498 — Start/Stop Time: 10:27-10:27 — Total Minutes Observed: 60

Evaluation Reg.: 060708 — Evaluation Method: — Highest Allowable 6 Min. Avg.:

Highest 6 Min. Avg: — 2nd: — Standard Exceeded ? — Regulation Nbr.:

Min. Exceeding: 20% Opacity = 00 OR % Opacity = — Vapor/Steam Plume Visible ?

Direction from Source: E — Distance from Source: 1200' — Plume Detatched ?

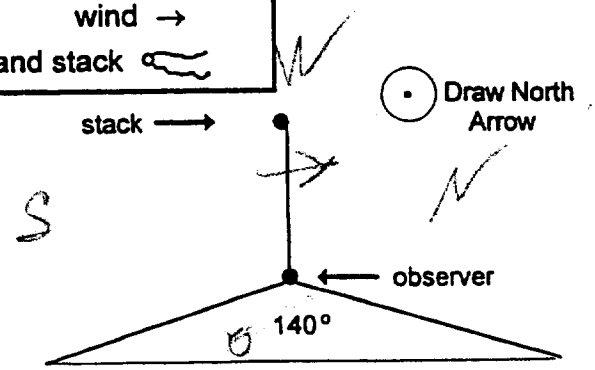
Stack Height: 200' ft. — Stack Height Rel. to Obs.: 150 ft. — Wind Direction: S — Wind Speed:

Plume Color: White — Background: Sky — Sky Condition:

Min	Seconds 0	15	30	45	Min	Seconds 0	15	30	45	Min	Seconds 0	15	30	45	Min	Seconds 0	15	30	45
0	5	5	5	5	15	0	0	0	0	30	0	0	0	0	45	0	0	0	0
1	5	5	5	5	16	0	0	0	0	31	0	0	5	10	46	0	0	0	0
2	10	10	10	10	17	0	0	0	0	32	10	10	10	10	47	0	0	0	0
3	10	10	10	10	18	0	0	0	0	33	10	10	10	10	48	0	0	0	0
4	15	15	20	20	19	0	0	0	0	34	15	15	15	15	49	0	0	0	0
5	20	20	20	20	*20	0	0	0	0	35	15	15	15	15	50	0	0	0	0
6	20	20	20	20	21	0	0	0	0	36	15	15	10	10	51	0	0	0	0
7	20	20	20	20	22	0	0	0	0	*37	10	10	5	5	52	0	0	0	0
8	20	15	10	10	23	0	0	0	0	38	5	0	0	0	*53	0	0	0	0
9	10	10	10	5	24	0	0	0	0	39	0	0	0	0	54	0	0	0	0
10	5	5	5	5	25	0	0	0	0	40	0	0	0	0	55	0	0	0	0
11	5	5	5	5	26	5	5	5	5	41	0	0	0	0	56	0	0	0	0
12	0	0	0	0	27	5	5	5	5	42	0	0	0	0	57	0	0	5	5
13	0	0	0	0	28	5	5	5	0	43	0	0	0	0	58	5	5	5	5
14	0	0	0	0	29	0	0	0		44	0	0	0	0	59	5	5	5	5

SYMBOLS
sun ✳ wind →
plume and stack

Results, Recommendations and Comments:
✳ Notes times oven being pushed.



Received By
Date

Observer: Kim Thompson — 37 — Municipality Code: — Time Analysis: 10

ENV-AP-008-Revised 7/97

JEFFERSON COUNTY DEPARTMENT OF HEALTH
ENVIRONMENTAL HEALTH
AIR POLLUTION CONTROL PROGRAM

VISIBLE EMISSIONS OBSERVATION REPORT

Company Name: ABC Coke Plant — Plant ID #: 000001

Source/Control Equipment: Underfiring stack ~~5 & 6~~ #4 — Point ID #: 007

Date: 092478 — Start/Stop Time: 11:27-12:27 — Total Minutes Observed: 60

Evaluation Reg.: 060908 — Evaluation Method: 2 — Highest Allowable 6 Min. Avg.:

Highest 6 Min. Avg: — 2nd: — Standard Exceeded ? — Regulation Nbr.:

Min. Exceeding: **20%** Opacity = 00 **OR** % Opacity = — Vapor/Steam Plume Visible ?

Direction from Source: SE — Distance from Source: 1200' — Plume Detatched ?

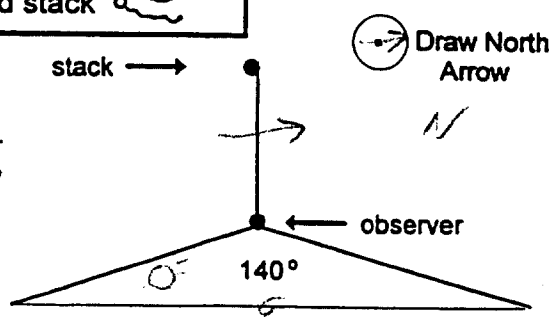
Stack Height: 200 ft. — Stack Height Rel. to Obs.: 150 ft. — Wind Direction: S — Wind Speed:

Plume Color: White — Background: sky — Sky Condition: Sunny

Min	Seconds 0	15	30	45	Min	Seconds 0	15	30	45	Min	Seconds 0	15	30	45	Min	Seconds 0	15	30	45
0	5	5	5	5	15	0	0	0	0	30					45	0	0	0	0
1	5	0	0	0	16	0	0	0	0	31					46	0	0	0	0
2	0	0	5	5	17	0	0	0	0	32					47	0	0	0	0
3	5	5	5	5	18	0	0	0	0	33					48	0	0	0	0
4	5	5	5	5	19	0	0	0	0	34					49	0	0	0	0
5	5	5	5	5	20	0	0	0	0	35					50	0	0	0	0
6	5	10	10	10	21	0	0	0	0	36	0	0	0	0	51	0	0	0	0
7	10	10	10	10	22	0	0	0	0	37	0	0	0	0	52	0	0	0	0
8	5	5	5	0	23	0	0	0	0	38	0	0	0	0	53	0	0	0	0
9	0	0	0	0	24	0	0	0	0	39	0	0	0	0	54	0	0	0	0
10	0	0	0	0	25	0	0	0	0	40	0	0	0	0	55	0	0	0	0
11	0	0	0	0	26	0	0	0	0	41	0	0	0	0	56	0	0	0	0 *
12	0	0	0	0	27	0	0	0	0	42	0	0	0	0	57	0	0	0	0
13	0	0	0	0	28					43	0	0	0	0	58	0	0	0	0
14	0	0	0	0	29					44	0	0	0	0	59	0	0	0	0

SYMBOLS
sun ✳ wind →
plume and stack

Results, Recommendations and Comments:
* Notes time oven being pushed.



Received By
Date

Observer: K Watkins — 33 — Municipality Code: 29 — Time Analysis: 10

ENV-AP-008-Revised 7/97

JEFFERSON COUNTY DEPARTMENT OF HEALTH
ENVIRONMENTAL HEALTH
AIR POLLUTION CONTROL PROGRAM

VISIBLE EMISSIONS OBSERVATION REPORT

Company Name ABC Coke Plant — Plant ID # 000001

Source/Control Equipment Underfiring stack 5 & 6 4 — Point ID # 007

Date 092478 — Start/Stop Time 12:27 - 13:27 — Total Minutes Observed 60

Evaluation Reg. 060708 — Evaluation Method ☐ — Highest Allowable 6 Min. Avg. ☐

Highest 6 Min. Avg: ☐ 2nd: ☐ — Standard Exceeded ? ☐ — Regulation Nbr. ☐

Min. Exceeding: 20% Opacity = 00 OR ☐ % Opacity = ☐ — Vapor/Steam Plume Visible ? ☐

Direction from Source SE of S — Distance from Source 1200' — Plume Detatched ? ☐

Stack Height 200 ft. Stack Height Rel. to Obs. 200 ft. Wind Direction S Wind Speed

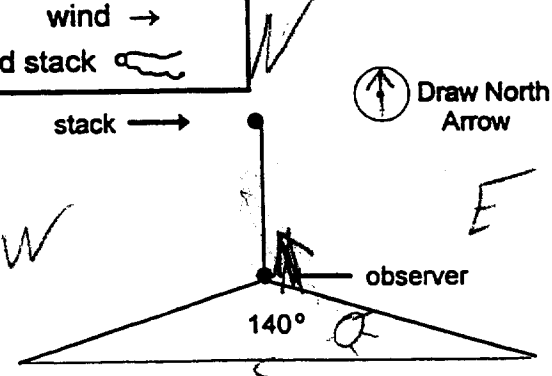
Plume Color White Background Sky Sky Condition Scattered Sunn

Min	Seconds 0	15	30	45	Min	Seconds 0	15	30	45	Min	Seconds 0	15	30	45	Min	Seconds 0	15	30	45
0	0	0	0	0	15	0	0	0	0	30	0	0	5	5	45	0	0	0	0
1	0	0	0	0	16	0	0	0	0	31	5	5	5	5	46	0	0	0	0
2	0	0	0	0	17	0	0	0	0	* 32	5	5	5	5	47	0	0	0	0
3	0	0	0	0	18	0	0	0	0	33	5	5	10	10	48	0	0	0	0
4	0	0	0	0	19	0	0	0	0	34	10	10	10	10	49	0	0	0	0
* 5	0	0	0	0	20	0	0	0	0	35	10	10	5	5	* 50	0	0	0	0
6	0	0	0	0	21	0	0	0	0	36	5	0	0	0	51	0	0	0	0
7	0	0	0	0	22	0	0	0	0	37	0	0	0	0	52	0	0	0	0
8	0	0	0	0	23	0	0	0	0	38	0	0	0	0	53	0	0	0	0
9	0	0	0	0	24	0	0	0	0	39	0	0	0	0	54	0	0	0	0
10	0	0	0	0	25	0	0	0	0	40	0	0	0	0	55	0	0	0	0
11	0	0	0	0	26	0	0	0	0	41	0	0	0	0	56	0	0	0	0
12	0	0	0	0	27	0	0	0	0	42	0	0	0	0	57	0	0	0	0
13	0	0	0	0	28	0	0	0	0	43	0	0	0	0	58	0	0	0	0
14	0	0	0	0	29	0	0	0	0	44	0	0	0	0	59	0	0	0	0

SYMBOLS
sun ✳ wind →
plume and stack

Results, Recommendations and Comments:

* Notes time oven being pushed.



Received By _____
Date _____

Observer KW Thompson — 33 — Municipality Code ☐ — Time Analysis 10

ENV-AP-008-Revised 7/97

JEFFERSON COUNTY DEPARTMENT OF HEALTH
ENVIRONMENTAL HEALTH
AIR POLLUTION CONTROL PROGRAM

VISIBLE EMISSIONS OBSERVATION REPORT

Company Name: A B C Coke Plant — Plant ID #: 0000001

Source/Control Equipment: Underfiring Stacks 5 & 6 — Point ID #: 007

Date: 09/24/98 — Start/Stop Time: 13:27-13:48 — Total Minutes Observed: [ ]

Evaluation Reg.: 060908 — Evaluation Method: [ ] — Highest Allowable 6 Min. Avg.: [ ]

Highest 6 Min. Avg: [ ] 2nd: [ ] — Standard Exceeded ? [ ] — Regulation Nbr. [ ]

Min. Exceeding: **20%** Opacity = 00 **OR** [ ] % Opacity = [ ] — Vapor/Steam Plume Visible ? [ ]

Direction from Source: S — Distance from Source: 1800' — Plume Detatched ? [ ]

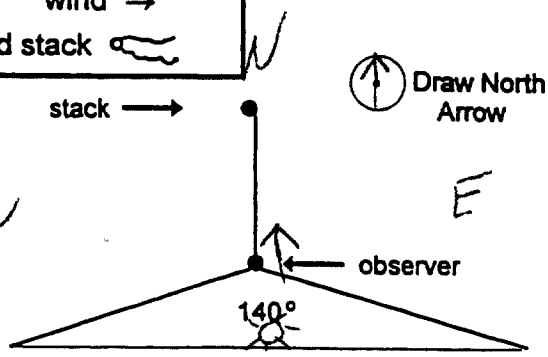
Stack Height: 200 ft. Stack Height Rel. to Obs.: 150 ft. Wind Direction: S — Wind Speed: [ ]

Plume Color: White — Background: Sky — Sky Condition: Scattered

Min	Seconds 0	15	30	45	Min	Seconds 0	15	30	45	Min	Seconds 0	15	30	45	Min	Seconds 0	15	30	45
0	0	0	0	0	15	0	0	0	0	30					45				
1	0	0	0	0	16	0	0	0	0	31					46				
2	0	0	0	0	17	0	0	0	0	32					47				
3	0	0	0	0	18	0	0	0	0	33					48				
4	0	0	0	5	19	0	0	0	0	34					49				
5	5	5	5	5	20	0	0	0	0	35					50				
6	5	10	10	10	21					36					51				
7	10	10	10	10	22					37					52				
8	5	5	0	0	23					38					53				
9	0	0	0	0	24					39					54				
10	0	0	0	0	25					40					55				
11	0	0	0	0	26					41					56				
12	0	0	0	0	27					42					57				
13	0	0	0	0	28					43					58				
14	0	0	0	0	29					44					59				

SYMBOLS
sun ✳ wind →
plume and stack

Results, Recommendations and Comments:



Received By _____
Date _____

Observer: K Whitington — 33 — Municipality Code [ ] — Time Analysis 25

ENV-AP-008-Revised 7/97

JEFFERSON COUNTY DEPARTMENT OF HEALTH
ENVIRONMENTAL HEALTH
AIR POLLUTION CONTROL PROGRAM

VISIBLE EMISSIONS OBSERVATION REPORT

Company Name: ABC Coke — Plant ID #: 00001

Source/Control Equipment: Underfiring Stack #4 — Point ID #: 007

Date: 09/24/98 — Start/Stop Time: 2:27/3:27 — Total Minutes Observed: 60

Evaluation Reg.: 060708 — Evaluation Method: 7 — Highest Allowable 6 Min. Avg.:

Highest 6 Min. Avg: — 2nd: — Standard Exceeded ?: N — Regulation Nbr.:

Min. Exceeding: **20%** Opacity = 00 **OR** % Opacity = — Vapor/Steam Plume Visible ?: N

Direction from Source: S — Distance from Source: 1200' — Plume Detatched ?: N

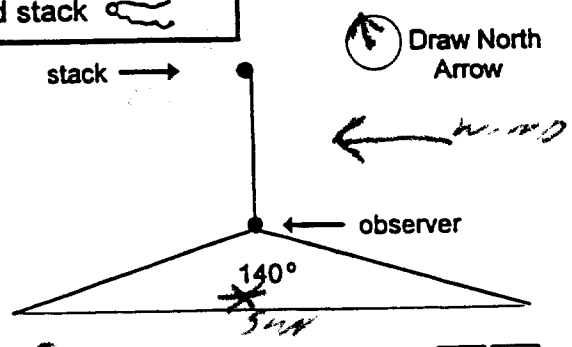
Stack Height: 200 ft. Stack Height Rel. to Obs.: 200 ft. Wind Direction: E — Wind Speed: 5-6 mph

Plume Color: GRAY — Background: SKY — Sky Condition: Scattered clouds

Min	Seconds 0	15	30	45	Min	Seconds 0	15	30	45	Min	Seconds 0	15	30	45	Min	Seconds 0	15	30	45
0	0	0	0	5	15	5	0	0	0	30	0	0	0	0	45	0	0	0	0
1	5	5	5	5	16	0	0	0	0	31	0	0	0	0	46	0	0	0	0
2	5	5	5	5	17	0	0	0	0	32	0	0	0	0	47	5	5	5	5
3	5	5	5	5	18	0	0	0	0	33	0	0	0	0	48	10	10	10	10
4	5	5	5	5	19	0	0	0	0	34	0	0	0	0	49	10	10	10	10
5	5	5	5	5	20	0	0	0	0	35	0	0	0	0	50	10	10	10	10
6	5	5	5	5	21	0	0	0	0	36	0	0	0	0	51	10	10	10	10
7	5	5	5	5	22	0	0	0	0	37	0	0	0	0	52	10	10	10	10
8	5	5	5	5	23	0	0	0	0	38	0	0	0	0	53	10	5	5	5
9	5	5	5	5	24	0	0	0	0	39	0	0	0	0	54	5	5	5	5
10	5	5	5	5	25	0	0	0	0	40	0	0	0	0	55	5	5	5	10
11	5	5	5	5	26	0	0	0	0	41	0	0	0	0	56	5	10	10	10
12	5	5	5	5	27	0	0	0	0	42	0	0	0	0	57	10	10	10	10
13	5	5	5	5	28	0	0	0	0	43	0	0	0	0	58	10	10	10	10
14	5	5	5	5	29	0	0	0	0	44	0	0	0	0	59	10	10	10	10

SYMBOLS
sun ✳ wind →
plume and stack

Results, Recommendations and Comments:



Received By _____
Date _____

Observer: EARWOOD — 40 — Municipality Code: 29 — Time Analysis: 60

ENV-AP-008-Revised 7/97

JEFFERSON COUNTY DEPARTMENT OF HEALTH
ENVIRONMENTAL HEALTH
AIR POLLUTION CONTROL PROGRAM

VISIBLE EMISSIONS OBSERVATION REPORT

Company Name: ABC Coke — Plant ID #: 000001

Source/Control Equipment: Underfiring stack #4 — Point ID #: 007

Date: 092498 — Start/Stop Time: 3:30 / 4:30 — Total Minutes Observed: 60

Evaluation Reg.: 060908 — Evaluation Method: 2 — Highest Allowable 6 Min. Avg.: ___

Highest 6 Min. Avg: ___ 2nd: ___ — Standard Exceeded ? ___ — Regulation Nbr. ___

Min. Exceeding: 20% Opacity = ___ OR ___ % Opacity = ___ — Vapor/Steam Plume Visible ? N

Direction from Source: S — Distance from Source: 1200' — Plume Detatched ? N

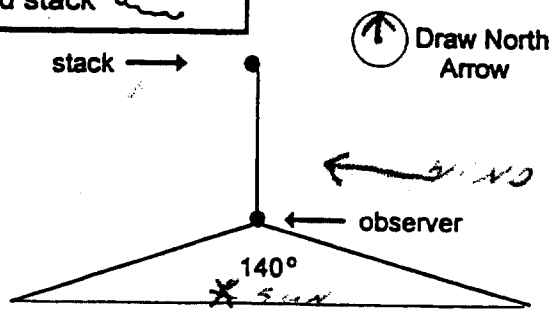
Stack Height: 200 ft. Stack Height Rel. to Obs.: 200 ft. Wind Direction: E — Wind Speed: 5-10 mph

Plume Color: Gray, Black — Background: Sky — Sky Condition: Scattered clouds

Min	Seconds 0	15	30	45	Min	Seconds 0	15	30	45	Min	Seconds 0	15	30	45	Min	Seconds 0	15	30	45
0	0	5	0	0	15	0	0	0	0	30	0	0	0	0	45	0	0	0	0
1	0	0	0	0	16	0	0	0	0	31	0	0	0	0	46	0	0	0	0
2	0	0	0	0	17	0	0	0	0	32	0	0	0	0	47	0	0	0	0
3	0	0	0	0	18	0	0	0	0	33	0	0	0	0	48	0	0	0	0
4	5	5	0	0	19	0	0	0	0	34	0	0	0	5	49	0	0	0	0
5	0	0	0	0	20	0	0	0	0	35	5	5	5	5	50	0	0	0	0
6	5	5	5	5	21	0	0	0	0	36	5	5	5	5	51	0	0	0	0
7	5	5	5	5	22	0	0	0	0	37	5	5	5	5	52	0	0	0	0
8	5	0	0	0	23	0	0	0	0	38	5	5	0	0	53	0	0	0	0
9	0	0	0	0	24	0	0	0	0	39	0	0	0	0	54	0	0	0	0
10	0	0	0	0	25	0	0	0	0	40	0	0	0	0	55	0	0	0	0
11	0	0	0	0	26	0	0	0	0	41	0	0	0	0	56	0	0	0	0
12	0	0	0	0	27	0	0	0	0	42	0	0	0	0	57	0	0	0	0
13	0	0	0	0	28	0	0	0	0	43	0	0	0	0	58	0	0	0	0
14	0	0	0	0	29	0	0	0	0	44	0	0	0	0	59	0	0	0	0

SYMBOLS
sun ✳ wind →
plume and stack

Results, Recommendations and Comments:



Received By ___
Date ___

Observer: EARWOOD — 40 — Municipality Code: 29 — Time Analysis: 00

ENV-AP-008-Revised 7/97

JEFFERSON COUNTY DEPARTMENT OF HEALTH
ENVIRONMENTAL HEALTH
AIR POLLUTION CONTROL PROGRAM

VISIBLE EMISSIONS OBSERVATION REPORT

Company Name: ABC COKE — Plant ID #: 00000/

Source/Control Equipment: Underfiring Stack #4 — Point ID #: 007

Date: 09/24/98 — Start/Stop Time: 4:30/5:00 — Total Minutes Observed: 30

Evaluation Reg.: 060908 — Evaluation Method: 2 — Highest Allowable 6 Min. Avg.:

Highest 6 Min. Avg: — 2nd: — Standard Exceeded ?: N — Regulation Nbr.:

Min. Exceeding: 20% Opacity = 00 OR % Opacity = — Vapor/Steam Plume Visible ?: N

Direction from Source: S — Distance from Source: 1200' — Plume Detatched ?: N

Stack Height: 200 ft. — Stack Height Rel. to Obs.: 200 ft. — Wind Direction: E.S.E. — Wind Speed: 5-10 mph

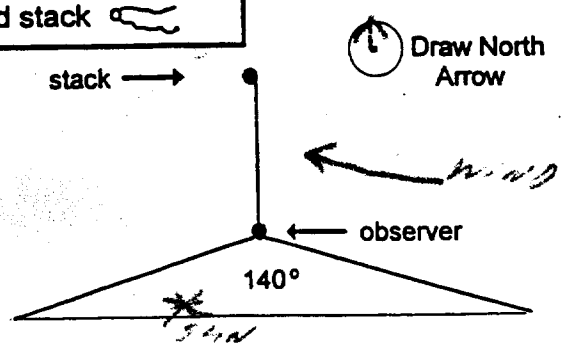
Plume Color: White/Gray — Background: Sky — Sky Condition: Scattered Clouds

Min	Seconds 0	15	30	45	Min	Seconds 0	15	30	45	Min	Seconds 0	15	30	45	Min	Seconds 0	15	30	45
0	0	0	0	0	15	0	0	0	0	30					45				
1	0	0	0	0	16	0	0	0	0	31					46				
2	0	0	0	0	17	0	0	0	0	32					47				
3	0	0	0	5	18	0	0	0	0	33					48				
4	5	5	5	5	19	0	0	0	0	34					49				
5	5	5	5	5	20	0	0	0	0	35					50				
6	5	5	5	5	21	0	0	0	0	36					51				
7	5	5	5	5	22	0	0	0	0	37					52				
8	0	0	0	0	23	0	0	0	0	38					53				
9	0	0	0	0	24	0	0	0	0	39					54				
10	0	0	0	0	25	0	0	0	0	40					55				
11	0	0	0	0	26	0	0	0	0	41					56				
12	0	0	0	0	27	0	0	0	0	42					57				
13	0	/	/	/	28	0	0	0	0	43					58				
14	0	0	0	0	29	0	0	0	0	44					59				

SYMBOLS
sun ✳ wind →
plume and stack

Results, Recommendations and Comments:

/ — Emissions from other sources obscured view for the reading.



Received By _____
Date _____

Observer: EARWOOD — 40 — Municipality Code: 79 — Time Analysis: 00

ENV-AP-008-Revised 7/97

JEFFERSON COUNTY DEPARTMENT OF HEALTH
ENVIRONMENTAL HEALTH
AIR POLLUTION CONTROL PROGRAM

VISIBLE EMISSIONS OBSERVATION REPORT

Company Name: ABC Coke — Plant ID #: 000001

Source/Control Equipment: UNDERFIRE # 4 — Point ID #: 007

Date: 09 05 98 — Start/Stop Time: 11:32/12:32 — Total Minutes Observed: 60

Evaluation Reg.: 060908 — Evaluation Method: 2 — Highest Allowable 6 Min. Avg.:

Highest 6 Min. Avg: — 2nd: — Standard Exceeded ? — Regulation Nbr.:

Min. Exceeding: 20% Opacity = — OR — % Opacity = — Vapor/Steam Plume Visible ? N

Direction from Source: S — Distance from Source: 1200' — Plume Detatched ? N

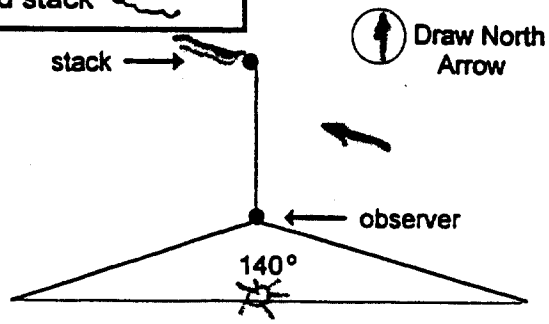
Stack Height: 200' ft. — Stack Height Rel. to Obs.: 200 ft. — Wind Direction: W — Wind Speed: 5-10MPH

Plume Color: WHITE/GRAY — Background: SKY — Sky Condition: SCATT. CLOUDS

Min	Seconds 0	15	30	45	Min	Seconds 0	15	30	45	Min	Seconds 0	15	30	45	Min	Seconds 0	15	30	45
0	0	0	0	0	15	0	0	0	0	30	5	5	5	5	45	0	5	0	0
1	0	0	0	0	16	0	0	0	0	31	5	5	5	0	46	0	0	0	0
2	0	0	0	0	17	5	0	0	0	32	0	0	0	0	47	0	0	0	0
3	0	0	0	0	18	0	0	0	0	33	0	0	0	0	48	0	0	0	0
4	0	0	0	0	19	0	0	5	0	34	0	0	0	0	49	0	0	0	0
5	0	0	0	0	20	0	0	0	0	35	0	0	0	0	50	0	5	0	5
6	0	0	0	0	21	0	0	0	0	36	0	0	0	0	51	5	5	5	0
7	0	0	0	0	22	0	0	0	0	37	0	0	0	0	52	0	0	0	1
8	0	0	0	0	23	0	0	0	0	38	0	0	0	0	53	0	5	5	5
9	0	0	0	0	24	5	0	0	5	39	0	0	0	0	54	0	0	0	5
10	0	0	0	0	25	5	5	5	5	40	0	0	0	0	55	5	5	0	5
11	0	0	0	0	26	5	5	5	5	41	0	0	0	0	56	5	0	0	0
12	0	0	0	0	27	5	5	5	5	42	0	0	0	5	57	0	5	5	5
13	0	0	0	0	28	5	5	5	5	43	0	5	5	0	58	5	5	5	5
14	0	0	0	0	29	5	5	5	0	44	0	5	0	5	59	5	5	5	5

SYMBOLS
sun ✳ wind →
plume and stack

Results, Recommendations and Comments:



Received By _____
Date _____

Observer: ALLEN — 19 — Municipality Code: 29 — Time Analysis: 1.0

ENV-AP-008-Revised 7/97

JEFFERSON COUNTY DEPARTMENT OF HEALTH
ENVIRONMENTAL HEALTH
AIR POLLUTION CONTROL PROGRAM

VISIBLE EMISSIONS OBSERVATION REPORT

Company Name: ABC COKE — Plant ID #: 000001

Source/Control Equipment: UNDERFIRE STACK # 4 — Point ID #: 007

Date: 09/25/98 — Start/Stop Time: 12:46 / 1:46 — Total Minutes Observed: 60

Evaluation Reg.: 060908 — Evaluation Method: 2 — Highest Allowable 6 Min. Avg.: ___

Highest 6 Min. Avg: ___ 2nd: ___ — Standard Exceeded ? ___ — Regulation Nbr. ___

Min. Exceeding: 20% Opacity = ___ OR ___ % Opacity = ___ — Vapor/Steam Plume Visible ? N

Direction from Source: S — Distance from Source: 1200' — Plume Detatched ? N

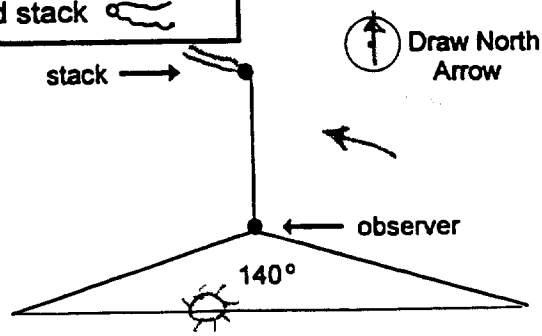
Stack Height: 200 ft. — Stack Height Rel. to Obs.: 200 ft. — Wind Direction: W — Wind Speed: 5-15 mph

Plume Color: WHITE/GRAY — Background: SKY — Sky Condition: SCATT. CLOUDS

Min	Seconds 0	15	30	45	Min	Seconds 0	15	30	45	Min	Seconds 0	15	30	45	Min	Seconds 0	15	30	45
0	0	0	0	0	15	5	5	5	0	30	0	0	0	0	45	0	0	0	0
1	0	0	0	0	16	5	5	5	5	31	0	0	0	0	46	0	0	0	0
2	0	0	0	0	17	5	5	5	5	32	0	0	0	0	47	0	0	0	0
3	0	0	0	0	18	5	0	0	0	33	0	0	0	0	48	0	0	0	0
4	0	0	0	0	19	0	0	0	0	34	0	0	0	0	49	0	0	0	0
5	0	0	0	0	20	0	0	0	0	35	0	0	0	0	50	0	0	0	/
6	0	0	0	0	21	0	0	0	0	36	0	0	0	0	51	RA	W	GAS	
7	0	0	0	0	22	0	0	0	0	37	0	0	0	0	52	0	0	0	0
8	0	0	0	0	23	0	0	0	0	38	0	0	0	0	53	0	0	0	0
9	0	0	0	0	24	0	0	0	0	39	0	0	0	0	54	0	0	0	0
10	0	0	0	0	25	0	0	0	0	40	5	5	0	5	55	0	0	0	0
11	0	0	0	5	26	0	0	0	0	41	0	0	0	0	56	0	0	0	0
12	0	0	0	0	27	0	0	0	0	42	0	0	0	0	57	0	0	0	0
13	0	0	5	0	28	0	0	0	0	43	0	0	0	0	58	0	0	0	0
14	5	5	5	5	29	0	0	0	0	44	0	0	0	0	59	0	0	0	0

Results, Recommendations and Comments:

SYMBOLS
sun ✳ wind →
plume and stack



Received By ___
Date ___

Observer: ALLEN — 19 — Municipality Code: 29 — Time Analysis: 1.0

ENV-AP-008-Revised 7/97

JEFFERSON COUNTY DEPARTMENT OF HEALTH
ENVIRONMENTAL HEALTH
AIR POLLUTION CONTROL PROGRAM

VISIBLE EMISSIONS OBSERVATION REPORT

Company Name: ABC COKE — Plant ID #: 000201

Source/Control Equipment: UNDERFIRE STACK #4 — Point ID #: 007

Date: 092598 — Start/Stop Time: 1:58/2:30 — Total Minutes Observed: 31

Evaluation Reg.: 060908 — Evaluation Method: 2 — Highest Allowable 6 Min. Avg.: ___

Highest 6 Min. Avg: ___ 2nd: ___ — Standard Exceeded ? N — Regulation Nbr.: ___

Min. Exceeding: **20%** Opacity = ___ OR ___ % Opacity = ___ — Vapor/Steam Plume Visible ? N

Direction from Source: S — Distance from Source: 1800' — Plume Detatched ? N

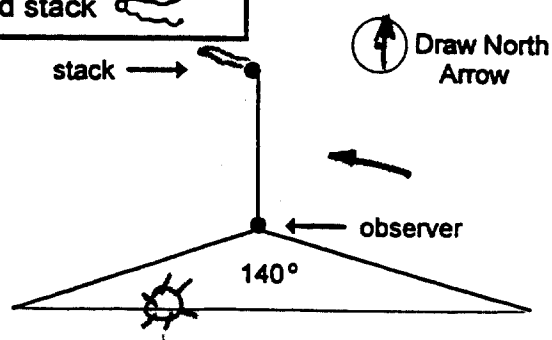
Stack Height: 200 ft. — Stack Height Rel. to Obs.: 200 ft. — Wind Direction: W — Wind Speed: 5-15mph

Plume Color: WHITE/GRAY — Background: SKY — Sky Condition: SCATT. CLOUDS.

Min	Seconds 0	15	30	45	Min	Seconds 0	15	30	45	Min	Seconds 0	15	30	45	Min	Seconds 0	15	30	45
0	0	0	0	0	15	0	0	0	0	30	0	0	0	0	45				
1	0	0	0	0	16	0	0	0	0	31	0	0	0	0	46				
2	0	0	0	0	17	0	0	0	0	32					47				
3	0	0	0	0	18	0	0	0	0	33					48				
4	5	5	0	0	19	0	0	0	0	34					49				
5	0	0	0	0	20	0	0	0	0	35					50				
6	0	0	0	0	21	0	0	0	0	36					51				
7	0	0	0	0	22	0	0	0	0	37					52				
8	0	0	0	0	23	0	0	0	0	38					53				
9	0	0	0	0	24	0	0	0	0	39					54				
10	0	0	0	0	25	0	0	0	0	40					55				
11	0	0	0	0	26	0	0	0	0	41					56				
12	0	0	0	0	27	0	0	0	0	42					57				
13	0	0	0	0	28	0	0	0	0	43					58				
14	0	0	0	0	29	0	0	0	0	44					59				

SYMBOLS
sun ✳ wind →
plume and stack

Results, Recommendations and Comments:



Received By ___
Date ___

Observer: ALLEN — 19 — Municipality Code: 29 — Time Analysis: 1.0

ENV-AP-008-Revised 7/97

VISIBLE EMISSIONS OBSERVATION REPORT

Company Name ABC Coke Plant ID #

Source/Control Equipment Combustion stack #4 Point ID #

Date 092598 Start/Stop Time 7:43 am - 8:43 am Total Minutes Observed 60

Evaluation Reg. Evaluation Method 9 Highest Allowable 6 Min. Avg.

Highest 6 Min. Avg: 2nd: Standard Exceeded ? Regulation Nbr.

Min. Exceeding: **20%** Opacity = OR % Opacity = Vapor/Steam Plume Visible ?

Direction from Source east Distance from Source ~1200' Plume Detatched ? N

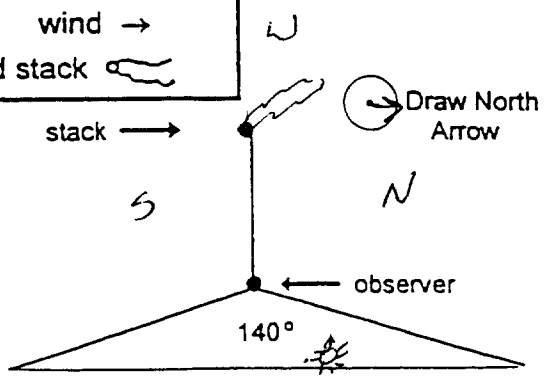
Stack Height 200 ft. Stack Height Rel. to Obs. 150 ft. Wind Direction Wind Speed

Plume Color white Background blue sky Sky Condition clear

Min	Seconds 0	15	30	45	Min	Seconds 0	15	30	45	Min	Seconds 0	15	30	45	Min	Seconds 0	15	30	45
0	0	0	0	0	15	0	0	5	5	30	5	0	0	0	45	5	5	5	5
1	0	0	0	0	16	0	0	0	0	31	0	0	0	0	46	15	20	20	25
2	0	0	0	0	17	5	10	10	15	32	0	0	0	0	47	30	15	10	20
3	0	0	5	0	18	10	10	15	5	33	0	0	0	0	48	15	20	30	25
4	0	0	5	5	19	10	10	5	10	34	0	0	0	0	49	20	15	30	30
5	0	0	0	0	20	5	5	0	10	35	0	0	0	0	50	20	25	10	5
6	0	0	0	0	21	15	20	20	15	36	0	0	0	0	51	5	5	15	15
7	0	0	0	0	22	5	5	10	15	37	0	0	5	0	52	15	20	25	10
8	0	0	0	0	23	5	5	5	0	38	5	0	0	5	53	10	5	0	0
9	0	0	0	0	24	5	0	0	0	39	0	0	0	0	54	0	0	0	0
10	0	0	0	0	25	0	5	0	0	40	0	0	0	0	55	0	0	0	0
11	0	0	0	0	26	0	0	0	0	41	0	0	0	0	56	0	0	0	0
12	0	0	5	5	27	0	0	0	0	42	0	5	5	5	57	0	0	0	0
13	5	0	0	0	28	0	0	0	0	43	0	0	5	5	58	0	0	0	0
14	5	0	5	5	29	0	0	0	0	44	10	10	10	10	59	0	0	0	0

SYMBOLS
sun ✳ wind →
plume and stack

Results, Recommendations and Comments:



Received By
Date

Observer S. George RTI Municipality Code Time Analysis

ENV-AP-008-Revised 7/97

VISIBLE EMISSIONS OBSERVATION REPORT

Company Name ABC Coke

Plant ID #

Source/Control Equipment Combustion Stack #4

Point ID #

Date 0 9 2 5 9 8

Start/Stop Time 8:43 - 9:43am

Total Minutes Observed 60

Evaluation Reg.

Evaluation Method 9

Highest Allowable 6 Min. Avg.

Highest 6 Min. Avg: 2nd:

Standard Exceeded ?

Regulation Nbr.

Min. Exceeding: 20% Opacity = OR % Opacity =

Vapor/Steam Plume Visible ?

Direction from Source

Distance from Source ~1200'

Plume Detatched ? N

Stack Height 200 ft. Stack Height Rel. to Obs. 150 ft. Wind Direction

Wind Speed

Plume Color white

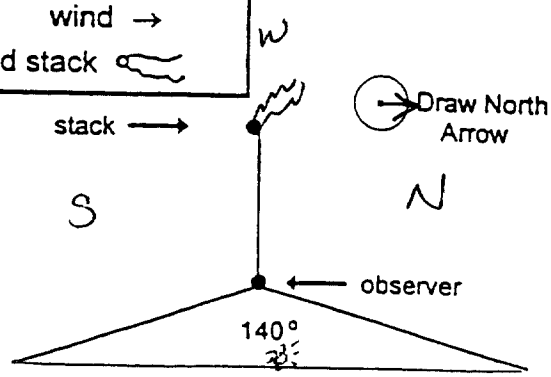
Background blue sky

Sky Condition clear

Min	Seconds 0	15	30	45	Min	Seconds 0	15	30	45	Min	Seconds 0	15	30	45	Min	Seconds 0	15	30	45
0	0	0	0	0	15	5	5	5	0	30	0	0	0	0	45	5	0	0	0
1	0	0	0	0	16	0	0	0	0	31	0	0	0	0	46	5	5	5	0
2	0	0	0	0	17	0	0	0	5	32	0	0	0	0	47	0	0	5	5
3	0	0	0	0	18	5	5	5	5	33	0	0	0	0	48	0	5	0	0
4	0	0	0	0	19	5	5	5	5	34	0	0	0	0	49	0	0	5	0
5	0	0	0	0	20	15	5	10	5	35	0	0	0	0	50	5	0	0	0
6	0	0	5	0	21	5	5	5	5	36	0	0	0	0	51	0	20	10	5
7	0	0	0	5	22	5	0	5	0	37	0	0	0	0	52	10	15	5	10
8	5	5	5	0	23	0	0	0	0	38	0	0	0	5	53	10	5	0	0
9	0	0	0	0	24	0	0	0	0	39	5	0	0	0	54	0	0	0	0
10	0	5	5	5	25	0	0	0	0	40	5	5	0	5	55	0	0	0	0
11	0	0	0	0	26	0	0	0	0	41	5	5	0	5	56	0	0	0	0
12	0	5	0	0	27	0	0	0	0	42	0	5	0	5	57	0	0	0	0
13	0	0	5	0	28	0	0	0	0	43	5	5	5	10	58	0	0	0	0
14	0	5	0	0	29	0	0	0	0	44	5	0	5	5	59	0	0	0	0

SYMBOLS
sun ✳ wind →
plume and stack

Results, Recommendations and Comments:



Received By

Date

Observer S. George RTI

Municipality Code

Time Analysis

ENV-AP-008-Revised 7/97

VISIBLE EMISSIONS OBSERVATION REPORT

Company Name ABC Coke Plant ID # [ ]

Source/Control Equipment Combustion Stack #4 Point ID # [ ]

Date 092598 Start/Stop Time 9:43 - 10:36 am Total Minutes Observed 54

Evaluation Reg. [ ] Evaluation Method 9 Highest Allowable 6 Min. Avg. [ ]

Highest 6 Min. Avg: [ ] 2nd: [ ] Standard Exceeded ? [ ] Regulation Nbr. [ ]

Min. Exceeding: **20%** Opacity = [ ] OR [ ] % Opacity = [ ] Vapor/Steam Plume Visible ? [ ]

Direction from Source E Distance from Source ~1200' Plume Detatched ? N

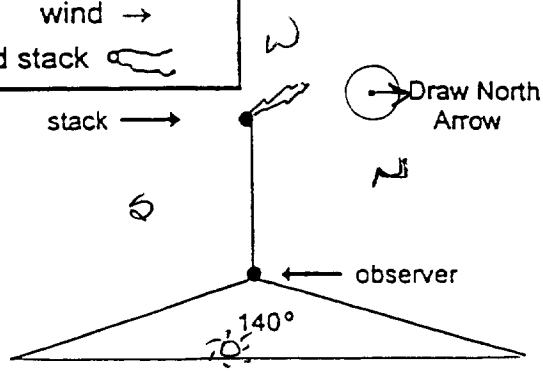
Stack Height 200 ft. Stack Height Rel. to Obs. 150 ft. Wind Direction _____ Wind Speed _____

Plume Color white Background blue sky Sky Condition partly cloudy

Min	Seconds 0	15	30	45	Min	Seconds 0	15	30	45	Min	Seconds 0	15	30	45	Min	Seconds 0	15	30	45
0	0	0	0	0	15	0	0	5	10	30	0	0	0	0	45	5	10	5	5
1	5	0	0	0	16	5	5	10	5	31	0	0	0	5	46	5	5	10	5
2	0	0	0	0	17	5	5	10	5	32	0	0	0	0	47	5	5	5	5
3	0	0	0	0	18	10	10	15	10	33	0	0	5	0	48	5	5	10	5
4	0	0	0	0	19	10	10	15	20	34	5	0	0	0	49	5	5	5	5
5	0	0	0	0	20	10	10	10	15	35	0	0	5	0	50	5	0	5	0
6	0	0	0	0	21	5	20	15	30	36	0	0	0	0	51	5	0	0	5
7	0	0	0	0	22	20	20	15	25	37	0	0	0	5	52	5	5	5	5
8	0	0	0	0	23	15	5	0	0	38	0	0	0	5	53	5	5	0	0
9	0	0	0	0	24	0	0	0	0	39	0	0	0	5	54				
10	0	5	0	5	25	0	0	0	0	40	0	0	0	0	55				
11	0	5	5	5	26	0	0	0	0	41	0	0	0	5	56				
12	5	5	5	5	27	0	0	0	0	42	0	5	5	0	57				
13	5	5	0	5	28	0	0	0	0	43	0	5	5	5	58				
14	5	0	5	0	29	0	0	0	0	44	5	5	5	5	59				

SYMBOLS
sun ✳ wind →
plume and stack

Results, Recommendations and Comments:



Received By _____
Date _____

Observer S. George RTI Municipality Code [ ] Time Analysis [ ]

ENV-AP-008-Revised 7/97

PUSHING PARAMETERS - CAPTURE OBSERVATIONS: ALABAMA BY-PRODUCT COKE, BIRMINGHAM, AL

Time	Oven ID	Capture Emissions Observations	Travel Emissions Observations
11:37	1	very low	very low
11:50	11	moderate	low
1:15	21	low	low
1:27	31	low	very low
1:46	41	moderate	moderate
2:08	3	low	very low
2:22	13	low	" "
2:37	23	low	" "
3:34	33	low - moderate	low
3:53	5	moderate	very low
4:05	15	low	moderate
4:28	25	high	high - Green push
4:43	35	low	very low
4:58	45	low	moderate
5:15	55	very high	very high - VERY GREEN
5:34	7	low	very low
5:52	17	low; very good Capture	moderate - slightly green
6:07	27	low	low
6:23	37	very low	very low

Date: 9/21/98

PUSHING PARAMETERS - CAPTURE OBSERVATIONS: ALABAMA BY-PRODUCT COKE, BIRMINGHAM, AL

Time	Oven ID	Capture Emissions Observations	Travel Emissions Observations
6:41	47	low (dusk)	low (dusk)
7:08	57	Too dark to tell	

Date: 9/21/98

PUSHING PARAMETERS - CAPTURE OBSERVATIONS: ALABAMA BY-PRODUCT COKE, BIRMINGHAM, AL

Time	Oven ID	Capture Emissions Observations	Travel Emissions Observations
11:20	18	low; good capture	very low
11:40	28	low - good capture	" "
11:54	38	" " "	" "
12:18	58	" " "	" "
12:38	1	low; good capture	very low
12:52	11	low-mod; fair capture	very low
1:06	21	moderate; fair capture	mod - high; green push
2:09	31	" " "	low
2:17	41	fair; very good capture	moderate (just at end of travel)
2:34	3	low; very good capture	very low
2:48	13	moderate - good capture	" "
3:06	23	moderate; fair capture	low
3:32	33	low; fair capture	low
3:48	5	low; fair capture	very low
3:58	15	moderate; poor capture	low
4:35	25	moderate; fair capture	moderate
4:50	35	good capture; low emiss.	very low
5:02	45	low; good capture	" "
5:34	55	mod; good capture	high

Date: 9/22/98

PUSHING PARAMETERS - CAPTURE OBSERVATIONS: ALABAMA BY-PRODUCT COKE, BIRMINGHAM, AL

Time	Oven ID	Capture Emissions Observations	Travel Emissions Observations
5:48	7	moderate emiss; ~~good~~ fair capture	low
6:14	17	mod. - poor capture	high - green push

Date: 9/22/98

PUSHING PARAMETERS - CAPTURE OBSERVATIONS: ALABAMA BY-PRODUCT COKE, BIRMINGHAM, AL

Time	Oven ID	Capture Emissions Observations	Travel Emissions Observations
10:33	36	low emiss; good capture	very low
10:53	56	low emiss; fair capture	very low
11:21	8	moderate; poor capture	low
11:39	18	high; very poor capture	high
11:57	28	low; good capture	very low
12:14	38	" " "	" "
12:30	58	low; fair capture	very low
12:46	1	low; fair capture	moderate
1:06	11	low; good capture	very low
1:20	21	moderate - poor capture	moderate
2:27	31	low - very good cap.	very low
2:39	41	moderate - fair capture	moderate
2:57	3	low, good capture	very low
3:11	13	" " "	" "
3:26	23	low, very good capture	very low
3:45	33	moderate - good capture	low
4:08	5	low - good capture	very low
4:23	15	— VIEW OBSTRUCTED BY RAIL CARS —	
4:42	25	moderate, fair capture	moderate

Date: 9/23/98

PUSHING PARAMETERS - CAPTURE OBSERVATIONS: ALABAMA BY-PRODUCT COKE, BIRMINGHAM, AL

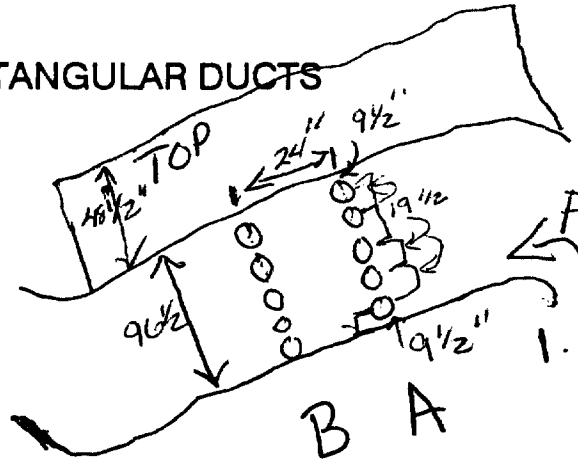
Time	Oven ID	Capture Emissions Observations	Travel Emissions Observations
5:01	35	low*, good capture	very low*
5:11	45	low* good capture	very low*
6:02	55	low* good capture	low*
		* fairly strong wind	

Date: 9/23/98

APPENDIX B

RAW FIELD DATA

TRAVERSE POINT LOCATION FOR RECTANGULAR DUCTS



Plant: ABC - Coke EPA - Coke

Date: 9/20/98

Sampling Location: Baghouse Inlet

Duct Width, inches: 96½

Inside of Far Wall to Outside of Nipple: 52"

Nipple Ends 1½" inside duct

Inside of Near Wall to Outside of Nipple (Nipple Length): 5½

Duct Length, inches: 48½

Equivalent Diameter = 2 x L x W / (L + W) = 64.56

Distance Downstream from Flow Disturbance (Distance B):

A = 300" B = 324" inches / Equivalent Diameter = 76/5.0 dd

Distance Upstream from Flow Disturbance (Distance A):

A = 70½" B = 46½" inches / Equivalent Diameter = 1.1/0.72 dd

Calculated By: TA / GG

Schematic of Sampling Location

Traverse Point Number	Fraction of Length	Length (inches)	Product of Columns 2 & 3* (To nearest 1/8")	Nipple Length (inches)	Traverse Point Location (Sum of Col. 4 & 5)
1	0.1	4.85	4.85	3"	7.85
2	0.3	14.55	14.55		17.55
3	0.5		24.25		27.25
4	0.7		33.95		36.95
5	0.9		43.65		46.65

If No Ports, Calculate Distances From Stack Walls For Port Locations

Number of Ports	Fraction of Width	Width (inches)	Port Location Product of Col. 2 & 3* (To Nearest 1/8")

* All points or ports should be an equal distance from each other (D) and 1/2 of that distance from the stack walls (D/2), where D = Width / # of points or ports

GAS VELOCITY AND VOLUMETRIC FLOW RATE

Plant: ABC Coke — Date: 9-~~30~~ 20-98

Sampling Location: Baghouse Inlet — Clock Time: 1705

Run #: Cyclonic Flow — Operators: TA/CG

Barometric Pressure, in. Hg: 29.64 — Static Pressure, in. H_2O: -59

Moisture, %: 3 — Molecular wt., Dry: 28 — Pitot Tube, Cp: .84

Stack Dimension, in. Diameter or Side 1: 96.5 — Side 2: 48.5

Wet Bulb, °F: — — Dry Bulb, °F: —

A ports

Traverse Point Number	~~Velocity Head in. H_2O~~ Angle	~~Stack Temp. °F~~ Direction
A 1	4	CW
2	4	CW
3	5	CW
4	5	CW
5	6	CW
B 1	0	—
2	0	—
3	4	CW
4	5	CW
5	5	CW
C 1	5	CW
2	4	CW
3	4	CW
4	5	CW
5	5	CW
D 1	4	CW
2	3	CW
3	0	CW
4	0	CW
5	0	CW
E 1	4	CW
2	5	CW
3	4	CW
4	2	CW
5	0	CW
	$\overline{\sqrt{\Delta P}}$ =	$\overline{Ts}$ =

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

$Md =$

$Ms = Md \times (1 - \frac{\% H_2O}{100}) + 18 (\frac{\% H_2O}{100})$

$Ms = (\quad) \times (1 - \frac{\quad}{100}) + 18 (\frac{\quad}{100})$

$Ms =$

$\overline{Ts} =$ °F = °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (\quad) + \frac{\quad}{13.6}$

$Ps =$ in. Hg

$\overline{\sqrt{\Delta P}} =$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\ (°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\quad}$

$Vs =$ ft/s

$As =$ ft^2

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs =$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\% H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$

$Qs_{std} =$ dscfm

K = 1.050 @ 1.8 DN MB3 MB2
Y 1.004 1.002
DHA 1.784 1.797
DN = .179 .179

GAS VELOCITY AND VOLUMETRIC FLOW RATE

Plant: ABC Coke Date: 9-20-98
Sampling Location: Baghouse Inlet - Sample Ports A Clock Time: 1445
Run #: Preliminary Operators: TA/SB/GG
Barometric Pressure, in. Hg: 29.64 Static Pressure, in. H_2O: -5.9
Moisture, %: 3 Molecular wt., Dry: _____ Pitot Tube, Cp: .84
Stack Dimension, in. Diameter or Side 1: 96.5 Side 2: 48.5
Wet Bulb, °F: _____ Dry Bulb, °F: _____

	Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F	
A	A 1	2.7	176	96
	2	2.4		
	3	2.2		
	4	2.5		
	5	2.0		
	B 1	2.1	172	90
	2	1.8		
	3	1.7		
	4	1.5		
	5	1.5		
	C 1	1.7	168	89
	2	1.5		
	3	1.2		
	4	1.1		
	5	1.0		
	D 1	2.1	189	
	2	1.8		
	3	1.6		
	4	1.6		
	5	1.6		
	E 1	2.2	190	
	2	2.3		
	3	2.2		
	4	2.1		
	5	2.0		
		$\overline{\sqrt{\Delta P}}$ = 1.353	$\overline{Ts}$ = 179	

$\overline{\Delta P}$ 1.856

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

$Md = 28.96$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (\quad) \times (1 - \frac{\quad}{100}) + 18 (\frac{\quad}{100})$

$Ms = 28.63$

$\overline{Ts} = 179$ °F = °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (\quad) + \frac{\quad}{13.6}$

$Ps = 29.21$ in. Hg

$\overline{\sqrt{\Delta P}} = 1.856$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\ (°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\quad}$

$Vs = 84.9$ ft/s

$As = 32.5$ ft²

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs = 165{,}606$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$

$Qs_{std} = 129{,}567$ dscfm
@ 3% H_2O

SB 10-1

Pacific Environmental Services, Inc.

Dry Molecular Weight Determination

Client/Project: 550,000/ABC Coke
Date/Time: 9/21/98
Sample Type: Orsat Analysis
Ambient Temp. °F: 70°F

Orsat No.: 0-1
Operator: RKB
Comments:
Site Location: Bayhouse Inlet

Run No.(s)	Gas	Run 1		Run 2		Run 3		Average Net Volume %	Multiplier	Molecular Weight of Stack Gas, Md (lb/Mole)
		Actual	Net	Actual	Net	Actual	Net			
A-I-429-1 A	CO_2	0.2	0.20	0.20	0.20			0.2	0.44	
	O_2[a]	20.5	20.3	20.5	20.3			20.3	0.32	
	CO[b]								0.28	
	N_2[c]								0.28	
									Md =	

Run No.(s)	Gas	Run 1		Run 2		Run 3		Average Net Volume %	Multiplier	Molecular Weight of Stack Gas, Md (lb/Mole)
		Actual	Net	Actual	Net	Actual	Net			
A-I-42A-1 B	CO_2	0.20	0.20	0.20	0.20			0.2	0.44	
	O_2[a]	20.4	20.2	20.4	20.2			20.2	0.32	
	CO[b]								0.28	
	N_2[c]								0.28	
									Md =	

Run No.(s)	Gas	Run 1		Run 2		Run 3		Average Net Volume %	Multiplier	Molecular Weight of Stack Gas, Md (lb/Mole)
		Actual	Net	Actual	Net	Actual	Net			
	CO_2								0.44	
	O_2[a]								0.32	
	CO[b]								0.28	
	N_2[c]								0.28	
									Md =	

[a] O_2 Net Volume is O_2 actual reading minus CO_2 actual reading.

[b] CO Net Volume is CO actual reading minus O_2 actual reading.

[c] N_2 Net Volume is 100 minus CO actual reading.

PACIFIC ENVIRONMENTAL SERVICES, INC.

Pacific Environmental Services, Inc.

Dry Molecular Weight Determination

Client/Project: ABC Coke
Date/Time: 9/22
Sample Type: Orsat
Ambient Temp. °F 72°F

Orsat No. O-1
Operator: RWD/RK
Comments:
Site Location: Inlet

Run No.(s)	Gas	Run 1		Run 2		Run 3		Average Net Volume %	Multiplier	Molecular Weight of Stack Gas, Md (lb/Mole)
A-I-4-27 2 Bag I		Actual	Net	Actual	Net	Actual	Net			
	CO_2	0.2	0.2	0.2	0.2			0.2	0.44	
	O_2[a]	20.5	20.3	20.5	20.3			20.3	0.32	
	CO[b]								0.28	
	N_2[c]								0.28	
									Md =	

Run No.(s)	Gas	Run 1		Run 2		Run 3		Average Net Volume %	Multiplier	Molecular Weight of Stack Gas, Md (lb/Mole)
A-I-4-27 2 Bag II		Actual	Net	Actual	Net	Actual	Net			
	CO_2	0.2	0.2	0.2	0.2			0.2	0.44	
	O_2[a]	20.4	20.2	20.4	20.2			20.2	0.32	
	CO[b]								0.28	
	N_2[c]								0.28	
									Md =	

Run No.(s)	Gas	Run 1		Run 2		Run 3		Average Net Volume %	Multiplier	Molecular Weight of Stack Gas, Md (lb/Mole)
		Actual	Net	Actual	Net	Actual	Net			
	CO_2								0.44	
	O_2[a]								0.32	
	CO[b]								0.28	
	N_2[c]								0.28	
									Md =	

[a] O_2 Net Volume is O_2 actual reading minus CO_2 actual reading.

[b] CO Net Volume is CO actual reading minus O_2 actual reading.

[c] N_2 Net Volume is 100 minus CO actual reading.

PACIFIC ENVIRONMENTAL SERVICES, INC.

Pacific Environmental Services, Inc.

Dry Molecular Weight Determination

Client/Project: ABC Coke

Date/Time: 9/23

Sample Type: ORSAT

Ambient Temp. °F: 72

Orsat No.: O-1

Operator: TA

Comments: —

Site Location: Baghouse Inlet

Run No.(s)	Gas	Run 1		Run 2		Run 3		Average Net Volume %	Multiplier	Molecular Weight of Stack Gas, Md (lb/Mole)
		Actual	Net	Actual	Net	Actual	Net			
A-I-429-3 Bag 1	CO_2	0.2	0.2	0.2	0.2			0.2	0.44	
	O_2[a]	20.4	20.2	20.4	20.2			20.2	0.32	
	CO[b]								0.28	
	N_2[c]								0.28	
									Md =	

Run No.(s)	Gas	Run 1		Run 2		Run 3		Average Net Volume %	Multiplier	Molecular Weight of Stack Gas, Md (lb/Mole)
		Actual	Net	Actual	Net	Actual	Net			
A-I-429-3 Bag 2	CO_2	0.2	0.2	0.2	0.2			0.2	0.44	
	O_2[a]	20.5	20.3	20.5	20.3			20.3	0.32	
	CO[b]								0.28	
	N_2[c]								0.28	
									Md =	

Run No.(s)	Gas	Run 1		Run 2		Run 3		Average Net Volume %	Multiplier	Molecular Weight of Stack Gas, Md (lb/Mole)
		Actual	Net	Actual	Net	Actual	Net			
	CO_2								0.44	
	O_2[a]								0.32	
	CO[b]								0.28	
	N_2[c]								0.28	
									Md =	

[a] O_2 Net Volume is O_2 actual reading minus CO_2 actual reading.

[b] CO Net Volume is CO actual reading minus O_2 actual reading.

[c] N_2 Net Volume is 100 minus CO actual reading.

PACIFIC ENVIRONMENTAL SERVICES, INC.

METHOD 18 FIELD DATA SHEET

Plant: ABC Coke EPA
Date: ~~9-20-98~~ 9-21-98 (N)
Location: Baghouse Inlet
Run #: A-I-MS05-1
Stack I.D.: 98.5 x 48.5
Pbar: 29.70
Sample Tube #: A-I-1 A, B, C
Operators: TA/SB
Leak Check: Pre: ✓ Post: ✓
(a) 17" Hg 12" Hg

Tested Analyte: PAH
Orifice Tank #: —
Pump/Rotometer #: VOST #1
Pt: Pretest (mm Hg): 17" Hg
Post-Test (mm Hg): 12" Hg
Tt: Pretest (°F): —
Post-Test (°F): —
Time: Start: — Finish: — Total: —
W/B: — D/B: — O_2: — CO_2: —

Time	Gauge Vacuum (Hg)	Flow Setting

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

$Md =$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (\quad) \times (1 - \frac{\quad}{100}) + 18 (\frac{\quad}{100})$

$Ms =$

$Ts = \quad °F = \quad °R \ (°F + 460)$

$Ps = Pb + \frac{S.P.}{13.6} = (\quad) + \frac{\quad}{13.6}$

$Ps = \quad$ in. Hg

$\sqrt{\Delta P} =$

$Vs = 85.49 \times Cp \times \sqrt{\Delta P} \times \sqrt{\frac{Ts\ (°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\quad}$

$Vs = \quad$ ft/s

$As = \quad ft^2$

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs = \quad$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$

$Qs_{std} =$ 448 dscfm 2686.80 2 98

Time		Vm Traverse Point Number	Vac Velocity Head in. H2O	Rot Stack Temp. °F	Tm
1147	0	1879.36	4	2	79
1157	10	1898	4	2	82
	20	1918	4	2	85
1217	30	1933	4	2	85
	45	1950	4	2	90
1247	60	1979	4	2	92
1252	70	1995	4	2	93
	80	2013	4	2	94
	100	2043	4	2	97
	113	2065	4	2	97
	130	2088	4	2	97
	150	2112	4	2	97
	170	2150	4	2	95
	180	2177	4	2	95
	190	2197	4	2	93
	210	2236	4	2	94
	220	2257	7	2	94
	230	2279	7	2	94
	250	2314	7	2	94
	270	2355	7	2	96
	290	2397	7	2	98
	300	2414	9	2	96
	320	2455	9	2	96
	340	2500	9	2	97
	360	2530	9	2	97
	380	2575	9	2	97
	400	2600	10	2	97
	420	2646	10	2	97
			10	2	96

METHOD 18 FIELD DATA SHEET

Plant: EPA - ABL Coke
Date: 9-22-98
Location: Baghouse Inlet
Run #: A-I-m5506-2
Stack I.D.: 98.5" x 48.5"
Pbar: 29.74
Sample Tube #: A-I-m5506-2A, 2B, 2C
Operators: TA
Leak Check: Pre: ✓ 17" Hg Post: ✓ 10" Hg

Tested Analyte: PAH
Orifice Tank #: —
Pump/Rotometer #: Vost 1
Pt: Pretest (mm Hg): —
Post-Test (mm Hg): —
Tt: Pretest (°F): —
Post-Test (°F): —
Time: Start: — Finish: — Total: —
W/B: — D/B: — O_2: — CO_2: —

Time	Gauge Vacuum (Hg)	Flow Setting

$$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$$

$$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$$

$$Md =$$

$$Ms = Md \times \left(1 - \frac{\%H_2O}{100}\right) + 18\left(\frac{\%H_2O}{100}\right)$$

$$Ms = (\quad) \times \left(1 - \frac{\quad}{100}\right) + 18\left(\frac{\quad}{100}\right)$$

$$Ms =$$

$$Ts = \quad {}^\circ F = \quad {}^\circ R \ ({}^\circ F + 460)$$

$$Ps = Pb + \frac{S.P.}{13.6} = (\quad) + \frac{\quad}{13.6}$$

$$Ps = \quad \text{in. Hg}$$

$$\overline{\sqrt{\Delta P}} =$$

$$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\ (^\circ R)}{Ps \times Ms}}$$

$$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\quad}$$

$$Vs = \quad \text{ft/s}$$

$$As = \quad \text{ft}^2$$

$$Qs = Vs \times As \times 60 \text{ s/m}$$

$$Qs = \quad \times \quad \times 60$$

$$Qs = \quad \text{acfm}$$

$$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times \left(1 - \frac{\%H_2O}{100}\right)$$

$$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times \left(1 - \frac{\quad}{100}\right)$$

$$Qs_{std} = \quad \text{dscfm}$$

Time	Vm Traverse Point Number	Vac Velocity Head in. H_2O	Rot Stack Temp. °F	Tm
1022	2686.50	5	2	81
1042 20	2728	5	2	89
1102 40	2762	5	2	94
1122 60	2800	6	2	98
1150 80	2838	6	2	99
100	2870	6	2	100
1230 120	2912	6	2	106
140	2948	6	2	106
160	2972	7	2	106
180	3001	7	2	106
200	3054	7	2	106
220	3097	9	2	108
240	3130	9	2	112
260	3176	9	2	112
280	3215	9	2	113
300	3254	9	2	112
320	3289	9	2	112
340	3332	9	2	112
1724 360	3371	9	2	113
380	3410	9	2	112
1753 390	3429.37	9	2	112

METHOD 18 FIELD DATA SHEET

Plant: ABC-Coke EPA
Date: 9-23-98
Location: Baghouse Inlet
Run #: A-I-5506-3
Stack I.D.: 96.5" x 48.5"
Pbar: 29.8
Sample Tube #: A-I-5506-3 A,B,C
Operators: SR/TA
Leak Check: Pre: ✓ Post: [illegible]

Tested Analyte: PAH -
Orifice Tank #: —
Pump/Rotometer #: Post 1
Pt: Pretest (mm Hg): —
Post-Test (mm Hg): —
Tt: Pretest (°F): —
Post-Test (°F): —
Time: Start: — Finish: — Total: —
W/B: — D/B: — O_2: — CO_2: —

Time	Gauge Vacuum (Hg) 17" hg	Flow Setting

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

$Md =$

$Ms = Md \times (1 - \frac{\% H_2O}{100}) + 18 (\frac{\% H_2O}{100})$

$Ms = (\quad) \times (1 - \frac{\quad}{100}) + 18 (\frac{\quad}{100})$

$Ms =$

$Ts = \quad °F = \quad °R \ (°F + 460)$

$Ps = Pb + \frac{S.P.}{13.6} = (\quad) + \frac{\quad}{13.6}$

$Ps = \quad$ in. Hg

$\overline{\sqrt{\Delta P}} =$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\ (°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\quad}$

$Vs = \quad$ ft/s

$As = \quad ft^2$

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs = \quad$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\% H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{\quad}{\quad} \times (1 - \frac{\quad}{100})$

$Qs_{std} = \quad$ dscfm

20 min

Time	Vm Traverse Point Number	Vac Velocity Head in. H_2O	Dot Stack Temp. °F	Tm
1022	3429.75	4	2	82
1042 20	3462.8	4	2	88
1102 40	3501.5	5	2	94
1122 60	3536.4	5	2	98
1142 80	3572.1	5	2	100
1202 100	3607.7	6	2	102
1222 120	3644.2	6	2	104
1242 140	3680.8	6	2	107
1302 160	3718.2	6	2	109
1322 180	~~575~~			
1335	3757.10	6	2	110
smp	3789.6	6	2	109
START	—	—	—	
~~1400 205~~	—	—	—	
1444 225	3828.9	6	2	111
1504 245	3872.3	6	2	113
1524 265	3914.2	6	2	115
1544 285	3947.3	6	2	114
1604 305	3985.9	8	2	118
1624 325	4025.1	8	2	119
1644 345	4065.1	8	2	119
1704 365	4104.9	8	2	119
1724 385	4138.85	9	2	117

METHOD 18 FIELD DATA SHEET

Plant: ABC - Coke
Date: 9-25-98
Location: Baghouse Inlet
Run #: A-I- NIOSH FB
Stack I.D.:
Pbar: 29.85
Sample Tube #:
Operators: D. Holzschuh
Leak Check: Pre: ______ Post: ______

Tested Analyte: XAI DF/XAD Resin
Orifice Tank #: N/A
Pump/Rotometer #: Vost Box 1
Pt: Pretest (mm Hg): 20" 413.800
Post-Test (mm Hg): 413.900
Tt: Pretest (°F):
Post-Test (°F):
Time: Start: ____ Finish: ____ Total: ____
W/B: ____ D/B: ____ O_2: ____ CO_2: ____

Time	Gauge Vacuum (Hg)	Flow Setting
14:30	20"	

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
4	413.800	
	413.900	

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

Md =

$Ms = Md \times (1 - \frac{\% H_2O}{100}) + 18 (\frac{\% H_2O}{100})$

$Ms = (\quad) \times (1 - \frac{}{100}) + 18 (\frac{}{100})$

Ms =

Ts = °F = °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (\quad) + \frac{}{13.6}$

Ps = in. Hg

$\overline{\sqrt{\Delta P}}$ =

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\ (°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\frac{}{}}$

Vs = ft/s

As = ft^2

Qs = Vs x As x 60 s/m

Qs = x x 60

Qs = acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\% H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{}{} \times (1 - \frac{}{100})$

Qs_{std} = dscfm

Port Set = A

K = 1.36

FIELD DATA SHEET

Plant: ABC - Coke - EPA
Sampling Location: Baghouse Inlet
Run Number: A-I-M315-1 Date: 9-21-98
Pretest Leak Rate: .005 cfm @ 15 in. Hg.
Pretest Leak Check: Pitot: ✓ Orsat: —

Sample Type: M315 Operator: TA/SB
Pbar: 29.70 Ps: -5.9
CO2: 2 O2: 18
Probe Length/Type: 5 ft Glass Pitot #: 5E
Stack Diameter: 98.5 x 48.5 As: 32.5

Nozzle ID: .192 Thermocouple #: 5E
Assumed Bws: 3% Filter #: ~~I 315 T~~ 080798-20
Meter Box #: 3 Y: 1.004 ΔH@: 1.784
Post-Test Leak Rate: .002 cfm @ 10 in. Hg.
Post-Test Leak Check: Pitot: ✓ Orsat: —

Traverse Point Number	Sampling Time (min)	Clock Time (24-hour clock)	Gas Meter Reading (Vm) ft³	Velocity Head (Δp) in H2O	Orifice Pressure Differential (ΔH) in H2O Desired	Actual	Stack Temp. (Ts)	Temperature °F Probe	Filter	Impinger Temp. °F	Dry Gas Meter Temp. Inlet (Tm in °F)	Outlet (Tm out °F)	Pump Vacuum (in. Hg)
0	0	1128	499.100										
A-1	2	1130	502	1.7	2.2	2.2	100	252	258	68	100	98	5
	8	1133	504	2.3	3.2	3.2	113	252	258	68	100	98	5
Push	10	1138	509.2	2.1	2.8	2.8	103	252	258	65	102	100	5
Push	12	1140	512.0	2.1	2.8	2.8	183	252	257	63	102	100	5
2	17.5	1142	513.2	.12	0.16	0.16	107	256	248	60	106	100	2
Push	26	1149	517.4	2.2	2.6	2.6	180	257	248	60	105	101	5
3	29.5	1152	519.1	.10	0.13	0.13	110	256	248	61	105	101	2
~~Push~~	40	1204	522	2.0	2.4	2.4	107	249	256	59	107	102	5
4	44	1207	526	2.0	2.4	2.4	107	250	250	59	112	103	5
5	57	1221	538.9	1.5	2.1	2.1	100	252	248	59	117	106	5
End Port	72	1238	550.010	1.5	2.1	2.1	100	252	248	59	117	106	5
A2-2	86.4	1251	564.3	1.8	2.5	2.5	105	250	254	55	116	108	5
3	100.8	1306	575.7	1.4	1.6	1.6	104	252	247	56	120	110	5
Push	108	1313	580.6	1.2	1.4	1.4	101	244	249	56	118	109	5
	110	1315	581.8	1.2	1.2	1.2	177	244	249	55	117	108	4
	115.1	1320	582.7	0.04	0.05	0.05	105	245	249	54	117	108	2
4	120.1	1325	583.2	0.04	0.05	0.05	112	244	248	53	116	109	2
Push	123	1328	585.5	1.2	1.4	1.4	201	245	246	52	116	113	4
	129.1	1335	586.3	.04	0.05	0.05	110	246	242	52	116	113	2
5	135	1340	587.2	.04	0.05	0.05	116	250	251	53	116	113	1
Push	140	1345	591.1	1.4	1.4	1.4	195	250	250	53	116	113	4
	144	1349	591.645-.712	.08	0.09	0.09	112	249	250	52	116	113	1
A3-1	159	1405	593.8	.02	0.02	0.02	115	249	252	55	116	113	1
Push	161	1408	595.2	1.4	1.4	1.4	201	248	253	55	117	114	4
	170	1417	597.3	.08	0.09	0.09	114	248	252	55	117	114	1
A3-3	173	1420	599.5	1.0	1.1	1.1	114	248	252	57	117	114	3

Leak check: 55: .010, 56: .025

Leak check: -0.005

.712 = .445

Leak check: -0.01

ΔVm= ~~192.362~~ 196 √Δp= .7631 ΔH= 0.94 Ts= 138 Tm= 111

928 Pushes ~~XXV~~ 11

Plant Name: EPA ABC Coke **Test Date:** 9-21-98

Run Number: A-I-M315-1 TA **Operator:** TA/SB

230.4
244.8
257.2
28

	Traverse Point Number	Sampling Time, (min.)	Clock Time (24-hour clock)	Gas Meter Reading (V_m) ft³	Velocity Head (ΔP_s) in. H_2O	Orifice Pres. Differential (ΔH) in. H_2O Desired	Orifice Pres. Differential (ΔH) in. H_2O Actual	Stack Temp. °F (T_s)	Probe Temp. / Filter Temp. °F	Impinger Temp. °F	Dry Gas Meter Temp. Inlet ($T_{m_{in}}$) °F	Dry Gas Meter Temp. Outlet ($T_{m_{out}}$) °F	Pump Vacuum In. Hg
Push	A3-3	176	1423	600.5	1.0	1.1	1.1	189	250 / 250	54	117	114	5
	A3-4	187	1433	603.2	0.08	0.09	0.09	114	250 / 252	53	117	114	1
Leak check .928	Push	189	1435	604.2	.92	1.0	1.0	111	251 / 252	55	117	114	3
		191	1438	605.8	.97	0.97	0.97	192	251 / 251	55	117	114	3
		202	1448	607.1	0.03	0.03	0.03	114	253 / 253	56	116	112	1
-.832 -.096	A3-5	216	1503	608.832	0.03	0.03	0.03	108	252 / 252	59	112	110	1
	A4-1	230.4	1522	613.1	0.03	0.03	0.03	109	248 / 252	55	111	110	1
	A4-2	239	1530	614.0	0.05	0.06	0.06	110	249 / 253	54	111	110	1
FAN		242	1533	616.5	1.6	1.8	1.8	105	250 / 250	52	111	110	4
	Push	244	1536	618.7	2.1	2.1	2.1	196	251 / 251	53	111	111	5
	A4-3	255	1547	620.7	.08	0.09	0.09	112	251 / 251	53	112	111	1
Leak check 30.211 30.102 -.109	Push 4.4	259	1551	623.4	1.5	1.5	1.5	200	252 / 251	54	113	110	4
		269	1600	625.3	0.05	0.06	0.06	115	252 / 251	54	113	110	1
	Push	273	1604	627.7	1.5	1.5	1.5	200	252 / 252	52	115	111	4
	A4-5	285	1616	630.1	0.05	0.06	0.06	123	251 / 251	52	115	111	1
	FAN	294	1625	632.5	1.5	1.7	1.7	197 TA	248 / 251	51	115	112	1
A5-1	Push	296	1627	639.0	1.5	1.5	1.5	197	248 / 251	51	115	112	1
	A5-2	303	1634	640.2	0.05	0.06	0.06	115	247 / 251	52	115	112	1
		307	1639	641.2	0.05	0.06	0.06	120	250 / 251	52	115	112	1
	FAN	310	1641	143.2	1.6	1.8	1.8	116	252 / 251	52	116	113	4
	Push	312	1643	644.9	1.6	1.6	1.6	204	252 / 251	52	116	113	4
	A5-3	317	1648	645.9	.03	0.03	0.03	115	252 / 251	52	116	113	1
		324	1656	647.1	.03	0.03	0.03	115	252 / 251	52	116	113	1
	Push	327	1658	649.6	1.6	1.6	1.6	203	252 / 252	52	116	114	4

302.
30.6
31.2

11,144

W

Plant Name: EPA ABC Coke **Test Date:** 9-21-98

Run Number: A-I-M315-1 **Operator:** TA/SB

	Traverse Point Number	Sampling Time, (min.)	Clock Time (24-hour clock)	Gas Meter Reading (V_m) ft³	Velocity Head (ΔP_s) in. H_2O	Orifice Pres. Differential (ΔH) in. H_2O Desired	Orifice Pres. Differential (ΔH) in. H_2O Actual	Stack Temp. °F (T_s)	Probe Temp. / Filter Temp. °F	Impinger Temp. °F	Dry Gas Meter Temp. Inlet ($T_{m_{in}}$) °F	Dry Gas Meter Temp. Outlet ($T_{m_{out}}$) °F	Pump Vacuum In. Hg
Leak check 1.011 .072 -0.939	A5-3	—	—	—	0.1	.11	.11	112	252 / 252	51	116	114	1
	A5-4	331	1723	654.0	0.1	.11	.11	116	252 / 252	51	116	114	1
	PUSH 14	344	1736	654.9	1.9	1.5	1.5	345	232 / 252	51	116	114	5
	A5-5	346	1717	655.1	0.1	.11	.11	120	251 / 252	51	116	114	1
		359	1730	657.8	0.1	.11	.11	120	251 / 252	51	116	114	1
	PUSH	362	1733	660.5	1.5	1.5	1.5	192	251 / 252	51	116	114	4
		365	—	—	.03	.03	.03	117	251 / 252	52	115	113	1
A3-1	FAN	FAN 37.5	1751	667.5	1.6	1.8	1.8	111	251 / 252	52	115	113	4
A3-2	PUSH	PUSH 370	1753	669.5	1.6	1.5	1.5		251 / 252	52	115	113	4
A3-3		389	1800	671.0	0.05	0.06	0.06	117	251 / 252	52	115	113	1
		391	1804	672.0	0.05	0.06	0.06	116	252 / 253	52	115	113	1
	PUSH	394	1807	673.8	1.0	0.98	0.98	195	254 / 254	55	114	114	4
	A3-4	403	1816	675.0		0.06	0.06	111	253 / 252	56	114	112	1
		408	1820	675.6	0.05	0.06	0.06	114	254 / 254	50	96	95	1
	PUSH 16	410	1821	677.0	1.0	0.98	0.98	208	254 / 252	50	95	94	4
	A3-5	418	1833	678.5	0.05	0.06	0.06	94	253 / 252	50	94	93	1
		427	1840	680.0	0.05	0.06	0.06	94	253 / 252	51	97	95	1
	PUSH 18	430	1845	681.2	1.0	0.98	0.98	187	245 / 247	51	97	95	4
		444	1856	683.1	0.03	0.03	0.03	92	247 / 247	51	96	95	1
	FAN	454	1907	690.6	1.4	1.6	1.6	92	249 / 249	53	98	96	4
	PUSH 20	458	1911	692.588	1.4	1.3	1.3	250	249 / 248	54	98	96	4

PACIFIC ENVIRONMENTAL SERVICES, INC

4700 Duke Drive, Suite 150
Mason, Ohio 45040
513.398.2556 FAX: 513.398.3342

Sample Train Recovery Data

01 DPA

Plant: ABC Coke Tarrant, AL Date: 9/20/98

Sampling Location: Inlet Baghouse

Sample Recovery Person: RWD Field Team Leader: DS

Sampling Method Type: EPA 315

Run Number: A-315-~~O~~ RWI I-1 Impinger Train ID: N-9

Job Number: 5505000

Comments: Method 315 Inlet Run 1
Used cyclone + flask for heavy particulate

Front Half Data

Filter No.: 080798-20 Filter Media Type: Treated Quartz

Filter Description: Heavy loading, Black particulate

Filter No.: — Filter Media Type: —

Filter Description: —

Good cyclone loading

Back Half Data

Impinger Purge-

Start Time: — Flow Rate: — Stop Time: — Purge Gas: —

	Impinger 1	Impinger 2	Impinger 3
Contents:	H_2O	H_2O	Empty
Final Volume: (ml)	755.7	723.4	~~755.5~~ RW 572.9
Initial Volume: (ml)	691.8	708.0	~~691.8~~ 568.0 RW 2
Net Volume: (ml)	63.9	15.4	4.9

	Impinger 4	Impinger 5	Silica Gel
Contents:			Sil Gel
Final Volume: (ml)			(g): 920.6
Initial Volume: (ml)			(g): 889.3
Net Volume: (ml)			(g): 31.3

Total Moisture Collected (ml): 115.5

Description of Impinger catch: clear

Sil Gel ~40% spent; pink, blue, white

Pushes ~~1~~ 1 11

FIELD DATA SHEET

Plant: EPA ABC Coke
Sampling Location Baghouse Inlet
Run Number: A-I-M315-2 Date: 9-22-98
Pretest Leak Rate: .001 cfm @ 15 in. Hg.
Pretest Leak Check: Pitot: ✓ Orsat: —

Sample Type: M315 Operator: TA/GG
Pbar: 29.74 Ps: -4.5
CO2: 1 O2: 20
Probe Length/Type: 5' Glass Pitot #: 5E
Stack Diameter: 98.5 x 48.5 As: ~~33.2~~ 32.5

Nozzle ID: .192 Thermocouple #: 5E
Assumed Bws: 3 Filter #: 080898-07
Meter Box #: 3 Y: 1.004 ΔH@: 1.784
Post-Test Leak Rate: .001 cfm @ 10 in. Hg.
Post-Test Leak Check: Pitot: ✓ Orsat: —

Traverse Point Number	Sampling Time (min)	Clock Time (24-hour clock)	Gas Meter Reading (Vm) ft³	Velocity Head (Δp) in H2O	Orifice Pressure Differential (ΔH) in H2O Desired	Orifice Pressure Differential (ΔH) in H2O Actual	Stack Temp. (Ts)	Temperature °F Probe	Temperature °F Filter	Impinger Temp. °F	Dry Gas Meter Temp. Inlet (Tm in °F)	Dry Gas Meter Temp. Outlet (Tm out °F)	Pump Vacuum (in. Hg)
⊙	0	1018	693.721										
A2-1	14.4	1032	696.0	.05	.06	.06	107	248	250	65	100	98	1
A2-2	18	1036	696.900	.05	.06	.06	113	251	255	65	102	99	1
FAN	18.8	1037	697.454	1.4	1.3	1.3	193	252	255	62	100	98	2
PUSH	20.8	1039	698.875	1.4	1.3	1.3	193	252	255	62	100	98	2
A2-3	33.2	1054	700.695	.03	.03	.03	112	252	253	61	100	98	1
PUSH	35.2	1053	702.211	1.2	1.1	1.1	195	252	252	61	107	102	2
A2-3	50.4	1108	703.240	.03	.03	.03	119	252	252	61	107	102	2
A2-4	60.6	1119	704.111	.03	.03	.03	123	249	252	62	106	103	1
PUSH	62.6	1121	705.271	.92	.91	.91	185	249	250	62	106	103	2
	80.5	1138	707.621	.03	.03	.03	129	248	251	61	111	105	1
PUSH	82.5	1140	708.810	1.1	1.0	1.0	220	249	250	62	113	109	2
	84.0	1142	709.369	.03	.03	.03	139	249	250	62	113	109	1
A3-1	86	—	709.465	.03	.03	.03	130	249	250	60	115	112	2
FAN	—	—	709.80	1.5	1.7	1.7	115	250	250	60	115	112	2
PUSH	93	1152	712.500	1.5	1.5	1.5	212	250	249	60	115	112	2
	95	1154	714.333	1.5	1.5	1.5	212	250	247	61	115	112	2
A3-2	101	1200	715.2	.03	.03	.03	122	250	247	60	115	112	1
A3-3	118	1216	717.311	.03	.03	.03	127	250	250	60	115	112	1
PUSH	120	1218	718.851	1.0	.97	.97	240	250	250	60	115	112	2
A3-4	134	1233	721.0	.03	.03	.03	121	251	248	62	115	113	1
	138	1237	721.621	.03	.03	.03	121	250	248	62	103	100	1
PUSH	140	1239	722.745	.88	.86	.86	180	250	248	62	103	100	2
A3-5	151	1249	724.700	.03	.03	.03	101	250	246	62	104	100	1
PUSH	152	1251	725.511	1.0	.96	.96	173	252	250	60	104	100	2
	154	1253	726.845	1.0	.96	.96	173	251	250	59	104	101	2
	164	1302	728.200	.03	.03	.03	108	251	250	59	104	101	1

Leak check .465 − .364 = .096

ΔVm= ____ $\overline{\sqrt{\Delta p}}$= ____ $\overline{\Delta H}$= ____ $\overline{Ts}$= ____ $\overline{Tm}$= 117

10 Pushes

Plant Name: EPA ABC Coke

Test Date: 9-22-98

Run Number: A-I-M315-2

Operator: TA/GG

Plant Down 2 LC .036

Traverse Point Number	Sampling Time, (min.)	Clock Time (24-hour clock)	Gas Meter Reading (V_m) ft³	Velocity Head (ΔP_s) in. H_2O	Orifice Pres. Differential (ΔH) in. H_2O Desired	Orifice Pres. Differential (ΔH) in. H_2O Actual	Stack Temp. °F (T_s)	Probe Temp. / Filter Temp. °F	Impinger Temp. °F	Dry Gas Meter Temp. Inlet ($T_{m_{in}}$) °F	Dry Gas Meter Temp. Outlet ($T_{m_{out}}$) °F	Pump Vacuum In. Hg
PUSH	167	1305	729.952	.97	.97	.97	172	250 / 250	60	105	103	2
—	—	1320	730.700	.03	.03	.03	104	251 / 250	58	105	103	1
—	—	—	730.786	—	—	—	—	— / —	—	—	—	—
A4-1	174	1404	730.890	1.5	1.5	1.5	195	250 / 251	57	118	118	2
Push	176	1407	732.477	1.5	1.5	1.5	195	250 / 251	57	118	118	2
A4-2	184.5	1416	734.337	.03	.03	.03	119	252 / 251	57	118	117	1
Push	186.5	1418	736.000	1.7	1.6	1.6	240	231 / 252	57	118	117	2
A4-3	201	1432	737.851	.03	.03	.03	115	252 / 257	56	119	116	1
PUSH	203	1433	740.882	1.5	1.5	1.5	211	253 / 253	55	120	118	2
	216	1448	742.100	.03	.03	.03	112	252 / 252	55	120	116	2
PUSH	218	1450	743.924	1.5	1.5	1.5	210	247 / 251	51	120	117	2
A4-4	231	1503	745.999	.03	.03	.03	128	247 / 251	52	120	117	1
PUSH	234	1506	747.532	1.5	1.5	1.5	206	245 / 245	53	120	117	1
A5-1	259	1531	752.211	.03	.03	.03	120	250 / 250	53	120	118	1
PUSH	261	1533	753.830	2.3	2.2	2.2	220	250 / 251	55	125	121	4
A5-2	268	1541	755.3	.03	.03	.03	126	250 / 252	56	125	121	2
	273	1545	756.053	.03	.03	.03	128	251 / 251	52	125	122	1
PUSH	276	1547	757.523	1.5	1.5	1.5	205	252 / 251	52	125	122	3
A5-3	284	1557	758.931	.03	.03	.03	124	251 / 251	52	125	122	1
PUSH	287	1600	761.195	~~1.2~~	~~1.0~~ 2.0	~~1.0~~ 2.0	220	252 / 251	53	127	123	4
A5-4	303	1614	763.1	.03	.03	.03	125	252 / 251	53	127	123	2
A5-5	311	1632	766.2	.06	.07	.07	133	252 / 251	55	127	123	2
	321	1633	~~767.321~~	.06	.07	.07	127	252 / 251	55	126	122	2
PUSH	323	1635	768.002	1.7	1.6	1.6	242	252 / 251	57	126	122	2

6497

Plant Name: EPA ABC Coke **Test Date:** 9-22-98

Run Number: A-I-m315-2 **Operator:** JA/GG

Traverse Point Number	Sampling Time, (min.)	Clock Time (24-hour clock)	Gas Meter Reading (V_m) ft³	Velocity Head (ΔP_s) in. H_2O	Orifice Pres. Differential (ΔH) in. H_2O Desired	Orifice Pres. Differential (ΔH) in. H_2O Actual	Stack Temp. °F (T_s)	Probe Temp. / Filter Temp. °F	Impinger Temp. °F	Dry Gas Meter Temp. Inlet ($T_{m_{in}}$) °F	Dry Gas Meter Temp. Outlet ($T_{m_{out}}$) °F	Pump Vacuum In. Hg
A5-5	335	1647	771.985	.06	.07	.07	125	251 / 252	52	126	125	2
Push	338	1650	773.035	1.5	1.5	1.5	205	251 / 252	51	126	125	2
LC -.82	341.0	—	774.165	.06	.07	.07	125	252 / 252	51	127	125	1
A1-1	345	—	774.240	2.2	2.2	2.2	215	251 / 252	52	126	122	2
Push	347	1702	776.985	.03	.03	.03	122	251 / 252	52	126	122	1
	352	1707	777.7	.03	.03	.03	122	251 / 252	52	126	122	1
A1-2	370	1725	780.1	.03	.03	.03	113	251 / 252	52	125	123	1
A1-3	377	1732	781.111	.03	.03	.03	113	252 / 252	52	125	122	1
PUSH	379	1734	782.745	1.5	1.5	1.5	225	251 / 251	53	109	107	1
	387	1741	783.7	.03	.03	.03	107	250 / 250	54	109	106	1
A-1-4	391	1746	784.411	.03	.03	.03	108	250 / 250	57	109	107	1
	393	1748	786.321	1.3	1.3	1.3	185	251 / 250	57	109	107	2
	403	—	—	.03	.03	.03	107	251 / 250	51	108	107	1
FAN A1-5	—	—	788.832	1.5	~~1.5~~ 1.7	~~1.5~~ 1.7	107	250 / 250	52	108	107	4
PUSH	419	1814	796.712	1.5	~~1.5~~ 1.7	~~1.5~~ 1.7	107	250 / 250	52	108	107	4
	421.4	1816.4	798.243	1.7	1.7	1.7	212	250 / 250	52	115	108	4

9722

PACIFIC ENVIRONMENTAL SERVICES, INC

4700 Duke Drive, Suite 150
Mason, Ohio 45040
513.398.2556 FAX: 513.398.3342

Sample Train Recovery Data

Plant: ABC Coke Tarrant, AL Date: 9/22/98
Sampling Location: Inlet
Sample Recovery Person: JWK Field Team Leader: DS
Sampling Method Type: 315
Run Number: A-T-315-2 Impinger Train ID: N-4
Job Number: 5505000

Comments: Inlet Method 315 Run 2
Used cyclone & flask

Front Half Data

Filter No.: 080898-07 Filter Media Type: Treated Quartz
Filter Description: heavy loading with fine black particulate
Filter No.: — Filter Media Type: —
Filter Description: —

Back Half Data

Impinger Purge-
Start Time: — Flow Rate: — Stop Time: — Purge Gas: —

	Impinger 1	Impinger 2	Impinger 3
Contents:	H_2O	H_2O	Empty
Final Volume: (ml)	607.8	616.3	546.7
Initial Volume: (ml)	574.9	611.4	546.0
Net Volume: (ml)	32.9	4.9	0.7

	Impinger 4	Impinger 5	Silica Gel
Contents:	—	—	5:1 Gel
Final Volume: (ml)	—	—	(g): 865.4
Initial Volume: (ml)	—	—	(g): 849.0
Net Volume: (ml)	—	—	(g): 6.4

Total Moisture Collected (ml): 44.9 g
Description of Impinger catch: clear
sil gel ~30% spent; blue white & pink

8

K = 1.34

FIELD DATA SHEET

Plant: ABC-Coke EPA
Sampling Location: Baghouse Inlet
Run Number: A-7-m315-3 Date: 9-23-98
Pretest Leak Rate: .002 cfm @ 15 in. Hg.
Pretest Leak Check: Pitot: ✓ Orsat: ✓

Sample Type: m 315 Operator: SB/TA
Pbar: 29.8 Ps: -5.5
CO2: 1 O2: 20
Probe Length/Type: 5ft glass Pitot #: 5E
Stack Diameter: 96.5"x48.5" As: 32.5 ft²

Nozzle ID: .192 Thermocouple #: 5E
Assumed Bws: 3% Filter #: 080898-16
Meter Box #: MB-3 Y: 1.004 ΔH@: 1.784
Post-Test Leak Rate: .001 cfm @ 6 in. Hg.
Post-Test Leak Check: Pitot: ✓ Orsat: ✓

	Traverse Point Number	Sampling Time (min)	Clock Time (24-hour clock)	Gas Meter Reading (Vm) ft³	Velocity Head (Δp) in H2O	Orifice Pressure Differential (ΔH) in H2O Desired	Actual	Stack Temp. (Ts)	Temperature °F Probe	Filter	Impinger Temp. °F	Dry Gas Meter Temp. Inlet (Tm in °F)	Outlet (Tm out °F)	Pump Vacuum (in. Hg)
	A2-1	0	1016	798.540										
F		14	1030	800.5	.01	.01	.01	102	249	256	60	100	99	1
	A2-2	16	1031	801.9	1.7	2.2	2.2	117	250	255	60	102	100	5
P		18	1033	804.1	2.3	2.6	2.6	200	249	253	60	103	100	6
F	A2-3	33.6	1048	805.9	.01	.01	.01	113	248	252	60	105	101	1
P	A2-4	34	1049	806.2	.01	.01	.01	117	250	254	60	106	102	1
F		36	1051	808.3	.8	.9	.9	112	250	254	60	106	103	5
	A2-5	50	1106	809.9	.01	.01	.01	117	250	252	60	109	103	1
F		61	1117	811.3	.01	.01	.01	120	249	253	60	109	104	1
P		62	1118	811.9	1.0	1.3	1.3	120	250	253	60	112	108	1
F		64	1120	813.5	1.2	1.4	1.4	180	252	250	59	112	109	4
		82	1138	817.9	.01	.01	.01	115	251	252	59	113	108	4
	A3-1	84	1140	819.0	1.5	1.7	1.7	200	248	247	60	116	112	5
P		98	1154	820.1	.01	.01	.01	117	249	250	60	117	111	1
F	A3-2	100	1156	822.0	1.6	1.9	1.9	180	249	253	59	117	114	5
P		114	1210	823.9	.01	.01	.01	105	250	252	60	119	115	1
		116	1211	824.3	~~.05~~ .5	.6	.6	103	230	235	60	101	98	1
P	A3-3	117	1213	825.2	1.4	1.6	1.6	210	231	233	60	103	99	5
F		131	1227	828.0	.01	.01	.01	101	231	232	60	104	100	1
		133	1229	829.8	1.8	2.1	2.1	180	232	232	60	103	100	5
	A3-4	146	1242	831.2	.01	.01	.01	101	229	233	60	106	101	1
F		147	1243	832.1	.75	1.0	1.0	99	232	234	60	105	102	4
P	A3-5	149	1245	833.1	1.0	1.2	1.2	180	232	233	60	106	102	4
LC .003		167	1303	836.1	.01	.01	.01	105	232	233	60	106	102	1
		169	1305	837.7	1.2	1.4	1.4	180	233	233	60	106	104	5
LC 1.033		1308	837.79/	838.825	.01	.01	.01	104	231	233	60	108	104	1
	A4-1	173.0	1312	838.4	—	—	—		—	—	—	—	—	—

ΔVm= _____ $\overline{\sqrt{\Delta p}}$= _____ $\overline{\Delta H}$= _____ $\overline{Ts}$= _____ $\overline{Tm}$= _____

SM 7

8

Plant Name: ABC-Coke EPA **Test Date:** 09-23-98

Run Number: A-I-M315-3 **Operator:** SB/TA

	Traverse Point Number	Sampling Time, (min.)	Clock Time (24-hour clock)	Gas Meter Reading (V_m) ft³	Velocity Head (ΔP_s) in. H_2O	Orifice Pres. Differential (ΔH) in. H_2O Desired	Orifice Pres. Differential (ΔH) in. H_2O Actual	Stack Temp. °F (T_s)	Probe Temp. / Filter Temp. °F	Impinger Temp. °F	Dry Gas Meter Temp. Inlet ($T_{m_{in}}$) °F	Dry Gas Meter Temp. Outlet ($T_{m_{out}}$) °F	Pump Vacuum In. Hg
	A4-1	180	1319	839.3	1.8	2.0	2.0	220	253 / 252	58	123	121	5
	A4-2	182	1321	840.8	.01	.01	.01	123	249 / 250	58	126	122	1
STOP		192	1335	841.926	—	—	—	—	— / —	—	—	—	—
START		—	—	—	—	—	—	—	— / —	—	—	—	—
F		192	1400	843.4	1.5	2.1	2.1	104	244 / 246	60	123	122	5
	A4-3	202	1407	848.2	2.1	3.0	3.0	91	238 / 248	60	110	106	6
	A4-4	221	1425	865.8	2.5	2.9	2.9	200	232 / 233	60	111	106	6
		223	1427	868.0	.01	.01	.01	108	227 / 232	58	109	108	6
F		—	—	869.4	~~1.9~~ .01	~~.91~~	~~.012~~	108 ~~200~~	230 / 233	60	108	108	1
F		233	1439	870.0	1.9	2.2	2.2	200	230 / 233	60	110	108	6
F	A4-5	235	1441	872.4	~~.01~~ 1.9	~~2.2~~	~~2.2~~	~~200~~ 108	232 / 233	60	110	108	~~6~~ 1
		—	—	872.791	—	—	—	—	— / —	—	—	—	—
P		253	1457	872.854	2.0	2.3	2.3	190	231 / 232	60	109	108	5
F		~~255~~ 255	1459	874.9	.01	.01	.01	109	233 / 232	60	108	110	1
P	A5-1	266	1510	876.3	1.8	2.1	2.1	180	231 / 232	58	110	109	6
	A5-2	268	1512	877.9	.01	.01	.01	106	230 / 231	60	111	108	1
F		280	1524	879.6	1.9	2.3	2.3	180	227 / 232	59	109	110	6
P		282	1526	881.3	.01	.01	.01	109	232 / 230	59	112	109	6
	A5-3	285	1529	885.7	.01	.01	.01	108	232 / 234	60	114	109	1
F		294	1538	886.9	1.5	2.0	2.0	108 ~~200~~	229 / 231	60	113	109	6
		300	1544	891.0	1.9	2.2	2.2	205	231 / 232	60	111	109	6
	A5-4	302	1546	893.0	.01	.01	.01	104	230 / 232	59	~~115~~	~~109~~ 111	1
		319	1603	895.3	.01	.01	.01	112	226 / 231	60	114	111	1
P		322	1606	896.0	2.1	2.5	2.5	190	233 / 233	60	113	111	5

4692

Plant Name: ABC Coke EPA **Test Date:** 9-23-98

Run Number: A-I-M215-3 **Operator:** SB/TA

Traverse Point Number	Sampling Time, (min.)	Clock Time (24-hour clock)	Gas Meter Reading (V_m) ft³	Velocity Head (ΔP_s) in. H_2O	Orifice Pres. Differential (ΔH) in. H_2O Desired	Orifice Pres. Differential (ΔH) in. H_2O Actual	Stack Temp. °F (T_s)	Probe Temp. / Filter Temp.° F	Impinger Temp. °F	Dry Gas Meter Temp. Inlet ($T_{m_{in}}$) °F	Dry Gas Meter Temp. Outlet ($T_{m_{out}}$) °F	Pump Vacuum In. Hg
A5-5	324	1608	897.6	.01	.01	.01	107	231 / 230	58	114	111	1
	338	1621	901.5	2.0	2.4	2.4	170	231 / 231	60	114	112	6
A1-1	340	1623	903.5	.01	.01	.01	108	230 / 229	60	115	111	1
A1-2	356	1639	908.0	2.4	2.9	2.9	180	231 / 229	59	115	113	6
	358	1641	909.6	.01	.01	.01	106	230 / 233	60	116	112	1
A1-3	375	1658	914.0	2.2	2.6	2.6	185	230 / 232	58	114	113	5
	377	1700	915.4	.01	.01	.01	106	227 / 230	60	114	112	1
A1-4	386	1709	916.9	1.7	2.0	2.0	190	230 / 230	60	114	112	5
	388	1711	918.2	.01	.01	.01	108	231 / 231	60	114	112	1
	397	1720	920.0	2.0	2.7	2.7	102	230 / 230	60	113	112	5
A1-5												
	435	1800	952.125	2.0	2.7	2.7	102	230 / 230	60	113	112	5

2488

PACIFIC ENVIRONMENTAL SERVICES, INC

4700 Duke Drive, Suite 150
Mason, Ohio 45040
513.398.2556 FAX: 513.398.3342

Sample Train Recovery Data

Plant: ABC Coke Tarrant, AL Date: 9/23/98

Sampling Location: Inlet

Sample Recovery Person: RWL Field Team Leader: DS

Sampling Method Type: M5

Run Number: ~~OOO~~ A-I-315-3 Impinger Train ID: N-9

Job Number: S505000

Comments: Inlet Run 3 Method B15
Cyclone P flask used

Front Half Data

Filter No.: 080898-16 Filter Media Type: Treated Quartz

Filter Description: heavy black particulate

Filter No.: — Filter Media Type: —

Filter Description: —

Back Half Data

Impinger Purge-

Start Time: — Flow Rate: — Stop Time: — Purge Gas: —

	Impinger 1	Impinger 2	Impinger 3
Contents:	H_2O	H_2O	Empty
Final Volume: (ml)	712.2	715.7	570.4
Initial Volume: (ml)	691.4	706.6	568.4
Net Volume: (ml)	20.8	9.1	2.0

	Impinger 4	Impinger 5	Silica Gel
Contents:	—	—	SilGel
Final Volume: (ml)	—	—	(g): 902.4
Initial Volume: (ml)	—	—	(g): 876.6
Net Volume: (ml)	—	—	(g): 25.8

Total Moisture Collected (ml): 57.7

Description of Impinger catch: Clear
~20% white, pink, blue

SB 10-14-98

FIELD DATA SHEET

Plant: ABC - Coke
Sampling Location: Baghouse Inlet
Run Number: A-I-315-FB Date: 9-25-98
Pretest Leak Rate: ① 0.002 cfm @ 15" in. Hg.
Pretest Leak Check: Pitot: N/A Orsat: N/A

Sample Type: 315 Operator: DDH
Pbar: 29.85 Ps:
CO2: ~0 O2: ~20.9
Probe Length/Type: 6' Glass Pitot #: N/A
Stack Diameter: N/A As:

Nozzle ID: .216 Thermocouple #: N/A
Assumed Bws: 3 Filter #: 080898-10
Meter Box #: MB-3 Y: 1.004 ΔH@: 1.784
Post-Test Leak Rate: ⑨ 0.002 cfm @ 15 in. Hg.
Post-Test Leak Check: Pitot: N/A Orsat: N/A

⑤ - 15" = 0.002 ⑥ 15" = 0.002

Traverse Point Number	Sampling Time (min)	Clock Time (24-hour clock)	Gas Meter Reading (Vm) ft³	Velocity Head (Δp) in H2O	Orifice Pressure Differential (ΔH) in H2O		Stack Temp. (Ts)	Temperature °F		Impinger Temp. °F	Dry Gas Meter Temp.		Pump Vacuum (in. Hg)
					Desired	Actual		Probe	Filter		Inlet (Tm in °F)	Outlet (Tm out °F)	
	0	1325	952.180										
	5	1330	952.282	N/A	N/A	N/A	N/A	250	250	70	82	82	N/A
	10	1335	952.382	↓	↓	↓	↓	↓	↓	↓	81	82	↓
	15	1340	952.530	↓	↓	↓	↓	↓	↓	↓	82	81	↓
	20	1345	952.641	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
	25	1350	952.745	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓

ΔVm= _____ $\overline{\sqrt{\Delta p}}$= _____ $\overline{\Delta H}$= _____ $\overline{Ts}$= _____ $\overline{Tm}$= _____

PACIFIC ENVIRONMENTAL SERVICES, INC

4700 Duke Drive, Suite 150
Mason, Ohio 45040
513.398.2556 FAX: 513.398.3342

Sample Train Recovery Data

Plant: ABC Coke Date: 9/24/98

Sampling Location: Baghouse Inlet

Sample Recovery Person: [illegible] Field Team Leader: DS

Sampling Method Type: Method 315

Run Number: A-I-315-FB Impinger Train ID: N-8

Job Number: 5505000

Comments: Method 429 - Inlet - FB

Front Half Data

Filter No.: 090898-#03 Filter Media Type: Treated Quartz

Filter Description: Clear

Filter No.: — Filter Media Type: —

Filter Description: —

Back Half Data

Impinger Purge-

Start Time: NA Flow Rate: — Stop Time: — Purge Gas: —

	Impinger 1	Impinger 2	Impinger 3
Contents:	H_2O	H_2O	Empty
Final Volume: (ml)	601.4	641.4	496.9
Initial Volume: (ml)	601.4	~~601.4~~ 641.4	496.9
Net Volume: (ml)	0	0	0

	Impinger 4	Impinger 5	Silica Gel
Contents:	—	—	Sil Gel
Final Volume: (ml)	—	—	(g): 853.5
Initial Volume: (ml)	—	—	(g): 853.5
Net Volume: (ml)	—	—	(g): 0

Total Moisture Collected (ml): 0

Description of Impinger catch: Clear

Sil gel ~0.0% spent

FIELD DATA SHEET

R = 1.20

Plant: ABC COKE
Sampling Location: Flues
Run Number: AI 1-429 Date: 9/1/99
Pretest Leak Rate: .003 cfm @ 15 in. Hg.
Pretest Leak Check: Pitot: ✓ Orsat: ✓

Sample Type: M429 Operator: G Gay
Pbar: 29.7 Ps: -5.9
CO2: 0.2 O2: 20.25
Probe Length/Type: 5 Glass Pitot #: 5C
Stack Diameter: 96.5 x 48.5 As: 32.5

Nozzle ID: ~~.196~~ .183 Thermocouple #: 5C
Assumed Bws: 3 Filter #: 011
Meter Box #: 2 Y: 1.002 ΔH@: 1.797
Post-Test Leak Rate: .002 cfm @ 10 in. Hg.
Post-Test Leak Check: Pitot: ✓ Orsat: ✓

	Traverse Point Number	Sampling Time (min)	Clock Time (24-hour clock)	Gas Meter Reading (Vm) ft³	Velocity Head (Δp) in H2O	Orifice Pressure Differential (ΔH) in H2O Desired	Actual	Stack Temp. (Ts)	Temperature °F Probe	Filter	Impinger Temp. °F	Dry Gas Meter Temp. Inlet (Tm in °F)	Outlet (Tm out °F)	Pump Vacuum (in. Hg)	
	B2 T	0	1128	434.281											60
Push		10	1138	441.77	1.9	2.2	2.2	88	253	261	54	82	82	5	60
					1.9	2.0	2.0	155	253	254	52	80	86	6	
F	2	14	1141	444.9	.01	.01	.01	91	254	255	56	82	85	2	
		20	~~1157~~	445.8	.01	.01	.01	95	259	250	57	83	85	2	55
Push			1151	447.2	1.0	1.4	1.4	157	257	263	51	82	86	6	
			1155	448.0	.01	.01	.01	94	258	255	57	83	87	1	
	3	30	1157	449.3	.01	.01	.01	95	260	261	60	83	83	1	55
F		38	1205	449.9	1.2	1.2	1.2	155	255	252	59	83	88	6	55
	4	45.2	1212	454.6	1.2	1.2	1.2	96	255	260	56	85	91	6	56
	5	57.6	1226	463.0	1.2	1.4	1.4	91	256	261	56	86	88	6	55
10" .002			1234	469.3	1.2	1.4	1.4	92	255	253	57	87	94	6	60
			Start	471.924											
F B3	1		1257	472.001	1.6	2.0	2.0	91	247	266	60	92	97	7	52
	2		1303	483.3	1.2	1.5	1.5	90	259	252	55	94	101	7	55
Push			1317	490.211	1.2	1.3	1.3	155	255	254	55	94	101	7	55
			1318	491.4	1.2	1.5	1.5	97	254	253	52	96	102	7	53
F	3		1322	492.5	.01	.01	.01	95	259	254	58	96	100	1	53
Push			1329	493.401	1.1	1.2	1.2	164	253	256	57	97	101	7	54
F			1331	494.642	1.1	1.3	1.3	99	257	257	57	97	101	7	56
			1333	496.9	.01	.01	.01	99	259	255	56	97	101	1	56
	4		1336	497.1	.01	.01	.01	103	258	257	56	96	101	1	51
			1345	499.0	1.1	1.3	1.3	98	259	255	55	97	101	6	51
Push			1347	500.692	1.1	1.3	1.3	179	257	263	53	97	101	6	52
			1349	501.638	1.1	1.3	1.3	102	259	255	53	98	103	6	57
F	5		1351	503.7	.01	.08	.08	99	258	263	54	98	103	1	52
			1405	505.3	.01	.08	.08	99	258	253	55	97	108	1	55

ΔVm= ~~174.754~~ 174.494 $\overline{\sqrt{\Delta p}}$= _____ $\overline{\Delta H}$= _____ $\overline{Ts}$= _____ $\overline{Tm}$= _____

Plant Name: ABC COKE **Test Date:** 9-21-98

Run Number: AF-1-429 **Operator:** C. Cox

	Traverse Point Number	Sampling Time, (min.)	Clock Time (24-hour clock)	Gas Meter Reading (V_m) ft³	Velocity Head (ΔP_s) in. H_2O	Orifice Pres. Differential (ΔH) in. H_2O Desired	Actual	Stack Temp. °F (T_s)	Probe Temp. / Filter Temp. °F	Impinger Temp. °F	Dry Gas Meter Temp. Inlet ($T_{m_{in}}$) °F	Outlet ($T_{m_{out}}$) °F	Pump Vacuum In. Hg	COND
B-4	B-1	[illegible]	1407	505.7	1.1	1.3	1.3	100	260 / 261	57	99	102	6	57
F			1410	506.501	1.8	1.9	1.9	195	263 / 260	57	99	102	7	55
			1412	508.273	1.8	1.9	1.9	103	260 / 262	57	99	102	7	55
			1413	509.9	.01	.01	.01	102	260 / 256	61	99	102	1	55
F	2		1421	510.0	1.8	2.2	2.2	100	259 / 257	57	100	102	8	56
Push			1424	512.892	1.8	1.9	1.9	186	260 / 257	57	100	102	8	55
F			1426	514.001	1.6	2.0	2.0	106	261 / 262	55	100	102	8	55
			1427	515.3	.01	.01	.01	100	260 / 263	55	100	102	1	55
	3		1435	516.5	.01	.01	.01	106	260 / 261	57	99	101	1	56
F			1437	517.026	1.5	1.9	1.9	97	261 / 258	57	99	101	8	56
Push			1439	518.638	1.5	1.6	1.6	168	262 / 255	56	99	101	8	57
			1441	519.845	1.5	1.9	1.9	101	260 / 259	54	99	101	8	56
F			1442	520.9	.01	.01	.01	99	259 / 260	54	99	101	1	56
	4		1449	521.9	.01	.01	.01	104	259 / 261	56	99	101	1	55
			1454	522.6	.01	.01	.01	102	259 / 261	56	99	101	1	55
			1500	523.4	.01	.01	.01	101	259 / 260	57	95	97	1	55
	5		1504	523.9	.01	.01	.01	101	257 / 259	58	94	96	1	55
			1512	525.1	.01	.01	.01	99	259 / 256	58	96	97	1	55
			1518	526.006	.01	.01	.01	99	258 / 259	58	96	97	1	56
	B-5-1		1522	526.104	.01	.01	.01	97	253 / 257	57	93	96	1	57
			1533	528.1	.01	.01	.01	99	255 / 259	57	93	96	1	53
F			1534	528.6	1.8	2.2	2.2	93	259 / 264	55	94	99	8	53
P	push 2		1536	530.920	1.9	2.0	2.0	181	261 / 261	55	95	98	8	53
			1538	532.001	1.7	2.1	2.1	104	259 / 255	54	95	101	8	55

Plant Name: ABC Coke **Test Date:** 9-21-98

Run Number: AI-1-429 **Operator:** G Gay

	Traverse Point Number	Sampling Time, (min.)	Clock Time (24-hour clock)	Gas Meter Reading (V_m) ft³	Velocity Head (ΔP_s) in. H_2O	Orifice Pres. Differential (ΔH) in. H_2O Desired	Orifice Pres. Differential (ΔH) in. H_2O Actual	Stack Temp. °F (T_s)	Probe Temp. / Filter Temp. °F	Impinger Temp. °F	Dry Gas Meter Temp. Inlet ($T_{m_{in}}$) °F	Dry Gas Meter Temp. Outlet ($T_{m_{out}}$) °F	Pump Vacuum In. Hg	COUT T-1
	B5-2		1540	534.0	.01	.01	.01	99	258 / 261	52	95	101	1	53
T	3		1550	534.9	.01	.01	.01	99	255 / 259	52	95	101	1	55
			1551	535.5	1.4	1.7	1.7	99	258 / 257	52	96	102	8	55
P	push		1553	536.407	1.7	1.8	1.8	185	255 / 257	51	97	102	8	55
			1555	538.095	1.7	1.8	1.8	102	257 / 255	51	98	103	8	55
			1556	539.0	.01	.01	.01	95	257 / 263	55	97	102	1	56
	4		1604	540.4	.01	.01	.01	108	258 / 259	55	97	102	1	56
F			1605	540.975	1.5	1.8	1.8	104	259 / 260	55	97	102	8	53
P	push		1606	541.772	1.7	1.9	1.9	181	260 / 257	55	97	102	8	53
F			1608	542.287	1.2	1.5	1.5	104	259 / 258	56	97	102	8	53
			1607	544.1	.01	.01	.01	104	259 / 260	56	97	102	1	53
	5		1618	546.9	.01	.01	.01	104	257 / 260	57	99	103	1	53
F			1619	547.1	1.2	1.5	1.5	104	257 / 258	55	99	103	8	51
			1626	552.5	1.6	2.0	2.0	100	259 / 258	55	99	104	8	51
P	push		1629	554.676	1.6	1.7	1.7	200	259 / 259	56	99	104	8	52
			1631	556.227	1.6	1.7	1.7	225	260 / 257	56	99	104	8	52
	Fnv Bll		1632	556.378	.01	.01	.01	105	257 / 259	57	98	102	1	51
			1640	558.6	.01	.01	.01	114	260 / 261	55	99	103	1	52
	Fnv		1642	558.990	.01	.01	.01	104	257 / 260	54	99	103	8	52
			1644	560.6	1.6	2.0	2.0	100	256 / 260	54	99	103	8	52
	Push		1645	561.395	1.7	1.8	1.8	184	259 / 261	53	98	102	8	
	2		1647	562.691	1.3	1.6	1.6	105	259 / 260	53	98	102	8	51
			1648	563.4	.01	.01	.01	100	251 / 261	53	98	102	1	51
			1655	564.6	.01	.01	.01	101	257 / 259	53	99	101	1	51

Plant Name: ABC COKE **Test Date:** 9-21-98

Run Number: AI-1-429 **Operator:** G Gy

	Traverse Point Number	Sampling Time, (min.)	Clock Time (24-hour clock)	Gas Meter Reading (V_m) ft³	Velocity Head (ΔP_s) in. H_2O	Orifice Pres. Differential (ΔH) in. H_2O Desired	Actual	Stack Temp. °F (T_s)	Probe Temp. / Filter Temp. °F	Impinger Temp. °F	Dry Gas Meter Temp. Inlet ($T_{m_{in}}$) °F	Outlet ($T_{m_{out}}$) °F	Pump Vacuum In. Hg	
Push	B1-3	1700	1700	565.401	1.7	1.8	1.8	185	260 / 265	56	99	101	8	55
			1702	566.659	1.7	1.8	1.8	180	260 / 261	56	99	101	8	51
Env			1703	567.5	.01	.01	.01	100	259 / 258	56	99	101	1	53
	4		1714	568.992	.01	.01	.01	100	256 / 254	55	98	101	1	54
		Push	1716	569.682	1.8	1.7	1.7	277	255 / 255	55	99	101	8	54
Env			1718	570.889	1.8	1.7	1.7	116	255 / 259	56	99	102	8	55
			1720	572.0	.01	.01	.01	102	255 / 257	55	99	102	1	54
	5		1728	573.2	.01	.01	.01	107	259 / 258	54	99	102	1	54
			1734	574.213	1.4	1.6	1.6	101	260 / 261	54	99	102	8	53
Push			1735	575.185	1.7	1.9	1.9	172	260 / 261	56	99	102	8	53
Env			1737	576.371	.01	.01	.01	100	257 / 259	55	98	103	1	54
10' 104			1742	577.995					/					
B.7				578.148					/					
Env 1			1749	—	1.8	2.2	2.2	98	257 / 260	57	99	102	8	51
Push			1754	581.481	1.8	1.9	1.9	192	260 / 259	57	100	103	8	51
			1756	582.990	.01	.01	.01	105	260 / 259	58	100	103	1	52
	2		1800	583.9	.01	.01	.01	103	261 / 262	58	101	102	1	53
Env.			1807	584.7	1.8	2.3	2.3	98	259 / 258	55	100	102	8	54
Push			1800	586.557	1.8	1.8	1.8	187	260 / 257	55	100	102	8	54
		Env	1810	587.742	.01	.01	.01	99	261 / 259	55	99	104	1	52
	3		1814	587.2	.01	.01	.01	100	257 / 259	55	99	104	1	54
			1820	590.3	.01	.01	.01	106	257 / 257	55	99	104	1	54
Push			1824	591.628	1.7	1.8	1.8	192	260 / 253	54	99	103	9	54
			1826	592.885	01	01	01	97	258 / 255	54	99	102	1	54

Plant Name: ABC Coke **Test Date:** 9-21-97

Run Number: AI-1-929 **Operator:** G Gr

Traverse Point Number	Sampling Time, (min.)	Clock Time (24-hour clock)	Gas Meter Reading (V_m) ft³	Velocity Head (ΔP_s) in. H_2O	Orifice Pres. Differential (ΔH) in. H_2O Desired	Orifice Pres. Differential (ΔH) in. H_2O Actual	Stack Temp. °F (T_s)	Probe Temp. / Filter Temp. °F	Impinger Temp. °F	Dry Gas Meter Temp. Inlet ($T_{m_{in}}$) °F	Dry Gas Meter Temp. Outlet ($T_{m_{out}}$) °F	Pump Vacuum In. Hg	
4		1828	593.7	.01	.01	.01	100	258 / 260	54	99	102	1	52
5		1842	595.9	.01	01	01	100	257 / 259	55	98	101	1	52
Push		1844	596.610	1.8	1.9	1.9	181	258 / 260	54	97	101	9	52
1		1846	598.001	.01	01	01	96	260 / 262	54	98	101	1	53
3 B Fin		1900	601.1	1.9	2.4	2.4	90	256 / 257	54	97	100	10	51
Push		1910	609.997	1.9	2.0	2.0	232	257 / 259	53	97	101	10	53
	458.0	1912	611.148	1.9	2.0	2.0	99	259 / 260	52	97	101	10	53
			612.368										

PACIFIC ENVIRONMENTAL SERVICES, INC

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Mason, Ohio 45040
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Sample Train Recovery Data

Plant: ABC Coke AL Date: 9/21/98
Sampling Location: Inlet
Sample Recovery Person: RWM RK Field Team Leader: DS
Sampling Method Type: 429
Run Number: A-I-429-1 Impinger Train ID: N-10
Job Number: 5505000

Comments: Inlet Method 429 Run
Cyclone + Flask used for heavy particulate

Front Half Data

Filter No.: NA Filter Media Type: Teflon mat
Filter Description: Heavy loading, black particulate, fine
Filter No.: — Filter Media Type: —
Filter Description: —
Cyclone loading good

Back Half Data

	XAD-Trap	Impinger 1	Impinger 2
Contents:	XAD-2	Empty	$NaHCO_3/Na_2CO_3$
Final Volume: (ml)	366	557.8	719.1
Initial Volume: (ml)	344.0	493.7	723.9
Net Volume: (ml)	17.6	64.1	-2.8

	Impinger 3	Impinger 4	Silica Gel
Contents:	$NaHCO_3/Na_2CO_3$	Empty	Sil Gel
Final Volume: (ml)	607.2	625.0	(g): 904.1
Initial Volume: (ml)	606.0	620.8	(g): 867.1
Net Volume: (ml)	1.2	4.2	(g): 37.0

Total Moisture Collected ~~(ml)~~: 121.3 g
Description of Impinger catch: clear
Sil Gel imp - ~30% spent blue, pink, white

K=1.12 1 of 3

FIELD DATA SHEET

Plant: ABC-Coke-EPA Coke
Sampling Location: Baghouse Inlet
Run Number: A-I-M429-2 Date: 9-22-98
Pretest Leak Rate: .006 cfm @ 14 in. Hg.
Pretest Leak Check: Pitot: ✓ Orsat: ✓

Sample Type: M-429 Operator: SB/GG
Pbar: 29.74 Ps: -4.5
CO2: 1 O2: 20
Probe Length/Type: 4' Glass Pitot #: 4B
Stack Diameter: 98½ x 48½ As: 33.186 ft²

Nozzle ID: .183 Thermocouple #: 4B
Assumed Bws: 3% Filter #: Teflon
Meter Box #: MB-2 Y: 1.002 ΔH@: 1.797
Post-Test Leak Rate: .001 cfm @ 8 in. Hg.
Post-Test Leak Check: Pitot: ✓ Orsat: ✓

	Traverse Point Number	Sampling Time (min)	Clock Time (24-hour clock)	Gas Meter Reading (Vm) ft³	Velocity Head (Δp) in H2O	Orifice Pressure Differential (ΔH) in H2O Desired	Actual	Stack Temp. (Ts)	Temperature °F Probe	Filter	Impinger Temp. °F	Dry Gas Meter Temp. Inlet (Tm in °F)	Outlet (Tm out °F)	Pump Vacuum (in. Hg)	XAD
	B1-1	0	1018	612.830											
	B2-1	14.40	1026	615.2	.02	SB ~~.05~~ .02	~~.05~~ .02	91	243	257	67	83	86	1	67
P	B2-1	20.0	1032	615.5	.02	.02	.02	94	257	250	67	84	87	1	67
F	B2-1	22.0	1034	617.7	1.6	1.6	1.6	SB ~~96~~ 170	258	264	67	84	89	5	67
P	B3-1	34.0	1048	619.2	.02	.02	.02	97	250	250	67	86	90	1	67
F	B3-1	36.0	1050	620.9	1.1	1.1	1.1	155	259	260	67	86	90	5	67
	B4-1	50.4	1104	622.8	.01	.01	.01	101	255	254	65	87	94	5	67
P	B4-1	62.0	1116	623.9	.01	.01	.01	107	259	261	62	90	95	1	45
F	B4-1	64.0	1118	625.0	1.1	1.1	1.1	170	263	269	62	92	98	5	62
P		71.0	1125	627.8	.01	.01	.01	108	259	262	62	94	98	1	62
	B5-1	73.0	1127	628.5	1.4	1.3	1.3	212	258	254	62	97	96	5	62
LG→		76.0	1130	629.211	.01	.01	.01	123	260	262	63	97	96	1	63
		–	–	629.306	–	–	–	–	~~258~~ SB ~~262~~		–	~~98~~ SB ~~101~~		–	–
F	B1-2	92.0	1146	630.9	–	–	–	–	–	–	–	–	–	–	–
P		95.0	1149	632.7	1.6	1.7	1.7	105	258	262	67	98	101	6	63
F		97.0	1151	634.5	1.7	1.7	1.7	176	236	258	65	99	104	6	63
	B2-2	100.0	1159	635.4	.01	~~.01~~ .01	.01	105	256	263	68	99	105	1	45
	B3-2	117.6	1213	638.0	.01	.01	.01	114	258	264	55	99	103	1	45
		119.0	1215	638.7	.01	.01	.01	111	257	265	67	100	104	1	56
P		121.0	1217	639.9	.8	.8	.8	180	258	252	67	100	104	6	59
F	B4-2	134.0	1230	641.3	.01	.01	.01	107	257	254	63	101	106	1	58
P		139.0	~~1234.0~~	642.0	.01	.01	.01	105	256	257	63	102	106	1	60
F		141	1237	643.2	1.0	1.0	1.0	180	261	259	63	102	106	5	62
	B5-2	151	SB 1247	645.3	.01	.01	.01	104	257	254	63	103	107	1	62
P		154	1250	646.7	.01	.01	.01	107	236	262	62	103	107	1	62
F		156	1252	647.9	1.1	1.1	1.1	170	236	260	66	104	108	5	65
F		165	1301	650.0	.01	.01	.01	106	239	256	68	104	108	1	68

ΔVm= _____ $\overline{\sqrt{\Delta p}}$= _____ $\overline{\Delta H}$= _____ $\overline{Ts}$= _____ $\overline{Tm}$= _____

Plant Name: ABC-Coke EPA **Test Date:** 9-22-98

Run Number: A-I-M429-2 **Operator:** SB/GG

	Traverse Point Number	Sampling Time, (min.)	Clock Time (24-hour clock)	Gas Meter Reading (V_m) ft³	Velocity Head (ΔP_s) in. H_2O	Orifice Pres. Differential (ΔH) in. H_2O Desired	Orifice Pres. Differential (ΔH) in. H_2O Actual	Stack Temp. °F (T_s)	Probe Temp. / Filter Temp. °F	Impinger Temp. °F	Dry Gas Meter Temp. Inlet ($T_{m_{in}}$) °F	Dry Gas Meter Temp. Outlet ($T_{m_{out}}$) °F	Pump Vacuum In. Hg	
P		166	1302	652.8	1.0	1.0	1.0	105	260 / 261	65	104	107	5	63
LE→		168	1304	652.8	.01	.01	.01	180	237 / 252	63	104	109	4	63
	B1-3	–	1320	652.8	–	–	–	–	– / –	–	–	–	–	–
shut down →		–	1405	652.661	–	–	–	–	– / –	–	–	–	–	–
P		173	1405	652.8	–	–	–	–	– / –	–	–	–	–	–
F		175	1407	654.1	.95	.94	.94	180	257 / 263	62	101	104	5	62
P	B2-3	183	1415	655.1	.01	.01	.01	105	255 / 254	63	102	103	1	65
F		185	1417	656.2	1.1	1.0	1.0	210	263 / 262	63	101	104	5	63
P	B3-3	199	1431	657.5	.01	.01	.01	109	254 / 265	63	101	104	1	65
F		201	1433	659.0	1.0	.97	.97	190	249 / 259	63	102	105	5	63
		214	1446	660.5	.01	.01	.01	109	243 / 254	63	103	105	1	63
P		216	1448	661.5	1.0	.97	.97	190	252 / 254	63	103	105	5	63
F	B4-3	218	1450	662.0	.01	.01	.01	109	249 / 257	63	102	106	1	63
P		230	1502	663.2	.01	.01	.01	109	251 / 265	63	102	106	1	61
F		232	1504	664.7	1.1	1.1	1.1	170	251 / 264	63	102	104	1	62
	B5-3	235	1507	665.5	.01	.01	.01	109	250 / 269	65	103	106	5	66
	G1-4	252	1524	668.5	.01	.01	.01	112	251 / 254	64	103	106	1	63
P		257	1529	669.8	.01	.01	.01	109	261 / 258	64	102	107	1	62
F		259	1531	670.9	1.8	1.8	1.8	170	260 / 266	61	104	107	6	63 240
	B2-4	268	1540	671.8	.01	.01	.01	110	257 / 264	62	105	107	1	62
P		272	1544	672.5	.01	.01	.01	114	262 / 249	62	105	108	1	63
F		274	1546	674.2	1.2	1.2	1.2	180	243 / 268	61	105	107	6	63
		283	1555	675.2	.01	.01	.01	110	244 / 258	61	106	110	1	62
P	B3-4	285	1557	676.3	1.4	1.4	1.4	180	240 / 263	64	105	110	6	65

Plant Name: ABC-Coke EPA Coke **Test Date:** 9-22-98

Run Number: A-I-M429-2 **Operator:** SB/GG

	Traverse Point Number	Sampling Time, (min.)	Clock Time (24-hour clock)	Gas Meter Reading (V_m) ft^3	Velocity Head (ΔP_s) in. H_2O	Orifice Pres. Differential (ΔH) in. H_2O Desired	Orifice Pres. Differential (ΔH) in. H_2O Actual	Stack Temp. °F (T_s)	Probe Temp. / Filter Temp. °F	Impinger Temp. °F	Dry Gas Meter Temp. Inlet (T_{in}) °F	Dry Gas Meter Temp. Outlet (T_{out}) °F	Pump Vacuum In. Hg	
F	B4-4	302	1614	679.3	.01	.01	.01	112	226 / 267	63	106	110	1	62
LB	~~B4-5~~	319.2	1631	681.5	.01	.01	.01	117	257 / 265	64	105	109	1	64
P	B5-4	320	1632	681.8	.01	.01	.01	114	252 / 258	62	105	108	1	62
F		322	1634	683.4	1.2	1.1	1.1	220	251 / 266	62	105	108	6	62
P		335	1647	685.7	.01	.01	.01	109	250 / 265	61	105	109	1	64
F		337	1649	687.2	1.9	1.7	1.7	220	236 / 268	61	105	107	6	64
		–	–	689.058	.01	.01	.01	109	228 / 251	61	105	108	1	64
LC	~~B4-5~~	–	–	689.168	–	–	–	–	– / –	–	–	–	–	–
P		344	1656	689.3	–	–	–	–	– / –	–	–	–	–	–
F		346	1658	690.8	2.0	2.0	2.0	160	258 / 261	65	104	107	7	65
SB B2	~~B4-5~~	352	1704	692.3	.01	.01	.01	112	262 / 263	64	104	108	1	64
B3	~~B5-5~~	369.01	1721	694.7	.01	.01	.01	120	254 / 264	62	104	108	1	61
P		377	1729	696.0	.01	.01	.01	117	259 / 250	60	104	107	1	64
F		379	1731	697.6	1.8	1.7	1.7	230	258 / 252	62	104	108	7	63
	B4-5	386	1738	698.5	.01	.01	.01	108	249 / 263	64	104	108	1	61
		390	1742	699.0	.01	.01	.01	111	261 / 259	63	104	107	1	63
		392	1744	700.4	1.6	1.6	1.6	190	259 / 250	61	103	106	6	62
		403	1755	702.2	.01	.01	.01	109	259 / 258	64	103	108	1	62
	B5-5	408	1800	702.6	.01	.01	.01	113	259 / 259	64	102	106	1	62
P		410	1802	702.8	.01	.01	.01	110	258 / 264	63	102	107	1	61
P		421	1814	711.0	1.6	1.6	1.6	190	258 / 262	63	102	107	7	62
F		422	1816	712.535	.01	.01	.01	109	258 / 265	61	104	111	1	60

PACIFIC ENVIRONMENTAL SERVICES, INC

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Sample Train Recovery Data

Plant: ABC Coke AL Date: 9/22/98

Sampling Location: Inlet to baghouse

Sample Recovery Person: RWR Field Team Leader: DS

Sampling Method Type: M429

Run Number: A-I-429-2 Impinger Train ID: #24

Job Number: 5505000

Comments: Used cyclone + flask to remove heavy particulate

Front Half Data

Filter No.: NA Filter Media Type: Teflon mat

Filter Description: heavy black particulate

Filter No.: — Filter Media Type: —

Filter Description: —

Back Half Data

	XAD-Trap	Impinger 1	Impinger 2
Contents:	XAD-2	Empty	$NaHCO_3/Na_2CO_3$
Final Volume: (ml)	356.6	496.2	600.8
Initial Volume: (ml)	342.9	463.7	603.8
Net Volume: (ml)	13.7	32.5	-3.0

	Impinger 3	Impinger 4	Silica Gel
Contents:	$NaHCO_3/Na_2CO_3$	~~Na_2~~ Empty	Sil Gel
Final Volume: (ml)	621.4	519.8	(g): 909.0
Initial Volume: (ml)	620.9	518.5	(g): 899.0
Net Volume: (ml)	0.5	1.3	(g): 18.0

Total Moisture Collected (ml): 63.0

Description of Impinger catch: Clear

Silica Gel 15% spent

K 1.13

FIELD DATA SHEET

Plant: ABC Coke
Sampling Location: Inlet
Run Number: AF3-429 Date: 9-23-98
Pretest Leak Rate: .003 cfm @ 15 in. Hg.
Pretest Leak Check: Pitot: ✓ Orsat: ✓

Sample Type: 429 Operator: G Gay
Pbar: 29.8 Ps: -5.8
CO2: 1 O2: 20
Probe Length/Type: 4 feet Pitot #: 4B
Stack Diameter: 96.5 x 48.5 As: 32.5

Nozzle ID: .183 Thermocouple #: 4B
Assumed Bws: 2 Filter #: TF
Meter Box #: 2 Y: 1.002 ΔH@: 1.797
Post-Test Leak Rate: .001 cfm @ 8 in. Hg.
Post-Test Leak Check: Pitot: ✓ Orsat: ✓

	Traverse Point Number	Sampling Time (min)	Clock Time (24-hour clock)	Gas Meter Reading (Vm) ft³	Velocity Head (Δp) in H2O	Orifice Pressure Differential (ΔH) in H2O Desired	Actual	Stack Temp. (Ts)	Temperature °F Probe	Filter	Impinger Temp. °F	Dry Gas Meter Temp. Inlet (Tm in °F)	Outlet (Tm out °F)	Pump Vacuum (in. Hg)	
	B1-1	0	1019	712.746											Comp
Fnv			1031	714.6	.01	.01	.01	94	200	264	62	86	88	1	61
Push			1034	716.012	2.5	2.1	2.1	91	258	255	58	87	91	5	52
	B2	16	1036	717.492	2.5	2.5	2.5	155	258	255	54	87	91	5	49
	B-2		1051	720.0	.01	.01	.01	101	255	259	58	91	94	1	52
	B3		1055	720.366	1.6	1.7	1.7	101	262	260	59	91	95	5	51
Push			1056	721.040	1.7	1.6	1.6	194	263	259	57	91	95	6	51
			1058	722.710	.01	.01	.01	101	265	257	58	92	97	1	51
	B4		1107	723.6	.01	.01	.01	104	259	261	59	94	97	1	55
Fnv			1122	725.435	1.2	1.3	1.3	100	259	259	57	94	98	6	55
Push			1123	726.211	1.8	1.8	1.8	164	255	259	56	96	103	7	59
	B-5		1125	727.875	.01	.01	.01	100	255	260	56	97	104	1	57
				731.915	—	—	—	—	—	—	—	—	—	—	—
Push	B2		1141	732.010	1.8	1.7	1.7	~~105~~ 210	259	261	58	98	104	7	54
			1143	733.475	.01	.01	.01	107	259	260	58	101	104	1	54
Push	B22		1159	736.278	1.8	1.7	1.7	216	260	254	56	100	104	7	52
			1201	737.915	.01	.01	.01	106	260	254	56	100	104	1	52
Fnv			1215	739.999	1.1	1.0	1.0	104	260	255	55	101	105	7	
Push	B3		1216	740.765	1.5	1.4	1.4	210	261	254	55	101	105	7	53
			1218	741.872	.01	.01	.01	105	261	258	55	101	105	1	55
	4		1229	743.8	.01	.01	.01	109	264	265	59	102	106	1	55
Push			1232	745.295	1.2	1.1	1.1	185	258	262	59	102	106	7	56
			1234	746.635	.01	.01	.01	105	259	265	57	101	106	1	56
Fnv	5		1247	748.675	1.2	1.3	1.3	164	258	262	56	104	109	7	56
Push			1248	749.952	1.2	1.3	1.3	145	258	261	56	104	109	7	55
			1250	750.857	.01	.01	.01	109	258	261	56	104	109	1	55
	Push		1307	755.195	1.1	1.1	1.1	175	255	262	57	105	110	1	53

ΔVm= ____ $\overline{\sqrt{\Delta p}}$= ____ $\overline{\Delta H}$= ____ $\overline{Ts}$= ____ $\overline{Tm}$= ____

4469

Plant Name: ABC COKE **Test Date:** 9-23-98

Run Number: INLET **Operator:** G GAY

Traverse Point Number	Sampling Time, (min.)	Clock Time (24-hour clock)	Gas Meter Reading (V_m) ft³	Velocity Head (ΔP_s) in. H_2O	Orifice Pres. Differential (ΔH) in. H_2O Desired	Orifice Pres. Differential (ΔH) in. H_2O Actual	Stack Temp. °F (T_s)	Probe Temp. / Filter Temp. °F	Impinger Temp. °F	Dry Gas Meter Temp. Inlet ($T_{m_{in}}$) °F	Dry Gas Meter Temp. Outlet ($T_{m_{out}}$) °F	Pump Vacuum In. Hg	Cold Trap Temp
B3-5	1309	1301	756.255	.01	.01	01	107	258 / 260	51	107	110	1	53
			756.563										
B3-1		1312	756.660	.01	01	01	107	258 / 257	53	108	111	1	54
PUSH		1322	757.250	1.5	1.4	1.4	208	258 / 257	54	108	112	7	53
		1324	758.910	.01	01	01	109	259 / 260	52	108	112	1	53
STOP B3-2		1336	761.187										
	FAN	1402	761.318	1.1	1.2	1.2	97	263 / 265	58	107	108	6	54
	PUSH	1428	779.575	1.1	1.1	1.1	180	267 / 251	57	114	115	6	55
B4		1430	780.610	01	01	01	101	267 / 252	55	108	114	1	55
5	PUSH	1440	783.327	1.5	1.4	1.4	208	262 / 253	57	109	114	6	56
		1442	784.315	01	01	01	102	256 / 257	56	109	114	1	56
	PUSH	1501	787.972	1.2	1.2	1.2	185	260 / 258	56	110	113	7	55
		1503	789.697	01	.01	.01	105	260 / 254	56	110	113	1	57
B4 1		1506	790.001	.01	01	01	102	260 / 268	57	111	113	1	58
	PUSH	1514	790.987	1.8	1.8	1.8	184	261 / 268	57	112	113	7	58
		1516	792.381	[illegible]	[illegible]	1.0	109	259 / 268	57	112	113	1	58
B4 2	PUSH	1528	799.034	1.8	1.8	1.8	186	251 / 266	56	113	114	7	57
		1530	795.442	.01	.01	01	107	257 / 259	56	114	116	1	55
B4 3		1538	—	1.8	20	20	107	260 / 269	55	112	115	7	55
	PUSH	1547	802.397	1.8	17	1.7	200	259 / 261	55	113	116	7	56
		1549	803.923	.01	01	01	107	260 / 268	57	113	116	1	56
B44		1556	—	.01	01	01	107	260 / 259	57	114	117	7	57
	PUSH	1610	809.710	1.7	17	1.7	193	262 / 251	58	114	117	8	57
B45-1		1612	810.186	01	01	01	107	263 / 259	57	115	118	1	57

4947

Plant Name: ABC COKE **Test Date:** 9-23-98

Run Number: INLET **Operator:** GGAY

Traverse Point Number	Sampling Time, (min.)	Clock Time (24-hour clock)	Gas Meter Reading (V_m) ft^3	Velocity Head (ΔP_s) in. H_2O	Orifice Pres. Differential (ΔH) in. H_2O Desired	Orifice Pres. Differential (ΔH) in. H_2O Actual	Stack Temp. °F (T_s)	Probe Temp. / Filter Temp. °F	Impinger Temp. °F	Dry Gas Meter Temp. Inlet ($T_{m_{in}}$) °F	Dry Gas Meter Temp. Outlet ($T_{m_{out}}$) °F	Pump Vacuum In. Hg	COMP TEMP
B1	PUSH	1625	813.486	1.8	1.8	1.8	189	259 / 261	56	115	119	9	55
B2		1627	819.795	.01	.01	.01	107	260 / 259	56	115	119	1	55
	PUSH	1634	819.857	1.9	1.9	1.9	182	259 / 259	57	115	120	8	55
B4		1645	820.630	.01	.01	.01	112	255 / 257	57	116	121	1	53
4	PUSH	1703	830.491	1.9	1.9	1.9	183	255 / 260	57	117	121	8	55
		1705	831.992	.01	.01	.01	107	251 / 259	57	117	122	1	56
	PUSH	1714	833.922	1.8	1.8	1.8	180	252 / 259	58	118	123	8	57
		1716	835.530	.01	.01	.01	106	258 / 260	58	118	123	1	57
END		1727	839.622	1.8	2.0	2.0	105	261 / 261	58	115	119	8	57
		1730	808980	2.0	2.0	2.0	180	260 / 260	57	115	119	8	
			~~808.980~~										
	435												

2367

PACIFIC ENVIRONMENTAL SERVICES, INC

4700 Duke Drive, Suite 150
Mason, Ohio 45040
513.398.2556 FAX: 513.398.3342

Sample Train Recovery Data

Plant: ABC Coke Tarrant Ala. Date: 9/23/98

Sampling Location: Baghouse Inlet

Sample Recovery Person: RK/RD Field Team Leader: D. Schuffel

Sampling Method Type: CARB 429

Run Number: A-I-429-3 Impinger Train ID: A-I-429-3

Job Number: 5505.00

Comments: PAH train

Front Half Data

Filter No.: A-I-429-3 Filter Media Type: Teflon mat (treated)

Filter Description: heavy black particulate

Filter No.: — Filter Media Type: —

Filter Description: —

Back Half Data

	XAD-Trap	Dunkard Impinger 1	$NaHCO_3/Na_2CO_3$ Impinger 2
Contents:	XAD-2 resin	Empty	
Final Volume: (ml)	361.7	521.7	605.9
Initial Volume: (ml)	348.0	494.8	610.5
Net Volume: (ml)	13.7	26.9	-4.6 ~~4.6~~ RWM

	Impinger 3	Impinger 4	Silica Gel
Contents:	$NaHCO_3/Na_2CO_3$	Empty	S.G.
Final Volume: (ml)	722.4	624.7	(g): 863.6
Initial Volume: (ml)	729.1	621.8	(g): 803.5
Net Volume: (ml)	-6.7	2.9	(g): 60.1

Total Moisture Collected (ml): 92.3

Description of Impinger catch: Clear

silica gel ~20% spent

SB 10-14-98

FIELD DATA SHEET

Plant: ABC - Coke
Sampling Location: Baghouse Inlet
Run Number: A-I-M1&4-FB Date: 9-25-98
Pretest Leak Rate: @ 0.003 cfm @ 15 in. Hg.
Pretest Leak Check: Pitot: N/A Orsat: N/A

Sample Type: 4/29 Operator: DDH
Pbar: 29.85 Ps:
CO2: ~0 O2: ~20.9
Probe Length/Type: 6'/Glass Pitot #: N/A
Stack Diameter: — As: —

Nozzle ID: .213 Thermocouple #: N/A
Assumed Bws: 3 Filter #: Unnumbered/Unbaked
Meter Box #: MB-3 Y: 1.0041 ΔH@: 1.7841
Post-Test Leak Rate: @ .003 @ .003 @ .003 cfm @ 15 in. Hg.
Post-Test Leak Check: Pitot: ____ Orsat: ____

Traverse Point Number	Sampling Time (min)	Clock Time (24-hour clock)	Gas Meter Reading (Vm) ft³	Velocity Head (Δp) in H2O	Orifice Pressure Differential (ΔH) in H2O		Stack Temp. (Ts)	Temperature °F		Impinger Temp. °F	Dry Gas Meter Temp.		Pump Vacuum (in. Hg)
					Desired	Actual		Probe	Filter		Inlet (Tm in °F)	Outlet (Tm out °F)	
	0	1345	952.532										
	5	1350	953.218	N/A	N/A	N/A	N/A	250	250	70	81	80	N/A
	10	1355	953.360	↓	↓	↓	↓	250	250	70	81	80	↓
	15	1400	953.500	↓	↓	↓	↓	250	250	70	81	80	↓
	20	1405	953.612	↓	↓	↓	↓						↓
	25	1410											

ΔVm= ____ $\overline{\sqrt{\Delta p}}$= ____ $\overline{\Delta H}$= ____ $\overline{Ts}$= ____ $\overline{Tm}$= ____

PACIFIC ENVIRONMENTAL SERVICES, INC

4700 Duke Drive, Suite 150
Mason, Ohio 45040
513.398.2556 FAX: 513.398.3342

Sample Train Recovery Data

Plant: ABC Coke Tarrant, AL Date: 9/29/98

Sampling Location: Inlet Baghouse

Sample Recovery Person: RWM Field Team Leader: DS

Sampling Method Type: Carb Method 429

Run Number: S505000 Impinger Train ID: N-10

Job Number: A-T-429-FB

Comments: FB

Front Half Data

Filter No.: NA Filter Media Type: Teflon Mat

Filter Description: clear

Filter No.: — Filter Media Type: —

Filter Description: —

Back Half Data

	XAD-Trap	Impinger 1	Impinger 2
Contents:	XAD-2	Empty	$NaHCO_3/Na_2SO_3$
Final Volume: (ml)	345.1	476.1	673.9
Initial Volume: (ml)	345.1	476.1	673.9
Net Volume: (ml)	0.0	0.0	0.0

	Impinger 3	Impinger 4	Silica Gel
Contents:	$NaHCO_3/Na_2CO_3$	Empty	Sil Gel
Final Volume: (ml)	602.0	506.7	(g): 917.9
Initial Volume: (ml)	602.0	506.6	(g): 917.8
Net Volume: (ml)	0.0	~~0.0~~ 0.1	(g): 0.1

Total Moisture Collected (ml): 0.2

Description of Impinger catch: Clear

silgel ~0.0 spent, blue/white

TRAVERSE POINT LOCATION FOR CIRCULAR DUCTS

Plant: ABC Coke

Date: 9/29/98

Sampling Location: Beckers Under Fire Stack

Inside of Far Wall to Outside of Nipple: 212"

Inside of Near Wall to Outside of Nipple (Nipple Length): Port B 25"

Stack I.D.: 187" Port A = 22"

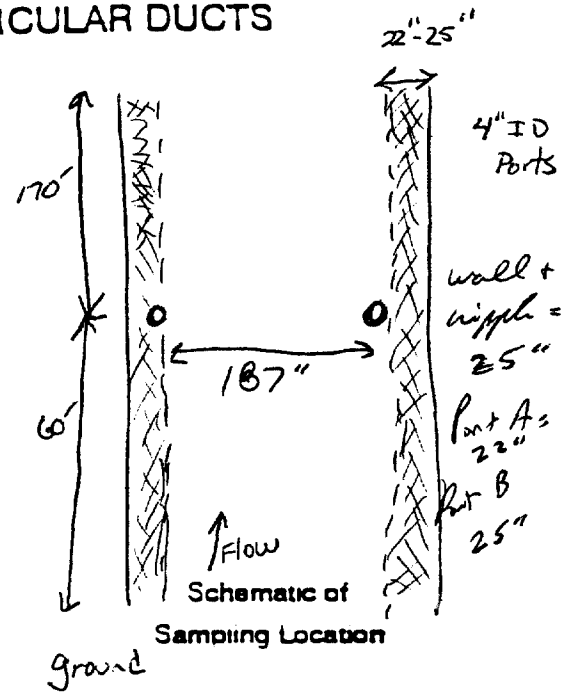
Distance Downstream from Flow Disturbance (Distance B):

720 inches / Stack I.D. = 3.9 dd

Distance Upstream from Flow Disturbance (Distance A):

2040 inches / Stack I.D. = 10.9 dd

Calculated By: DR/DS



Schematic of Sampling Location

Traverse Point Number	Fraction of Length	Length (inches)	Product of Columns 2 & 3 (To nearest 1/8")	Nipple Length (inches)	Traverse Point Location (Sum of Col. 4 & 5)
1	0.021	187"	3.93	25"	28.93
2	0.067		12.53		37.53
3	0.118		22.07		47.07
4	0.177		33.10		58.10
5	0.250		46.75		71.75
6	0.356		66.57		91.57
7	0.644		120.43		145.43
8	0.750		140.25		165.25
9	0.823		153.90		178.90
10	0.882		164.93		189.93
11	0.933		174.47		199.47
12	0.979		183.07		208.07

FIELD DATA SHEET

VELOCITY TRAVERSE PTS

Plant: ABC Coke
Sampling Location UNDERFIRE STACK
Run Number: _____ Date: 9-25-98
Pretest Leak Rate: _____ cfm @ ___ in. Hg.
Pretest Leak Check: Pitot: ___ Orsat: _____

Sample Type: ~~M-315~~ Operator: P. SIEGEL
Pbar: 29.85 Ps: -1.0
CO2: 3 O2: 17
Probe Length/Type: 10' Glass Pitot #: ___
Stack Diameter: _____ As: _____

Nozzle ID: 0.740 Thermocouple #: _____
Assumed Bws: 14 Filter #: _____
Meter Box #: MB 6 Y: 0.981 ΔH@: 1.770
Post-Test Leak Rate: _____ cfm @ ___ in. Hg.
Post-Test Leak Check: Pitot: ___ Orsat: NA

Traverse Point Number	Sampling Time (min)	Clock Time (24-hour clock)	Gas Meter Reading (Vm) ft^3	Velocity Head (Δp) in H2O	Orifice Pressure Differential (ΔH) in H2O		Stack Temp. (Ts)	Temperature °F		Impinger Temp. °F	Dry Gas Meter Temp.		Pump Vacuum (in. Hg)
					Desired	Actual		Probe	Filter		Inlet (Tm in °F)	Outlet (Tm out °F)	
	14:40												
B 1				0.004			~475						
2				0.006									
3				0.010									
4				0.012									
5				0.011									
6				0.009									
7				0.004									
8				0.003									
9				0.003									
10				0.006									
11				0.010									
12	14:55			0.008									
A 1	15:13			0.005									
2				0.008									
3				0.008									
4				0.006									
5				0.013									
6				0.010									
7				0.008									
8				0.007									
9				0.005									
10				0.007									
11				0.010									
12	15:25			0.009									

ΔVm= _____ $\overline{\sqrt{\Delta p}}$= 0.085 $\overline{\Delta H}$= _____ $\overline{Ts}$= _____ $\overline{\sqrt{\Delta p}}$ 0.091 STD. DEV. .016 $\overline{Tm}$= _____

$\overline{\Delta p}$ STD =

9/24/93 Non-pushing + charging Beckers Underfire Stack
1840

FIELD DATA SHEET

Plant: ABC Coke
Sampling Location: Underfire Stack
Run Number: Velocity 1 Date: _____
Pretest Leak Rate: _____ cfm @ ___ in. Hg.
Pretest Leak Check: Pitot: ___ Orsat: _____

Sample Type: _____ Operator: _____
Pbar: _____ Ps: _____
CO2: _____ O2: _____
Probe Length/Type: _____ Pitot #: ___
Stack Diameter: _____ As: _____

Nozzle ID: _____ Thermocouple #: _____
Assumed Bws: ___ Filter #: _____
Meter Box #: _____ Y: _____ ΔH@: _____
Post-Test Leak Rate: _____ cfm @ ___ in. Hg.
Post-Test Leak Check: Pitot: ___ Orsat: ___

Traverse Point Number	Sampling Time (min)	Clock Time (24-hour clock)	Gas Meter Reading (Vm) ft³	Velocity Head (Δp) in H2O	Orifice Pressure Differential (ΔH) in H2O		Stack Temp. (Ts)	Temperature °F		Impinger Temp. °F	Dry Gas Meter Temp.		Pump Vacuum (in. Hg)
					Desired	Actual		Probe	Filter		Inlet (Tm in °F)	Outlet (Tm out °F)	
B 0			ΔP										
1			0.005										
2			0.005										
3			0.006										
4			0.006										
5			0.007										
6			0.008										
7			0.005										
8			0.003	Static pressure = -1.00"									
9			0.005										
10			0.005										
11			0.006										
12			0.005										
A 1			0.005										
2			0.003										
3			0.004										
4			0.006										
5			0.006										
6			0.009										
7			0.010										
8			0.009										
9			0.008										
10			0.008										
11			0.009										
12			0.008										

1 = 29
2 = 37 1/2
3 = 47
4 = 58 1/4
5 = 71 3/4
6 = 91 1/2
7 = 145 1/2
8 = 165 1/4
9 = 178 7/8
10 = 187 7/8
11 = 199 1/2
12 = 208 1/8

ΔVm= _____ $\overline{\sqrt{\Delta p}}$= _____ $\overline{\Delta H}$= _____ $\overline{Ts}$= _____ $\overline{Tm}$= _____

Pacific Environmental Services, Inc.

Dry Molecular Weight Determination

Client/Project:	ABC Coke	Orsat No.	O-1
Date/Time:	9/24/98	Operator:	TA
Sample Type:	ORSAT -	Comments:	—
Ambient Temp. °F	75	Site Location:	Underfire

Run No.(s)	Gas	Run 1		Run 2		Run 3		Average Net Volume %	Multiplier	Molecular Weight of Stack Gas, Md (lb/Mole)
		Actual	Net	Actual	Net	Actual	Net			
A-U-42A-1 Bag 1	CO_2	2.4	2.4	2.4	2.4			2.4	0.44	
	O_2[a]	17.7	15.3	17.9	15.5			15.4	0.32	
	CO[b]								0.28	
	N_2[c]								0.28	
									Md =	

Run No.(s)	Gas	Run 1		Run 2		Run 3		Average Net Volume %	Multiplier	Molecular Weight of Stack Gas, Md (lb/Mole)
		Actual	Net	Actual	Net	Actual	Net			
A-U-42A-1 Bag 2	CO_2	3.0	3.0	3.0	3.0			3.0	0.44	
	O_2[a]	17.0	14.0	17.0	14.0			14.0	0.32	
	CO[b]								0.28	
	N_2[c]								0.28	
									Md =	

Run No.(s)	Gas	Run 1		Run 2		Run 3		Average Net Volume %	Multiplier	Molecular Weight of Stack Gas, Md (lb/Mole)
		Actual	Net	Actual	Net	Actual	Net			
	CO_2								0.44	
	O_2[a]								0.32	
	CO[b]								0.28	
	N_2[c]								0.28	
									Md =	

[a] O_2 Net Volume is O_2 actual reading minus CO_2 actual reading.

[b] CO Net Volume is CO actual reading minus O_2 actual reading.

[c] N_2 Net Volume is 100 minus CO actual reading.

PACIFIC ENVIRONMENTAL SERVICES, INC.

Pacific Environmental Services, Inc.

Dry Molecular Weight Determination

Client/Project: ABC Coke
Date/Time: 9-24-98
Sample Type: Continuous
Ambient Temp. °F: 70

Orsat No.: 0-1
Operator: TA
Comments: —
Site Location: Underfire

Run No.(s)	Gas	Run 1		Run 2		Run 3		Average Net Volume %	Multiplier	Molecular Weight of Stack Gas, Md (lb/Mole)
A-U-424-2 Bag 1		Actual	Net	Actual	Net	Actual	Net			
	CO_2	2.7	2.7	2.9	2.9			2.8	0.44	
	O_2[a]	17.7	15.0	17.9	15.0			15.0	0.32	
	CO[b]								0.28	
	N_2[c]								0.28	
									Md =	

Run No.(s)	Gas	Run 1		Run 2		Run 3		Average Net Volume %	Multiplier	Molecular Weight of Stack Gas, Md (lb/Mole)
A-U-424-2 Bag 2		Actual	Net	Actual	Net	Actual	Net			
	CO_2	3.2	3.2	3.0	3.0			3.1	0.44	
	O_2[a]	18.2	15.0	18.2	14.8			14.9	0.32	
	CO[b]								0.28	
	N_2[c]								0.28	
									Md =	

Run No.(s)	Gas	Run 1		Run 2		Run 3		Average Net Volume %	Multiplier	Molecular Weight of Stack Gas, Md (lb/Mole)
		Actual	Net	Actual	Net	Actual	Net			
	CO_2								0.44	
	O_2[a]								0.32	
	CO[b]								0.28	
	N_2[c]								0.28	
									Md =	

[a] O_2 Net Volume is O_2 actual reading minus CO_2 actual reading.

[b] CO Net Volume is CO actual reading minus O_2 actual reading.

[c] N_2 Net Volume is 100 minus CO actual reading.

PACIFIC ENVIRONMENTAL SERVICES, INC.

Pacific Environmental Services, Inc.

Dry Molecular Weight Determination

Client/Project:	ABL Coke	Orsat No.	O-1
Date/Time:	9-25-98	Operator:	TA
Sample Type:	~~Continuous~~ Integrated	Comments:	—
Ambient Temp. °F	75	Site Location:	Under fire

Run No.(s)	Gas	Run 1		Run 2		Run 3		Average Net Volume %	Multiplier	Molecular Weight of Stack Gas, Md (lb/Mole)
A-U-429-3 Bag 1		Actual	Net	Actual	Net	Actual	Net			
	CO_2	2.7	2.7	2.9	2.9			2.8	0.44	
	O_2[a]	15.7	13.0	15.9	13.0			13.0	0.32	
	CO[b]								0.28	
	N_2[c]								0.28	
									Md =	

Run No.(s)	Gas	Run 1		Run 2		Run 3		Average Net Volume %	Multiplier	Molecular Weight of Stack Gas, Md (lb/Mole)
A-U-429-3 Bag 2		Actual	Net	Actual	Net	Actual	Net			
	CO_2	2.5	2.5	2.5	2.5	TA	~~2.5~~	2.5	0.44	
	O_2[a]	15.9	13.4	15.9	13.4	TA	~~13.~~	13.4	0.32	
	CO[b]								0.28	
	N_2[c]								0.28	
									Md =	

Run No.(s)	Gas	Run 1		Run 2		Run 3		Average Net Volume %	Multiplier	Molecular Weight of Stack Gas, Md (lb/Mole)
		Actual	Net	Actual	Net	Actual	Net			
	CO_2								0.44	
	O_2[a]								0.32	
	CO[b]								0.28	
	N_2[c]								0.28	
									Md =	

[a] O_2 Net Volume is O_2 actual reading minus CO_2 actual reading.

[b] CO Net Volume is CO actual reading minus O_2 actual reading.

[c] N_2 Net Volume is 100 minus CO actual reading.

PACIFIC ENVIRONMENTAL SERVICES, INC.

Pacific Environmental Services, Inc.

Dry Molecular Weight Determination

Client/Project:	ABC Coke	Orsat No.	O-1
Date/Time:	9-25-98	Operator:	TA
Sample Type:	Integrated	Comments:	
Ambient Temp. °F	75	Site Location:	Underfire

Run No.(s)	Gas	Run 1		Run 2		Run 3		Average Net Volume %	Multiplier	Molecular Weight of Stack Gas, Md (lb/Mole)
A-U-429-4 Bag1		Actual	Net	Actual	Net	Actual	Net			
	CO_2	2.7	2.7	2.7	2.7			2.7	0.44	
	O_2[a]	16.2	13.5	16.2	13.5			13.5	0.32	
	CO[b]								0.28	
	N_2[c]								0.28	
									Md =	

Run No.(s)	Gas	Run 1		Run 2		Run 3		Average Net Volume %	Multiplier	Molecular Weight of Stack Gas, Md (lb/Mole)
A-U-429-4 Bag2		Actual	Net	Actual	Net	Actual	Net			
	CO_2	2.9	2.9	2.7	2.7			2.8	0.44	
	O_2[a]	16.3	13.4	16.3	13.6			13.5	0.32	
	CO[b]								0.28	
	N_2[c]								0.28	
									Md =	

Run No.(s)	Gas	Run 1		Run 2		Run 3		Average Net Volume %	Multiplier	Molecular Weight of Stack Gas, Md (lb/Mole)
		Actual	Net	Actual	Net	Actual	Net			
	CO_2								0.44	
	O_2[a]								0.32	
	CO[b]								0.28	
	N_2[c]								0.28	
									Md =	

[a] O_2 Net Volume is O_2 actual reading minus CO_2 actual reading.

[b] CO Net Volume is CO actual reading minus O_2 actual reading.

[c] N_2 Net Volume is 100 minus CO actual reading.

PACIFIC ENVIRONMENTAL SERVICES, INC.

VOLATILE ORGANIC SAMPLING TRAIN (VOST) SAMPLING DATA

COMPANY: ABC Coke
CITY: Tarrant, Alabama
DATE: 9/25/98
LOCATION: Underfire Stack
TIME:
RUN #: A-V-5506-1
METER #: VB-2
Y-FACTOR:
BAROMETRIC PRESSURE, in. Hg: 29.85
OPERATOR: [illegible]
AMBIENT TEMPERATURE, °F: 82°F
PURGE TIME:

LEAK CHECK DATA

	Vacuum Initial, (in. Hg)	Final, (in. Hg)	Time, (min.)
Pre-test:			
Post-test:			

Sample Time (min)	Clock Time, (24-hr)	Meter Volume, (liter)	Rotometer Setting	Dry Gas Meter Temp., (°F)	Vacuum, (in. Hg)	Meter Press.
0	1444	3970.730	2 l	90	10	
25	1510	4019.500	2 l	100	10	
38	1522	4036.30	2 l	100	10	
53	15:37	4051.3	1 l/m	101	19	1.8" w.c.
61	15:47	4060.2	1 L/m	100	19	
71	15:57	4069.1	1 L/m	100	19	
76	16.0 L	4073.78	1 L/m	100	19	

Nitrogen purge/activated carbon packing in sample holding container:

$$V_{std} = V_m(\text{liters}) \times Y \times 17.647 \times \frac{P_b(\text{in. Hg})}{T_m(°R)}$$

V_{std}=

FIELD DATA SHEET

Plant: ABC Coke
Sampling Location: UNDERFIRE STACK
Run Number: A-U-315-1 Date: 9-24-98
Pretest Leak Rate: 0.005 cfm @ 15 in. Hg.
Pretest Leak Check: Pitot: ✓ Orsat: NA

Sample Type: M-315 Operator: P. SIEGEL
Pbar: 29.85 Ps: -1
CO2: ~5 O2: ~16
Probe Length/Type: 10' Glass Pitot #: 12A
Stack Diameter: 187" As: 190.73
K = 281.1

Nozzle ID: 0.740 Thermocouple #: 12A
Assumed Bws: 7 Filter #: 080898-11
Meter Box #: MB5 Y: 0.981 ΔH@: 1.77
Post-Test Leak Rate: 0.007 cfm @ 8 in. Hg.
Post-Test Leak Check: Pitot: ✓ Orsat: —

Traverse Point Number	Sampling Time (min)	Clock Time (24-hour clock)	Gas Meter Reading (Vm) ft³	Velocity Head (Δp) in H2O	Orifice Pressure Differential (ΔH) in H2O Desired	Orifice Pressure Differential (ΔH) in H2O Actual	Stack Temp. (Ts)	Temperature °F Probe	Temperature °F Filter	Impinger Temp. °F	Dry Gas Meter Temp. Inlet (Tm in °F)	Dry Gas Meter Temp. Outlet (Tm out °F)	Pump Vacuum (in. Hg)
0	0	10:25	658.178										
B1	7.5		662.39	0.005	0.88	0.88	419	235	260	65	88	88	3.0
2	15.0	10:40	667.82	0.010	1.76	1.76	418	234	261	65	90	89	4.5
3	22.5		673.97	0.012	2.09	2.09	430	231	263	60	93	90	5.0
4	30.0	10:55	679.66	0.010	1.69	1.69	460	232	259	61	96	91	5.0
5	37.5		684.72	0.008	1.34	1.34	467	231	257	62	97	91	4.0
6	45.0	11:10	689.80	0.008	1.33	1.33	482	231	258	64	99	93	4.0
6(7)	52.5		694.61	0.007	1.20	1.20	456	230	258	66	100	95	4.0
5(8)	60.0	11:25	699.49	0.007	1.20	1.20	457	234	258	63	101	95	4.0
4(9)	67.5		705.06	0.010	1.68	1.68	474	232	252	59	99	95	5.0
3(10)	75.0	11:40	710.17	0.008	1.32	1.32	492	232	255	62	99	96	4.0
2(11)	82.5		714.44	0.005	0.86	0.86	458	231	256	64	101	97	3.5
1(12)	90.0	11:55	718.192	0.004	0.71	0.71	429	232	256	65	100	97	3.0
				LEAK CHECK	0.003 @	8 in Hg							
		12:14	721.684	LEAK CHECK	0.005 @	8 in Hg							
A 1	97.5		725.63	0.004	0.75	0.75	382	230	255	65	~~98~~	~~98~~	~~3.2~~ PTS
2	105.0	12:29	730.23	0.006	1.09	1.09	408	232	256	67	98	98	3.2
3	112.5		734.82	0.006	1.03	1.03	461	232	255	68	102	99	3.5
4	120.0	12:44	739.96	0.008	1.40	1.40	445	235	254	66	103	100	4
5	127.5		745.72	0.010	1.73	1.73	455	239	253	67	105	100	4.5
6	135.0	12:59	751.60	0.011	1.83	1.83	490	233	252	66	105	101	5
6 (7)	142.5		757.26	0.010	1.70	1.70	473	239	252	66	105	101	5.5
5 (8)	150.0	13:14	763.00	0.010	1.69	1.69	477	236	251	67	105	100	5.5
4 (9)	157.5		769.17	0.012	2.08	2.08	454	239	253	66	106	101	6
3 (10)	165.0	13:29	774.86	0.010	1.74	1.74	451	244	255	68	108	103	5.5
2 (11)	172.5		780.31	0.009	1.58	1.58	440	231	251	68	106	102	5
1 (12)	180.0	13:44	785.486	0.008	1.49	1.49	391	234	256	67	108	103	5

ΔVm = 123.816 $\overline{\sqrt{\Delta p}}$ = .0984 $\overline{\Delta H}$ = 1.42 $\overline{Ts}$ = 449 $\overline{Tm}$ = 99

ACFM 85,087
DSCFM 42,363
350°F
96.2

PACIFIC ENVIRONMENTAL SERVICES, INC

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Mason, Ohio 45040
513.398.2556 FAX: 513.398.3342

Sample Train Recovery Data

Plant: ABC Coke Tarrant, AL Date: 9/24/98

Sampling Location: Underfire stack

Sample Recovery Person: TA/RWDJ Field Team Leader: DS

Sampling Method Type: M315

Run Number: A-U-315-1 Impinger Train ID: N-4

Job Number: 55050000

Comments:

Front Half Data

Filter No.: 080998-11 Filter Media Type: Treated quartz

Filter Description: Black Particle

Filter No.: — Filter Media Type: —

Filter Description: —

Back Half Data

Impinger Purge-

Start Time: — Flow Rate: — Stop Time: — Purge Gas: —

	Impinger 1	Impinger 2	Impinger 3
Contents:	H_2O	H_2O	Empty
Final Volume: (ml)	889.8	677.8	554.4
Initial Volume: (ml)	573.7	611.2	547.4
Net Volume: (ml)	316.1	66.6	7.0

	Impinger 4	Impinger 5	Silica Gel
Contents:	—	—	Sil Gel
Final Volume: (ml)	—	—	(g): 857.4
Initial Volume: (ml)	—	—	(g): 852.5
Net Volume: (ml)	—	—	(g): 4.9

Total Moisture Collected (ml): 394.6

Description of Impinger catch: Yellow tint

FIELD DATA SHEET

Plant: ABC Coke
Sampling Location: UNDERFIRE STACK
Run Number: A-U-315-2 Date: 9-24-98
Pretest Leak Rate: 0.002 cfm @ 15 in. Hg.
Pretest Leak Check: Pitot: ✓ Orsat: NA

Sample Type: M-315 Operator: P. SIEGER
Pbar: 29.85 Ps: PTS ~~[illegible]~~ -1.0
CO2: 5 O2: 16
Probe Length/Type: 10' Glass Pitot #: 12A
Stack Diameter: 187 As: —
K = 247.2

Nozzle ID: 0.74 Thermocouple #: 12A
Assumed Bws: 14 Filter #: 080898-12
Meter Box #: MB 6 Y: 0.981 ΔH@: 1.770
Post-Test Leak Rate: 0.004 cfm @ 8 in. Hg.
Post-Test Leak Check: Pitot: ✓ Orsat: NA

Traverse Point Number	Sampling Time (min)	Clock Time (24-hour clock)	Gas Meter Reading (Vm) ft³	Velocity Head (Δp) in H2O	Orifice Pressure Differential (ΔH) in H2O Desired	Orifice Pressure Differential (ΔH) in H2O Actual	Stack Temp. (Ts)	Temperature °F Probe	Temperature °F Filter	Impinger Temp. °F	Dry Gas Meter Temp. Inlet (Tm in °F)	Dry Gas Meter Temp. Outlet (Tm out °F)	Pump Vacuum (in. Hg)
0	0	14:43	786.040										
A 1	7.5		790.25	0.005	0.84	0.84	358	233	259	64	99	97	2.5
2	15.0	14:58	795.19	0.008	1.28	1.28	403	238	258	65	100	98	3
3	22.5		800.57	0.010	1.50	1.50	461	228	259	65	101	97	3
4	30.0	15:13	806.24	0.012	1.79	1.79	467	234	248	64	103	98	3.5
5	37.5		811.51	0.010	1.52	1.52	453	240	249	64	105	99	3
6	45.0	15:28	816.6	0.009	1.36	1.36	460	243	236	63	105	99	3
6 (7)	52.5		822.01	0.010	1.49	1.49	471	241	237	63	106	100	3
5 (8)	60.0	15:43	827.72	0.012	1.80	1.80	470	245	237	64	108	102	4
4 (9)	67.5		833.64	0.012	1.83	1.83	453	245	235	62	107	101	4
3 (10)	75.0	15:58	839.05	0.010	1.56	1.56	438	248	235	62	108	102	3.5
2 (11)	82.5		843.99	0.008	1.24	1.24	441	248	236	64	109	103	3
1 (12)	90.0	16:13	848.010	0.005	0.79	0.79	422	247	237	66	108	103	2.5
			848.102	Leak rate	@ 0.001	@ 8 inches	Hg						
		16:36	848.191	Leak rate	@ 0.002	@ 8 inches	Hg						
B 1	97.5	~~16:36~~ PTS	851.46	0.003	0.51	0.51	355	230	241	66	99	99	2
2	105.0	16:51	855.61	0.006	0.95	0.95	412	232	234	59	101	99	3
3	112.5	~~16:51~~ PTS	860.96	0.010	1.55	1.55	432	234	234	58	103	99	3.5
4	120.0	17:06	867.14	0.014	2.15	2.15	445	235	234	58	104	99	4
5	127.5	~~17:06~~ PTS	873.19	0.013	1.94	1.94	470	238	235	57	105	99	4
6	135.0	17:21	878.72	0.011	1.67	1.67	450	237	233	58	104	98	4
6 (7)	142.5	~~17:21~~ PTS	884.03	0.010	1.51	1.51	458	238	234	58	104	98	3.5
5 (8)	150.0	17:36	889.92	0.013	1.95	1.95	464	237	233	60	105	98	4
4 (9)	157.5	~~17:~~ PTS	895.69	0.012	1.80	1.80	466	238	232	60	104	99	4
3 (10)	165.0	17:51	900.54	0.008	1.24	1.24	438	238	231	60	104	98	3
2 (11)	172.5		904.19	0.004	0.64	0.64	403	237	232	61	102	97	3
1 (12)	180.0	18:06	909.421	0.010	1.65	1.65	380	237	232	61	103	97	4

ΔVm= 123.20 $\overline{\sqrt{\Delta p}}$= 0.0954 $\overline{\Delta H}$= 1.44 $\overline{Ts}$= 437 $\overline{Tm}$= 101.6

✓

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513.398.2556 FAX: 513.398.3342

Sample Train Recovery Data

Plant: ABC Coke Date: 9/24/98

Sampling Location: Underfire

Sample Recovery Person: TA Field Team Leader: DS

Sampling Method Type: Method 315

Run Number: A-U-315-2 Impinger Train ID: N-1

Job Number: 5505.000

Comments:

Front Half Data

Filter No.: 080898-12 Filter Media Type: Treated Quartz

Filter Description: Black Coat

Filter No.: — Filter Media Type: —

Filter Description: —

Back Half Data

Impinger Purge-

Start Time: — Flow Rate: — Stop Time: — Purge Gas: —

	Impinger 1	Impinger 2	Impinger 3
Contents:	H_2O	H_2O	Empty
Final Volume: (ml)	779.2	875.7	558.2
Initial Volume: (ml)	549.5	709.1	552.8
Net Volume: (ml)	229.7	166.6	5.4

	Impinger 4	Impinger 5	Silica Gel
Contents:	—	—	Sil Gel
Final Volume: (ml)	—	—	(g): ~~905.3~~ 929.3
Initial Volume: (ml)	—	—	(g): 904.6
Net Volume: (ml)	—	—	(g): 24.7

Total Moisture Collected (ml): 426.4

Description of Impinger catch: Yellowish Tint

FIELD DATA SHEET

Plant: ABC Coke
Sampling Location: UNDERFIRE STACK
Run Number: A-0-315-3 Date: 9-25-98
Pretest Leak Rate: 0.002 cfm @ 15 in. Hg.
Pretest Leak Check: Pitot: ✓ Orsat: NA

Sample Type: M-315 Operator: P. SIEGEL
Pbar: 29.85 Ps: -1.0
CO2: 3 % O2: 17 %
Probe Length/Type: 10' Glass Pitot #: 12A
Stack Diameter: 187 As:
K = 247.2

Nozzle ID: 0.740 Thermocouple #: 12A
Assumed Bws: 14 Filter #: 080898-17
Meter Box #: ~~MB6~~ 5HL Y: 0.981 ΔH@: 1.770
Post-Test Leak Rate: 0.007 cfm @ 7 in. Hg.
Post-Test Leak Check: Pitot: ✓ Orsat: NA

Traverse Point Number	Sampling Time (min)	Clock Time (24-hour clock)	Gas Meter Reading (Vm) ft³	Velocity Head (Δp) in H2O	Orifice Pressure Differential (ΔH) in H2O Desired	Actual	Stack Temp. (Ts)	Temperature °F Probe	Filter	Impinger Temp. °F	Dry Gas Meter Temp. Inlet (Tm in °F)	Outlet (Tm out °F)	Pump Vacuum (in. Hg)
0	0	7:38	909.637										
B 1	7.5		913.02	0.004	0.58	0.58	443	234	234	65	70	70	2
2	15.0	7:53	917.12	0.007	1.01	1.01	460	251	234	56	78	74	3
3	22.5		923.06	0.014	1.98	1.98	485	252	233	57	83	76	4.5
4	30.0	8:08	928.56	0.012	1.69	1.69	489	246	234	58	86	77	4
5	37.5		933.45	0.010	1.43	1.43	481	236	233	59	87	79	3.5
6	45.0	8:23	938.73	0.010	1.42	1.42	490	240	233	59	89	81	3.5
6 (7)	52.5		944.01	0.011	1.55	1.55	496	242	233	60	89	82	4
5 (8)	60.0	8:38	949.49	0.012	1.69	1.69	501	241	235	60	91	83	4
4 (9)	67.5		955.21	0.013	1.86	1.86	488	240	233	57	93	85	4.5
3 (10)	75.0	8:53	960.95	0.013	1.86	1.86	487	238	233	58	93	85	4.5
2 (11)	82.5		966.11	0.010	1.44	1.44	485	240	231	58	94	87	4
1 (12)	90.0	9:08	970.31	0.006	0.89	0.89	455	241	233	60	94	87	2.5
1	97.5		974.50	0.006	0.89	0.89	456	240	232	62	93	87	2.5
2	105.0	9:23	978.92	0.007	1.04	1.04	452	237	232	61	93	88	3
3	112.5		984.07	0.010	1.46	1.46	472	238	234	58	94	89	4
4	120.0	9:38	988.70	0.013	1.86	1.86	493	237	234	58	95	90	4.5
5	127.5		995.28	0.012	1.73	1.73	489	238	234	59	96	90	4.5
6	135.0	9:53	999.96	0.008	1.15	1.15	492	237	232	61	96	91	3.5
6 (7)	142.5		1004.57	0.008	1.14	1.14	499	240	233	61	96	91	3.5
5 (8)	150.0	10:08	1010.47	0.014	1.98	1.98	505	242	234	60	95	91	5
4 (9)	157.5		1016.41	0.013	1.88	1.88	486	241	234	61	96	91	5
3 (10)	165.0	10:23	1021.72	0.011	1.60	1.60	484	239	233	59	97	92	4
2 (11)	~~172.5~~ 173	10:29	1025.927	0.009	1.34	1.34	460	238	231	59	96	91	4
1 (12)	180.0												
		171.4											

ΔVm= 116.290 $\overline{\sqrt{\Delta p}}$= 0.0996 $\overline{\Delta H}$= 1.46 $\overline{Ts}$= 480 $\overline{Tm}$= 88.1

PACIFIC ENVIRONMENTAL SERVICES, INC

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Sample Train Recovery Data

Plant: ABC Coke Tarrant, Alabama Date: 9/25/98

Sampling Location: Beckers Underfire Stack

Sample Recovery Person: TA/RWDJ Field Team Leader: D Schedel

Sampling Method Type: EPA Method 315

Run Number: A-U-M315-3 Impinger Train ID: A-U-M315-3

Job Number: S505,000

Comments: M315 Run3 Underfire Stack

Front Half Data

Filter No.: 080898-17 Filter Media Type: Quartz Fiber (tared)

Filter Description: gray black particulate

Filter No.: — Filter Media Type: —

Filter Description: —

Back Half Data

Impinger Purge-

Start Time: — Flow Rate: — Stop Time: — Purge Gas: —

	Impinger 1	Impinger 2	Impinger 3
Contents:	Type I H_2O	Type I H_2O	Empty
Final Volume: (ml)	853.6	771.2	567.6
Initial Volume: (ml)	570.4	717.6	563.1
Net Volume: (ml)	283.2	53.6	4.5

	Impinger 4	Impinger 5	Silica Gel
Contents:			Silica Gel
Final Volume: (ml)			(g): 781.4
Initial Volume: (ml)			(g): 729.4
Net Volume: (ml)			(g): 52.0

Total Moisture Collected (ml): Clear 393.3

Description of Impinger catch: clear
~35% spent

FIELD DATA SHEET

Plant: ABC Coke Tarrant, Alabama
Sampling Location: Underfire Stack
Run Number: A-U-345-FB Date: 9/24/98
Pretest Leak Rate: _____ cfm @ ___ in. Hg.
Pretest Leak Check: Pitot: ✓ Orsat: ✓

Sample Type: M315 Operator: [illegible]
Pbar: 29.85 Ps: _____
CO2: _____ O2: _____
Probe Length/Type: 10' Glass Pitot #: RTP
Stack Diameter: _____ As: _____

Nozzle ID: 0.740 Thermocouple #: RTP
Assumed Bws: ___ Filter #: 080898-08
Meter Box #: 4 Y: 1.872 ΔH@: 0.979
Post-Test Leak Rate: _____ cfm @ ___ in. Hg.
Post-Test Leak Check: Pitot: ✓ Orsat: ✓

Traverse Point Number	Sampling Time (min)	Clock Time (24-hour clock)	Gas Meter Reading (Vm) ft³	Velocity Head (Δp) in H2O	Orifice Pressure Differential (ΔH) in H2O		Stack Temp. (Ts)	Temperature °F		Impinger Temp. °F	Dry Gas Meter Temp.		Pump Vacuum (in. Hg)
					Desired	Actual		Probe	Filter		Inlet (Tm in °F)	Outlet (Tm out °F)	
	0	0848	345.208										
	5	0853	345.370	0.007 at	12"	Hg		246	247				12
	10	0858	345.447	0.008 at	12"	Hg		250	253				12
	15	0903		0.007 at	12"	Hg		253	248				12

ΔVm= _____ $\overline{\sqrt{\Delta p}}$= _____ $\overline{\Delta H}$= _____ $\overline{Ts}$= _____ $\overline{Tm}$= _____

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Sample Train Recovery Data

Plant: ABC Coke EPA Date: 9-25-98

Sampling Location: Underfire Stack

Sample Recovery Person: TA Field Team Leader: DS

Sampling Method Type: M315

Run Number: A-U-315-FB Impinger Train ID: N-4

Job Number: S505.000

Comments: Underfire Method 315 FB

Front Half Data

Filter No.: 080898-08 Filter Media Type: Quartz

Filter Description:

Filter No.: — Filter Media Type: —

Filter Description: —

Back Half Data

Impinger Purge-

Start Time: — Flow Rate: — Stop Time: — Purge Gas: —

	Impinger 1	Impinger 2	Impinger 3
Contents:	H_2O	H_2O	Empty
Final Volume: (ml)	576.3	613.0	547.8
Initial Volume: (ml)	576.4	613.1	547.8
Net Volume: (ml)	-0.10	-0.1	0.0

	Impinger 4	Impinger 5	Silica Gel
Contents:			
Final Volume: (ml)			(g): 860.7
Initial Volume: (ml)			(g): 860.6
Net Volume: (ml)			(g): 0.1

Total Moisture Collected (ml): -0.1

Description of Impinger catch: Clear

0% spent blue white pink

FIELD DATA SHEET

K = 285.97

Plant: ABC Coke
Sampling Location: Under Fire
Run Number: A-U-429 Date: 9-28-98
Pretest Leak Rate: .003 cfm @ 12 in. Hg.
Pretest Leak Check: Pitot: ✓ Orsat: ✓

Sample Type: M429 Operator: Gray
Pbar: 29.85 Ps: -1.0
CO2: O2:
Probe Length/Type: 8' 123" Pitot #: RTP20
Stack Diameter: 187 As: 190.7

Nozzle ID: .74 Thermocouple #: RTP-20
Assumed Bws: 7 Filter #: TF
Meter Box #: 2 Y: 1.002 ΔH@: 1.797
Post-Test Leak Rate: .001 cfm @ 14 in. Hg.
Post-Test Leak Check: Pitot: ✓ Orsat: ✓

Traverse Point Number	Sampling Time (min)	Clock Time (24-hour clock)	Gas Meter Reading (Vm) ft³	Velocity Head (Δp) in H2O	Orifice Pressure Differential (ΔH) in H2O Desired	Actual	Stack Temp. (Ts)	Temperature °F Probe	Filter	Impinger Temp. °F	Dry Gas Meter Temp. Inlet (Tm in °F)	Outlet (Tm out °F)	Pump Vacuum (in. Hg)	
A1	0	1025	868.183											
2	7.5	1033	870.0	.001 .01	.22	.22	247	262	261	47	89	90	1	46
3	15	1040	873.4	.005 .05	.90	.90	405	261	261	47	90	90	4	46
4	22.5	1048	876.4	.0010 .01	.17	.17	438	261	257	47	90	92	4	46
5	30	1055	878.1	.001 .01	.17	.17	450	261	258	46	90	92	2	46
6	37.5	1103	879.9	.001 .01	.16	.16	474	261	255	46	91	93	2	47
6	45.0	1110	881.6	.001 .01	.16	.16	480	255	261	46	91	92	2	47
5	52.5	1118	883.6	.001 .01	.17	.17	466	262	262	46	95	92	2	45
4	60	1125	885.0	~~.005~~ .05	.85	.85	465	260	259	47	92	95	2	47
3	67.5	1133	887.5	~~.001~~ .01	.17	.17	467	257	255	48	92	97	9	47
2	75	1141	895.5	.040	1.7	1.7	448	259	261	48	96	99	9	48
1	82.5	1148	901.2	.010	1.8	1.8	419	261	262	48	97	100	9	48
B1		1155	906.768	.010	1.8	1.8	423	261	257	48	98	101	9	50
			907.001											
B-1	90	1215	~~906.~~ 907.001	.010	1.8	1.8	405	250	259	47	99	99	8	46
2	97	1223	912.5	.010	2.3	2.3	210	261	280	47	99	104	8	47
3	105	1231	919.0	.015	2.6	2.6	459	261	257	48	100	105	10	49
4	112.5	1238	925.5	.010	1.8	1.8	457	259	257	49	101	106	11	49
5	120	1245	931.3	.010	1.8	1.8	467	280	261	47	101	106	11	49
6	127.5	1253	937.3	.010	1.8	1.8	475	259	260	47	102	107	10	47
6	135	1301	943.0	.010	1.8	1.8	481	251	257	45	103	108	10	46
5	142.5	1308	948.4	.010	1.8	1.8	464	258	259	45	103	107	11	45
4	150	1316	954.7	.010	1.8	1.8	463	259	261	45	104	108	11	45
3	157.5	1323	960.4	.015	2.6	2.6	456	257	266	45	105	109	13	45
2	165.0	1331	967.3	.010	1.8	1.8	467	262	255	46	107	108	14	44
1	172.5	1338	972.9	.010	1.8	1.8	453	261	259	47	107	109	14	45
	180	1345	978.380	—	—	—	—	—	—	—	—	—	—	—

PORT 4" CHANGE .001 4" .001

ΔVm= 109.964 √Δp= ~~.0887~~ .09948 ΔH= 1.396 ✓ Ts= 435 ✓ Tm= ~~77.7~~ ALFM ~~76.930~~

PACIFIC ENVIRONMENTAL SERVICES, INC

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Sample Train Recovery Data

Plant: ABC Coke Tarrant, Ala. Date: 9/24/98

Sampling Location: Underfire Stack

Sample Recovery Person: ~~PH~~/RD Field Team Leader: D. Scheffel

Sampling Method Type: ~~BH~~ Carb 429

Run Number: A-U-M429-1 Impinger Train ID: A-U-M429-1

Job Number: S505.000

Comments: Carb 429 train for PAH's

Front Half Data

Filter No.: A-U-429-1 Filter Media Type: Teflon Mat

Filter Description: gray in color; moderate loading

Filter No.: — Filter Media Type: —

Filter Description: —

Back Half Data

	XAD-Trap	Dwlkard Impinger 1	$NaHCO_3/Na_2CO_3$ Impinger 2
Contents:	XAD-2 Resin	Empty	
Final Volume: (ml)	351.9	814.0	636.1
Initial Volume: (ml)	345.7	461.5	646.5
Net Volume: (ml)	6.2	352.5	-10.4

	Impinger 3	Impinger 4	Silica Gel
Contents:	$NaHCO_3/Na_2CO_3$	Empty	S.G.
Final Volume: (ml)	621.0	483.9	(g): 889.4
Initial Volume: (ml)	622.7	484.0	(g): 830.5
Net Volume: (ml)	1.7	0.1	(g): 58.9

Total Moisture Collected (ml): ~~429.8~~ Hh 409.0

Description of Impinger catch: Clear

~82% blue/white/pink

K = ~~275.47~~ 250.93

FIELD DATA SHEET

Plant: ABC Coke
Sampling Location: Unpack Fine
Run Number: AV-929-2 Date: 9-29-98
Pretest Leak Rate: .009 cfm @ 15 in. Hg.
Pretest Leak Check: Pitot: ✓ Orsat: ✓

Sample Type: 429 Operator: GGM
Pbar: 29.85 Ps: -1.0
CO2: 3 O2: 14
Probe Length/Type: 12 ft Pitot #: RTD-20
Stack Diameter: 187" As: 190.7

Nozzle ID: .74 Thermocouple #: RTD20
Assumed Bws: 19 Filter #: TF
Meter Box #: 2 Y: 1.002 ΔH@: 1.797
Post-Test Leak Rate: .002 cfm @ 8 in. Hg.
Post-Test Leak Check: Pitot: ✓ Orsat: ✓

Traverse Point Number	Sampling Time (min)	Clock Time (24-hour clock)	Gas Meter Reading (Vm) ft³	Velocity Head (Δp) in H2O	Orifice Pressure Differential (ΔH) in H2O Desired	Actual	Stack Temp. (Ts)	Temperature °F Probe	Filter	Impinger Temp. °F	Dry Gas Meter Temp. Inlet (Tm in °F)	Outlet (Tm out °F)	Pump Vacuum (in. Hg)	
A-1	0	1445	978.756											COOL
2	7.5	1451	982.7	.005	.87	.87	350	260	258	65	101	103	2	52
3	15	1458	986.5	.005	.79	.79	430	261	258	58	101	102	4	52
4	22.5	1506	990.4	.005	.78	.78	441	261	261	58	99	100	4	52
5	30	1513	993.1	.01	1.5	1.5	478	262	258	58	99	101	6	52
6	37.5	1521	000.4	.01	1.5	1.5	461	261	263	50	99	101	8	49
6	45.0	1529	005.5	.01	1.5	1.5	467	260	259	51	100	105	12	52
5	52.5	1536	010.9	.01	1.5	1.5	472	257	260	52	102	106	14	53
4	60	1543	016.2	.01	1.5	1.5	477	258	257	54	102	107	14	53
3	67.5	1550	020.4	.005	.78	.78	461	260	261	51	103	108	8	48
2	75.0	1558	024.1	.005	.78	.78	454	258	259	51	104	109	8	49
1	82.5	1606	028.4	.005	.78	.78	420	260	261	52	106	109	8	50
	90	1613	031.640	.005	.78	.78	452	259	256	58	106	107	8	51
	0	1626	031.924											CHANGE FILTER
B1 +	97	1636	036.510	.01	1.6	1.6	410	257	255	52	101	103	20	53
2	[illegible]	1650	036.910	.01	1.5	1.5	445	257	258	52	102	103	6	53
3	105	1658	042.5	.01	1.5	1.5	470	261	257	53	101	102	6	52
4	112.5	1705	048.1	.015	2.2	2.2	479	259	257	53	100	103	8	51
5	120	1712	054.5	.01	1.9	1.9	457	260	259	53	100	106	8	52
6	127.5	1720	060.4	.01	1.5	1.5	466	258	258	55	101	106	7	54
6	135	1727	065.6	.01	1.5	1.5	473	261	259	56	101	107	7	55
5	142.6	1734	070.9	.01	1.5	1.5	480	261	262	57	101	107	7	56
4	150	1742	076.3	.01	1.5	1.5	464	258	261	57	102	106	7	56
3	157.5	1749	081.6	.01	1.5	1.5	452	261	262	56	101	105	7	55
2	165	1757	086.5	.01	1.5	1.5	451	260	258	57	101	105	7	56
1	172.5	1804	091.6	.01	1.5	1.5	443	262	259	57	103	104	7	56
	180	1812	096.890	—	—	—	—	—	—	—	—	—	—	

LEAK V 100 1" 15" 003 15

CHANGE FILTER 15" .002

ΔVm= 117.85 $\sqrt{\Delta p}$= 0.0924 ΔH= 1.3 Ts= 454 Tm= 103

PACIFIC ENVIRONMENTAL SERVICES, INC

4700 Duke Drive, Suite 150
Mason, Ohio 45040
513.398.2556 FAX: 513.398.3342

Sample Train Recovery Data

Plant: ABC Coke Tarrant, AL Date: 9/24/98

Sampling Location: Underfire Stack

Sample Recovery Person: RWV Field Team Leader: DS

Sampling Method Type: Carb Method 429

Run Number: Underfire 2 A-U-429-2 Impinger Train ID: RTP 24

Job Number: S505.000

Comments: Underfire Method 429

Front Half Data

Filter No.: NA Filter Media Type: Teflon mat

Filter Description: gray discoloration, fine, loose particulate

Filter No.: — Filter Media Type: —

Filter Description: —

Back Half Data

	XAD-Trap	Impinger 1	Impinger 2
Contents:	XAD-2	Empty	$NaHCO_3/Na_2CO_3$
Final Volume: (ml)	354.5	834.4	616.8
Initial Volume: (ml)	343.1	463.5	624.1
Net Volume: (ml)	11.4	370.9	-7.3

	Impinger 3	Impinger 4	Silica Gel
Contents:	$NaHCO_3/Na_2CO_3$	Empty	SilGel
Final Volume: (ml)	605.0	523.3	(g): 936.9
Initial Volume: (ml)	602.7	519.7	(g): 907.0
Net Volume: (ml)	0.3	3.6	(g): 29.9

Total Moisture Collected (ml): ~~423.4~~ 408.8

Description of Impinger catch: clear

SilGel ~ 55% spent, blue/white/pink

FIELD DATA SHEET

K = 250.96

Plant: ABC Corp
Sampling Location: Unit 2 Firestack
Run Number: AU-429.3 Date: 9-25-94
Pretest Leak Rate: .006 cfm @ 15 in. Hg.
Pretest Leak Check: Pitot: ✓ Orsat: ✓

Sample Type: M429 Operator: Gary
Pbar: 29.85 Ps: -1.0
CO2: 3 2.8 O2: 17 13
Probe Length/Type: 12'11" Pitot #: RTP26
Stack Diameter: 187 As: 190.7

Nozzle ID: .74 Thermocouple #: RTP20
Assumed Bws: 14 - 325.8 Filter #: TF
Meter Box #: 2 Y: 1.002 ΔH@: 1.797
Post-Test Leak Rate: .001 cfm @ 7 in. Hg.
Post-Test Leak Check: Pitot: ✓ Orsat: ✓

Traverse Point Number	Sampling Time (min)	Clock Time (24-hour clock)	Gas Meter Reading (Vm) ft³	Velocity Head (Δp) in H2O	Orifice Pressure Differential (ΔH) in H2O Desired	Actual	Stack Temp. (Ts)	Temperature °F Probe	Filter	Impinger Temp. °F	Dry Gas Meter Temp. Inlet (Tm in °F)	Outlet (Tm out °F)	Pump Vacuum (in. Hg)	Cond Temp
	0	0738	097.136											
A 1	7.5	746	099.9	.003	.48	.48	360	261	265	54	70	71	1	33
2	15	753	103.5	.005	.73	.73	456	258	259	56	72	75	4	41
3	22.5	800	108.3	.01	1.4	1.4	498	260	267	58	73	78	6	43
4	30	808	113.2	.01	1.4	1.4	500	261	267	57	75	82	7	45
5	31.5	816	117.3	.006	.85	.95	484	261	270	58	75	83	5	43
6	45	823	121.0	.005	.72	.72	475	263	276	47	77	84	5	42
6	52.5	830	124.7	.005	.73	.73	464	261	270	49	80	87	5	44
5	60	838	128.2	.005	.72	.72	490	262	270	49	82	87	5	43
4	67.5	846	132.7	.006	.86	.86	487	261	268	50	83	84	5	45
3	75	853	137.0	.01	1.4	1.4	493	261	269	51	84	90	7	45
2	82.5	901	141.0	.005	.72	.72	497	262	267	51	85	92	5	46
1	90	908	144.2	.003	.52	.52	330	261	265	52	87	91	4	48
1	97	915	147.9	.005	.88	.88	324	262	263	52	88	92	6	44
2	105	923	152.7	.008	1.2	1.2	418	261	262	51	87	93	6	49
3	112.5	930	158.0	.01	1.4	1.4	497	262	261	52	90	93	7	48
4	120	937	162.6	.01	1.4	1.4	501	263	268	52	91	94	7	49
5	127.5	946	167.9	.01	1.4	1.4	491	262	265	52	91	95	7	50
6	135	953	171.7	.005	.75	.75	459	263	268	50	93	95	5	50
6	142.5	1006	175.5	.005	.72	.72	503	261	265	50	93	95	5	58
5	150	1008	180.0	.01	1.4	1.4	505	262	268	51	91	95	7	47
4	157.5	1016	185.4	.01	1.5	1.5	492	264	269	52	93	96	7	49
3	165	1023	190.4	.01	1.5	1.5	494	262	265	52	92	96	7	47
2	172.5	1029	194.305	.008	1.1	1.1	500	264	261	52	94	96	7	47
1	180													

Inlv 171

ΔVm= 97.169 $\sqrt{\Delta p}$= .1794 .0830 SB ΔH= .99 1.03 SB Ts= 465 Tm= 83 86° SB ✓

PACIFIC ENVIRONMENTAL SERVICES, INC

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Mason, Ohio 45040
513.398.2556 FAX: 513.398.3342

Sample Train Recovery Data

Plant: ABC Coke Tarrant Alabama Date: 9/25/98

Sampling Location: Underfire Stack Outlet

Sample Recovery Person: RD/TA Field Team Leader: D. Schlegel

Sampling Method Type: CARB 429

Run Number: A-U-429-3 Impinger Train ID: A-U-429-3

Job Number: 5505.000

Comments: Under fire Carb 429 Run 3

Front Half Data

Filter No.: A-U-429-3 Filter Media Type: Teflon Mat

Filter Description: Grey-Black Particles

Filter No.: — Filter Media Type: —

Filter Description: —

Back Half Data

	XAD-Trap	Dunkard Impinger 1	Impinger 2
Contents:	XAD-2 Resin	Empty	$NaHCO_3/Na_2CO_3$
Final Volume: (ml)	357.0	774.5	722.4
Initial Volume: (ml)	336.7	495.6	722.4
Net Volume: (ml)	20.3	278.9	0.0

	Impinger 3	Impinger 4	Silica Gel
Contents:	$NaHCO_3/Na_2CO_3$	Empty	S.G.
Final Volume: (ml)	719.7	620.6	(g): 789.6
Initial Volume: (ml)	719.7	620.5	(g): 763.1
Net Volume: (ml)	0.0	0.1	(g): 26.5

Total Moisture Collected (ml): 325.8

Description of Impinger catch: Clear 25% Spent

FIELD DATA SHEET

Plant: ABC COKE
Sampling Location: Unoby Fire Stack
Run Number: AU-429-4 Date: 9-25-98
Pretest Leak Rate: .006 cfm @ 15 in. Hg.
Pretest Leak Check: Pitot: ✓ Orsat: ✓

Sample Type: M429 Operator: GGM
Pbar: 29.85 Ps: -1.0
CO2: 3 3 O2: 17 13.5
Probe Length/Type: 12.5' Pitot #: RTD20
Stack Diameter: 18' As: 190.7

Nozzle ID: .174 Thermocouple #: RTP20
Assumed Bws: ___ Filter #: TF
Meter Box #: 2 Y: 1.002 ΔH@: 1.797
Post-Test Leak Rate: .002 cfm @ 12 in. Hg.
Post-Test Leak Check: Pitot: ✓ Orsat: ✓

Traverse Point Number	Sampling Time (min)	Clock Time (24-hour clock)	Gas Meter Reading (Vm) ft³	Velocity Head (Δp) in H2O	Orifice Pressure Differential (ΔH) in H2O Desired	Orifice Pressure Differential (ΔH) in H2O Actual	Stack Temp. (Ts)	Temperature °F Probe	Temperature °F Filter	Impinger Temp. °F	Dry Gas Meter Temp. Inlet (Tm in °F)	Dry Gas Meter Temp. Outlet (Tm out °F)	Pump Vacuum (in. Hg)	
	0	1110	199.546											
A 1	7.5	1117	198.2	.005	.76	.76	446	250	267	62	90	91	2	48
2	15	1125	204.0	.015	2.1	2.1	495	262	261	52	91	96	7	49
3	22.5	1132	208.4	.006	.86	.86	502	261	263	52	92	97	5	49
4	30	1139	212.6	.008	1.15	1.1	508	262	264	52	93	97	5	48
5	37.5	1147	217.2	.007	1.0	1.0	460	261	260	53	94	99	6	49
6	45	1154	221.8	.01	1.5	1.5	464	263	264	53	95	100	7	48
6	52.5	1202	227.6	.01	1.5	1.5	463	261	260	52	96	101	7	47
5	60	1210	232.0	.006	.9	.9	471	260	263	53	98	103	7	49
4	67.5	1218	237.0	.007	1.0	1.0	486	261	268	49	98	104	7	50
3	75	1226	240.6	.006	.88	.88	496	259	261	50	99	105	5	51
2	82.5	1231	244.5	.005	.7	.7	483	261	268	51	99	105	5	52
1	90	1238	248.523	.005	.7	.7	489	259	266	50	101	106	5	51
		1257	248.678											
1	97	1304	252.5	.005	.9	.9	304	262	262	51	102	104	5	52
2	105	1312	257.2	.009	1.3	1.3	495	263	255	51	102	106	7	52
3	112.5	1320	262.7	.01	1.5	1.5	479	262	260	50	103	106	8	49
4	120	1327	268.2	.013	1.9	1.9	500	257	262	50	104	109	10	49
5	127.5	1335	274.1	.013	1.9	1.9	502	264	265	52	105	109	10	49
6	135	1342	279.6	.011	1.6	1.6	508	261	266	53	105	109	11	51
6	142.5	1349	285.2	.011	1.6	1.6	492	262	261	52	106	108	11	51
5	150	1357	290.7	.012	1.8	1.8	498	260	263	53	107	109	11	52
4	157.5	1404	296.5	.013	1.9	1.9	508	262	263	52	108	110	12	52
3	165	1412	302.7	.014	2.0	2.0	514	262	263	52	108	110	12	52
2	172.5	1420	308.0	.010	1.5	1.5	490	263	264	52	108	109	11	52
1	180	1427	312.833	.008	1.2	1.2	490	261	263	52	101	108		52

ΔVm= 118.132 $\overline{\sqrt{\Delta p}}$= 0.094 $\overline{\Delta H}$= 1.33 $\overline{Ts}$= 481 $\overline{Tm}$= 102

PACIFIC ENVIRONMENTAL SERVICES, INC

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Mason, Ohio 45040
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Sample Train Recovery Data

Plant: ABC Coke Tarrant, AL Date: 9/25/98

Sampling Location: underfire stack

Sample Recovery Person: RWN Field Team Leader: DS

Sampling Method Type: M429

Run Number: U-429-4 Impinger Train ID: N-10

Job Number: 5505-000

Comments: underfire Method 429 Run 4

Front Half Data

Filter No.: NA Filter Media Type: Teflon

Filter Description: Black - Grey Particulate

Filter No.: — Filter Media Type: —

Filter Description: —

Back Half Data

	XAD-Trap	Impinger 1	Impinger 2
Contents:	XAD-2	Empty	$NaHCO_3/Na_2CO_3$
Final Volume: (ml)	345.0	819.9	606.1
Initial Volume: (ml)	335.1	495.0	608.1
Net Volume: (ml)	9.9	324.9	-2.0

	Impinger 3	Impinger 4	Silica Gel
Contents:	$NaHCO_3/Na_2CO_3$	Empty	5:1 Gel
Final Volume: (ml)	717.0	625.2	(g): 916.7
Initial Volume: (ml)	716.9	621.4	(g): 883.2
Net Volume: (ml)	0.1	3.8	(g): 33.5

Total Moisture Collected (ml): 370.2 J

Description of Impinger catch: clear ~30% spent; blue/White/pink

FIELD DATA SHEET

Plant: ABC Coke
Sampling Location: Underfire Stack
Run Number: A-U-429-FB Date: 9/25/98
Pretest Leak Rate: _____ cfm @ ___ in. Hg.
Pretest Leak Check: Pitot: ✓ Orsat: ✓

Sample Type: M429 Operator: R/Kolodn
Pbar: 29.85 Ps: _____
CO2: _____ O2: _____
Probe Length/Type: 10' glass Pitot #: RTP
Stack Diameter: _____ As: _____

Nozzle ID: .740 Thermocouple #: RTP
Assumed Bws: ___ Filter #: A-U-429-FB
Meter Box #: 4 Y: 1.872 ΔH@: 0.979
Post-Test Leak Rate: _____ cfm @ ___ in. Hg.
Post-Test Leak Check: Pitot: ✓ Orsat: ✓

Traverse Point Number	Sampling Time (min)	Clock Time (24-hour clock)	Gas Meter Reading (Vm) ft³	Velocity Head (Δp) in H2O	Orifice Pressure Differential (ΔH) in H2O		Stack Temp. (Ts)	Temperature °F		Impinger Temp. °F	Dry Gas Meter Temp.		Pump Vacuum (in. Hg)
					Desired	Actual		Probe	Filter		Inlet (Tm in°F)	Outlet (Tm out°F)	
	0	0905	343.675										
1	5	0910	344.752	0.006 at	12" Hg			236	234				
2	10	0915	344.910	0.004 at	12" Hg			248	241				
3	15	0920	345.208	0.003 at	12" Hg			245	243				

ΔVm= _____ $\overline{\sqrt{\Delta p}}$= _____ $\overline{\Delta H}$= _____ $\overline{Ts}$= _____ $\overline{Tm}$= _____

PACIFIC ENVIRONMENTAL SERVICES, INC

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Sample Train Recovery Data

Plant: ABC Coke Tarrant, AL Date: 9/25/97

Sampling Location: U-429-FB Underfire

Sample Recovery Person: RWDJ Field Team Leader: DS

Sampling Method Type: 429

Run Number: U-429-FB Impinger Train ID: 104

Job Number: 5505,000

Comments:

Front Half Data

Filter No.: NA Filter Media Type: Teflon mat

Filter Description: Clear

Filter No.: — Filter Media Type: —

Filter Description: —

Back Half Data

	XAD-Trap	Impinger 1	Impinger 2
Contents:	XAD-2	Empty	$NaHCO_3/Na_2CO_3$
Final Volume: (ml)	345.2	460.5	652.1
Initial Volume: (ml)	345.2	460.6	652.1
Net Volume: (ml)	0.0	-0.1	0.0

	Impinger 3	Impinger 4	Silica Gel
Contents:	$NaHCO_3/Na_2CO_3$	Empty	silGel
Final Volume: (ml)	623.4	482.7	(g): 805.7
Initial Volume: (ml)	623.3	482.7	(g): 805.4
Net Volume: (ml)	0.1	0.0	(g): 0.0

Total Moisture Collected (ml): 0.0

Description of Impinger catch: clear

0% spent blue/white

40. ft²

5 min path

TRAVERSE POINT LOCATION FOR CIRCULAR DUCTS

Plant: ABC

Date: 09-20-98

Sampling Location: Baghouse Outlet

Inside of Far Wall to Outside of Nipple: 89 3/8"

Inside of Near Wall to Outside of Nipple (Nipple Length): 3 5/8"

Stack I.D.: 85 3/4"

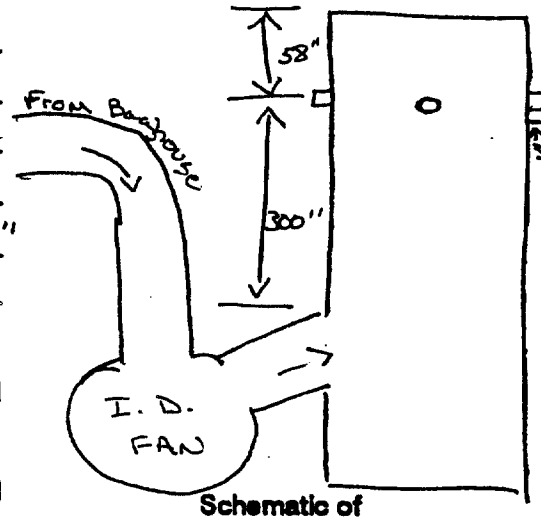
Distance Downstream from Flow Disturbance (Distance B):

300" inches / Stack I.D. = 3.49 dd

Distance Upstream from Flow Disturbance (Distance A):

58" inches / Stack I.D. = .67 dd

Calculated By: Dennis D. Holzschuh



Schematic of Sampling Location

4 Ports 85 3/4" Ø

No Insulation

Inlet TL -- Baghouses -- ID FAN -- Stack → Atmosphere

Traverse Point Number	Fraction of Length	Length (inches)	Product of Columns 2 & 3 (To nearest 1/8")	Nipple Length (inches)	Traverse Point Location (Sum of Col. 4 & 5)
1	.021	85 3/4"	1.80" = 1 3/4"	3 5/8"	5 3/8"
2	.067	85 3/4"	5.75" = 5 3/4"	3 5/8"	9 3/8"
3	.118	85 3/4"	10 1/8" = 10.11"	3 5/8"	13 3/4"
4	.177	85 3/4"	15.1/8" = 15.17"	3 5/8"	18 3/4"
5	.250	85 3/4"	21.43" = 21 1/2"	3 5/8"	25 1/8"
6	.356	85 3/4"	30.52 = 30 1/2"	3 5/8"	34 1/8"

* Based on a 12 pt. traverse point diameter

GAS VELOCITY AND VOLUMETRIC FLOW RATE

Plant: ABL Date: 9-21

Sampling Location: Baghouse Outlet Clock Time: 1809

Run #: M2-7 (Cyclonic) Operators: DDH

Barometric Pressure, in. Hg: 29.80 Static Pressure, in. H_2O: +.15

Moisture, %: 4 Molecular wt., Dry: _____ Pitot Tube, Cp: .84

Stack Dimension, in. Diameter or Side 1: _____ Side 2: _____

Wet Bulb, °F: ——— Dry Bulb, °F: ———

Cyclonic

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
A 1	+4	
2	+4	
3	+4	
4	0	
5	0	
6	0	
B 1	+4	
2	+5	
3	+5	
4	0	
5	0	
6	0	
C 1	+3	
2	+3	
3	+3	
4	0	
5	0	
6	0	
D 1	+4	
2	+3	
3	+2	
4	0	
5	0	
6	0	
	$\overline{\sqrt{\Delta P}}$ =	$\overline{T_s}$ =

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times 0) + (0.32 \times 20.9) + (0.28 \times 79.1)$

(0) 6.68 22.148

$Md = 28.82$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18(\frac{\%H_2O}{100})$

$Ms = (28.82) \times (1 - \frac{4}{100}) + 18(\frac{4}{100})$

.96 (.72)

$Ms = 28.38$

$\overline{T_s} = 114$ °F = 574 °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (29.7) + \frac{+.15}{13.6}$

.0110

$Ps = 29.71$ in. Hg

$\overline{\sqrt{\Delta P}} = .02$

429 . 213

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\,(°R)}{Ps \times Ms}}$

315 . 216

$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\quad}$

$Vs =$ ft/s

$As =$ ft^2

$Qs = Vs \times As \times 60$ s/m

$Qs =$ x x 60

$Qs =$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} =$ x 17.647 x ——— x (1 - ———)

$Qs_{std} =$ dscfm

MB-1 1.954 DN .204 MB6 1.778

GAS VELOCITY AND VOLUMETRIC FLOW RATE

K = 2.2

Plant: ABC Date: 9-20-98
Sampling Location: Baghouse Outlet Clock Time: 1400
Run #: M2-1 Preliminary Operators: DDH
Barometric Pressure, in. Hg: 29.64 Static Pressure, in. H_2O: +.12
Moisture, %: 3-4% Molecular wt., Dry: 28 Pitot Tube, Cp: .84
Stack Dimension, in. Diameter or Side 1: 85.3/4 Side 2: ——
Wet Bulb, °F: —— Dry Bulb, °F: ——

Traverse Point Number	Velocity Head in. H_2O	Stack Temp. °F
1500	.02	134
1501	.02	132
1502	.02	134
1503	1.1	114
1504	1.1	115
1505	1.0	118
1506	.9	118
1507	.9	118
1508	.02	129
1509	.02	
1510	.02	
	$\overline{\sqrt{\Delta P}}$ = .999	$\overline{Ts}$ = 134

$\overline{\Delta P}$ = 1

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

$Md =$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (\quad) \times (1 - \frac{}{100}) + 18 (\frac{}{100})$

$Ms =$

$\overline{Ts} =$ °F = °R (°F + 460)

$Ps = Pb + \frac{S.P.}{13.6} = (\quad) + \frac{}{13.6}$

$Ps =$ in. Hg

$\overline{\sqrt{\Delta P}} =$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\,(°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\quad}$

$Vs =$ 59.7 ft/s

$As =$ 40.1 ft^2

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs =$ 143,620 acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{}{} \times (1 - \frac{}{100})$

$Qs_{std} =$ 122,715 dscfm

MB6 Nozzle = 0.216

MB-1 Nozzle = 0.213

Pacific Environmental Services, Inc.

Dry Molecular Weight Determination

Client/Project: 5505.000/ABC Coke
Date/Time: 9/21/98
Sample Type: Orsat
Ambient Temp. °F: 70 °F

Orsat No.: O-1
Operator: RKolde
Comments:
Site Location: Baghouse Outlet

Run No.(s)	Gas	Run 1		Run 2		Run 3		Average Net Volume %	Multiplier	Molecular Weight of Stack Gas, Md (lb/Mole)
		Actual	Net	Actual	Net	Actual	Net			
A-O-429-1 A	CO_2	0.2	0.2	0.20	0.20	0.2	0.20	0.2	0.44	
	O_2[a]	20.6	20.4	20.6	20.4			20.4	0.32	
	CO[b]								0.28	
	N_2[c]								0.28	
									Md =	

Run No.(s)	Gas	Run 1		Run 2		Run 3		Average Net Volume %	Multiplier	Molecular Weight of Stack Gas, Md (lb/Mole)
		Actual	Net	Actual	Net	Actual	Net			
A-O-429-1 B	CO_2	0.20	0.20	0.20	0.20	~~0.20~~ RWB	~~0.20~~	0.2	0.44	
	O_2[a]	20.6	20.4	20.6	20.4	20.50	~~20.3~~	20.4	0.32	
	CO[b]								0.28	
	N_2[c]								0.28	
									Md =	

Run No.(s)	Gas	Run 1		Run 2		Run 3		Average Net Volume %	Multiplier	Molecular Weight of Stack Gas, Md (lb/Mole)
		Actual	Net	Actual	Net	Actual	Net			
	CO_2								0.44	
	O_2[a]								0.32	
	CO[b]								0.28	
	N_2[c]								0.28	
									Md =	

[a] O_2 Net Volume is O_2 actual reading minus CO_2 actual reading.

[b] CO Net Volume is CO actual reading minus O_2 actual reading.

[c] N_2 Net Volume is 100 minus CO actual reading.

PACIFIC ENVIRONMENTAL SERVICES, INC.

Pacific Environmental Services, Inc.

Dry Molecular Weight Determination

Client/Project: ABC Coke
Date/Time: 9/22
Sample Type: Orsat
Ambient Temp. °F: 72°F

Orsat No.: O-2
Operator: RWD/RK
Comments:
Site Location: Baghouse Outlet

Run No.(s)	Gas	Run 1		Run 2		Run 3		Average Net Volume %	Multiplier	Molecular Weight of Stack Gas, Md (lb/Mole)
A-O-4-29-2 Bag 1		Actual	Net	Actual	Net	Actual	Net			
	CO_2	0.20	0.20	.20	.20			0.2	0.44	
	O_2[a]	20.6	20.4	20.6	20.4			20.4	0.32	
	CO[b]								0.28	
	N_2[c]								0.28	
									Md =	

Run No.(s)	Gas	Run 1		Run 2		Run 3		Average Net Volume %	Multiplier	Molecular Weight of Stack Gas, Md (lb/Mole)
A-O-4-29-2 Bag 2		Actual	Net	Actual	Net	Actual	Net			
	CO_2	0.20	0.20	0.20	0.20			0.2	0.44	
	O_2[a]	20.6	20.4	20.6	20.4			20.4	0.32	
	CO[b]								0.28	
	N_2[c]								0.28	
									Md =	

Run No.(s)	Gas	Run 1		Run 2		Run 3		Average Net Volume %	Multiplier	Molecular Weight of Stack Gas, Md (lb/Mole)
		Actual	Net	Actual	Net	Actual	Net			
	CO_2								0.44	
	O_2[a]								0.32	
	CO[b]								0.28	
	N_2[c]								0.28	
									Md =	

[a] O_2 Net Volume is O_2 actual reading minus CO_2 actual reading.

[b] CO Net Volume is CO actual reading minus O_2 actual reading.

[c] N_2 Net Volume is 100 minus CO actual reading.

PACIFIC ENVIRONMENTAL SERVICES, INC.

Pacific Environmental Services, Inc.

Dry Molecular Weight Determination

Client/Project: ABC Coke

Date/Time: 9/23

Sample Type: ORSAT

Ambient Temp. °F: 72°F

Orsat No.: 0-1

Operator: TA/RWDJ

Comments:

Site Location: Baghouse Outlet

Run No.(s)	Gas	Run 1		Run 2		Run 3		Average Net Volume %	Multiplier	Molecular Weight of Stack Gas, Md (lb/Mole)
		Actual	Net	Actual	Net	Actual	Net			
A-0-H2A-3 Bag 1	CO_2	0.1	0.1	0.1	0.1			0.1	0.44	
	O_2[a]	20.5	20.4	20.5	20.4			20.4	0.32	
	CO[b]								0.28	
	N_2[c]								0.28	
									Md =	

Run No.(s)	Gas	Run 1		Run 2		Run 3		Average Net Volume %	Multiplier	Molecular Weight of Stack Gas, Md (lb/Mole)
		Actual	Net	Actual	Net	Actual	Net			
A-0-H2A-3 Bag 2	CO_2	0.1	0.1	0.1	0.1			0.1	0.44	
	O_2[a]	20.5	20.4	20.5	20.4			20.4	0.32	
	CO[b]								0.28	
	N_2[c]								0.28	
									Md =	

Run No.(s)	Gas	Run 1		Run 2		Run 3		Average Net Volume %	Multiplier	Molecular Weight of Stack Gas, Md (lb/Mole)
		Actual	Net	Actual	Net	Actual	Net			
	CO_2								0.44	
	O_2[a]								0.32	
	CO[b]								0.28	
	N_2[c]								0.28	
									Md =	

[a] O_2 Net Volume is O_2 actual reading minus CO_2 actual reading.

[b] CO Net Volume is CO actual reading minus O_2 actual reading.

[c] N_2 Net Volume is 100 minus CO actual reading.

PACIFIC ENVIRONMENTAL SERVICES, INC.

METHOD 18 FIELD DATA SHEET

Plant: ADC COKE
Date: 9-21-98
Location: BAGHOUSE OUTLET
Run #: A-0-5506-1
Stack I.D.: 85 3/4"
Pbar: 29.70
Sample Tube #: #A, #B, #C
Operators: PTS
Leak Check: Pre: ✓ Post: .005 @ 18" Hg

Tested Analyte: PAH's
Orifice Tank #: Vost Box 2
Pump/Rotometer #:
Pt: Pretest (mm Hg):
Post-Test (mm Hg):
Tt: Pretest (°F):
Post-Test (°F):
Time: Start: Finish: Total:
W/B: D/B: O_2: CO_2:

Time	Gauge Vacuum (Hg)	Flow Setting

$Md = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times \%N_2)$

$Md = (0.44 \times \quad) + (0.32 \times \quad) + (0.28 \times \quad)$

$Md =$

$Ms = Md \times (1 - \frac{\%H_2O}{100}) + 18 (\frac{\%H_2O}{100})$

$Ms = (\quad) \times (1 - \frac{}{100}) + 18 (\frac{}{100})$

$Ms =$

$Ts = \quad °F = \quad °R \ (°F + 460)$

$Ps = Pb + \frac{S.P.}{13.6} = (\quad) + \frac{}{13.6}$

$Ps = \quad$ in. Hg

$\overline{\sqrt{\Delta P}} =$

$Vs = 85.49 \times Cp \times \overline{\sqrt{\Delta P}} \times \sqrt{\frac{Ts\ (°R)}{Ps \times Ms}}$

$Vs = 85.49 \times (\quad) \times (\quad) \times \sqrt{\quad}$

$Vs = \quad$ ft/s

$As = \quad ft^2$

$Qs = Vs \times As \times 60$ s/m

$Qs = \quad \times \quad \times 60$

$Qs = \quad$ acfm

$Qs_{std} = Qs \times 17.647 \times \frac{Ps}{Ts} \times (1 - \frac{\%H_2O}{100})$

$Qs_{std} = \quad \times 17.647 \times \frac{}{} \times (1 - \frac{}{100})$

$Qs_{std} = \quad$ dscfm

# in H_2O meter es	in Hg Vacuum	Traverse Point Number	Velocity Head Vel in. H_2O	~~Meter/Stack~~ Temp. °F	L/min
3	4	11:38	1276.20	79°F	2.0
3	4	11:58	1317.4	85	2.0
3	4	12:18	1358.9	89	2.0
3	4	12:38	1400.8	92	2.0
3	4	12:58	1442.6	94	2.0
3	4	13:18	1484.1	95	2.0
3	4	13:38	1526.75	96	2.0
3	4	13:58	1569.70	97	2.0
3	4	14:18	1612.0	97	2.0
3	4	14:38	1654.3	97	2.0
3	4	14:58	1696.6	97	2.0
3	4	15:18	1740.9	99	2.0
3	4	15:38	1787.9	102	2.0
3	2	15:58	1832.3	104	2.0
3	2	16:18	1873.5	104	2.0
3	2	16:38	1914.5	103	2.0
3	4	16:48	1936.1	102	2.0
3	4	16:58	1956.5	101	2.0
3	4	17:18	1999.9	100	2.0
3	4	17:38	2041.5	99	2.0
3	4	17:58	2083.0	99	2.0
3	4	18:18	2125.2	97	2.0
3	4	18:45	2178.0	95	2.0
3	4	18:58	2209.7	95	2.0
3	4	19:14	2241.78	93	2.0

VOLATILE ORGANIC SAMPLING TRAIN (VOST) SAMPLING DATA

COMPANY: ABC Coke
DATE: 9-22-98
TIME: 10:39 - 17:47
METER #: Vost Box 2
BAROMETRIC PRESSURE, in. Hg: 29.74
AMBIENT TEMPERATURE, °F:

CITY: Birmingham, Alabama
LOCATION: Baghouse Outlet
RUN #: A-0-5506-2
Y-FACTOR:
OPERATOR: P. Siegel
PURGE TIME: NA

LEAK CHECK DATA

	Vacuum Initial, (in. Hg)	~~Final, (in. Hg)~~ Leak rate	Time, (min.)
Pre-test:	18 in Hg	0.00 Liters	1 minute
Post-test:	20 in Hg	0.00 Liters	1 minute

Sample Time (min)	Clock Time, (24-hr)	Meter Volume, (liter)	Rotometer Setting Liter/min	Dry Gas Meter Temp., (°F)	Vacuum, (in. Hg)	Meter Pressure in. W.C.
0	10:39	224.678	2.0	79	4	3.1
20	10:59	2283.2	2.0	88	4	2.9
40	11:19	2325.2	2.0	92	4.5	3.0
60	11:39	2366.8	2.0	95	5.0	3.0
87	12:06	2424.0	2.0	98	5.0	3.1
101	12:20	2454.2	2.0	100	5.0	3.0
124	12:43	2502.05	2.0	101	5.0	3.1
140	12:59	2534.70	2.0	101	5.0	3.0
160	13:19	2576.42	2.0	101	5.0	3.0
180	14:27	2618.4	2.0	101	5.5	3.0
200	14:47	2661.8	2.0	103	5.5	3.1
220	15:07	2703.6	2.0	104	5.5	3.1

STOP
START 1407

Nitrogen purge/activated carbon packing in sample holding container:

$$V_{std} = V_m(\text{liters}) \times Y \times 17.647 \times \frac{P_b\,(\text{in. Hg})}{T_m\,(°R)}$$

V_{std}=

VOLATILE ORGANIC SAMPLING TRAIN (VOST) SAMPLING DATA

COMPANY: ABC COKE
CITY: BIRMINGHAM, ALABAMA
DATE: 9-22-98
LOCATION: BAGHOUSE OUTLET
TIME: 10:39-17:47
RUN #: A-0-5506-2
METER #: VOST BOX 2
Y-FACTOR:
BAROMETRIC PRESSURE, in. Hg: 29.74
OPERATOR: P. SIEGEL
AMBIENT TEMPERATURE, °F:
PURGE TIME: NA

LEAK CHECK DATA

	Vacuum Initial, (in. Hg)	Vacuum Final, (in. Hg)	Time, (min.)
Pre-test:	—	—	—
Post-test:	—	—	—

Sample Time (min)	Clock Time, (24-hr)	Meter Volume, (liter)	Rotometer Setting Liters/min	Dry Gas Meter Temp., (°F)	Vacuum, (in. Hg)	meter press, in. W.C.
240	15:27	2746.4	2.0	107	5.5	3.1
260 ~~4~~ PTS	15:~~47~~ 51 PTS	2798.6	2.0	108	5.5	3.0
280	16:07	2831.0	2.0	108	5.5	3.0
300	16:27	2873.9	2.0	107	5.0	3.0
320	16:47	2916.8	2.0	108	5.0	3.1
340	17:07	2959.8	2.0	108	5.0	3.1
360	17:27	3002.8	2.0	108	5.0	3.0
380	17:47	3046.05	2.0	107	5.0	3.0

Nitrogen purge/activated carbon packing in sample holding container:

$$V_{std} = V_m(\text{liters}) \times Y \times 17.647 \times \frac{P_b(\text{in. Hg})}{T_m(°R)}$$

V_{std}=

VOLATILE ORGANIC SAMPLING TRAIN (VOST) SAMPLING DATA

COMPANY: ABC COKE
CITY: BIRMINGHAM, AL
DATE: 9-23-98
LOCATION: BAGHOUSE OUTLET
TIME: 1020 - 1748
RUN #: A-0-5506-3
METER #: VOST BOX 2
Y-FACTOR:
BAROMETRIC PRESSURE, in. Hg: 29.80
OPERATOR: DDH
AMBIENT TEMPERATURE, °F: 80
PURGE TIME:

LEAK CHECK DATA

Page - 1 of 2

	Vacuum Initial, (in. Hg)	~~Final, (in. Hg)~~ Leak rate	Time, (min.)
Pre-test:	20	0.00	1 min.
Post-test:	20	0.00	1 min.

Sample Time (min)	Clock Time, (24-hr)	Meter Volume, (liter)	Rotometer Setting Liters/min	Dry Gas Meter Temp., (°F)	Vacuum, (in. Hg)	Meter Press. in. W.C.
0	1020	3047.47	2.0	77	4	3.2
20	1040	3088.00	2.0	84	4	3.2
40	1100	3133.10	2.0	89	4	3.2
60	1120	3176.21	2.0	92	4	3.2
80	1140	3218.21	2.0	94	4	3.2
100	1200	3261.00	2.0	95	4	3.2
120	1220	3304.12	2.0	97	4	3.2
140	1240	3346.34	2.0	101	4	3.2
160	1300	3383.75	2.0	102	4	3.2
180	1320	3426.35	2.0	104	4	3.2
200	1408	3478.80	2.0	100	4	3.2
220	1428	3513.71	2.0	100	4	3.2

* Stopped at 193 for the 30 min. Break (13:38) / * Restart - 1401

Nitrogen purge/activated carbon packing in sample holding container:

$$V_{std} = V_m(\text{liters}) \times Y \times 17.647 \times \frac{P_b(\text{in. Hg})}{T_m(°R)}$$

V_{std} =

VOLATILE ORGANIC SAMPLING TRAIN (VOST) SAMPLING DATA

COMPANY: ABC - Coke
CITY: Birmingham, Al
DATE: 09-23-98
LOCATION: Baghouse Outlet
TIME: 1020 - 1748
RUN #: A-O-5506-3
METER #: Vost Box - 2
Y-FACTOR:
BAROMETRIC PRESSURE, in. Hg: 29.80
OPERATOR: D. Holtschuh
AMBIENT TEMPERATURE, °F: 80
PURGE TIME:

LEAK CHECK DATA

Page - 2 of 2

	Vacuum Initial, (in. Hg)	Final, (in. Hg)	Time, (min.)
Pre-test:			
Post-test:			

Sample Time (min)	Clock Time, (24-hr)	Meter Volume, (liter)	Rotometer Setting liters/min	Dry Gas Meter Temp., (°F)	Vacuum, (in. Hg)	Meter P in w.c
240	1448	3556.29	2.0	97	4	3.2
260	1508	3597.00	2.0	99	4	3.2
280	1528	3640.00	2.0	98	4	3.2
300	1548	3683.10	2.0	99	4	3.2
320	1608	3726.20	2.0	99	4	3.2
340	1628	3768.17	2.0	99	4	3.2
360	1648	3810.00	2.0	99	4	3.2
380	1708	3852.86	2.0	99	4	3.2
400	1728	3895.36	2.0	99	4	3.2
420	1748	3937.94	2.0	99	4	3.2
~~440~~ 437 DDH	1805					

Nitrogen purge/activated carbon packing in sample holding container:

$$V_{std} = V_m(\text{liters}) \times Y \times 17.647 \times \frac{P_b(\text{in. Hg})}{T_m(°R)}$$

V_{std} =

FIELD DATA SHEET

Sample head #8

Plant: ABC Coke
Sampling Location: Baghouse Outlet
Run Number: A-0-315-1 Date: 9-21-98
Pretest Leak Rate: 0.002 cfm @ 15 in. Hg.
Pretest Leak Check: Pitot: ✓ Orsat: NA

Sample Type: 315 Operator: PTS
Pbar: 29.70 Ps: +0.15
CO2: 0 O2: 21%
Probe Length/Type: 5' Glass Pitot #: 4E
Stack Diameter: 85 3/4" As: 40.1
K = 2.16

Nozzle ID: 0.216 Thermocouple #: 4E
Assumed Bws: 4 Filter #: 080798-08
Meter Box #: MB6 Y: 1.005 ΔH@: 1.778
Post-Test Leak Rate: 0.001 cfm @ 6 in. Hg.
Post-Test Leak Check: Pitot: ✓ Orsat: NA

Traverse Point Number	Sampling Time (min)	Clock Time (24-hour clock)	Gas Meter Reading (Vm) ft³	Velocity Head (Δp) in H2O	Orifice Pressure Differential (ΔH) in H2O		Stack Temp. (Ts)	Temperature °F		Impinger Temp. °F	Dry Gas Meter Temp.		Pump Vacuum (in. Hg)
					Desired	Actual		Probe	Filter		Inlet (Tm in °F)	Outlet (Tm out °F)	
0	0	11:26	794.568										
B1	13	11:39	805.3	1.2	2.53	2.5	94	226	235	68	82	80	2.5
B2				0.02	0.04	0.04	109	229	231	70	85	81	1
	23	11:49	806.85	1.2	2.51	2.51	102	231	239	72	86	83	2.5
	27	11:53	809.71	0.02	0.04	0.04	116	231	235	70	87	83	1
B3	37	12:03	811.11	1.1	2.30	2.3	103	230	235	70	87	84	2.8
B4							~~99~~	~~231~~	~~235~~	~~69~~	~~95~~		
B5	60	12:26	830.41	1.1	2.34	2.3	99	231	235	69	95	87	3.0
B6	75	12:41	843.24	1.1	2.35	2.35	99	230	235	70	98	88	3.0
B6	90	12:56	856.101	1.1	2.35	2.35	99	228	235	70	100	90	3.0
			856.190	Leak rate	0.002	@ PTS ~~15~~	8" Hg	vacuum					
C1	90	13:10	856.190	1.1	2.35	2.35	99	252	230	70	95	90	3.0
		13:18	863.630	0.02	0.04	0.04	124	256	240	71	95	91	3.0
C2	105	13:25	864.425	0.02	0.04	0.04	127	254	241	72	92	90	2.0
		13:28	865.01	1.0	2.07	2.07	118	255	238	71	94	90	3.0
		13:30	866.81	0.02	0.04	0.04	123	253	237	71	94	90	2.0
C3	120	13:40	868.195	0.02	0.04	0.04	134	248	236	70	92	91	2.0
	123	13:43	868.56	1.1	2.31	2.3	108	241	236	68	93	90	3
	128	13:48	873.48	0.02	0.04	0.04	124	244	239	62	95	91	2
C4	147	14:07	876.1	1.0	2.09	2.1	110	242	235	66	92	91	3
C5	151	14:11	879.25	0.02	0.04	0.04	128	237	234	63	92	91	2
	158	14:18	879.69	1.0	2.09	2.1	111	245	236	64	93	91	3
C6	165	14:25	885.87	0.02	0.04	0.04	126	229	233	63	94	91	2
	176	14:36	887.60	1.0	2.09	2.09	110	242	235	65	93	91	3
	180	14:40	890.899	0.02									
			891.038	Leak rate 0.003 @ 8" Hg vacuum									

ΔVm= 176.377 $\overline{\sqrt{\Delta p}}$= _____ $\overline{\Delta H}$= _____ $\overline{Ts}$= 118 $\overline{Tm}$= 92

Plant Name: ABC Coke **Test Date:** 9-21-98

Run Number: A-0-315-1 **Operator:** P. Siegel

Traverse Point Number	Sampling Time, (min.)	Clock Time (24-hour clock)	Gas Meter Reading (V_m) ft³	Velocity Head (ΔP_s) in. H_2O	Orifice Pres. Differential (ΔH) in. H_2O Desired	Orifice Pres. Differential (ΔH) in. H_2O Actual	Stack Temp. °F (T_s)	Probe Temp. / Filter Temp.° F	Impinger Temp. °F	Dry Gas Meter Temp. Inlet (T_{in}) °F	Dry Gas Meter Temp. Outlet (T_{out}) °F	Pump Vacuum In. Hg
D-1	180	15:04	891.038	0.02	0.04	0.04	126	244 / 232	71	88	88	2
D-2	195	15:19	893.04	0.02	0.04	0.04	134	242 / 239	71	90	89	2
D-3	208	15:32	894.57	1.2	2.52	2.5	108	241 / 242	64	93	91	3
	214	15:38	900.01	0.02	0.04	0.04	124	241 / 238	59	96	91	2
D-4	225	15:49	901.13	1.1	2.31	2.3	111	245 / 238	69	97	93	3
	230	15:54	905.31	0.02	0.04	0.04	126	243 / 236	60	99	93	2
D-5	239	16:03	906.48	1.1	2.30	2.3	114	243 / 237	69	97	94	3
	243	16:07	909.77	0.02	0.04	0.04	132	237 / 236	66	97	94	2
D-6	258	16:19	911.30	1.0	2.10	2.1	111	239 / 238	63	97	94	3
	266	16:30	920.035	0.02	0.04	0.04	128	248 / 235	65	100	95	2
	270	16:34	920.670					/				
		/	920.750	LEAK RATE @		5"-6002		/				
A-1	270	16:49	920.750	0.02	0.04	0.04	135	244 / 236	70	94	94	2
	279	16:58	922.11	1.0	2.1	2.1	114	243 / 235	61.	95	94	3
A-1 / A-2	282	17:01	924.64	0.02	0.04	0.04	126	247 / 234	54	96	94	2
A-2	296	17:15	926.42	1.0	2.1	2.1	138	238 / 237	56	95	93	3
A-3	299	17:18	929.28	0.02	0.04	0.04	131	235 / 238	57	95	94	2
	314	17:32	931.13	1.0	2.1	2.1	119	245 / 236	60	96	94	3
A-4	318	17:36	934.38	0.02	0.04	0.04	127	248 / 236	54	97	94	2
	325	17:43	935.44	1.0	2.08	2.1	116	244 / 236	61	96	94	3
A-5	336	17:54	944.005	0.02	0.04	0.04	120	248 / 238	57	99	94	3
A-6	346	18:04	945.53	1.0	2.32	2.3	107	241 / 235	62	94	94	3
	351	18:09	949.32	0.02	0.04	0.04	119	245 / 233	64	94	93	2
	363	18:21	950.7	1.0	2.03	2.0	130	240 / 237	62	94	92	3

Plant Name: ABC COKE **Test Date:** 9-21-98

Run Number: A-0-315-1 **Operator:** P. SIEGEL

Traverse Point Number	Sampling Time, (min.)	Clock Time (24-hour clock)	Gas Meter Reading (V_m) ft^3	Velocity Head (ΔP_s) in. H_2O	Orifice Pres. Differential (ΔH) in. H_2O Desired	Actual	Stack Temp. °F (T_s)	Probe Temp. / Filter Temp. °F	Impinger Temp. °F	Dry Gas Meter Temp. Inlet ($T_{m_{in}}$) °F	Outlet ($T_{m_{out}}$) °F	Pump Vacuum In. Hg
A-6	366	18:24	953.38	0.02	0.04	0.04	125	246 / 237	62	94	92	2
A-5	383	18:41	955.61	1.1	2.24	2.2	126	236 / 232	63	91	91	3
	386	18:45	958.16	0.02	0.04	0.04	124	246 / 233	60	91	92	2
A-4	398	18:57	959.87	1.0	2.09	2.1	109	242 / 238	63	91	90	3
	412.	19:11	971.253									

PACIFIC ENVIRONMENTAL SERVICES, INC

4700 Duke Drive, Suite 150
Mason, Ohio 45040
513.398.2556 FAX: 513.398.3342

Sample Train Recovery Data

Plant: ABC Coke Tarrant, AL Date: 9/21/98
Sampling Location: Outlet of Baghouse
Sample Recovery Person: RWR Field Team Leader: DS
Sampling Method Type: M315
Run Number: O-M315-1 Impinger Train ID: N-8
Job Number: 5505000

Comments: Run 1 Outlet Method 315

Front Half Data

Filter No.: 080798-08 Filter Media Type: Treated quartz
Filter Description: light gray in color, some loose grain particulate
Filter No.: — Filter Media Type: —
Filter Description: —

Back Half Data

Impinger Purge-

Start Time: — Flow Rate: — Stop Time: — Purge Gas: —

	Impinger 1	Impinger 2	Impinger 3
Contents:	H_2O	H_2O	Empty
Final Volume: (ml)	655.8	659.9	501.2
Initial Volume: (ml)	602.0	647.5	495.8
Net Volume: (ml)	53.8	12.4	5.4

	Impinger 4	Impinger 5	Silica Gel
Contents:			Sil Gel
Final Volume: (ml)			(g): 885.1
Initial Volume: (ml)			(g): 852.8
Net Volume: (ml)			(g): 32.3

Total Moisture Collected (ml): 103.9 ml.
Description of Impinger catch: Clear
Sil Gel ~35% spent, pink, blue

FIELD DATA SHEET

Sample Head #8

Plant: ABC Coke
Sampling Location: Baghouse Outlet
Run Number: A-0-315-2 Date: 9-22-98
Pretest Leak Rate: 0.004 cfm @ 15 in. Hg.
Pretest Leak Check: Pitot: ✓ Orsat: NA

Sample Type: 315 Operator: PTS
Pbar: 29.74 Ps: +.15
CO2: 0 O2: 21 %
Probe Length/Type: 5' Glass Pitot #: 4E
Stack Diameter: 85 3/4" As: 40.1 sqft
K=2.163

Nozzle ID: 0.216 Thermocouple #: 4E
Assumed Bws: 4 Filter #: 080898-20
Meter Box #: MB 6 Y: 1.005 ΔH@: 1.778
Post-Test Leak Rate: 0.005 cfm @ 14 in. Hg.
Post-Test Leak Check: Pitot: ✓ Orsat: NA

Traverse Point Number	Sampling Time (min)	Clock Time (24-hour clock)	Gas Meter Reading (Vm) ft³	Velocity Head (Δp) in H2O	Orifice Pressure Differential (ΔH) in H2O Desired	Actual	Stack Temp. (Ts)	Temperature °F Probe	Filter	Impinger Temp. °F	Dry Gas Meter Temp. Inlet (Tm in °F)	Outlet (Tm out °F)	Pump Vacuum (in. Hg)
0	0	10:28	971.596										
A 1	9	10:37	972.65	0.02	0.04	0.04	133	241	239	65	80	79	1
	13	10:41	975.58	1.1	2.29	2.3	104	237	241	62	84	81	4
2	25	10:53	977.01	0.02	0.04	0.04	122	247	236	63	85	82	1
	27	10:55	978.80	1.0	2.04	2.0	119	243	237	65	87	83	4
3	45	11:13	981.175	0.02	0.04	0.04	123	243	237	65	86	83	1
4	52	11:20	982.16	0.02	0.04	0.04	142	244	238	67	87	85	1
	53.5	11:22	983.07	0.9	1.80	1.80	131	240	237	68	89	86	3
5	72	11:40	985.66	0.02	0.04	0.04	137	243	237	68	89	86	1
	74	11:42	987.03	0.9	1.83	1.8	123	245	239	66	89	86	3
6	81	11:49	987.98	0.02	0.04	0.04	141	248	239	65	89	87	1
	88	11:56	993.375	1.1	2.25	2.25	120	235	237	64	91	88	4
	90	11:58	993.715	0.02	0.04	0.04	135	248	239	63	92	88	1
		12:10	993.805	Leak Rate	0.002	@	8	in. Hg					
D-1	98	12:18	994.2	0.02	0.04	0.04	146	240	236	65	92	90	1
D-2	100	12:20	996.67	1.0	2.01	2.0	134	245	238	66	93	90	3
D-3	118	12:38	998.98	0.02	0.04	0.04	141	243	237	66	93	90	1
	121	12:41	1061.365	1.0	2.02	2.0	131	239	237	64	94	91	4
	130	12:50	1002.575	0.02	0.04	0.04	134	236	234	61	93	91	1
	135	12:55	1006.39	1.1	2.27	2.3	118	239	236	62	94	91	4
D-4	144	13:04	1007.51	0.02	0.04	0.04	131	245	235	61	95	92	1
	148	13:08	1011.11	1.2	2.48	2.5	120	241	237	63	96	92	4
	160	13:20	1012.467	0.02	0.04	0.04	130	247	237	60	95	92	1
			1012.640	Leak	rate at 0.002	cfm		at	10 mm Hg				
START 1406 C 1	164	14:10	1015.04	1.0	2.02	2.0	129	237	235	66	92	92	4
	172	14:18	1015.80	0.01	0.02	0.02	134	248	236	67	93	93	1
	174	14:20	1017.94	1.0	2.0	2.0	125	250	237	67	95	93	4

ΔVm= ___ $\overline{\sqrt{\Delta p}}$= ___ $\overline{\Delta H}$= ___ $\overline{T_s}$= ___ $\overline{T_m}$= ___

FIELD DATA SHEET

PAGE 2

Plant: ABC coke
Sampling Location: BAGHOUSE OUTLET
Run Number: A-0-315-2 Date: 9-22-98
Pretest Leak Rate: — cfm @ — in. Hg.
Pretest Leak Check: Pitot: — Orsat: —

Sample Type: 315 Operator: P. SIEGEL
Pbar: 29.74 Ps: +0.15
CO2: 0 % O2: 21 %
Probe Length/Type: 5' Glass Pitot #: 4E
Stack Diameter: 85 3/4" As: 40.1 sqft

Nozzle ID: 0.216 Thermocouple #: 4E
Assumed Bws: 4 Filter #: 080898-20
Meter Box #: M6b Y: 1.005 ΔH@: 1.778
Post-Test Leak Rate: — cfm @ — in. Hg.
Post-Test Leak Check: Pitot: — Orsat: —

Traverse Point Number	Sampling Time (min)	Clock Time (24-hour clock)	Gas Meter Reading (Vm) ft³	Velocity Head (Δp) in H2O	Orifice Pressure Differential (ΔH) in H2O Desired	Orifice Pressure Differential (ΔH) in H2O Actual	Stack Temp. (Ts)	Temperature °F Probe	Temperature °F Filter	Impinger Temp. °F	Dry Gas Meter Temp. Inlet (Tm in °F)	Dry Gas Meter Temp. Outlet (Tm out °F)	Pump Vacuum (in. Hg)
C2	188	14:34	1019.54	0.02	0.04	0.04	140	252	239	66	96	94	1
	191	14:37	1021.67	1.0	2.01	2.0	135	237	238	67	94	92	4
C3	202	pts 14:48	1023.08	0.02	0.04	0.04	138	239	238	67	93	91	1
	206	pts 14:52	1025.87	1.0	2.05	2.05	124	234	237	67	96	93	4
C4	218	pts 15:04	1027.38	0.02	0.04	0.04	135	247	238	68	96	93	1
	222	15:08	1030.47	1.1	2.26	2.3	123	239	240	66	96	93	4
5	245	15:31	1033.45	0.02	0.04	0.04	144	245	241	67	97	94	1
6	248	15:34	1036.055	1.0	2.05	2.05	129	237	238	68	100	97	4
START 15:45	250	15:36	1036.294	0.02	0.04	0.04	141	237	238	68	102	98	1
			1036.426	Leak Rate 0.001 at 10 in Hg									
B1	252	15:47	1036.79	0.02	0.04	0.04	147	249	239	66	97	97	1
	255	15:50	1038.93	0.9	1.82	1.8	135	239	236	66	98	96	4
	264	15:59	1040.03	0.02	0.04	0.04	138	249	239	65	98	97	1
B2	~~264~~	~~15:59~~	1042.39	1.1	2.22	2.2	137	247	240	64	99	97	4
B3 pts	267	16:02	1045.91	0.02	0.04	0.04	137	244	243	64	98	96	1
B4	295 / 300	16:28 / 16:33	1046.52	0.02	0.04	0.04	148	244	238	67	96	96	1
	303	16:36	1048.535	0.9	1.82	1.8	135	241	238	66	96	95	4
B5	314	16:48	1049.87	0.02	0.04	0.04	139	242	238	63	96	96	1
	318	16:52	1053.39	1.1	2.26	2.3	126	238	238	64	96	95	4
B6	326	17:00	1054.41	0.02	0.04	0.04	143	235	237	62	97	95	1
	329	17:03	1057.50	1.2	2.47	2.5	126	239	237	64	99	97	4
B6	355	17:30	1060.755	0.02	0.04	0.04	138	250	237	62	101	97	1
B5	359	17:34	1061.10	0.02	0.04	0.04	146	247	235	63	99	99	1
	361	17:36	1063.08	1.0	2.02	2.02	139	248	236	67	99	99	4
	373	17:48	1064.61	0.02	0.04	0.04	138	249	236	65	101	100	1

ΔVm= _____ $\overline{\sqrt{\Delta p}}$= _____ $\overline{\Delta H}$= _____ $\overline{Ts}$= _____ $\overline{Tm}$= _____

FIELD DATA SHEET

PAGE 3

Plant: ABC COKE
Sampling Location BAGHOUSE OUTLET
Run Number: A-0-315-2 Date: 9-22-98
Pretest Leak Rate: — cfm @ — in. Hg.
Pretest Leak Check: Pitot: — Orsat: —

Sample Type: 315 Operator: P. SIEGEL
Pbar: 29.74 Ps: +0.15
CO2: 0 O2: 21%
Probe Length/Type: 5' Glass Pitot #: 4E
Stack Diameter: 85 3/4" As: 40.1 sqft

Nozzle ID: 0.216 Thermocouple #: 4E
Assumed Bws: 4 Filter #: 080898-20
Meter Box #: MB6 Y: 1.005 ΔH@: 1.778
Post-Test Leak Rate: — cfm @ — in. Hg.
Post-Test Leak Check: Pitot: — Orsat: —

Traverse Point Number	Sampling Time (min)	Clock Time (24-hour clock)	Gas Meter Reading (Vm) ft³	Velocity Head (Δp) in H2O	Orifice Pressure Differential (ΔH) in H2O		Stack Temp. (Ts)	Temperature °F		Impinger Temp. °F	Dry Gas Meter Temp.		Pump Vacuum (in. Hg)
					Desired	Actual		Probe	Filter		Inlet (Tm in °F)	Outlet (Tm out °F)	
	373	17:48	1064.61										
B-4	376	17:51	1067.05	1.0	2.03	2.0	135	239	236	67	100	99	4
B-3	390	18:05	1069.02	0.02	0.04	0.04	140	237	232	66	100	100	1
	404	18:19	1081.093	1.2	2.50	2.50	121	248	239	60	100	99	4

ΔVm= _____ $\overline{\sqrt{\Delta p}}$= _____ $\overline{\Delta H}$= _____ $\overline{Ts}$= _____ $\overline{Tm}$= _____

PACIFIC ENVIRONMENTAL SERVICES, INC

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Sample Train Recovery Data

Plant: ABC Coke Tarrant, AL Date: 9/22/98

Sampling Location: Outlet

Sample Recovery Person: RWD Field Team Leader: DS

Sampling Method Type: 315

Run Number: A-O-315-2 Impinger Train ID: N-1

Job Number: 5505000

Comments: Outlet Method 315 Run 2

Front Half Data

Filter No.: A 080898-20 Filter Media Type: Treated Quartz

Filter Description: light loading, ~~fat~~ fine black particulate

Filter No.: — Filter Media Type: —

Filter Description: —

Back Half Data

Impinger Purge-

Start Time: — Flow Rate: — Stop Time: — Purge Gas: —

	Impinger 1	Impinger 2	Impinger 3
Contents:	H_2O	H_2O	Empty
Final Volume: (ml)	597.4	706.8	553.1
Initial Volume: (ml)	551.0	706.8	552.6
Net Volume: (ml)	46.4	0.0	0.5

	Impinger 4	Impinger 5	Silica Gel
Contents:	—	—	Sil Gel
Final Volume: (ml)	—	—	(g): 901.3
Initial Volume: (ml)	—	—	(g): 886.2
Net Volume: (ml)	—	—	(g): 15.1

Total Moisture Collected (ml): 62.0

Description of Impinger catch: Clear

Sil gel ~25% spent, pink, white, blue

FIELD DATA SHEET

Plant: ABC - Coke
Sampling Location: Baghouse Outlet
Run Number: A-0-35-3 Date: 09-23-98
Pretest Leak Rate: .009 ✓ cfm @ 15 in. Hg.
Pretest Leak Check: Pitot: ✓ Orsat: N/A

Sample Type: 315 Operator: DDH
Pbar: 29.80 Ps: +.15
CO2: ~0 O2: ~20.9
Probe Length/Type: 5' Glass Pitot #: 4 E
Stack Diameter: 85 3/4 As: 40.1
K = 2.16

Nozzle ID: .216 Thermocouple #: 4E
Assumed Bws: 4 Filter #: 080398-24 / [illegible]
Meter Box #: MB-6 Y: 1.005 ΔH@: 1.778
Post-Test Leak Rate: 0.003 cfm @ 15 in. Hg.
Post-Test Leak Check: Pitot: ✓ Orsat: N/A

Traverse Point Number	Sampling Time (min)	Clock Time (24-hour clock)	Gas Meter Reading (Vm) ft³	Velocity Head (Δp) in H2O	Orifice Pressure Differential (ΔH) in H2O Desired	Actual	Stack Temp. (Ts)	Temperature °F Probe	Filter	Impinger Temp. °F	Dry Gas Meter Temp. Inlet (Tm in °F)	Outlet (Tm out °F)	Pump Vacuum (in. Hg)
B 1	0	1020	82.012										
	9	1029	83.210	.02	.04	.04	131	244	237	60	80	79	2
	15	1035	87.580	1.10	2.27	2.27	106	247	239	60	80	80	4
(17.5) 2	32	1052	89.200	.01	.02	.02	121	248	239	59	80	81	2
(35) 3	36	1056	91.390	1.00	2.05	2.05	109	248	240	56	80	80	4
(52.5) 4	58	1118	93.145	.02	.04	.04	124	246	237	54	82	80	2
	59	1119	93.745	.02	.04	.04	136	241	239	52	82	80	2
	63	1123	96.360	1.10	2.48	2.48	108	242	243	52	82	81	4
(70) 5	79	1139	98.060	.02	.04	.04	120	243	244	51	82	81	2
	82	1142	100.550	1.00	2.05	2.05	109	244	243	51	80	80	4
(87.5) 6	96	1156	101.904	.02	.04	.04	120	244	244	52	81	80	2
	100	1200	104.665	1.10	2.27	2.27	117	242	236	50	91	90	4
	105	1205	105.065	.02	.04	.04	123	243	237	50	91	90	2
C 1	105	1214	105.134	*(Leak check at 5" = 0.005)									
	108	1217	107.250	1.00	2.05	2.05	109	244	242	51	80	80	4
	118	1227	108.300	.02	.04	.04	118	243	241	51	82	81	2
(122.5) 2	123	1232	111.175	1.00	2.05	2.05	109	244	240	51	82	81	4
	136	1245	112.233	.02	.04	.04	119	243	244	52	82	81	2
(140) 3	140	1249	115.000	1.10	2.27	2.27	115	244	243	50	83	81	4
(157½) 4	157	1306	116.560	.02	.04	.04	123	245	244	51	82	81	2
	160	1309	118.700	1.00	2.25	2.25	121	243	245	52	90	88	4
	170	1319	119.755	.02	.04	.04	126	241	243	53	90	88	2
(175) 5	174	1323	122.425	1.10	2.31	2.31	113	241	236	54	96	95	4
	185	1334	123.730	.02	.04	.04	118	242	244	53	97	95	2
	185	1401	123.750	* (Leak check at 5" = .005)									
(192½) D 1	210	1426	144.871	1.00	2.24	2.24	121	243	245	51	90	89	4
	213	1429	146.810	1.00	2.10	2.10	107	243	245	52	90	90	4

* meant wheel + change part

← Damper Stuck
← Push

ΔVm= ___ $\overline{\sqrt{\Delta p}}$= ___ $\overline{\Delta H}$= ___ $\overline{T_s}$= ___ $\overline{T_m}$= ___

Plant Name: ABC - Coke **Test Date:** 09-23-98

Run Number: A-O-315-3 **Operator:** Dennis D. Holzschuh

Traverse Point Number	Sampling Time, (min.)	Clock Time (24-hour clock)	Gas Meter Reading (V_m) ft³	Velocity Head (ΔP_s) in. H_2O	Orifice Pres. Differential (ΔH) in. H_2O Desired	Orifice Pres. Differential (ΔH) in. H_2O Actual	Stack Temp. °F (T_s)	Probe Temp. / Filter Temp. °F	Impinger Temp. °F	Dry Gas Meter Temp. Inlet ($T_{m_{in}}$) °F	Dry Gas Meter Temp. Outlet ($T_{m_{out}}$) °F	Pump Vacuum In. Hg
	222	1438	147.650	.02	.04	.04	122	242 / 237	67	90	90	2
	226	1442	150.325	1.20	2.47	2.47	119	243 / 241	60	90	91	4
227½(2)	242	1458	152.390	.02	.04	.04	116	244 / 241	60	91	91	2
(245)-3	245	1501	154.655	1.10	2.23	2.23	130	242 / 240	58	92	90	4
	256	1512	155.500	.02	.04	.04	114	243 / 244	57	91	90	2
	259	1515	158.045	1.10	2.23	2.23	130	242 / 237	55	91	91	4
(262½)-4	270	1526	159.412	.02	.04	.04	131	241 / 239	54	92	91	2
	273	1529	162.190	1.00	2.04	2.04	122	242 / 238	54	90	90	4
(280)-5	284	1540	163.425	.02	.04	.04	129	242 / 237	52	90	90	2
	292	1548	169.760	1.00	2.06	2.06	119	246 / 238	50	91	90	4
(297½) 6	311	1607	172.270	.02	.04	.04	130	243 / 235	50	92	90	2
(315) A-1	316	1612	175.000	1.10	2.24	2.24	127	244 / 240	51	92	91	4
	316	1621	175.255	~~.02~~	~~.04~~	~~.04~~	*5"-	.005 /	LC ✓			
	318	1623	176.000	.02	.04	.04	130	244 / 238	50	91	90	2
	321	1626	178.145	1.10	2.24	2.24	127	244 / 238	50	92	90	4
(332½) 2	334	1639	179.325	.02	.04	.04	120	245 / 240	50	91	91	2
	337	1642	182.470	1.10	2.24	2.24	124	244 / 238	49	91	90	4
(350) 3	354	1659	184.000	.02	.04	.04	120	240 / 241	49	92	90	2
	358	1703	186.810	1.00	2.07	2.07	117	242 / 242	51	92	90	4
(367½) 4	367	1712	187.700	.02	.04	.04	117	241 / 245	50	92	91	2
	370	1715	188.915	1.00	2.07	2.07	116	243 / 242	51	92	91	4
	378	1723	189.860	.02	.04	.04	116	244 / 241	50	91	91	2
385 5	405	1750	211.410	1.00	2.07	2.07	118	240 / 244	50	92	91	4
402½ 6	420	1800	223.137	1.00	2.07	2.07	118	240 / 245	51	91	91	4

PACIFIC ENVIRONMENTAL SERVICES, INC

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EPA 315

Sample Train Recovery Data

Plant: ABC Coke Tarrant, Alabama Date: 9/23/98

Sampling Location: Baghouse Outlet

Sample Recovery Person: RK/RD Field Team Leader: D Schuffel

Sampling Method Type: EPA Method 315

Run Number: A-O-315-3 Impinger Train ID: A-O-315-3

Job Number: 5505.000

Comments: EOM
filter was wet when recovered RWRJ

Front Half Data

Filter No.: 090898-~~08~~24 Filter Media Type: Quartz fiber filter

Filter Description: fine, black, particulate

Filter No.: — Filter Media Type: —

Filter Description: —

Back Half Data

Impinger Purge-

Start Time: — Flow Rate: — Stop Time: — Purge Gas: —

	Impinger 1	Impinger 2	Impinger 3
Contents:	Type I H_2O	Type I H_2O	Empty
Final Volume: (ml)	619.2	652.9	503.9
Initial Volume: (ml)	595.6	649.8	502.7
Net Volume: (ml)	23.6	3.1	1.2

	Impinger 4	Impinger 5	Silica Gel
Contents:	—	—	S.G.
Final Volume: (ml)	—	—	(g): 853.6
Initial Volume: (ml)	—	—	(g): 825.9
Net Volume: (ml)	—	—	(g): 27.7

Total Moisture Collected (ml): 55.6

Description of Impinger catch: Clear
silgel ~20% spent, blue/white/pink

FIELD DATA SHEET

Plant: ABC COKE
Sampling Location: UNDERFIRE STACK
Run Number: A-0-315-4 Date: 9-25-98
Pretest Leak Rate: 0.002 cfm @ 15 in. Hg.
Pretest Leak Check: Pitot: ✓ Orsat: NA

Sample Type: M-315 Operator: P. SIEGEL
Pbar: 29.85 Ps: -1.0
CO2: 3% 2.7 O2: 17% 13.5
Probe Length/Type: 10' GLASS Pitot #: 12A
Stack Diameter: 187 As:
K=247.2

Nozzle ID: 0.740 Thermocouple #: 12A
Assumed Bws: 14 Filter #: 080898-13
Meter Box #: ~~MB 6~~ 5AC Y: 0.981 ΔH@: 1.770
Post-Test Leak Rate: 0.002 cfm @ 9 in. Hg.
Post-Test Leak Check: Pitot: ✓ Orsat: NA

Traverse Point Number	Sampling Time (min)	Clock Time (24-hour clock)	Gas Meter Reading (Vm) ft³	Velocity Head (Δp) in H2O	Orifice Pressure Differential (ΔH) in H2O Desired	Orifice Pressure Differential (ΔH) in H2O Actual	Stack Temp. (Ts)	Temperature °F Probe	Temperature °F Filter	Impinger Temp. °F	Dry Gas Meter Temp. Inlet (Tm in °F)	Dry Gas Meter Temp. Outlet (Tm out °F)	Pump Vacuum (in. Hg)
0	0	11:10	26.198										
B 1	7.5		29.81	0.004	0.66	0.66	368	235	237	66	90	90	2
2	15.0	11:25	34.29	0.007	1.04	1.04	457	239	236	56	93	91	3
3	22.5		39.12	0.009	1.32	1.32	474	240	233	56	94	92	3
4	30.0	11:40	44.24	0.010	1.43	1.43	498	241	234	58	97	93	3
5	37.5		49.80	0.012	1.74	1.74	489	242	233	59	100	94	4
6	45.0	11:55	54.95	0.010	1.44	1.44	497	241	232	57	101	97	3.5
6(7)	52.5		60.29	0.010	1.44	1.44	502	241	233	58	101	96	3.5
5(8)	60.0	12:10	65.43	0.011	1.57	1.57	510	240	233	57	102	97	3.5
4(9)	67.5		70.81	0.011	1.61	1.61	483	239	235	57	103	97	3.5
3(10)	75.0	12:25	76.44	0.012	1.76	1.76	486	240	233	58	106	98	4
2(11)	82.5		81.32	0.008	1.19	1.19	475	240	232	60	107	101	3
1(12)	90.0	12:40	85.458	0.005	0.76	0.76	452	238	233	57	106	100	2.5
			85.565	Leak check	0.001	@ 8 inches	Hg						
		12:58	85.645	Leak check	0.001	@ 8 inches	Hg						
A 1	97.5		89.28	0.005	0.79	0.79	421	240	238	61	101	100	2.5
2	105.0	13:13	94.43	0.010	1.52	1.52	454	239	237	56	102	99	3.5
3	112.5		99.78	0.010	1.53	1.53	453	238	239	55	107	102	3.5
4	120.0	13:28	105.07	0.010	1.48	1.48	488	238	236	56	109	103	3.5
5	127.5		110.31	0.010	1.46	1.46	500	239	241	56	109	104	3.5
6	135.0	13:43	115.31	0.010	1.44	1.44	512	237	242	60	108	103	3.5
6(7)	142.5		120.74	0.010	1.46	1.46	501	238	242	61	110	105	4
5(8)	150.0	13:58	125.97	0.010	1.45	1.45	509	238	242	61	109	105	4
4(9)	157.5		131.41	0.011	1.61	1.61	495	239	240	57	107	102	4
3(10)	165.0	14:13	137.06	0.012	1.75	1.75	493	237	238	57	107	101	4.5
2(11)	172.5		141.89	0.008	1.20	1.20	466	236	239	58	105	100	3.5
1(12)	180.0	14:28	146.148	0.006	0.93	0.93	434	237	235	61	106	101	3

ΔVm= 119.763 $\overline{\sqrt{\Delta p}}$= 0.0912 $\overline{\Delta H}$= 1.36 $\overline{Ts}$= 476 $\overline{Tm}$= 101.1

PACIFIC ENVIRONMENTAL SERVICES, INC

4700 Duke Drive, Suite 150
Mason, Ohio 45040
513.398.2556 FAX: 513.398.3342

Sample Train Recovery Data

Plant: ABC Coke Tarrant, AL Date: 9/25/98

Sampling Location: Underfire Stack

Sample Recovery Person: TA Field Team Leader: DS

Sampling Method Type: M315

Run Number: 550 5000 A-0-315-4 Impinger Train ID: N-9

Job Number: U-315-4

Comments:

Front Half Data

Filter No.: 080898-13 Filter Media Type: Treated Quartz

Filter Description: Black Grit

Filter No.: — Filter Media Type: —

Filter Description: —

Back Half Data

Impinger Purge-

Start Time: — Flow Rate: — Stop Time: — Purge Gas: —

	Impinger 1	Impinger 2	Impinger 3
Contents:	H_2O	H_2O	Empty
Final Volume: (ml)	962.0	778.7	571.9
Initial Volume: (ml)	692.3	712.4	568.9
Net Volume: (ml)	269.7	66.3	3.0

	Impinger 4	Impinger 5	Silica Gel
Contents:	—	—	Sil Gel
Final Volume: (ml)	—	—	(g): 922.9
Initial Volume: (ml)	—	—	(g): 901.4
Net Volume: (ml)	—	—	(g): 21.5

Total Moisture Collected (ml): 360.5

Description of Impinger catch: Clear Silica Gel 50% Spent

FIELD DATA SHEET

Plant: ABC Coke
Sampling Location: Baghouse Outlet
Run Number: A-0-315-SB Date: 9/24/98
Pretest Leak Rate: 0.003 cfm @ 15 in. Hg.
Pretest Leak Check: Pitot: ✓ Orsat: ✓

Sample Type: ~~FB~~ SB Operator: AR
Pbar: 29.85 Ps:
CO2: 0 O2: 21
Probe Length/Type: glass Pitot #: ~~AA~~ AA
Stack Diameter: 85.75 As: 41.1

Nozzle ID: 0.216 Thermocouple #: 4A
Assumed Bws: 4 Filter #: unwinned
Meter Box #: 6 Y: 1.005 ΔH@: 1.778
Post-Test Leak Rate: 0.004 cfm @ 16 in. Hg.
Post-Test Leak Check: Pitot: ✓ Orsat: ✓

Traverse Point Number	Sampling Time (min)	Clock Time (24-hour clock)	Gas Meter Reading (Vm) ft³	Velocity Head (Δp) in H2O	Orifice Pressure Differential (ΔH) in H2O		Stack Temp. (Ts)	Temperature °F		Impinger Temp. °F	Dry Gas Meter Temp.		Pump Vacuum (in. Hg)
					Desired	Actual		Probe	Filter		Inlet (Tm in °F)	Outlet (Tm out °F)	
	0		223.389										
	5		223.442	Leak Rate 0.003 at 15 in Hg.				135	131		75	71	12
	10		223.674					135	133		74	70	12
	15		223.929					136	131		71	70	12

ΔVm= ____ $\overline{\sqrt{\Delta p}}$= ____ $\overline{\Delta H}$= ____ $\overline{Ts}$= ____ $\overline{Tm}$= ____

PACIFIC ENVIRONMENTAL SERVICES, INC

4700 Duke Drive, Suite 150
Mason, Ohio 45040
513.398.2556 FAX: 513.398.3342

Sample Train Recovery Data

Plant: ABC Coke Tarrant, AL Date: 9/24/98

Sampling Location: Baghouse outlet

Sample Recovery Person: TA/MW Field Team Leader: D S

Sampling Method Type: Method 315

Run Number: A-O-315-FB Impinger Train ID: N-C

Job Number: S505000

Comments: Baghouse Outlet Field Blank

Front Half Data

Filter No.: D80758-13 Filter Media Type: Treated Quartz

Filter Description: Clear

Filter No.: — Filter Media Type: —

Filter Description: —

Back Half Data

Impinger Purge-

Start Time: — Flow Rate: — Stop Time: — Purge Gas: —

	Impinger 1	Impinger 2	Impinger 3
Contents:	Type I H_2O	Type I H_2O	Empty
Final Volume: (ml)	567.1	714.6	559.6
Initial Volume: (ml)	567.2	714.5	559.5
Net Volume: (ml)			

	Impinger 4	Impinger 5	Silica Gel
Contents:	—	—	5.6.
Final Volume: (ml)	—	—	(g): 753.2
Initial Volume: (ml)	—	—	(g): 752.4
Net Volume: (ml)	—	—	(g):

Total Moisture Collected (ml):

Description of Impinger catch: Clear

Silica Gel 0% spent

FIELD DATA SHEET

Plant: ABC Coke
Sampling Location: Baghouse Outlet
Run Number: A-0429-1 Date: 9-28-98
Pretest Leak Rate: .004 cfm @ 15 in. Hg.
Pretest Leak Check: Pitot: ✓ Orsat: ✓

Sample Type: 429 Operator: DDH
Pbar: 29.7 Ps: +.15
CO2: ~0 O2: 20.9
Probe Length/Type: 5'/Glass Pitot #: 4A
Stack Diameter: 85.75 As: 40.10
K = 2.25

Nozzle ID: .213 Thermocouple #: 4A
Assumed Bws: 4 Filter #: Unbaked
Meter Box #: MB-1 Y: 1.012 ΔH@: 1.954
Post-Test Leak Rate: .005 cfm @ 15 in. Hg.
Post-Test Leak Check: Pitot: ✓ Orsat: ✓

Traverse Point Number	Sampling Time (min)	Clock Time (24-hour clock)	Gas Meter Reading (Vm) ft³	Velocity Head (Δp) in H2O	Orifice Pressure Differential (ΔH) in H2O Desired	Actual	Stack Temp. (Ts)	Temperature °F Probe	Filter	Impinger Temp. °F	Dry Gas Meter Temp. Inlet (Tm in °F)	Outlet (Tm out °F)	Pump Vacuum (in. Hg)	XAD
A	0	1126	902.203											
1	13	1139	912.700	1.0	2.14	2.14	114	225	230	48	85	86	5	48
2	23	1150	918.530	.02	.04	.04	113	235	240	49	86	86	2	49
	26	1153	922.300	1.0	2.14	2.14	114	225	240	48	84	86	5	50
3	37	1204	925.121	.02	.04	.04	114	230	255	49	85	86	2	50
4+5	60	1227	942.100	1.10	2.40	2.40	102	230	245	49	83	84	5	50
6	1:15:00	1242	954.650	1.10	2.40	2.40	102	230	245	49	83	82	5	49
(restart 1310) B 1	1:30:00	1257	966.115	1.00	2.14	2.14	102	230	240	49	82	88	8	49
	1:33:00	1308	972.530	1.10	2.36	2.36	112	245	240	50	83	82	8	48
2	1:45	1325	973.400	.02	.04	.04	112	245	240	51	82	81	2	48
	1:48	1328	973.425	.02	.04	.04	112	245	245	50	82	81	2	49
	1:50	1330	975.240	1.10	2.36	2.36	112	240	245	50	81	81	8	49
3	2:00	1340	976.200	.02	.04	.04	108	245	250	50	81	80	2	48
	2:02	1342	976.650	.02	.04	.04	133	248	250	49	81	82	2	49
	2:08	1348	980.700	1.0	2.14	2.14	108	249	252	49	82	81	8	48
4	2:15	1355	981.400	.02	.04	.04	133	248	253	49	81	80	2	49
	2:27:00	1407	983.127	.02	.04	.04	133	248	253	49	81	81	8	48
5	2:32:00	1412	985.560	1.10	2.36	2.36	119	248	251	48	82	82	10	49
	2:38:00	1418	986.500	.02	.04	.04	118	249	254	55	81	81	2	49
6	2:45:00	1425	990.780	1.0	2.14	2.14	113	248	251	49	81	81	10	51
	2:55	1435	992.561	.02	.04	.04	118	249	251	50	81	81	2	51
	3:00	1440	995.490	1.10	2.36	2.36	108	245	250	49	81	82	10	51
		946.358	~~996.024~~ PTS	leak rate	0.001	@ 12"	Hg							10"-0.00
C 1	3:00	1505	996.358											
2	3:15	1520	997.660	.02	.04	.04	134	248	250	49	81	81	2	48
3	3:32	1537	998.810	.02	.04	.04	134	248	250	48	81	81	2	49
	3:34	1539	1003.450	1.10	2.36	2.36	108	247	248	49	81	81	10	49

(966.115)

ΔVm= ____ $\overline{\sqrt{\Delta p}}$= ____ $\overline{\Delta H}$= ____ $\overline{Ts}$= ____ $\overline{Tm}$= 87

Plant Name: ABC Coke **Test Date:** 9-22-98

Run Number: A-O-429-1 **Operator:** DDH

Traverse Point Number	Sampling Time, (min.) / Clock Time (24-hour clock)	Gas Meter Reading (V_m) ft³	Velocity Head (ΔP_s) in. H_2O	Orifice Pres. Differential (ΔH) in. H_2O Desired	Orifice Pres. Differential (ΔH) in. H_2O Actual	Stack Temp. °F (T_s)	Probe Temp. / Filter Temp.° F	Impinger Temp. °F	Dry Gas Meter Temp. Inlet (T_{in})° F	Dry Gas Meter Temp. Outlet (T_{out}) °F	Pump Vacuum In. Hg	XAD
4	3:44:00 / 1549	1004.600	.02	.04	.04	125	246 / 249	48	83	84	2	49
	3:50:00 / 1555	1008.440	1.0	2.18	2.18	111	245 / 249	49	93	83	10	49
	3:59:00 / 1604	1009.317	.02	.04	.04	126	226 / 254	49	92	82	2	49
5	4:03:00 / 1608	1012.251	1.0	2.18	2.18	114	235 / 251	50	92	91	9	49
	4:14:00 / 1619	1013.440	.02	.04	.04	124	238 / 256	51	92	91	2	48
	4:26:00 / 1631	1022.075	1.0	2.16	2.16	114	239 / 248	51	92	91	9	49
D 1	4:30:00 / 1635	1022.642	.02	.04	.04	114	242 / 249	52	92	91	2	51
restart 1649	4:39:00 / 1658	1023.630	.02	.04	.04	120	243 / 249	51	92	92	2	50
	4:42:00 / 1701	1025.850	1.10	2.30	2.30	109	244 / 245	52	92	91	9	48
2	4:56:00 / 1715	1026.745	.02	.04	.04	120	245 / 245	51	91	92	2	49
3	4:59:00 / 1718	1029.615	1.0	2.16	2.16	115	245 / 250	50	92	91	9	48
4	5:14:00 / 1733	1031.180	.02	.04	.04	130	240 / 245	51	92	92	2	49
	5:18:00 / 1737	1033.900	1.10	2.37	2.37	116	229 / 240	46	92	91	9	48
	5:25:00 / 1744	1034.871	.02	.04	.04	127	233 / 243	48	92	92	2	49
5	5:36:00 / 1755	1042.600	1.10	2.38	2.38	113	240 / 245	47	92	91	9	48
6	5:45:00 / 1804	1044.131	.02	.04	.04	124	245 / 245	47	91	91	2	49
	5:50:00 / 1809	1046.952	1.10	2.38	2.38	120	245 / 240	46	92	91	9	50
6	6:05:00 / 1822	1047.996	.02	.04	.04	124	240 / 241	46	91	91	2	49
	6:06:00 / 1825	1049.950	1.1	2.38	2.38	111	240 / 245	47	92	92	9	49
5	6:23:00 / 1842	1051.650	.02	.04	.04	124	245 / 243	48	92	91	2	49
	6:26:00 / 1845	1053.645	1.16	2.37	2.37	111	240 / 245	48	91	91	9	49
	6:38:00 / 1857	1054.710	.02	.04	.04	124	243 / 244	47	92	91	2	51
	6:52:00 / 1911	1064.950	1.00	2.16	2.16	115	245 / 245	46	92	91	9	52
	/						/					

(13" - 0.000) (1022.642 / 1022.803)

PACIFIC ENVIRONMENTAL SERVICES, INC

4700 Duke Drive, Suite 150
Mason, Ohio 45040
513.398.2556 FAX: 513.398.3342

Sample Train Recovery Data

Plant: ABC Coke AL Date: 9/21/98

Sampling Location: Outlet of Baghouse

Sample Recovery Person: RL/RD Field Team Leader: DS

Sampling Method Type: Carb 429

Run Number: A-O-429-1 Impinger Train ID: N-5

Job Number: S505000

Comments: Carb 429 train for PAH's

Front Half Data

Filter No.: NA Filter Media Type: Teflon mat

Filter Description: light gray loading (barely visible)

Filter No.: — Filter Media Type: —

Filter Description: —

Back Half Data

	XAD-Trap	Impinger 1	Impinger 2
Contents:	XAD-2	Empty	$NaHCO_3/Na_2CO_3$
Final Volume: (ml)	360.1	520.4	601.9
Initial Volume: (ml)	340.6	476.0	606.0
Net Volume: (ml)	19.5	44.4	-4.1

	Impinger 3	Impinger 4	Silica Gel
Contents:	$NaHCO_3/Na_2CO_3$	Empty	Silgel
Final Volume: (ml)	677.0	526.8	(g): 978.8 50% spent
Initial Volume: (ml)	678.7	522.7	(g): 930.8
Net Volume: (ml)	-1.7	4.1	(g): 48.0

Total Moisture Collected (ml): 110.2 mls

Description of Impinger catch: clear

080898-20

FIELD DATA SHEET

Plant: ABC Coke
Sampling Location: Baghouse Outlet
Run Number: A-O-429 Date: 9/22/98
Pretest Leak Rate: 0.006 cfm @ 15 in. Hg.
Pretest Leak Check: Pitot: ✓ Orsat: ✓

Sample Type: 429 Operator: AR
Pbar: 29.74 Ps: 0.15
CO2: 0 O2: 21
Probe Length/Type: glass Pitot #: 4A
Stack Diameter: 85.75" As: 40.1 K=2.25

Nozzle ID: 0.213 Sample Head Thermocouple #: 4A
Assumed Bws: 4 Filter #: A-O-429-2
Meter Box #: 1 Y: 1.012 ΔH@: 1.954
Post-Test Leak Rate: ~~0.001~~ 0.002 cfm @ ~~8~~ 15 in. Hg.
Post-Test Leak Check: Pitot: ✓ Orsat: ✓ >3

	Traverse Point Number	Sampling Time (min)	Clock Time (24-hour clock)	Gas Meter Reading (Vm) ft³	Velocity Head (Δp) in H2O	Orifice Pressure Differential (ΔH) in H2O Desired	Actual	Stack Temp. (Ts)	Temperature °F Probe	Filter	Impinger Temp. °F	Dry Gas Meter Temp. Inlet (Tm in °F)	Outlet (Tm out °F)	Pump Vacuum (in. Hg)	XAD
	D1	0	1028	65.262											
1		9.5	1037	66.8	0.02	0.041	0.041	130	231	261	68	79	78	2	39
		13	1041	69.3	1.1	2.36	2.36	103	229	255	69	80	79	6	41
	D2	21	1053	70.8	0.01	0.020	0.020	123	231	257	68	81	79	2	41
2		27	1055	73.4	1.1	2.32	2.32	116	229	260	68	83	80	7	41
		45	1112	74.7	0.02	0.04	0.04	129	230	250	69	83	81	2	42
	D3	52	1120	75.6	0.01	0.02	0.02	141	230	253	69	84	83	2	39
3	D4	53	1122	76.4	1.1	2.32	2.32	119	230	261	69	85	83	7	38
		1:12	1140	78.2	0.01	0.02	0.02	133	231	260	69	85	83	2	38
4	D5	1:13	1142	79.3	1.0	2.1	2.1	125	229	249	72	86	84	6	39
	D6	1:21	11:49	80.3	0.01	0.02	0.02	137	231	259	69	86	84	2	39
5		1:28	11:56	83.7	1.3	2.7	2.7	126	229	258	69	87	85	8	40
		1:30	11:58	85.868	0.01	0.02	0.02	131	232	250	67	87	86	2	40
				85.998	Leak rate @		0.002	@	10 in.	Hg					40
	C1	1:38	12:18	87.1	0.01	0.02	0.02	127	229	255	69	87	86	2	40
6	C-2	1:40	12:20	88.9	1.1	2.3	2.3	119	229	247	69	89	86	7	43
	C-3	1:58	12:38	91.32	0.02	0.04	0.04	118	231	255	68	89	87	2	40
7		2:00	12:41	93.4	1.2	2.5	2.5	131	230	258	67	90	88	7	36
		2:10	12:50	94.4	0.01	0.02	0.02	129	230	247	66	90	88	2	37
8		2:15	12:55	97.61	1.0	2.12	2.12	120	229	255	69	90	87	7	37
	C-4	2:24	13:04	98.4	0.01	0.02	0.02	128	231	258	67	90	88	2	38
9		2:28	13:08	101.4	1.0	2.13	2.13	120	229	262	69	91	89	7	39
		2:38	13:20	102.606	0.01	0.02	0.02	130	231	258	69	91	89	2	40
				102.737	Leak rate @ 0.002 @ 10mm Hg										
	B-1	2:40	1406	102.9	0.01	0.02	0.02	143	230	263	69	90	91	2	46
10		2:44	1410	105.1	1.0	2.1	2.1	120	230	248	69	91	90	7	45
		2:49	1415	105.9	0.02	0.04	0.04	121	230	258	69	91	90	2	46

ΔVm= ___ $\overline{\sqrt{\Delta p}}$= ___ $\overline{\Delta H}$= ___ $\overline{Ts}$= ___ $\overline{Tm}$= ___

Plant Name: ABC Coke **Test Date:** 9/22/98

Run Number: A-0-429-2 **Operator:** AR

	Traverse Point Number	Sampling Time, (min.) / Clock Time (24-hour clock)	Gas Meter Reading (V_m) ft³	Velocity Head (ΔP_s) in. H_2O	Orifice Pres. Differential (ΔH) in. H_2O Desired	Orifice Pres. Differential (ΔH) in. H_2O Actual	Stack Temp. °F (T_s)	Probe Temp. / Filter Temp. °F	Impinger Temp. °F	Dry Gas Meter Temp. Inlet ($T_{m_{in}}$) °F	Dry Gas Meter Temp. Outlet ($T_{m_{out}}$) °F	Pump Vacuum In. Hg	XAD
11		2:52 / 1420	107.8	1.0	2.1	2.1	122	230 / 259	68	91	90	7	42
	B-2	3:06 / 1434	109.0	0.01	0.02	0.02	136	230 / 255	69	92	91	2	38
12	[illegible]	3:09 / 1437	110.9	1.0	2.1	2.1	130	229 / 253	72	92	91	7	38
	B-3	3:20 / 1448	112.5	0.02	0.04	0.04	133	231 / 257	69	92	91	1	39
13		3:24 / 1452	114.9	1.0	2.1	2.1	123	229 / 251	69	93	91	7	40
	B-4	3:36 / 1504	116.5	0.01	0.04	0.04	135	231 / 260	66	94	92	2	39
14		3:40 / 1508	119.5	1.[illegible]	2.6	2.6	122	230 / 255	60	94	92	7	39
	B-5	4:03 / 1531	121.7	0.01	0.02	0.02	133	231 / 256	62	95	90	2	38
15	B-6	4:06 / 1534	[illegible] 123.0	0.99	2.1	2.1	126	229 / 257	64	97	94	7	38
		4:08 / 1536	123.998	0.01	0.02	0.02	139	230 / 250	66	97	95	2	38
	A-1	/ 124.145 → leak rate 0.002 at 12 in Hg											
		4:10 / 124.5	[illegible]	0.01	0.02	0.02	129	230 / 253	69	96	95	2	41
16		4:11 / 1[illegible]1	126.3	0.95	2.1	2.1	112	229 / 258	69	97	95	7	42
	A-2	4:20 / 1600	127.4	0.01	0.02	0.02	120	231 / 249	69	97	95	2	42
17		4:23 / 1603	129.6	1.[illegible]	2.6	2.6	129	229 / 254	69	96	95	8	40
		4:53 / 1633	132.7	0.01	0.02	0.02	137	230 / 248	67	96	95	2	43
	A-3	4:55 / 1635	133.9	0.01	0.02	0.02	147	230 / 254	69	94	94	2	42
18	A-4	4:58 / 1638	135.0	1.1	2.3	2.3	129	229 / 259	67	95	94	8	43
	A-5	5:09 / 1649	136.2	0.01	0.02	0.02	136	231 / 253	65	95	94	2	42
19		5:13 / 1653	139.7	1.4	3.0	3.0	128	229 / 249	69	95	93	10	42
	A-6	5:22 / 1702	140.6	0.01	0.02	0.02	135	231 / 261	62	95	93	2	41
20		5:25 / 1705	143.5	1.3	2.8	2.8	129	229 / 255	62	97	94	10	41
		5:30 / 1730	146.5	0.01	0.02	0.02	134	231 / 253	58	98	95	2	40
	A-5	5:55 / 1735	146.9	0.01	0.02	0.02	147	230 / 241	65	97	96	2	40

FIELD DATA SHEET

Plant: ABC Coke
Sampling Location: Baghouse Outlet
Run Number: A-0-315-3 Date: 9/23/98
Pretest Leak Rate: 0.004 cfm @ 15 in. Hg.
Pretest Leak Check: Pitot: ✓ Orsat: ✓

Sample Type: 429 Operator: AR
Pbar: 29.80 Ps: 0.15
CO2: 0 O2: 21
Probe Length/Type: glass Pitot #: 4A
Stack Diameter: 85.75 As: 40.1
K2.25

Nozzle ID: 0.215 Thermocouple #: 4A
Assumed Bws: 4 Filter #: A-0-315-3
Meter Box #: 1 Y: 1.012 ΔH@: 1.954
Post-Test Leak Rate: 0.002 cfm @ 16 in. Hg.
Post-Test Leak Check: Pitot: ✓ Orsat: ✓

Traverse Point Number	Sampling Time (min)	Clock Time (24-hour clock)	Gas Meter Reading (Vm) ft³	Velocity Head (Δp) in H2O	Orifice Pressure Differential (ΔH) in H2O Desired	Actual	Stack Temp. (Ts)	Temperature °F Probe	Filter	Impinger Temp. °F	Dry Gas Meter Temp. Inlet (Tm in °F)	Outlet (Tm out °F)	Pump Vacuum (in. Hg)	XAD
A-1	0	1020	166.317											
-1	09	1029	167.3	0.02	0.04	0.04	120	230	253	69	77	76	2	57
-1	15	1035	171.6	1.2	2.53	2.53	112	230	245	62	78	77	8	44
A-2	33	1053	174.1	0.02	0.04	0.04	120	230	251	56	80	78	2	43
-2	36	1056	176.3	1.4	3.0	3.0	112	230	251	55	82	80	10	43
A-3	57	1117	178.9	0.01	0.02	0.02	128	230	257	55	83	80	2	44
A-4	59	119	179.9	0.01	0.02	0.02	138	230	256	68	86	84	2	45
-4	1:03	1123	182.7	1.0	2.11	2.11	118	229	249	58	86	84	9	45
	1:18	1139	183.6	0.01	0.02	0.02	127	230	254	58	87	84	2	47
A-5	122	1142	186.0	1.1	2.35	2.35	113	229	255	62	88	86	9	45
	1:36	1156	187.7	0.01	0.02	0.02	121	231	254	59	88	86	2	46
	1:40	1200	190.2	1.2	2.6	2.6	108	229	259	61	89	87	10	47
	1:45	1205	190.745	0.01	0.02	0.02	110	231	249	62	89	87	2	48
		1214	190.852	Leak Rate of 0.004 @ 10 in Hg										
B-1	1:47	1217	192.7	1.2	2.6	2.6	125	229	253	66	90	88	10	45
	1:56	1227	193.5	0.01	0.002	0.02	133	231	252	67	89	88	2	46
B-2	2:03	1232	197.2	1.3	2.8	2.8	117	229	250	64	90	89	9	45
	2:15	1245	197.070	0.01	0.02	0.02	130	232	258	61	91	89	2	44
B-3	2:20	1249	201.0	1.2	2.6	2.6	125	229	239	61	92	90	10	44
	2:35	1306	203.1	0.01	0.02	0.02	126	231	257	60	92	91	2	45
B-4	2:38	1309	205.6	1.0	2.14	2.14	121	229	257	62	93	92	9	45
	2:50	1319	207.5	0.01	0.02	0.02	129	231	252	62	93	92	2	47
	254	1323	209.8	1.2	2.6	2.6	120	229	258	66	93	92	9	41
B-5	3:05	1334	211.160	0.01	0.02	0.02	132	231	255	62	93	92	2	48
20 min break		1401		1.1	2.4	2.4	109	229	258	68	93	93	9	43
C-1		[illegible]	211.255	Leak Rate 0.004 at 10 in Hg										
	3:30	1426	231.7	1.1	2.4	2.4	109	229	258	68	90	93	4	46

ΔVm= ___ √Δp= ___ ΔH= ___ Ts= ___ Tm= ___

Plant Name: ABC Coke **Test Date:** 9/23/98

Run Number: A-O-[illegible]-3 **Operator:** AR

Traverse Point Number	Sampling Time, (min.)	Clock Time (24-hour clock)	Gas Meter Reading (V_m) ft³	Velocity Head (ΔP_s) in. H_2O	Orifice Pres. Differential (ΔH) in. H_2O Desired	Orifice Pres. Differential (ΔH) in. H_2O Actual	Stack Temp. °F (T_s)	Probe Temp. / Filter Temp. °F	Impinger Temp. °F	Dry Gas Meter Temp. Inlet ($T_{m_{in}}$) °F	Dry Gas Meter Temp. Outlet ($T_{m_{out}}$) °F	Pump Vacuum in. Hg	XAB
C-1	3:33	1429	234.3	1.1	2.4	2.4	107	231 / 255	57	97	93	9	44
	3:42	1438	235.3	0.01	0.02	0.02	130	232 / 261	63	95	93	2	43
	3:45	1442	237.5	1.1	2.3	2.3	128	230 / 250	69	94	94	9	44
C-2	4:01	1458	239.8	0.02	0.04	0.04	128	231 / 261	65	95	94	2	44
C-3	4:05	1503	242.5	1.0	2.1	2.1	124	230 / 260	60	95	94	9	44
	4:15	1513	243.9	0.02	0.04	0.04	129	230 / 253	54	95	94	2	44
	4:19	1517	246.5	1.0	2.1	2.1	123	229 / 247	56	96	95	9	43
C-4	4:25	1523	247.7	0.01	0.02	0.02	133	231 / 260	55	97	95	2	44
	4:33	1531	250.1	1.0	2.1	2.1	122	230 / 257	61	96	95	8	43
	4:44	1542	251.5	0.01	0.02	0.02	129	230 / 249	55	96	95	2	44
C-5	4:52	1550	257.9	1.1	2.3	2.3	124	229 / 252	61	95	95	9	46
C-6	5:11	1609	260.6	0.01	0.02	0.02	129	231 / 260	59	97	95	2	46
	5:15	1613	263.715	1.1	2.35	2.35	122	229 / 257	59	96	95	9	45
		1621	263.981	Leak Check 0.004 at 15 in Hg									
D-1	5:16	1623	264.0	0.01	0.02	0.02	146	230 / 261	69	95	95	2	45
	5:20	1627	266.9	1.2	2.5	2.5	130	230 / 252	69	96	95	8	44
D-2	5:34	1641	268.1	0.01	0.02	0.02	132	230 / 256	65	97	96	2	47
	5:39	1646	272.2	1.2	2.5	2.5	131	230 / 253	68	96	95	10	48
D-3	5:54	1701	273.9	0.01	0.02	0.02	134	231 / 258	65	97	95	3	48
	5:58	1705	276.8	1.2	2.5	2.5	127	229 / 257	66	96	95	10	43
	6:06	1712	278.500	0.02	0.04	0.04	140	231 / 261	57	95	94	2	46
	6:09	1715	279.7	1.20	2.5	2.5	127	229 / 257	64	95	94	10	46
D-4	6:18	1724	281.6	0.01	0.02	0.02	136	231 / 249	63	95	94	2	46
	6:25	1731	304.1	1.3	2.76	2.76	126	229 / 256	62	95	94	10	44

FIELD DATA SHEET

Plant: ABC Coke
Sampling Location: Baghouse Outlet
Run Number: A-0-4296 Date: 9/24/98
Pretest Leak Rate: 0.002 cfm @ 12 in. Hg.
Pretest Leak Check: Pitot: – Orsat: ✓

Sample Type: EB Operator: AR
Pbar: 29.85 Ps:
CO2: 0 O2: 21
Probe Length/Type: glass Pitot #: 4E
Stack Diameter: 85.75 As: 41.1

Nozzle ID: 0.213 Thermocouple #: 4E
Assumed Bws: 4 Filter #: unbaked
Meter Box #: 1 Y: 1.012 ΔH@: 1.954
Post-Test Leak Rate: 0.002 cfm @ 12 in. Hg.
Post-Test Leak Check: Pitot: ✓ Orsat: ✓

Traverse Point Number	Sampling Time (min)	Clock Time (24-hour clock)	Gas Meter Reading (Vm) ft³	Velocity Head (Δp) in H2O	Orifice Pressure Differential (ΔH) in H2O		Stack Temp. (Ts)	Temperature °F		Impinger Temp. °F	Dry Gas Meter Temp.		Pump Vacuum (in. Hg)
					Desired	Actual		Probe	Filter		Inlet (Tm in °F)	Outlet (Tm out °F)	
	0		317.900										
	5		318.112	① leak	Rate 0.002		at 12	130 in Hg	130		71	70	12
	10		318.230					133	130		71	71	12
	15		318.359					135	130		70	71	12

ΔVm= _____ $\overline{\sqrt{\Delta p}}$= _____ $\overline{\Delta H}$= _____ $\overline{Ts}$= _____ $\overline{Tm}$= _____

PACIFIC ENVIRONMENTAL SERVICES, INC

4700 Duke Drive, Suite 150
Mason, Ohio 45040
513.398.2556 FAX: 513.398.3342

Sample Train Recovery Data

Plant: ABC Coke Tarrant, AL Date: 9/24/98

Sampling Location: Outlet Baghouse

Sample Recovery Person: TA Field Team Leader: DS

Sampling Method Type: Carb Method 429

Run Number: A-O-429-FB Impinger Train ID: N-2

Job Number: S505000

Comments:

Front Half Data

Filter No.: — Filter Media Type: Teflon mat

Filter Description: Clean

Filter No.: — Filter Media Type: —

Filter Description:

Back Half Data

	XAD-Trap	Impinger 1	Impinger 2
Contents:	XAD	Empty	H_2O
Final Volume: (ml)	351.9	494.8	719.4
Initial Volume: (ml)	351.9	494.8	719.4
Net Volume: (ml)	0	0	0

	Impinger 3	Impinger 4	Silica Gel
Contents:	H_2O	Empty	—
Final Volume: (ml)	717.5	620.0	(g): 786.7
Initial Volume: (ml)	717.4	620.0	(g): 786.4
Net Volume: (ml)	0.1	0	(g): 0.3

Total Moisture Collected (ml): 0.4

Description of Impinger catch: Clear SG 0% Sat

APPENDIX C

ANALYTICAL DATA
(Except CARB 429)

EASTERN RESEARCH GROUP, INC.

P.O. Box 2010
Morrisville, NC 27560
Ph. (919) 468-7800

Narrative

Site: *ABC Coke*
Prepared for: *Frank Meadows* **(PES)**
Prepared by: *Linh Nguyen*

Description of Procedures for EPA Method 315 and Observations:

Filters -

Procedure:
The filters (including any loose particles) were transferred to a tared amber jar. The amber jars were placed into a desiccator overnight in a temperature controlled environment. The following day, the samples were weighed and initial weights were taken. To ensure that all conditions remained the same, the samples were placed back into the desiccator and allowed to sit overnight and the second weighings were taken at the same time the next day. Once constant weight had been attained, 100 mL of methylene chloride was added to each jar. The jars were placed in a sonicator and allowed to sonicate for 3 minutes. After sonication was complete, the samples were taken out of the sonicator. Each sample was filtered through a buchner funnel reinforced with an additional Whatman 934-AH filter to prevent cross contamination on the buchner funnels. Once the solutions were vacuum filtered, the extract was placed into a triple rinsed beaker (methylene chloride solvent). The beaker containing the extract was placed onto a hotplate at low heat and the solvent was allowed to evaporate. Once the samples almost reached dryness, the samples were taken off the hotplate and poured into a tared aluminum pan. The beakers were triple rinsed with methylene chloride and then the solvent was poured into the aluminum pan. The rinse was performed to ensure that no material remained in the beaker. The aluminum weighing pan was heated to complete dryness, placed into a desiccator and allowed to sit in the desiccator overnight. The following day, the samples were weighed and the weights recorded.

Observations:
The filters had a lot of loose, black particles which were also placed into the jars for PM weights. This was seen mostly on the Inlets.

Acetone Front Half Rinse-

Procedure:
The rinses were taken and poured into tared 400 mL beakers. The beakers were triple rinsed with $MeCl_2$. The weights of the beakers including the rinses were taken. This gives an initial and a final weight to which the volumes of the rinses were calculated. A separate sheet is attached explaining how the volumes were calculated. The beakers containing the rinses were allowed to sit overnight in a hood to allow the acetone solvent to evaporate. The next day the beakers, which now contain no solvent, were taken and placed into the dessicator. The beakers were allowed to sit in the dessicator overnight. The next day, initial weighings for the samples were taken. The samples were then allowed to sit in the dessicator again for 24 hours. The next day at approximately the same time, the samples were weighed again for the second weighings. Once constant weight had been

attained, the weights were recorded for the Particulate Mass (PM) portion of the analysis. Next, the beakers were taken and 25 mL of $MeCl_2$ was added to each beaker. Aluminum foil was placed over the tops of the beakers. The beakers were then placed into a sonicator and allowed to sonicated for 3 minutes. This fraction will be combined with the $MeCl_2$ Front Half Rinse.

Observations:

No observations out of the ordinary were noted.

Methylene Chloride Front Half Rinse-

Procedure:

The rinses were taken and poured into tared 400 mL beakers. The beakers were triple rinsed with $MeCl_2$. The weights of the beakers including the rinses were taken. This gives an initial and a final weight to which the volumes of the rinses were calculated. At this point, the extracts from the Acetone Front Half Rinse were combined with this fraction. The combined fractions were placed onto a hotplate and allowed to heat gently at a low temperature setting. Once the solution has almost reached dryness, the solution was poured into a tared aluminum pan. The pan was then was placed back onto the hotplate and taken to complete dryness. The pans were then transferred to the dessicator and allowed to sit overnight. The following day, the samples were weighed and the weights recorded.

Observations:

No observations out of the ordinary were noted.

Impinger, Back Half Water-

Procedure:

Each sample was then poured into a clean, 1000 mL separatory funnel. Once in the separatory funnel, the amber jars containing the original samples were triple rinsed with $MeCl_2$ and then poured into the separatory funnel. The approximate volume of this rinse is 50 mL. The samples were then shaken for 1 minute. After 1 minute, the bottom $MeCl_2$ layer was drained into a clean, 250 mL beaker. After the $MeCl_2$ was drained, an additional 25 mL of $MeCl_2$ was added. The solution was then shaken for another minute and the bottom MeCl2 layer was drained into the same 250 mL beaker. This was repeated once more. Once the third shake was completed, and the MeCl2 was drained into the 250 mL beaker, the beaker was placed onto a hotplate and was gently heated to evaporate the solvent. Once the solution was almost to dryness, the solution was transferred to a tared aluminum pan. The pan was then placed back onto the hotplate and heated to complete dryness. Afterwards, the pans were placed into the dessicator to sit overnight. The following day, the pans were weighed and the weights recorded.

Observations:

No observations out of the ordinary were noted.

Acetone, Back Half Rinse-

Procedure:

The exact same procedure was used for the Back Half Rinse as was used for the Front Half Rinse. The only difference was that since PM analysis was not required, when the solvent dried down in the beaker, constant weight was not taken for these samples. After the solvent had evaporated, 25 mL of MeCl2 was added to each

beaker and sonicated for 3 minutes each. The rest of the procedure was the same as that of the Acetone Front Half Rinse.

Observations:
No observations out of the ordinary were noted.

Methylene Chloride, Back Half Rinse-

Procedure:
The solution was poured into a tared beaker. After the solution had been poured into the beaker, another weight was taken to calculate the volume. Once the volume had been determined, the sample was filtered through the buchner funnel. The extract was placed into a clean, 250 mL beaker. The beaker containing the rinse was placed onto a hotplate and gently heated almost to dryness. Once the rinse was almost dry, the solution was transferred to a tared aluminum pan. The pans were placed back onto the hotplate and the solution heated to complete dryness. Once the pans were dry, the aluminum pans were transferred to a desiccator and allowed to sit overnight. The following day, the pans were weighed and the weights recorded.

Observations:
No observations out of the ordinary were noted.

Field Reagent Blanks-

Procedure:
The samples were poured into tared beakers. Weights were taken after the reagent blank rinses were poured in. These final weights were used to calculated the volumes of the reagent blanks. The reagent blanks were allowed to sit on a hotplate at low heat. After the solvents had evaporated, the final weights of the beakers with any contents remaining were taken. Particulate Mass was calculated. For the filter blank, 100 mL of methylene chloride was added to the beaker and sonicated for 3 minutes. Afterwards, the methylene chloride was filtered and poured into a clean beaker. The beaker containing the solvent was heated down to near dryness. The solvent was then transferred to a tared aluminum pan. The pan was placed onto the hotplate and reduced to dryness. The pan was desiccated and weights recorded the next day.

Observations:
There was a lot of particulate matter in the Outlet portion of the MeCl2 BHR Blank.

Laboratory Reagent Blanks-

Procedure:
The same procedures were used for Laboratory Reagent blanks as for the Field Reagent Blanks. Solvents that were used during the extraction process were tested in the reagent blank. A filter from the same lot that was sent to the field was used to go through the extraction process.

Observations:
No observations out of the ordinary were noticed

EASTERN RESEARCH GROUP, INC.

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Meadows (ABC Coke)

Matrix = ***FILTERS***

Method = **PM**

Sample ID:	Weight of Amber jar (g)	Filter Pre-weight (g)	Avg. wt. Of filter+jar (g)	Final weight of filter PM (g)
A-I-M315-1-F (080798-20)	160.3937	0.32121	161.59030	0.8754
A-I-M315-2-F (080898-07)	159.0294	0.33624	160.22695	0.8613
A-I-M315-3-F (080898-16)	159.2766	0.32869	160.63200	1.0267
A-I-M315-FB-F (080898-03)	168.5301	0.33476	168.86500	0.0001
A-O-M315-1-F (080798-08)	158.6706	0.32736	159.00000	0.0020
A-O-M315-2-F (080898-20)	159.4988	0.33727	159.83995	0.0039
A-O-M315-3-F (080898-24)	159.1533	0.32882	159.49325	0.0111
A-O-M315-FB-F (080798-13)	167.1656	0.31986	167.48550	0.0000
A-U-M315-1-F (080898-11)	167.5069	0.33611	167.91045	0.0674
A-U-M315-2-F (080898-12)	167.9281	0.34986	168.36170	0.0837
A-U-M315-3-F (080898-17)	166.7330	0.33930	167.14735	0.0751
A-U-M315-4-F (080898-13)	167.1268	0.33162	167.57910	0.1207
A-U-M315-FB-F (080898-08)	167.1157	0.33071	167.44640	0.0000

Method = **MCEM**

Sample ID:		Weight of Alum. pan (g)	Weight after evaporation (g)	Final weight of MCEM (g)
A-I-M315-1-F	1	1.6384	1.6393	0.0009
A-I-M315-2-F	2	1.6719	1.6722	0.0003
A-I-M315-3-F	3	1.6480	1.6482	0.0002
A-I-M315-FB-F	4	1.6657	1.6657	0.0000
A-O-M315-1-F	5	1.6562	1.6562	0.0000
A-O-M315-2-F	6	1.6565	1.6565	0.0000
A-O-M315-3-F	7	1.6499	1.6499	0.0000
A-O-M315-FB-F	8	1.6601	1.6601	0.0000
A-U-M315-1-F	9	1.6560	1.6560	0.0000
A-U-M315-2-F	10	1.6398	1.6398	0.0000
A-U-M315-3-F	11	1.6524	1.6525	0.0001
A-U-M315-4-F	12	1.6435	1.6435	0.0000
A-U-M315-FB-F	13	1.6358	1.6358	0.0000

ERG
EASTERN RESEARCH GROUP, INC.

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Meadows (ABC Coke)

Matrix = ***Acetone FHR***

Method = **PM**

Sample ID:	Volume of liquid (mL)	Weight of beaker (g)	Avg. weight of rinse (g)	Final weight of filter PM (g)
A-I-M315-1-FH-A	151.8	178.6432	178.72260	0.0794
A-I-M315-2-FH-A	121.2	178.0182	178.14590	0.1277
A-I-M315-3-FH-A	179.3	177.3675	177.46000	0.0925
A-I-M315-FB-FH-A	65.8	178.0854	178.08555	0.0002
A-O-M315-1-FH-A	122.4	173.2616	173.26590	0.0043
A-O-M315-2-FH-A	173.2	175.0847	175.08950	0.0048
A-O-M315-3-FH-A	145.1	165.7398	165.74420	0.0044
A-O-M315-FB-FH-A	113.3	177.5533	177.55335	0.0001
A-U-M315-1-FH-A	160.2	175.1573	175.20535	0.0481
A-U-M315-2-FH-A	117.0	164.5483	164.60570	0.0574
A-U-M315-3-FH-A	203.8	170.4723	170.54025	0.0680
A-U-M315-4-FH-A	135.3	178.4886	178.53745	0.0489
A-U-M315-FB-FH-A	143.1	177.2716	177.27185	0.0002

Matrix = ***Methylene Chloride FHR***

Method = **MCEM**

Sample ID:		Volume of liquid (mL)	Weight of Alum. pan (g)	Weight after evaporation (g)	Final weight of MCEM (g)
A-I-M315-1-FH-M	14	143.7	1.6616	1.6624	0.0008
A-I-M315-2-FH-M	15	164.2	1.6589	1.6592	0.0003
A-I-M315-3-FH-M	16	112.8	1.6636	1.6638	0.0002
A-I-M315-FB-FH-M	17	89.5	1.6564	1.6564	0.0000
A-O-M315-1-FH-M	18	102.1	1.6587	1.6598	0.0011
A-O-M315-2-FH-M	19	191.9	1.6518	1.6523	0.0005
A-O-M315-3-FH-M	20	89.9	1.6254	1.6259	0.0005
A-O-M315-FB-FH-M	21	154.3	1.6625	1.6625	0.0000
A-U-M315-1-FH-M	22	82.5	1.6722	1.6755	0.0033
A-U-M315-2-FH-M	23	103.6	1.6625	1.6630	0.0005
A-U-M315-3-FH-M	24	98.3	1.6631	1.6659	0.0028
A-U-M315-4-FH-M	25	91.7	1.6630	1.6637	0.0007
A-U-M315-FB-FH-M	26	163.2	1.6588	1.6588	0.0000

ERG
EASTERN RESEARCH GROUP, INC.

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Ph. (919) 468-7800

Meadows (ABC Coke)

Matrix = ***Acetone BHR***

Method = **MCEM**

Sample ID:		Volume of liquid (mL)	Weight of Alum. pan (g)	Weight after evaporation (g)	Final weight of MCEM (g)
A-I-M315-1-BH-A	1	75.3	1.7408	1.7413	0.0005
A-I-M315-2-BH-A	2	89.4	1.7404	1.7405	0.0001
A-I-M315-3-BH-A	3	71.6	1.7517	1.7524	0.0007
A-I-M315-FB-BH-A	4	66.2	1.7522	1.7522	0.0000
A-O-M315-1-BH-A	5	131.4	1.7433	1.7442	0.0009
A-O-M315-2-BH-A	6	126.7	1.7652	1.7655	0.0003
A-O-M315-3-BH-A	7	168.4	1.7650	1.7650	0.0000
A-O-M315-FB-BH-A	8	74.3	1.7633	1.7645	0.0012
A-U-M315-1-BH-A	9	82.6	1.7560	1.7563	0.0003
A-U-M315-2-BH-A	10	142.4	1.7402	1.7404	0.0002
A-U-M315-3-BH-A	11	72.9	1.7294	1.7295	0.0001
A-U-M315-4-BH-A	12	146.0	1.7158	1.7161	0.0003
A-U-M315-FB-BH-A	13	52.8	1.7255	1.7256	0.0001

Matrix = ***Methylene Chloride BHR***

Method = **MCEM**

Sample ID:		Volume of liquid (mL)	Weight of Alum. pan (g)	Weight after evaporation (g)	Final weight of MCEM (g)
A-I-M315-1-BH-M	14	234.1	1.7355	1.7439	0.0084
A-I-M315-2-BH-M	15	182.2	1.7231	1.7290	0.0059
A-I-M315-3-BH-M	16	181.6	1.7516	1.7545	0.0029
A-I-M315-FB-BH-M	17	96.8	1.7556	1.7557	0.0001
A-O-M315-1-BH-M	18	205.9	1.7641	1.7787	0.0146
A-O-M315-2-BH-M	19	240.2	1.7535	1.7573	0.0038
A-O-M315-3-BH-M	20	196.7	1.7631	1.7652	0.0021
A-O-M315-FB-BH-M	21	101.4	1.7531	1.7608	0.0077
A-U-M315-1-BH-M	22	172.6	1.7555	1.7573	0.0018
A-U-M315-2-BH-M	23	101.5	1.7441	1.7480	0.0039
A-U-M315-3-BH-M	24	53.7	1.7486	1.7530	0.0044
A-U-M315-4-BH-M	25	173.3	1.7338	1.7350	0.0012
A-U-M315-FB-BH-M	26	57.9	1.7425	1.7428	0.0003

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P.O. Box 2010
Morrisville, NC 27560
Ph. (919) 468-7800

Meadows (ABC Coke)

Matrix = ***H20 Impinger rinses***

Method = **MCEM**

Sample ID:		Volume of liquid (mL)	Weight of Alum. pan (g)	Weight after evaporation (g)	Final weight of MCEM (g)
A-I-M315-1-IMP H20	27	466.7	1.7392	1.7400	0.0008
A-I-M315-2-IMP H20	28	321.9	1.7290	1.7293	0.0003
A-I-M315-3-IMP H20	29	316.6	1.7432	1.7434	0.0002
A-I-M315-FB-IMP H20	30	181.7	1.7382	1.7383	0.0001
A-O-M315-1-IMP H20	31	383.4	1.7439	1.7444	0.0005
A-O-M315-2-IMP H20	32	354.5	1.7405	1.7408	0.0003
A-O-M315-3-IMP H20	33	221.0	1.7516	1.7519	0.0003
A-O-M315-FB-IMP H20	34	271.0	1.7507	1.7508	0.0001
A-U-M315-1-IMP H20	35	581.3	1.7386	1.7389	0.0003
A-U-M315-2-IMP H20	36	596.3	1.7395	1.7397	0.0002
A-U-M315-3-IMP H20	37	627.8	1.7347	1.7351	0.0004
A-U-M315-4-IMP H20	38	556.5	1.7333	1.7335	0.0002
A-U-M315-FB-IMP H20	39	222.4	1.7294	1.7296	0.0002

Matrix = ***Blanks***

Method = **PM**

Sample ID:	Weight of Amber jar (g)	Avg. wt. Of filter+jar (g)	Final weight of filter PM (g)
A-LB-F	167.7995	168.1222	0.0002

Sample ID:	Volume of liquid (mL)	Avg. wt. Of beaker+cont. (g)	Final weight of filter PM (g)
A-LB-Acetone	93.6	104.9438	0.0003
A-LB-MeCl2	96.3	116.2450	0.0001
A-LB-H20	99.2	114.1338	0.0003

Sample ID:	Volume of liquid (mL)	Avg. wt. Of beaker+cont. (g)	Final weight of PM (g)
Lab Blank - Filter		1.7259	0.0002
Lab Blank - Acetone	107.0	116.0317	0.0001
Lab Blank - MeCl2	100.9	111.4530	0.0002

Method = **MCEM**

Sample ID:		Weight of Alum. pan (g)	Weight after evaporation (g)	Final weight of MCEM (g)
A-LB-F	27	1.6667	1.6668	0.0001

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Contents in Aluminum Pans for "FILTERS" represent MCEM from the filter Matrix

Sample ID	Aluminum Pan #
A-I-M315-1-F	1
A-I-M315-2-F	2
A-I-M315-3-F	3
A-I-M315-FB-F	4
A-O-M315-1-F	5
A-O-M315-2-F	6
A-O-M315-3-F	7
A-O-M315-FB-F	8
A-U-M315-1-F	9
A-U-M315-2-F	10
A-U-M315-3-F	11
A-U-M315-4-F	12
A-U-M315-FB-F	13

Contents in Aluminum Pans for MeCl2 FHR represent MCEM from the MeCl2 Matrix

Matrix = **Methylene Chloride FHR**

Sample ID	Aluminum Pan #
A-I-M315-1-FH-M	14
A-I-M315-2-FH-M	15
A-I-M315-3-FH-M	16
A-I-M315-FB-FH-M	17
A-O-M315-1-FH-M	18
A-O-M315-2-FH-M	19
A-O-M315-3-FH-M	20
A-O-M315-FB-FH-M	21
A-U-M315-1-FH-M	22
A-U-M315-2-FH-M	23
A-U-M315-3-FH-M	24
A-U-M315-4-FH-M	25
A-U-M315-FB-FH-M	26

Contents in Aluminum Pans for H2O Imp Rinses represent MCEM from the H20 Imp Rinse Matrix

Matrix = **H2O Impinger Rinses**

Sample ID	Aluminum Pan #
A-I-M315-1-IMP H20	27
A-I-M315-2-IMP H20	28
A-I-M315-3-IMP H20	29
A-I-M315-FB-IMP H20	30
A-O-M315-1-IMP H20	31
A-O-M315-2-IMP H20	32
A-O-M315-3-IMP H20	33
A-O-M315-FB-IMP H20	34
A-U-M315-1-IMP H20	35
A-U-M315-2-IMP H20	36
A-U-M315-3-IMP H20	37
A-U-M315-4-IMP H21	38
A-U-M315-FB-IMP H20	39

Contents in Aluminum Pans for "Acetone BHR" represent MCEM from the Acetone BHR Matrix

Matrix = **Acetone BHR**

Sample ID	Aluminum Pan #
A-I-M315-1-AH-A	1
A-I-M315-2-AH-A	2
A-I-M315-3-AH-A	3
A-I-M315-FB-BH-A	4
A-O-M315-1-AH-A	5
A-O-M315-2-AH-A	6
A-O-M315-3-AH-A	7
A-O-M315-FB-BH-A	8
A-U-M315-1-AH-A	9
A-U-M315-2-AH-A	10
A-U-M315-3-AH-A	11
A-U-M315-4-AH-A	12
A-U-M315-FB-BH-A	13

Contents in Aluminum Pans for MeCl2 BHR represent MCEM from the MeCl2 BHR Matrix

Matrix = **Methylene Chloride BHR**

Sample ID	Aluminum Pan #
A-I-M315-1-AH-M	14
A-I-M315-2-AH-M	15
A-I-M315-3-AH-M	16
A-I-M315-FB-BH-M	17
A-O-M315-1-AH-M	18
A-O-M315-2-AH-M	19
A-O-M315-3-AH-M	20
A-O-M315-FB-BH-M	21
A-U-M315-1-AH-M	22
A-U-M315-2-AH-M	23
A-U-M315-3-AH-M	24
A-U-M315-4-AH-M	25
A-U-M315-FB-BH-M	26

Relinquished by: (Truong Linh Nguyen) Date: 11/2/98
Received by: Dennis P. Holzschuh Date: 11-2-98

Dennis P Holzschuh
Rec'd for Fdy
11/2/98

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Contents in Amber jars represent samples taken from filters

Matrix = **Filters**

Sample ID

A-I-M315-1-F
A-I-M315-2-F
A-I-M315-3-F
A-I-M315-FB-F
A-O-M315-1-F
A-O-M315-2-F
A-O-M315-3-F
A-O-M315-FB-F
A-U-M315-1-F
A-U-M315-2-F
A-U-M315-3-F
A-U-M315-4-F
A-U-M315-FB-F
A-F-RB

Contents in Amber Jars for MeCl2 FHR represent Particulates from the MeCl2 Matrix

Matrix = **Methylene Chloride FHR**

Sample ID

A-I-M315-1-FH-M
A-I-M315-2-FH-M
A-I-M315-3-FH-M
A-I-M315-FB-FH-M
A-O-M315-1-FH-M
A-O-M315-2-FH-M
A-O-M315-3-FH-M
A-O-M315-FB-FH-M
A-U-M315-1-FH-M
A-U-M315-2-FH-M
A-U-M315-3-FH-M
A-U-M315-4-FH-M
A-U-M315-FB-FH-M

Contents in Amber Jars for "Acetone BHR" represent Particulates from the Acetone BHR Matrix

Matrix = **Acetone BHR**

Sample ID

A-I-M315-1-AH-A
A-I-M315-2-AH-A
A-I-M315-3-AH-A
A-I-M315-FB-BH-A
A-O-M315-1-AH-A
A-O-M315-2-AH-A
A-O-M315-3-AH-A
A-O-M315-FB-BH-A
A-U-M315-1-AH-A
A-U-M315-2-AH-A
A-U-M315-3-AH-A
A-U-M315-4-AH-A
A-U-M315-FB-BH-A

Contents in Amber Jars for MeCl2 BHR represent Particulates from the MeCl2 BHR Matrix

Matrix = **Methylene Chloride BHR**

Sample ID

A-I-M315-1-AH-M
A-I-M315-2-AH-M
A-I-M315-3-AH-M
A-I-M315-FB-BH-M
A-O-M315-1-AH-M
A-O-M315-2-AH-M
A-O-M315-3-AH-M
A-O-M315-FB-BH-M
A-U-M315-1-AH-M
A-U-M315-2-AH-M
A-U-M315-3-AH-M
A-U-M315-4-AH-M
A-U-M315-FB-BH-M

Relinquished by: (Tuan-Linh Nguyen) Date: 11/2/98
Received by: Dennis P Holzschuh Date: 11-2-98

Dennis P Holzschuh
Rec'd for FRC
W K Wallace 11/2/98

First Analytical Laboratories

ANALYSIS REPORT

Metals Residues

Project # S512.000

Prepared for:

Pacific Environmental Services, Inc.
5001 S. Miami Blvd.; Suite 300
Research Triangle Park, NC 27711

Reviewed and Approved by:

William H. Wadlin, Ph. D.
Laboratory Manager

November 16, 1998

First Analytical Laboratories

CASE NARRATIVE

Project #: 81101 Report Date: 16-Nov-98
Client: Pacific Environmental Services, Inc.
Client Project ID: S512.000

Samples:

Thirteen sets of samples were submitted for determination of various metals. A blank filter was also provided which required the same analyses. Each set consisted of a filter and several aluminum pans in which extracts of the filters had been dried for a gravimetric measurement already performed by another laboratory. The target elements were antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, lead, manganese, mercury, nickel, phosphorus, selenium, silver, thallium and zinc. All of the samples were hand delivered in good condition, with no apparent damage.

Preparation:

The preparation procedure was that developed for Project # S511.000 which was reported last month. The procedure adopted was to wrap a portion of one of the sample filters around the end of a clean spatula, and use this assembly to swab all of the residue out of all of the corresponding pans of the sample subset. It was then possible to use another filter portion for a second cleaning, taking up any film of desired residue missed by the first swab.

When the pans were cleaned of residue in this way, and all of the residue was on the filters, the filter portions used and any remaining unused were placed in a beaker for digestion. The samples were then prepared according to EPA Method 3050A, which is a nitric acid digestion.

Analysis:

Manganese and zinc were determined by Direct Aspiration Flame Atomic Absorption Spectrophotometry (FLAA). Antimony, arsenic, beryllium, cadmium, chromium, lead, nickel, selenium, silver and thallium were determined by Graphite Furnace Atomic Absorption Spectrophotometry (GFAA). Barium, cobalt, copper and phosphorus were determined by Inductively Coupled Plasma - Optical Emission (ICP).

Results:

The results are reported as total micrograms in the whole combination of original samples for each subset. Mercury was not found in any of the samples. Antimony and silver were found in one or two of the inlet runs, barely above the detection limit, but not in any of the other samples. Cobalt was measurable in all of the inlets, but in none of the other samples.

A most unusual observation is that cadmium in inlet #3 is about thirty times the other two inlets. We believe this result should be discarded as significantly different from the correlative results, and probably not representative of the system under test. We suspect this unusual result is due to contamination either in the lab or in the field. The digestate was run three times with consistent results.

Quality Control:

Traces of manganese and zinc were found in the blank filter, which is not unusual. They are commonly found on blank filters at these low levels. The spike recoveries were all within the normal range of 70% to 130%. The duplicates were all within the normal limit of 20% for all cases in which the sample level is more than five times the detection limit. If the sample level is lower than this it is not possible to make a meaningful evaluation of the deviation between the duplicates.

First Analytical Laboratories
1126 Burning Tree Dr. Chapel Hill, NC 27514
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ANALYSIS REPORT

Project #: 81101
Client: Pacific Environmental Services
Client Project ID: S512.000

Report Date: 16-Nov-98
Date Received: 02-Nov-98

Total Micrograms in Combined Sample

µg

Sample	Sb	As	Ba	Be	Cd	Cr
	GFAA	GFAA	ICP	GFAA	GFAA	GFAA
A-O-M315-1	< 0.3	0.3	4.9	< 0.02	0.09	1.9
A-O-M315-2	< 0.3	0.4	6.9	0.03	0.12	3.0
A-O-M315-3	< 0.3	0.5	7.8	0.04	0.07	3.5
A-O-M315-FB	< 0.3	< 0.3	5.6	0.02	0.03	1.9
A-U-M315-1	< 0.3	2.8	5.4	0.02	0.31	5.2
A-U-M315-2	< 0.3	5.1	12.1	0.07	0.35	10.7
A-U-M315-3	< 0.3	4.1	7.8	0.03	0.45	6.7
A-U-M315-4	< 0.3	4.7	8.3	0.03	0.47	5.8
A-U-M315-FB	< 0.3	0.4	4.3	< 0.02	0.16	1.4
A-I-M315-1	0.5	16.8	36.2	0.35	0.38	12.9
A-I-M315-2	< 0.3	11.5	41.8	0.47	0.36	11.8
A-I-M315-3	< 0.3	9.7	35.6	0.48	10.20	9.8
A-I-M315-FB	< 0.3	< 0.3	3.8	< 0.02	0.04	1.2
BLANK FILTER	< 0.3	< 0.3	< 2.0	< 0.02	< 0.02	< 0.5

QC SUMMARY

Spikes						
% Recovery	93%	113%	94%	83%	92%	92%
Duplicates						
%RPD			6.0%			

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ANALYSIS REPORT

Project #: 81101
Client: Pacific Environmental Services
Client Project ID: S512.000

Report Date: 16-Nov-98
Date Received: 02-Nov-98

Total Micrograms in Combined Sample

µg

Sample	Co ICP	Cu ICP	Mn FLAA	Hg CVAA	Pb GFAA	Ni GFAA
A-O-M315-1	< 1.5	2.8	5.2	< 0.2	1.2	< 1.0
A-O-M315-2	< 1.5	3.6	7.2	< 0.2	2.5	1.8
A-O-M315-3	< 1.5	4.4	8.1	< 0.2	1.6	1.2
A-O-M315-FB	< 1.5	2.5	4.9	< 0.2	1.2	< 1.0
A-U-M315-1	< 1.5	4.9	5.1	< 0.2	8.1	1.1
A-U-M315-2	< 1.5	5.1	8.3	< 0.2	8.4	2.9
A-U-M315-3	< 1.5	4.6	5.5	< 0.2	4.3	1.9
A-U-M315-4	< 1.5	5.7	8.9	< 0.2	5.3	1.6
A-U-M315-FB	< 1.5	2.4	3.6	< 0.2	0.9	< 1.0
A-I-M315-1	2.5	16.1	36.3	< 0.2	20.6	19.6
A-I-M315-2	2.0	11.4	18.7	< 0.2	17.6	14.0
A-I-M315-3	1.6	25.7	20.9	< 0.2	17.1	24.3
A-I-M315-FB	< 1.5	1.5	4.0	< 0.2	0.8	< 1.0
BLANK FILTER	< 1.5	< 1.5	2.7	< 0.2	< 0.3	< 1.0

QC SUMMARY

Spikes % Recovery	87%	93%	96%	104%	93%	105%
Duplicates %RPD	NA	NA	10.2%			

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ANALYSIS REPORT

Project #: 81101
Client: Pacific Environmental Services
Client Project ID: S512.000

Report Date: 16-Nov-98
Date Received: 02-Nov-98

Total Micrograms in Combined Sample

µg

Sample	P	Se	Ag	Tl	Zn
	ICP	GFAA	GFAA	GFAA	FLAA
A-O-M315-1	16	< 0.4	< 0.1	< 0.1	16
A-O-M315-2	15	0.6	< 0.1	< 0.1	18
A-O-M315-3	20	< 0.4	< 0.1	< 0.1	20
A-O-M315-FB	16	< 0.4	< 0.1	< 0.1	8
A-U-M315-1	15	2.0	< 0.1	0.9	31
A-U-M315-2	36	4.3	< 0.1	1.0	37
A-U-M315-3	18	4.5	< 0.1	0.6	34
A-U-M315-4	30	5.2	< 0.1	0.8	35
A-U-M315-FB	11	< 0.4	< 0.1	0.2	11
A-I-M315-1	59	4.4	0.3	1.1	70
A-I-M315-2	56	3.6	0.1	1.1	47
A-I-M315-3	70	4.3	< 0.1	1.2	54
A-I-M315-FB	< 10	< 0.4	< 0.1	< 0.1	12
BLANK FILTER	< 10	< 0.4	< 0.1	< 0.1	5

QC SUMMARY

Spikes					
% Recovery	87%	104%	92%	100%	91%
Duplicates					
%RPD	8.8%				7.0%

ANTIMONY

GFAA ANALYSIS RUN SUMMARY AND CALCULATION WORKSHEET

Client: PES
Proj. #: 81101
Date: 16-Nov-98

IDL = 3.0 µg/L
Postdig'n spike conc. 100.0 µg/L

Sample ID Client	FAL	Test Sol'n µg/L	Dig'te Conc µg/L	FV ml	Dil'n Factor	Init. Vol. ml	Vol. Dig'd ml	Total µg
A-O-M315-1	81101.O1	1.5	1.5	100	1			< 0.30
A-O-M315-2	81101.O2	1.5	1.5	100	1			< 0.30
A-O-M315-3	81101.O3	0.6	0.6	100	1			< 0.30
A-O-M315-FB	81101.OB	2.0	2.0	100	1			< 0.30
A-U-M315-1	81101.U1	1.4	1.4	100	1			< 0.30
A-U-M315-2	81101.U2	2.9	2.9	100	1			< 0.30
A-U-M315-3	81101.U3	2.0	2.0	100	1			< 0.30
A-U-M315-4	81101.U4	0.3	0.3	100	1			< 0.30
B-U-M315-FB	81101.UB	1.5	1.5	100	1			< 0.30
A-I-M315-1	81101.I1	5.3	5.3	100	1.0			0.53
A-I-M315-2	81101.I2	2.2	2.2	100	1.0			< 0.30
A-I-M315-3	81101.I3	-0.1	-0.1	100	1.0			< 0.30
A-I-M315-FB	81101.IB	0.0	0.0	100	1.0			< 0.30
BLANK FILTER	81101.BF	-1.6	-1.6	100	1			< 0.30
SPIKE	81101.O1 S	92.7			% REC	92.7%		

Calibration Data

	Abs.	True conc., µg/L
Blank	0.000	0.0
Standard 1	0.025	10.0
Standard 2	0.085	50.0
Standard 3	0.160	100.0
Standard 4	0.283	200.0

Calibration Verifications

ICV = 100	103.9	CCV2 = 100	108.1
ICB = 0	1.9	CCB2 = 0	0.9
CCV1 = 100	102.3	CCV3 = 100	110.0
CCB1 = 0	0.8	CCB3 = 0	0.5

ARSENIC

GFAA ANALYSIS RUN SUMMARY AND CALCULATION WORKSHEET

Client: PES
Proj. #: 81101
Date: 16-Nov-98

IDL = 3.0 µg/L
Postdig'n spike conc. 100.0 µg/L

Sample ID Client	FAL	Test Sol'n µg/L	Dig'te Conc µg/L	FV ml	Dil'n Factor	Init. Vol. ml	Vol. Dig'd ml		Total µg
A-O-M315-1	81101.O1	3.1	3.1	100	1				0.31
A-O-M315-2	81101.O2	4.3	4.3	100	1				0.43
A-O-M315-3	81101.O3	4.7	4.7	100	1				0.47
A-O-M315-FB	81101.OB	0.6	0.6	100	1			<	0.30
A-U-M315-1	81101.U1	28.3	28.3	100	1				2.83
A-U-M315-2	81101.U2	50.6	50.6	100	1				5.06
A-U-M315-3	81101.U3	41.4	41.4	100	1				4.14
A-U-M315-4	81101.U4	46.6	46.6	100	1				4.66
B-U-M315-FB	81101.UB	3.8	3.8	100	1				0.38
A-I-M315-1	81101.I1	67.1	167.8	100	2.5				16.78
A-I-M315-2	81101.I2	114.7	114.7	100	1.0				11.47
A-I-M315-3	81101.I3	96.9	96.9	100	1.0				9.69
A-I-M315-FB	81101.IB	0.2	0.2	100	1.0			<	0.30
BLANK FILTER	81101.BF	-0.6	-0.6	100	1			<	0.30
SPIKE	81101.O1 S	116.5			% REC	113.4%			

Calibration Data

	Abs.	True conc., µg/L
Blank	0.000	0.0
Standard 1	0.018	10.0
Standard 2	0.120	50.0
Standard 3	0.237	100.0
Standard 4	0.465	200.0

Calibration Verifications

ICV = 100	100.7	CCV2 = 100	107.0
ICB = 0	0.2	CCB2 = 0	2.9
CCV1 = 100	106.9	CCV3 = 100	
CCB1 = 0	-0.3	CCB3 = 0	

BARIUM

ICP ANALYSIS RUN SUMMARY AND CALCULATION WORKSHEET

Client: PES
Proj. #: 81101
Date: 16-Nov-98

IDL = 20 µg/L
Postdig'n spike conc. 500 µg/L

Sample ID Client	FAL	Test Sol'n µg/L	Dig'te Conc µg/L	FV ml	Dil'n Factor	Init. Vol. ml	Vol. Dig'd ml	Total µg
A-O-M315-1	81101.O1	49	49	100	1			4.9
A-O-M315-2	81101.O2	69	69	100	1			6.9
A-O-M315-3	81101.O3	78	78	100	1			7.8
A-O-M315-FB	81101.OB	56	56	100	1			5.6
A-U-M315-1	81101.U1	54	54	100	1			5.4
A-U-M315-2	81101.U2	121	121	100	1			12.1
A-U-M315-3	81101.U3	78	78	100	1			7.8
A-U-M315-4	81101.U4	83	83	100	1			8.3
B-U-M315-FB	81101.UB	43	43	100	1			4.3
A-I-M315-1	81101.I1	362	362	100	1			36.2
A-I-M315-2	81101.I2	418	418	100	1			41.8
A-I-M315-3	81101.I3	356	356	100	1			35.6
A-I-M315-FB	81101.IB	38	38	100	1			3.8
BLANK FILTER	81101.BF	19	19	100	1			< 2.0
SPIKE	81101.O1 S	518			% REC	93.8%		
DUPLICATE	81101.O2 D	65			%RPD	6.0%		

Calibration Data

	Emiss.	True conc., µg/L
Blank	17	0
Standard 1	54	20
Standard 2	136	100
Standard 3	1158	1000
Standard 4	2403	2000

Calibration Verifications

ICV = 1000	1059	CCV2 = 1000	963
ICB = 0	13	CCB2 = 0	16
CCV1 = 1000	1159		964
CCB1 = 0	21		16

BERYLLIUM

GFAA ANALYSIS RUN SUMMARY AND CALCULATION WORKSHEET

Client: PES
Proj. #: 81101
Date: 16-Nov-98

IDL = 0.2 µg/L
Postdig'n spike conc. 5.0 µg/L

Sample ID Client	FAL	Test Sol'n µg/L	Dig'te Conc µg/L	FV ml	Dil'n Factor	Init. Vol. ml	Vol. Dig'd ml		Total µg
A-O-M315-1	81101.O1	0.1	0.1	100	1			<	0.02
A-O-M315-2	81101.O2	0.3	0.3	100	1				0.03
A-O-M315-3	81101.O3	0.4	0.4	100	1				0.04
A-O-M315-FB	81101.OB	0.2	0.2	100	1				0.02
A-U-M315-1	81101.U1	0.2	0.2	100	1				0.02
A-U-M315-2	81101.U2	0.7	0.7	100	1				0.07
A-U-M315-3	81101.U3	0.3	0.3	100	1				0.03
A-U-M315-4	81101.U4	0.3	0.3	100	1				0.03
B-U-M315-FB	81101.UB	0.2	0.2	100	1			<	0.02
A-I-M315-1	81101.I1	3.5	3.5	100	1.0				0.35
A-I-M315-2	81101.I2	4.7	4.7	100	1.0				0.47
A-I-M315-3	81101.I3	4.8	4.8	100	1.0				0.48
A-I-M315-FB	81101.IB	0.1	0.1	100	1.0			<	0.02
BLANK FILTER	81101.BF	0.0	0.0	100	1			<	0.02
SPIKE	81101.O1 S	4.2			% REC	83.2%			

Calibration Data

	Abs.	True conc., µg/L
Blank	0.000	0.0
Standard 1	0.014	0.5
Standard 2	0.047	2.0
Standard 3	0.104	5.0
Standard 4	0.141	10.0

Calibration Verifications

ICV = 5	5.24	CCV2 = 5	4.32
ICB = 0	0.04	CCB2 = 0	0.03
CCV1 = 5	4.41	CCV3 = 5	
CCB1 = 0	0.05	CCB3 = 0	

CADMIUM

GFAA ANALYSIS RUN SUMMARY AND CALCULATION WORKSHEET

Client: PES
Proj. #: 81101
Date: 16-Nov-98

IDL = 0.2 µg/L
Postdig'n spike conc. 6.0 µg/L

Sample ID Client	FAL	Test Sol'n µg/L	Dig'te Conc µg/L	FV ml	Dil'n Factor	Init. Vol. ml	Vol. Dig'd ml	Total µg
A-O-M315-1	81101.O1	0.89	0.89	100	1			0.089
A-O-M315-2	81101.O2	1.21	1.21	100	1			0.121
A-O-M315-3	81101.O3	0.70	0.70	100	1			0.070
A-O-M315-FB	81101.OB	0.34	0.34	100	1			0.034
A-U-M315-1	81101.U1	3.08	3.08	100	1			0.308
A-U-M315-2	81101.U2	3.51	3.51	100	1			0.351
A-U-M315-3	81101.U3	4.52	4.52	100	1			0.452
A-U-M315-4	81101.U4	4.74	4.74	100	1			0.474
B-U-M315-FB	81101.UB	1.57	1.57	100	1			0.157
A-I-M315-1	81101.I1	1.52	3.80	100	2.5			0.380
A-I-M315-2	81101.I2	3.56	3.56	100	1.0			0.356
A-I-M315-3	81101.I3	5.09	101.80	100	20.0			10.180
A-I-M315-FB	81101.IB	0.41	0.41	100	1.0			0.041
BLANK FILTER	81101.BF	0.10	0.10	100	1			< 0.020
SPIKE	81101.O1 S	6.42			% REC	92.2%		

Calibration Data

	Abs.	True conc., µg/L
Blank	0.000	0.0
Standard 1	0.024	0.5
Standard 2	0.111	2.0
Standard 3	0.333	6.0
Standard 4	0.526	10.0

Calibration Verifications

ICV = 6	6.05	CCV2 = 6	6.40
ICB = 0	-0.07	CCB2 = 0	-0.18
CCV1 = 6	6.61	CCV3 = 6	6.42
CCB1 = 0	-0.03	CCB3 = 0	-0.15

CHROMIUM

GFAA ANALYSIS RUN SUMMARY AND CALCULATION WORKSHEET

Client: PES
Proj. #: 81101
Date: 16-Nov-98

IDL = 5.0 µg/L
Postdig'n spike conc. 50.0 µg/L

Sample ID Client	FAL	Test Sol'n µg/L	Dig'te Conc µg/L	FV ml	Dil'n Factor	Init. Vol. ml	Vol. Dig'd ml	Total µg
A-O-M315-1	81101.O1	18.5	18.5	100	1			1.9
A-O-M315-2	81101.O2	30.2	30.2	100	1			3.0
A-O-M315-3	81101.O3	34.7	34.7	100	1			3.5
A-O-M315-FB	81101.OB	19.0	19.0	100	1			1.9
A-U-M315-1	81101.U1	51.6	51.6	100	1			5.2
A-U-M315-2	81101.U2	107.1	107.1	100	1			10.7
A-U-M315-3	81101.U3	67.2	67.2	100	1			6.7
A-U-M315-4	81101.U4	57.6	57.6	100	1			5.8
B-U-M315-FB	81101.UB	14.2	14.2	100	1			1.4
A-I-M315-1	81101.I1	51.4	128.5	100	2.5			12.9
A-I-M315-2	81101.I2	47.2	118.0	100	2.5			11.8
A-I-M315-3	81101.I3	39.3	98.3	100	2.5			9.8
A-I-M315-FB	81101.IB	12.1	12.1	100	1.0			1.2
BLANK FILTER	81101.BF	3.6	3.6	100	1		<	0.5
SPIKE	81101.O1 S	64.7			% REC	92.4%		

Calibration Data

	Abs.	True conc., µg/L
Blank	0.000	0.0
Standard 1	0.072	10.0
Standard 2	0.159	20.0
Standard 3	0.398	50.0
Standard 4	0.841	100.0

Calibration Verifications

ICV = 50	50.9	CCV2 = 50	50.8
ICB = 0	1.0	CCB2 = 0	1.0
CCV1 = 50	49.8	CCV3 = 50	
CCB1 = 0	0.0	CCB3 = 0	

COBALT

ICP ANALYSIS RUN SUMMARY AND CALCULATION WORKSHEET

Client: PES
Proj. #: 81100
Date: 16-Nov-98

IDL = 15 µg/L
Postdig'n spike conc. 1000 µg/L

Sample ID Client	FAL	Test Sol'n µg/L	Dig'te Conc µg/L	FV ml	Dil'n Factor	Init. Vol. ml	Vol. Dig'd ml	Total µg
A-O-M315-1	81101.O1	2	2	100	1			< 1.5
A-O-M315-2	81101.O2	-4	-4	100	1			< 1.5
A-O-M315-3	81101.O3	-10	-10	100	1			< 1.5
A-O-M315-FB	81101.OB	0	0	100	1			< 1.5
A-U-M315-1	81101.U1	-3	-3	100	1			< 1.5
A-U-M315-2	81101.U2	-1	-1	100	1			< 1.5
A-U-M315-3	81101.U3	1	1	100	1			< 1.5
A-U-M315-4	81101.U4	1	1	100	1			< 1.5
B-U-M315-FB	81101.UB	-5	-5	100	1			< 1.5
A-I-M315-1	81101.I1	25	25	100	1			2.5
A-I-M315-2	81101.I2	20	20	100	1			2.0
A-I-M315-3	81101.I3	16	16	100	1			1.6
A-I-M315-FB	81101.IB	-6	-6	100	1			< 1.5
BLANK FILTER	81101.BF	-4	-4	100	1			< 1.5
SPIKE	81101.O1 S	873			% REC	87.3%		
DUPLICATE	81101.O2 D	-3			%RPD	NA		

Calibration Data

	Emiss.	True conc., µg/L
Blank	395	0
Standard 1	482	20
Standard 2	681	100
Standard 3	1669	500
Standard 4	2940	1000

Calibration Verifications

ICV = 500	498	CCV2 = 500	607
ICB = 0	3	CCB2 = 0	6
CCV1 = 500	593		
CCB1 = 0	5		

COPPER

ICP ANALYSIS RUN SUMMARY AND CALCULATION WORKSHEET

Client: PES
Proj. #: 81100
Date: 16-Nov-98

IDL = 15 µg/L
Postdig'n spike conc. 500 µg/L

Sample ID Client	FAL	Test Sol'n µg/L	Dig'te Conc µg/L	FV ml	Dil'n Factor	Init. Vol. ml	Vol. Dig'd ml	Total µg
A-O-M315-1	81101.O1	28	28	100	1			2.8
A-O-M315-2	81101.O2	36	36	100	1			3.6
A-O-M315-3	81101.O3	44	44	100	1			4.4
A-O-M315-FB	81101.OB	25	25	100	1			2.5
A-U-M315-1	81101.U1	49	49	100	1			4.9
A-U-M315-2	81101.U2	51	51	100	1			5.1
A-U-M315-3	81101.U3	46	46	100	1			4.6
A-U-M315-4	81101.U4	57	57	100	1			5.7
B-U-M315-FB	81101.UB	24	24	100	1			2.4
A-I-M315-1	81101.I1	161	161	100	1			16.1
A-I-M315-2	81101.I2	114	114	100	1			11.4
A-I-M315-3	81101.I3	257	257	100	1			25.7
A-I-M315-FB	81101.IB	15	15	100	1			1.5
BLANK FILTER	81101.BF	9	9	100	1		<	1.5
SPIKE	81101.O1 S	492			% REC	92.8%		
DUPLICATE	81101.O2 D	37			%RPD	NA		

Calibration Data

	Emiss.	True conc., µg/L
Blank	1229	0
Standard 1	1564	20
Standard 2	2760	100
Standard 3	9073	500
Standard 4	17578	1000

Calibration Verifications

ICV = 500	499	CCV2 = 500	513
ICB = 0	8	CCB2 = 0	13
CCV1 = 500	574		
CCB1 = 0	11		

LEAD

GFAA ANALYSIS RUN SUMMARY AND CALCULATION WORKSHEET

Client: PES
Proj. #: 81101
Date: 16-Nov-98

IDL = 3.0 µg/L
Postdig'n spike conc. 100.0 µg/L

Sample ID Client	FAL	Test Sol'n µg/L	Dig'te Conc µg/L	FV ml	Dil'n Factor	Init. Vol. ml	Vol. Dig'd ml	Total µg
A-O-M315-1	81101.O1	11.9	11.9	100	1			1.19
A-O-M315-2	81101.O2	25.4	25.4	100	1			2.54
A-O-M315-3	81101.O3	15.5	15.5	100	1			1.55
A-O-M315-FB	81101.OB	11.8	11.8	100	1			1.18
A-U-M315-1	81101.U1	81.3	81.3	100	1			8.13
A-U-M315-2	81101.U2	84.4	84.4	100	1			8.44
A-U-M315-3	81101.U3	43.0	43.0	100	1			4.30
A-U-M315-4	81101.U4	53.3	53.3	100	1			5.33
B-U-M315-FB	81101.UB	8.8	8.8	100	1			0.88
A-I-M315-1	81101.I1	82.2	205.5	100	2.5			20.55
A-I-M315-2	81101.I2	175.7	175.7	100	1.0			17.57
A-I-M315-3	81101.I3	170.6	170.6	100	1.0			17.06
A-I-M315-FB	81101.IB	7.5	7.5	100	1.0			0.75
BLANK FILTER	81101.BF	2.5	2.5	100	1			< 0.30
SPIKE	81101.O1 S	104.9			% REC	93.0%		

Calibration Data

	Abs.	True conc., µg/L
Blank	0.000	0.0
Standard 1	0.024	10.0
Standard 2	0.118	50.0
Standard 3	0.237	100.0
Standard 4	0.409	200.0

Calibration Verifications

ICV = 100	99.6	CCV2 = 100	103.2
ICB = 0	2.0	CCB2 = 0	1.4
CCV1 = 100	98.5	CCV3 = 100	
CCB1 = 0	1.2	CCB3 = 0	

MANGANESE

FLAA ANALYSIS RUN SUMMARY AND CALCULATION WORKSHEET

Client: PES
Proj. #: 81100
Date: 16-Nov-98

IDL = 25 µg/L
Postdig'n spike conc. 400 µg/L

Sample ID Client	FAL	Test Sol'n µg/L	Dig'te Conc µg/L	FV ml	Dil'n Factor	Init. Vol. ml	Vol. Dig'd ml	Total µg
A-O-M315-1	81101.O1	52	52	100	1			5.2
A-O-M315-2	81101.O2	72	72	100	1			7.2
A-O-M315-3	81101.O3	81	81	100	1			8.1
A-O-M315-FB	81101.OB	49	49	100	1			4.9
A-U-M315-1	81101.U1	51	51	100	1			5.1
A-U-M315-2	81101.U2	83	83	100	1			8.3
A-U-M315-3	81101.U3	55	55	100	1			5.5
A-U-M315-4	81101.U4	89	89	100	1			8.9
B-U-M315-FB	81101.UB	36	36	100	1			3.6
A-I-M315-1	81101.I1	363	363	100	1			36.3
A-I-M315-2	81101.I2	187	187	100	1			18.7
A-I-M315-3	81101.I3	209	209	100	1			20.9
A-I-M315-FB	81101.IB	40	40	100	1			4.0
BLANK FILTER	81101.BF	27	27	100	1			2.7
SPIKE	81101.O1 S	434			% REC	95.5%		
DUPLICATE	81101.O2 D	65			%RPD	10.2%		

MANGANESE

QUALITY CONTROL DATA

Client: PES
Proj. #: 81101
Date: 16-Nov-98

Calibration Data

	Abs.	True conc., µg/L
Blank	0.000	0
Standard 1	0.009	50
Standard 2	0.014	100
Standard 3	0.028	200
Standard 4	0.066	500
Standard 5	0.132	1000

Calibration Verifications

ICV = 500	509	CCV2 = 500	504
ICB = 0	13	CCB2 = 0	11
CCV1 = 500	536		
CCB1 = 0	24		

MERCURY

CVAA ANALYSIS RUN SUMMARY AND CALCULATION WORKSHEET

Client: PES
Proj. #: 81100
Date: 16-Nov-98

IDL = 0.20 µg/L
Postdig'n spike conc. 5.00 µg/L

Sample ID Client	FAL	Test Sol'n µg/L	Dig'te Conc µg/L	FV ml	Dil'n Factor	Init. Vol. ml	Aliquot Dig'd ml		Total µg
A-O-M315-1	81101.O1	-0.03	-0.03	100	1	100	10	<	0.20
A-O-M315-2	81101.O2	-0.02	-0.02	100	1	100	10	<	0.20
A-O-M315-3	81101.O3	-0.06	-0.06	100	1	100	10	<	0.20
A-O-M315-FB	81101.OB	-0.09	-0.09	100	1	100	10	<	0.20
A-U-M315-1	81101.U1	-0.06	-0.06	100	1	100	10	<	0.20
A-U-M315-2	81101.U2	-0.07	-0.07	100	1	100	10	<	0.20
A-U-M315-3	81101.U3	-0.06	-0.06	100	1	100	10	<	0.20
A-U-M315-4	81101.U4	-0.04	-0.04	100	1	100	10	<	0.20
B-U-M315-FB	81101.UB	-0.04	-0.04	100	1	100	10	<	0.20
A-I-M315-1	81101.I1	0.01	0.01	100	1	100	10	<	0.20
A-I-M315-2	81101.I2	0.01	0.01	100	1	100	10	<	0.20
A-I-M315-3	81101.I3	-0.07	-0.07	100	1	100	10	<	0.20
A-I-M315-FB	81101.IB	-0.03	-0.03	100	1	100	10	<	0.20
BLANK FILTER	81101.BF	-0.07	-0.07	100	1	100	10	<	0.20
SPIKE	81101.O1 S	5.19			% REC	103.7%			

MERCURY

QUALITY CONTROL DATA

Client: PES
Proj. #: 81101
Date: 16-Nov-98

Calibration Data

	Abs.	True conc., µg/L
Blank	0.000	0.0
Standard 1	0.012	0.5
Standard 2	0.026	1.0
Standard 3	0.052	2.0
Standard 4	0.131	5.0
Standard 5	0.253	10.0

Calibration Verifications

ICV = 5	5.08	CCV2 = 5	4.99
ICB = 0	-0.11	CCB2 = 0	-0.14
CCV1 = 5	5.19	CCV3 = 5	
CCB1 = 0	-0.06	CCB3 = 0	

NICKEL

GFAA ANALYSIS RUN SUMMARY AND CALCULATION WORKSHEET

Client: PES
Proj. #: 81101
Date: 16-Nov-98

IDL = 10.0 µg/L
Postdig'n spike conc. 100.0 µg/L

Sample ID Client	FAL	Test Sol'n µg/L	Dig'te Conc µg/L	FV ml	Dil'n Factor	Init. Vol. ml	Vol. Dig'd ml		Total µg
A-O-M315-1	81101.O1	7.8	7.8	100	1			<	1.00
A-O-M315-2	81101.O2	18.0	18.0	100	1				1.80
A-O-M315-3	81101.O3	12.1	12.1	100	1				1.21
A-O-M315-FB	81101.OB	5.5	5.5	100	1			<	1.00
A-U-M315-1	81101.U1	10.9	10.9	100	1				1.09
A-U-M315-2	81101.U2	28.6	28.6	100	1				2.86
A-U-M315-3	81101.U3	18.9	18.9	100	1				1.89
A-U-M315-4	81101.U4	15.9	15.9	100	1				1.59
B-U-M315-FB	81101.UB	2.3	2.3	100	1			<	1.00
A-I-M315-1	81101.I1	78.3	195.8	100	2.5				19.58
A-I-M315-2	81101.I2	139.8	139.8	100	1.0				13.98
A-I-M315-3	81101.I3	97.3	243.3	100	2.5				24.33
A-I-M315-FB	81101.IB	1.8	1.8	100	1.0			<	1.00
BLANK FILTER	81101.BF	0.0	0.0	100	1			<	1.00
SPIKE	81101.O1 S	105.1			% REC	105.1%			

Calibration Data

	Abs.	True conc., µg/L
Blank	0.000	0.0
Standard 1	0.019	20.0
Standard 2	0.101	50.0
Standard 3	0.201	100.0
Standard 4	0.396	200.0

Calibration Verifications

ICV = 100	101.7	CCV2 = 100	105.8
ICB = 0	-1.4	CCB2 = 0	1.0
CCV1 = 100	95.9	CCV3 = 100	
CCB1 = 0	-4.3	CCB3 = 0	

PHOSPHORUS

RUN 1

ICP ANALYSIS RUN SUMMARY AND CALCULATION WORKSHEET

Client: PES
Proj. #: 81100
Date: 16-Nov-98

IDL = 100 µg/L
Postdig'n spike conc. 2000 µg/L

Sample ID Client	FAL	Test Sol'n µg/L	Dig'te Conc µg/L	FV ml	Dil'n Factor	Init. Vol. ml	Vol. Dig'd ml		Total µg
A-O-M315-1	81101.O1	163	163	100	1				16.3
A-O-M315-2	81101.O2	152	152	100	1				15.2
A-O-M315-3	81101.O3	195	195	100	1				19.5
A-O-M315-FB	81101.OB	156	156	100	1				15.6
A-U-M315-1	81101.U1		0	100	1				
A-U-M315-2	81101.U2		0	100	1				
A-U-M315-3	81101.U3		0	100	1				
A-U-M315-4	81101.U4		0	100	1				
B-U-M315-FB	81101.UB	113	113	100	1				11.3
A-I-M315-1	81101.I1		0	100	1				
A-I-M315-2	81101.I2		0	100	1				
A-I-M315-3	81101.I3		0	100	1				
A-I-M315-FB	81101.IB	84	84	100	1			<	10.0
BLANK FILTER	81101.BF	54	54	100	1			<	10.0
SPIKE	81101.O1 S	1902			% REC	87.0%			
DUPLICATE	81101.O2 D	166			%RPD	8.8%			

PHOSPHORUS

QUALITY CONTROL DATA

Client: PES
Proj. #: 81101
Date: 16-Nov-98

Calibration Data

	Emiss.	True conc., µg/L
Blank	252	0
Standard 1	292	200
Standard 2	451	1000
Standard 3	669	2000
Standard 4	1280	5000

Calibration Verifications

ICV = 2000	1976	CCV2 = 2000
ICB = 0	79	CCB2 = 0
CCV1 = 2000	2368	
CCB1 = 0	11	

PHOSPHORUS

RUN 2

ICP ANALYSIS RUN SUMMARY AND CALCULATION WORKSHEET

Client: PES
Proj. #: 81100
Date: 16-Nov-98

IDL = 100 µg/L
Postdig'n spike conc. 2000 µg/L

Sample ID Client	FAL	Test Sol'n µg/L	Dig'te Conc µg/L	FV ml	Dil'n Factor	Init. Vol. ml	Vol. Dig'd ml	Total µg
A-O-M315-1	81101.O1		0	100	1			
A-O-M315-2	81101.O2		0	100	1			
A-O-M315-3	81101.O3		0	100	1			
A-O-M315-FB	81101.OB		0	100	1			
A-U-M315-1	81101.U1	149	149	100	1			14.9
A-U-M315-2	81101.U2	359	359	100	1			35.9
A-U-M315-3	81101.U3	175	175	100	1			17.5
A-U-M315-4	81101.U4	301	301	100	1			30.1
B-U-M315-FB	81101.UB		0	100	1			
A-I-M315-1	81101.I1	593	593	100	1			59.3
A-I-M315-2	81101.I2	558	558	100	1			55.8
A-I-M315-3	81101.I3	700	700	100	1			70.0
A-I-M315-FB	81101.IB		0	100	1			

PHOSPHORUS

QUALITY CONTROL DATA

Client: PES
Proj. #: 81101
Date: 16-Nov-98

Calibration Data

	Emiss.	True conc., µg/L
Blank	276	0
Standard 1	329	200
Standard 2	513	1000
Standard 3	748	2000
Standard 4	1419	5000

Calibration Verifications

ICV = 2000	2095	CCV2 = 2000
ICB = 0	88	CCB2 = 0
CCV1 = 2000	2205	
CCB1 = 0	88	

SELENIUM

GFAA ANALYSIS RUN SUMMARY AND CALCULATION WORKSHEET

Client: PES
Proj. #: 81101
Date: 16-Nov-98

IDL = 4 µg/L
Postdig'n spike conc. 50 µg/L

Sample ID Client	FAL	Test Sol'n µg/L	Dig'te Conc µg/L	FV ml	Dil'n Factor	Init. Vol. ml	Vol. Dig'd ml		Total µg
A-O-M315-1	81101.O1	0.6	0.6	100	1			<	0.4
A-O-M315-2	81101.O2	5.9	5.9	100	1				0.6
A-O-M315-3	81101.O3	1.5	1.5	100	1			<	0.4
A-O-M315-FB	81101.OB	3.6	3.6	100	1			<	0.4
A-U-M315-1	81101.U1	20.2	20.2	100	1				2.0
A-U-M315-2	81101.U2	43.2	43.2	100	1				4.3
A-U-M315-3	81101.U3	44.6	44.6	100	1				4.5
A-U-M315-4	81101.U4	52.2	52.2	100	1				5.2
B-U-M315-FB	81101.UB	3.3	3.3	100	1			<	0.4
A-I-M315-1	81101.I1	17.6	44.0	100	2.5				4.4
A-I-M315-2	81101.I2	35.5	35.5	100	1.0				3.6
A-I-M315-3	81101.I3	43.3	43.3	100	1.0				4.3
A-I-M315-FB	81101.IB	-1.5	-1.5	100	1.0			<	0.4
BLANK FILTER	81101.BF	1.9	1.9	100	1			<	0.4
SPIKE	81101.O1 S	52.1			% REC	104.2%			

Calibration Data

	Abs.	True conc., µg/L
Blank	0.000	0.0
Standard 1	0.021	10.0
Standard 2	0.048	25.0
Standard 3	0.100	50.0
Standard 4	0.194	100.0

Calibration Verifications

ICV = 50	53.0	CCV2 = 50	58.0
ICB = 0	-3.8	CCB2 = 0	3.3
CCV1 = 50	57.0		
CCB1 = 0	-1.7		

SILVER

GFAA ANALYSIS RUN SUMMARY AND CALCULATION WORKSHEET

Client: PES
Proj. #: 81101
Date: 16-Nov-98

IDL = 1.0 µg/L
Postdig'n spike conc. 10.0 µg/L

Sample ID Client	FAL	Test Sol'n µg/L	Dig'te Conc µg/L	FV ml	Dil'n Factor	Init. Vol. ml	Vol. Dig'd ml		Total µg
A-O-M315-1	81101.O1	0.6	0.6	100	1			<	0.1
A-O-M315-2	81101.O2	0.3	0.3	100	1			<	0.1
A-O-M315-3	81101.O3	0.2	0.2	100	1			<	0.1
A-O-M315-FB	81101.OB	0.3	0.3	100	1			<	0.1
A-U-M315-1	81101.U1	0.8	0.8	100	1			<	0.1
A-U-M315-2	81101.U2	0.5	0.5	100	1			<	0.1
A-U-M315-3	81101.U3	0.4	0.4	100	1			<	0.1
A-U-M315-4	81101.U4	0.8	0.8	100	1			<	0.1
B-U-M315-FB	81101.UB	0.4	0.4	100	1			<	0.1
A-I-M315-1	81101.I1	2.8	2.8	100	1.0				0.3
A-I-M315-2	81101.I2	1.4	1.4	100	1.0				0.1
A-I-M315-3	81101.I3	0.3	0.3	100	1.0			<	0.1
A-I-M315-FB	81101.IB	0.1	0.1	100	1.0			<	0.1
BLANK FILTER	81101.BF	0.1	0.1	100	1			<	0.1
SPIKE	81101.O1 S	9.2			% REC	91.7%			

Calibration Data

	Abs.	True conc., µg/L
Blank	0.000	0.0
Standard 1	0.093	5.0
Standard 2	0.186	10.0
Standard 3	0.364	20.0
Standard 4	0.547	30.0

Calibration Verifications

ICV = 20	21.2	CCV2 = 20	19.6
ICB = 0	0.3	CCB2 = 0	-0.1
CCV1 = 20	20.5	CCV3 = 20	18.1
CCB1 = 0	-0.1	CCB3 = 0	-0.6

THALLIUM

GFAA ANALYSIS RUN SUMMARY AND CALCULATION WORKSHEET

Client: PES
Proj. #: 81101
Date: 16-Nov-98

IDL = 1.0 µg/L
Postdig'n spike conc. 50.0 µg/L

Sample ID Client	FAL	Test Sol'n µg/L	Dig'te Conc µg/L	FV ml	Dil'n Factor	Init. Vol. ml	Vol. Dig'd ml		Total µg
A-O-M315-1	81101.O1	0.3	0.3	100	1			<	0.10
A-O-M315-2	81101.O2	0.6	0.6	100	1			<	0.10
A-O-M315-3	81101.O3	0.6	0.6	100	1			<	0.10
A-O-M315-FB	81101.OB	0.5	0.5	100	1			<	0.10
A-U-M315-1	81101.U1	9.1	9.1	100	1				0.91
A-U-M315-2	81101.U2	10.3	10.3	100	1				1.03
A-U-M315-3	81101.U3	6.1	6.1	100	1				0.61
A-U-M315-4	81101.U4	8.4	8.4	100	1				0.84
B-U-M315-FB	81101.UB	1.9	1.9	100	1				0.19
A-I-M315-1	81101.I1	10.9	10.9	100	1.0				1.09
A-I-M315-2	81101.I2	11.2	11.2	100	1.0				1.12
A-I-M315-3	81101.I3	11.6	11.6	100	1.0				1.16
A-I-M315-FB	81101.IB	0.7	0.7	100	1.0			<	0.10
BLANK FILTER	81101.BF	0.1	0.1	100	1			<	0.10
SPIKE	81101.O1 S	50.1			% REC	100.2%			

Calibration Data

	Abs.	True conc., µg/L
Blank	0.000	0.0
Standard 1	0.022	10.0
Standard 2	0.042	20.0
Standard 3	0.102	50.0
Standard 4	0.186	100.0

Calibration Verifications

ICV = 50	51.3	CCV2 = 50	52.8
ICB = 0	0.2	CCB2 = 0	0.3
CCV1 = 50	48.9	CCV3 = 50	
CCB1 = 0	0.1	CCB3 = 0	

Z I N C

FLAA ANALYSIS RUN SUMMARY AND CALCULATION WORKSHEET

Client: PES
Proj. #: 81100
Date: 16-Nov-98

IDL = 15 µg/L
Postdig'n spike conc. 400 µg/L

Sample ID Client	FAL	Test Sol'n µg/L	Dig'te Conc µg/L	FV ml	Dil'n Factor	Init. Vol. ml	Vol. Dig'd ml	Total µg
A-O-M315-1	81101.O1	155	155	100	1			15.5
A-O-M315-2	81101.O2	177	177	100	1			17.7
A-O-M315-3	81101.O3	204	204	100	1			20.4
A-O-M315-FB	81101.OB	82	82	100	1			8.2
A-U-M315-1	81101.U1	312	312	100	1			31.2
A-U-M315-2	81101.U2	373	373	100	1			37.3
A-U-M315-3	81101.U3	342	342	100	1			34.2
A-U-M315-4	81101.U4	354	354	100	1			35.4
B-U-M315-FB	81101.UB	110	110	100	1			11.0
A-I-M315-1	81101.I1	700	700	100	1			70.0
A-I-M315-2	81101.I2	470	470	100	1			47.0
A-I-M315-3	81101.I3	540	540	100	1			54.0
A-I-M315-FB	81101.IB	121	121	100	1			12.1
BLANK FILTER	81101.BF	47	47	100	1			4.7
SPIKE	81101.O1 S	518			% REC	90.8%		
DUPLICATE	81101.O2 D	165			%RPD	7.0%		

ZINC

QUALITY CONTROL DATA

Client: PES
Proj. #: 81101
Date: 16-Nov-98

Calibration Data

	Abs.	True conc., µg/L
Blank	0.000	0
Standard 1	0.021	50
Standard 2	0.041	100
Standard 3	0.081	200
Standard 4	0.194	500
Standard 5	0.359	1000

Calibration Verifications

ICV = 500	486	CCV2 = 500	520
ICB = 0	5	CCB2 = 0	12
CCV1 = 500	514		
CCB1 = 0	4		

Element File: SB.GEL
Date: 11/05/98
Data File:
Technique: HGA

Element: Sb
Time: 12:01
ID/Wt File: 81101.IDW
Calib. Type: Linear

Wavelength: 217.
Slit: 0.7 L
Lamp Current: 0
Energy: 37

Sb ID: BLANK Seq. No.: 00086 A/S Pos.: 0 Date: 11/05

Replicate 1
Peak Area (A-s): -0.000
Background Pk Area (A-s): 0.138
Blank Corrected Pk Area (A-s): 0.007
Concentration (ug/L): 4.9

Time: 12:01
Peak Height (A): 0.027
Background Pk Height (A): 0.073

Replicate 2
Peak Area (A-s): -0.004
Background Pk Area (A-s): 0.125
Blank Corrected Pk Area (A-s): 0.003
Concentration (ug/L): 2.3

Time: 12:04
Peak Height (A): 0.026
Background Pk Height (A): 0.071

Mean Conc (ug/L): 3.6 SD: 1.86 RSD(%): 51.6

Auto-zero performed.

Sb ID: 10 PPB Seq. No.: 00087 A/S Pos.: 1 Date: 11/05

Replicate 1
Peak Area (A-s): 0.028
Background Pk Area (A-s): 0.125
Blank Corrected Pk Area (A-s): 0.030
Concentration (ug/L): 21.8

Time: 12:07
Peak Height (A): 0.050
Background Pk Height (A): 0.074

Sb ID: BLANK Seq. No.: 00088 A/S Pos.: 0 Date: 11/05/

Replicate 1
Peak Area (A-s): -0.004
Background Pk Area (A-s): 0.125
Blank Corrected Pk Area (A-s): -0.001
Concentration (ug/L): -1.0

Time: 12:14
Peak Height (A): 0.024
Background Pk Height (A): 0.081

Replicate 2
Peak Area (A-s): 0.000
Background Pk Area (A-s): 0.115
Blank Corrected Pk Area (A-s): 0.002
Concentration (ug/L): 1.7

Time: 12:17
Peak Height (A): 0.020
Background Pk Height (A): 0.069

Mean Conc (ug/L): 0.3 SD: 1.87 RSD(%): 539.7

Auto-zero performed.

Sb ID: 10 PPB Seq. No.: 00089 A/S Pos.: 1 Date: 11/05

Replicate 1
Peak Area (A-s): 0.021
Background Pk Area (A-s): 0.113

Time: 12:20
Peak Height (A): 0.042
Background Pk Height (A): 0.072

Blank Corrected Pk Area (A-s): 0.023
Concentration (ug/L): 16.5

Replicate 2
Time: 12:23
Peak Area (A-s): 0.024
Peak Height (A): 0.045
Background Pk Area (A-s): 0.099
Background Pk Height (A): 0.069
Blank Corrected Pk Area (A-s): 0.026
Concentration (ug/L): 18.8

Mean Conc (ug/L): 17.7   SD: 1.60   RSD(%): 9.07

Standard number 1 applied. [10.0]
Correlation coefficient: 1.00000   Slope: 0.0024

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Sb   ID: 50 PPB   Seq. No.: 00090   A/S Pos.: 2   Date: 11/05/

Replicate 1
Time: 12:26
Peak Area (A-s): 0.082
Peak Height (A): 0.143
Background Pk Area (A-s): 0.107
Background Pk Height (A): 0.070
Blank Corrected Pk Area (A-s): 0.084
Concentration (ug/L): 34.6

Replicate 2
Time: 12:29
Peak Area (A-s): 0.083
Peak Height (A): 0.140
Background Pk Area (A-s): 0.108
Background Pk Height (A): 0.071
Blank Corrected Pk Area (A-s): 0.085
Concentration (ug/L): 35.1

Mean Conc (ug/L): 34.9   SD: 0.32   RSD(%): 0.93

Standard number 2 applied. [50.0]
Correlation coefficient: 0.98908   Slope: 0.0017

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Sb   ID: 100 PPB   Seq. No.: 00091   A/S Pos.: 3   Date: 11/05

Replicate 1
Time: 12:32
Peak Area (A-s): 0.155
Peak Height (A): 0.256
Background Pk Area (A-s): 0.112
Background Pk Height (A): 0.073
Blank Corrected Pk Area (A-s): 0.157
Concentration (ug/L): 91.1

Replicate 2
Time: 12:35
Peak Area (A-s): 0.161
Peak Height (A): 0.266
Background Pk Area (A-s): 0.107
Background Pk Height (A): 0.068
Blank Corrected Pk Area (A-s): 0.163
Concentration (ug/L): 94.6

Mean Conc (ug/L): 92.9   SD: 2.47   RSD(%): 2.66

Standard number 3 applied. [100.0]
Correlation coefficient: 0.99643   Slope: 0.0016

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Sb   ID: 200 PPB   Seq. No.: 00092   A/S Pos.: 4   Date: 11/05

Replicate 1
Time: 12:38
Peak Area (A-s): 0.283
Peak Height (A): 0.400
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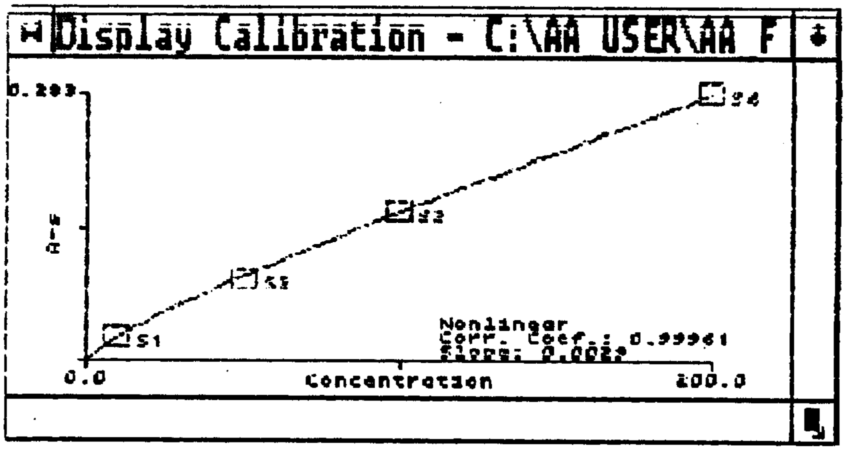
Background Pk Area (A-s): 0.123 Background Pk Height (A): 0.071
Blank Corrected Pk Area (A-s): 0.285
Concentration (ug/L): 175.1

Replicate 2 Time: 12:41
Peak Area (A-s): 0.279 Peak Height (A): 0.412
Background Pk Area (A-s): 0.120 Background Pk Height (A): 0.075
Blank Corrected Pk Area (A-s): 0.280
Concentration (ug/L): 172.1

Mean Conc (ug/L): 173.6 SD: 2.09 RSD(%): 1.2

Standard number 4 applied. [200.0]
Correlation coefficient: 0.99419 Slope: 0.0015



Sb ID: ICV Seq. No.: 00093 A/S Pos.: 5 Date: 11/0

Replicate 1 Time: 12:53
Concentration (ug/L): 105.3

Replicate 2 Time: 12:56
Concentration (ug/L): 102.5

Mean Conc (ug/L): 103.9 SD: 1.98 RSD(%): 1.90

QC sample is within range 79.5 - 120.49

Sb ID: ICB Seq. No.: 00094 A/S Pos.: 0 Date: 11/0

Replicate 1 Time: 13:00
Concentration (ug/L): 2.0

Replicate 2 Time: 13:03
Concentration (ug/L): 1.8

Mean Conc (ug/L): 1.9 SD: 0.18 RSD(%): 9.41

QC sample is within range -15.49 - 15.49

Sb ID: 81101.B-F Seq. No.: 00095 A/S Pos.: 6 Date: 11/05/

Replicate 1 Time: 13:06
Concentration (ug/L): -1.4

Replicate 2 Time: 13:09
Concentration (ug/L): -1.8

Mean Conc (ug/L): -1.6 SD: 0.24 RSD(%): 15.07

Sb ID: 81101.OB Seq. No.: 00096 A/S Pos.: 7 Date: 11/05/

Replicate 1 Time: 13:12
Concentration (ug/L): 1.7

Replicate 2 Time: 13:15
Concentration (ug/L): 2.3

Mean Conc (ug/L): 2.0 SD: 0.45 RSD(%): 22.50

Sb ID: 81101.UB Seq. No.: 00097 A/S Pos.: 8 Date: 11/05/

Replicate 1 Time: 13:19
Concentration (ug/L): 2.3

Replicate 2 Time: 13:22
Concentration (ug/L): 0.7

Mean Conc (ug/L): 1.5 SD: 1.14 RSD(%): 75.33

Sb ID: 81101.IB Seq. No.: 00098 A/S Pos.: 9 Date: 11/05/

Replicate 1 Time: 13:25
Concentration (ug/L): 1.7

Replicate 2 Time: 13:28
Concentration (ug/L): -1.5

Mean Conc (ug/L): 0.0 SD: 2.22 RSD(%): 1948

Sb ID: 81101.01 Seq. No.: 00099 A/S Pos.: 10 Date: 11/05/

Replicate 1 Time: 13:31
Concentration (ug/L): 4.0

Replicate 2 Time: 13:35
Concentration (ug/L): -0.8

Mean Conc (ug/L): 1.5 SD: 3.40 RSD(%): 210.

Sb ID: 81101.01 Seq. No.: 00100 A/S Pos.: 10 Date: 11/05

Replicate 1 Time: 13:38

Concentration (ug/L): 90.2

Replicate 2 Time: 13:41
Concentration (ug/L): 95.2

Mean Conc (ug/L): 92.7 SD: 3.58 RSD(%): 3.86

Recovery is 91.2%

Sb ID: 81101.02 Seq. No.: 00101 A/S Pos.: 11 Date: 11/05/

Replicate 1 Time: 13:44
Concentration (ug/L): 1.3

Autosampler
halted/reset.

Element File: SB.GEL
Date: 11/05/98
Data File:
Technique: HGA

Element: Sb
Time: 17:45
ID/Wt File: 81101.IDW
Calib. Type: Nonlinear

Wavelength: 217.6
Slit: 0.7 L
Lamp Current: 0
Energy: 38

Sb ID: 81101.02 Seq. No.: 00102 A/S Pos.: 11 Date: 11/05/

Replicate 1 Time: 17:45
Concentration (ug/L): 2.6

Replicate 2 Time: 17:48
Concentration (ug/L): 0.5

Mean Conc (ug/L): 1.5 SD: 1.46 RSD(%): 94.67

Sb ID: 81101.03 Seq. No.: 00103 A/S Pos.: 12 Date: 11/05/

Replicate 1 Time: 17:51
Concentration (ug/L): 1.8

Replicate 2 Time: 17:54
Concentration (ug/L): -0.6

Mean Conc (ug/L): 0.6 SD: 1.70 RSD(%): 283.

Sb ID: CCV Seq. No.: 00104 A/S Pos.: 3 Date: 11/05

Replicate 1 Time: 17:57
Concentration (ug/L): 102.9

Replicate 2 Time: 18:00
Concentration (ug/L): 101.7

Mean Conc (ug/L): 102.3 SD: 0.86 RSD(%): 0.84

QC sample is within range 79.5 - 120.49

Sb ID: CCB Seq. No.: 00105 A/S Pos.: 0 Date: 11/05

Replicate 1 Time: 18:03
Concentration (ug/L): 3.5

Replicate 2 Time: 18:06
Concentration (ug/L): -1.6

Mean Conc (ug/L): 0.8 SD: 3.59 RSD(%): 377.

QC sample is within range -15.49 - 15.49

Sb ID: 81101.U1 Seq. No.: 00106 A/S Pos.: 13 Date: 11/05

Replicate 1 Time: 18:09
Concentration (ug/L): -2.3

Replicate 2 Time: 18:12
Concentration (ug/L): 6.1

Mean Conc (ug/L): 1.4 SD: 5.94 RSD(%): 317.2

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Sb ID: 81101.U2 Seq. No.: 00107 A/S Pos.: 14 Date: 11/05/

Replicate 1 Time: 18:15
Concentration (ug/L): 4.8

Replicate 2 Time: 18:18
Concentration (ug/L): 1.1

Mean Conc (ug/L): 2.9 SD: 2.61 RSD(%): 89.32

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Sb ID: 81101.U3 Seq. No.: 00108 A/S Pos.: 15 Date: 11/05/

Replicate 1 Time: 18:21
Concentration (ug/L): 1.9

Replicate 2 Time: 18:24
Concentration (ug/L): 2.1

Mean Conc (ug/L): 2.0 SD: 0.20 RSD(%): 10.01

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Sb ID: 81101.U4 Seq. No.: 00109 A/S Pos.: 16 Date: 11/05/9

Replicate 1 Time: 18:27
Concentration (ug/L): 1.0

Replicate 2 Time: 18:30
Concentration (ug/L): -0.3

Mean Conc (ug/L): 0.3 SD: 0.94 RSD(%): 271.5

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Sb ID: 81101.I1X2.5 Seq. No.: 00110 A/S Pos.: 17 Date: 11/05/9

Replicate 1 Time: 18:33
Concentration (ug/L): 0.8 Corrected Conc (ug/L): 2.0

Replicate 2 Time: 18:36
Concentration (ug/L): 2.9 Corrected Conc (ug/L): 7.2

Mean Conc (ug/L): 1.8 SD: 1.47 RSD(%): 79.97
Corrected Conc (ug/L): 4.5

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Sb ID: 81101.I2 Seq. No.: 00111 A/S Pos.: 18 Date: 11/05/

Replicate 1 Time: 18:39
Concentration (ug/L): 3.6

Replicate 2 Time: 18:42
Concentration (ug/L): 0.8
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Mean Conc (ug/L): 2.2 SD: 1.98 RSD(%): 89.5

Sb ID: 81101.I3X2.5 Seq. No.: 00112 A/S Pos.: 19 Date: 11/05

Replicate 1 Time: 18:45
Concentration (ug/L): 4.6 Corrected Conc (ug/L): 11.4

Replicate 2 Time: 18:49
Concentration (ug/L): 0.8 Corrected Conc (ug/L): 2.1

Mean Conc (ug/L): 2.6 SD: 2.64 RSD(%): 97.3
Corrected Conc (ug/L): 6.6

Sb ID: CCV Seq. No.: 00113 A/S Pos.: 3 Date: 11/05

Replicate 1 Time: 18:52
Concentration (ug/L): 107.4

Replicate 2 Time: 18:55
Concentration (ug/L): 108.9

Mean Conc (ug/L): 108.1 SD: 1.09 RSD(%): 1.01

QC sample is within range 79.5 - 120.49

Sb ID: CCB Seq. No.: 00114 A/S Pos.: 0 Date: 11/05

Replicate 1 Time: 18:58
Concentration (ug/L): -0.5

Replicate 2 Time: 19:01
Concentration (ug/L): 2.3

Mean Conc (ug/L): 0.9 SD: 2.01 RSD(%): 217.

QC sample is within range -15.49 - 15.49

Sb ID: 81101.I1 Seq. No.: 00115 A/S Pos.: 17 Date: 11/06

Replicate 1 Time: 08:39
Concentration (ug/L): 6.3

Replicate 2 Time: 08:42
Concentration (ug/L): 4.4

Mean Conc (ug/L): 5.3 SD: 1.32 RSD(%): 24.6

Sb ID: 81101.I3 Seq. No.: 00116 A/S Pos.: 19 Date: 11/06

Replicate 1 Time: 08:45
Concentration (ug/L): -0.3

Replicate 2 Time: 08:48
Concentration (ug/L): 0.0

Mean Conc (ug/L): -0.1 SD: 0.23 RSD(%): 154.

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Sb ID: CCV Seq. No.: 00117 A/S Pos.: 3 Date: 11/06

Replicate 1 Time: 08:51
Concentration (ug/L): 109.0

Replicate 2 Time: 08:54
Concentration (ug/L): 111.1

Mean Conc (ug/L): 110.0 SD: 1.47 RSD(%): 1.34

QC sample is within range 79.5 - 120.49

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Sb ID: CCB Seq. No.: 00118 A/S Pos.: 0 Date: 11/06

Replicate 1 Time: 08:57
Concentration (ug/L): 3.2

Replicate 2 Time: 09:00
Concentration (ug/L): -1.9

Mean Conc (ug/L): 0.5 SD: 3.55 RSD(%): 539.

QC sample is within range -15.49 - 15.49

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---------------------------------------------------------------------------------
Element File: AS.GEL          Element: As                    Wavelength: 193.7
Date: 11/04/98                Time: 14:00                    Slit: 0.70 L
Data File:                    ID/Wt File: 81101.IDW          Lamp Current: 0
Technique: HGA                Calib. Type: Linear            Energy: 32
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As    ID: BLANK               Seq. No.: 00027    A/S Pos.: 0     Date: 11/04/

Replicate  1                                Time: 14:00
Peak Area (A-s): 0.004                      Peak Height (A): 0.044
Background Pk Area (A-s): 0.063             Background Pk Height (A): 0.087
Blank Corrected Pk Area (A-s): 0.004

Replicate  2                                Time: 14:03
Peak Area (A-s): -0.005                     Peak Height (A): 0.040
Background Pk Area (A-s): 0.071             Background Pk Height (A): 0.079
Blank Corrected Pk Area (A-s): -0.005

Mean Pk Area (A-s):      -0.000             SD: 0.0062                RSD(%): 1609.

Auto-zero performed.

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As    ID: 10 PPB AS           Seq. No.: 00028    A/S Pos.: 1     Date: 11/04/

Replicate  1                                Time: 14:06
Peak Area (A-s): 0.023                      Peak Height (A): 0.078
Background Pk Area (A-s): 0.060             Background Pk Height (A): 0.072
Blank Corrected Pk Area (A-s): 0.023

Replicate  2                                Time: 14:09
Peak Area (A-s): 0.012                      Peak Height (A): 0.078
Background Pk Area (A-s): 0.082             Background Pk Height (A): 0.078
Blank Corrected Pk Area (A-s): 0.012

Mean Pk Area (A-s):       0.018             SD: 0.0080                RSD(%): 45.14

Standard number 1 applied.  [10.00]
Correlation coefficient: 1.00000            Slope: 0.0018

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As    ID: 50 PPB AS           Seq. No.: 00029    A/S Pos.: 2     Date: 11/04/

Replicate  1                                Time: 14:12
Peak Area (A-s): 0.119                      Peak Height (A): 0.296
Background Pk Area (A-s): 0.077             Background Pk Height (A): 0.086
Blank Corrected Pk Area (A-s): 0.120
Concentration (ug/L  ): 67.91

Replicate  2                                Time: 14:16
Peak Area (A-s): 0.119                      Peak Height (A): 0.322
Background Pk Area (A-s): 0.082             Background Pk Height (A): 0.078
Blank Corrected Pk Area (A-s): 0.119
Concentration (ug/L  ): 67.68

Mean Conc  (ug/L  ):       67.79            SD: 0.164                 RSD(%): 0.24

Standard number 2 applied.  [50.00]
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Correlation coefficient: 0.99578   Slope: 0.0024

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As   ID: 100 PPB AS   Seq. No.: 00030   A/S Pos.: 3   Date: 11/04/

Replicate 1   Time: 14:19
Peak Area (A-s): 0.235   Peak Height (A): 0.549
Background Pk Area (A-s): 0.084   Background Pk Height (A): 0.094
Blank Corrected Pk Area (A-s): 0.236
Concentration (ug/L): 99.37

Replicate 2   Time: 14:22
Peak Area (A-s): 0.237   Peak Height (A): 0.576
Background Pk Area (A-s): 0.082   Background Pk Height (A): 0.098
Blank Corrected Pk Area (A-s): 0.237
Concentration (ug/L): 100.14

Mean Conc (ug/L): 99.75   SD: 0.546   RSD(%): 0.55

Standard number 3 applied. [100.00]
Correlation coefficient: 0.99917   Slope: 0.0024

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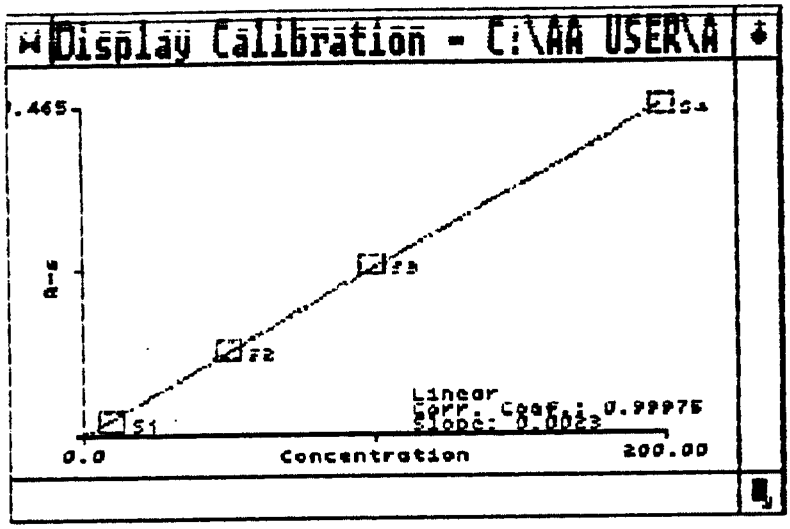
As   ID: 200 PPB AS   Seq. No.: 00031   A/S Pos.: 4   Date: 11/04/

Replicate 1   Time: 14:25
Peak Area (A-s): 0.438   Peak Height (A): 1.029
Background Pk Area (A-s): 0.085   Background Pk Height (A): 0.131
Blank Corrected Pk Area (A-s): 0.438
Concentration (ug/L): 185.07

Replicate 2   Time: 14:28
Peak Area (A-s): 0.491   Peak Height (A): 1.185
Background Pk Area (A-s): 0.083   Background Pk Height (A): 0.117
Blank Corrected Pk Area (A-s): 0.491
Concentration (ug/L): 207.55

Mean Conc (ug/L): 196.31   SD: 15.895   RSD(%): 8.10

Standard number 4 applied. [200.00]
Correlation coefficient: 0.99975   Slope: 0.0023



As ID: ICV Seq. No.: 00032 A/S Pos.: 5 Date: 11/04/

Replicate 1 Time: 14:36
Concentration (ug/L): 104.96

Replicate 2 Time: 14:39
Concentration (ug/L): 96.37

Mean Conc (ug/L): 100.67 SD: 6.069 RSD(%): 6.03

QC sample is within range 79.50 - 120.49

As ID: ICB Seq. No.: 00033 A/S Pos.: 0 Date: 11/04/

Replicate 1 Time: 14:42
Concentration (ug/L): 2.07

Replicate 2 Time: 14:45
Concentration (ug/L): -1.63

Mean Conc (ug/L): 0.22 SD: 2.622 RSD(%): 1196.

QC sample is within range -5.49 - 5.49

As ID: 81101.B-F Seq. No.: 00034 A/S Pos.: 6 Date: 11/04/

Replicate 1 Time: 14:48
Concentration (ug/L): 1.64

Replicate 2 Time: 14:51
Concentration (ug/L): -2.85

Mean Conc (ug/L): -0.61 SD: 3.178 RSD(%): 522.

software locked

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-----------------------------------------------------------------------------
Element File: AS.GEL          Element: As                    Wavelength: 193.7
Date: 11/04/98                Time: 15:16                    Slit: 0.70 L
Data File:                    ID/Wt File: 81101.IDW          Lamp Current: 0
Technique: HGA                Calib. Type: Linear            Energy: 31
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As    ID: 81101.0B            Seq. No.: 00037    A/S Pos.: 7     Date: 11/04

Replicate  1                              Time: 15:16
Concentration (ug/L  ): 1.03

Replicate  2                              Time: 15:19
Concentration (ug/L  ): 0.09

Mean Conc  (ug/L  ):        0.56          SD: 0.664                RSD(%): 118.0
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As    ID: 81101.UB            Seq. No.: 00038    A/S Pos.: 8     Date: 11/04/

Replicate  1                              Time: 15:22
Concentration (ug/L  ): 2.07

Replicate  2                              Time: 15:25
Concentration (ug/L  ): 5.53

Mean Conc  (ug/L  ):        3.80          SD: 2.441                RSD(%): 64.2
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As    ID: 81101.IB            Seq. No.: 00039    A/S Pos.: 9     Date: 11/04'

Replicate  1                              Time: 15:28
Concentration (ug/L  ): -0.65

Replicate  2                              Time: 15:32
Concentration (ug/L  ): 1.02

Mean Conc  (ug/L  ):        0.18          SD: 1.175                RSD(%): 635.
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As    ID: 81101.01            Seq. No.: 00040    A/S Pos.: 10    Date: 11/04

Replicate  1                              Time: 15:35
Concentration (ug/L  ): 4.58

Replicate  2                              Time: 15:38
Concentration (ug/L  ): 1.54

Mean Conc  (ug/L  ):        3.06          SD: 2.152                RSD(%): 70.28
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As    ID: 81101.01            Seq. No.: 00041    A/S Pos.: 10    Date: 11/04.

Replicate  1                              Time: 15:41
Concentration (ug/L  ): 120.26

Replicate  2                              Time: 15:44
Concentration (ug/L  ): 112.76
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Mean Conc (ug/L): 116.51 SD: 5.304 RSD(%): 4.55

Recovery is 113.4%

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As ID: 81101.02 Seq. No.: 00042 A/S Pos.: 11 Date: 11/04/

Replicate 1 Time: 15:47
Concentration (ug/L): 3.25

Replicate 2 Time: 15:50
Concentration (ug/L): 5.35

Mean Conc (ug/L): 4.30 SD: 1.485 RSD(%): 34.5

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As ID: 81101.03 Seq. No.: 00043 A/S Pos.: 12 Date: 11/04

Replicate 1 Time: 15:53
Concentration (ug/L): 4.47

Replicate 2 Time: 15:57
Concentration (ug/L): 4.92

Mean Conc (ug/L): 4.70 SD: 0.318 RSD(%): 6.77

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As ID: CCV Seq. No.: 00044 A/S Pos.: 3 Date: 11/04

Replicate 1 Time: 16:00
Concentration (ug/L): 105.89

Replicate 2 Time: 16:03
Concentration (ug/L): 107.80

Mean Conc (ug/L): 106.85 SD: 1.349 RSD(%): 1.26

QC sample is within range 79.50 - 120.49

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As ID: CCB Seq. No.: 00045 A/S Pos.: 0 Date: 11/04

Replicate 1 Time: 16:06
Concentration (ug/L): -0.18

Replicate 2 Time: 16:09
Concentration (ug/L): -0.50

Mean Conc (ug/L): -0.34 SD: 0.229 RSD(%): 67.7

QC sample is within range -5.49 - 5.49

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As ID: 81101.U1 Seq. No.: 00046 A/S Pos.: 13 Date: 11/04

Replicate 1 Time: 16:12
Concentration (ug/L): 28.18

Replicate 2 Time: 16:15
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Concentration (ug/L): 28.50

Mean Conc (ug/L): 28.34 SD: 0.223 RSD(%): 0.79

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As ID: 81101.U2 Seq. No.: 00047 A/S Pos.: 14 Date: 11/04/

Replicate 1 Time: 16:18
Concentration (ug/L): 50.54

Replicate 2 Time: 16:21
Concentration (ug/L): 50.60

Mean Conc (ug/L): 50.57 SD: 0.044 RSD(%): 0.09

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As ID: 81101.U3 Seq. No.: 00048 A/S Pos.: 15 Date: 11/04

Replicate 1 Time: 16:24
Concentration (ug/L): 38.35

Replicate 2 Time: 16:27
Concentration (ug/L): 44.35

Mean Conc (ug/L): 41.35 SD: 4.243 RSD(%): 10.2_

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As ID: 81101.U4 Seq. No.: 00049 A/S Pos.: 16 Date: 11/04

Replicate 1 Time: 16:30
Concentration (ug/L): 45.67

Replicate 2 Time: 16:33
Concentration (ug/L): 47.43

Mean Conc (ug/L): 46.55 SD: 1.240 RSD(%): 2.66

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As ID: 81101.I1X2.5 Seq. No.: 00050 A/S Pos.: 17 Date: 11/04/

Replicate 1 Time: 16:36
Concentration (ug/L): 61.59 Corrected Conc (ug/L): 153.98

Replicate 2 Time: 16:39
Concentration (ug/L): 72.67 Corrected Conc (ug/L): 181.68

Mean Conc (ug/L): 67.13 SD: 7.835 RSD(%): 11.6
Corrected Conc (ug/L): 167.83

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As ID: 81101.I2 Seq. No.: 00051 A/S Pos.: 18 Date: 11/04

Replicate 1 Time: 16:42
Concentration (ug/L): 115.51

Replicate 2 Time: 16:45
Concentration (ug/L): 113.86

Mean Conc (ug/L): 114.68 SD: 1.164 RSD(%): 1.02
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As ID: B1101.I3 Seq. No.: 00052 A/S Pos.: 19 Date: 11/04/9

Replicate 1 Time: 16:48
Concentration (ug/L): 99.73

Replicate 2 Time: 16:51
Concentration (ug/L): 94.06

Mean Conc (ug/L): 96.90 SD: 4.011 RSD(%): 4.14

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As ID: CCV Seq. No.: 00053 A/S Pos.: 3 Date: 11/04/

Replicate 1 Time: 16:54
Concentration (ug/L): 108.50

Replicate 2 Time: 16:57
Concentration (ug/L): 105.44

Mean Conc (ug/L): 106.97 SD: 2.167 RSD(%): 2.03

QC sample is within range 79.50 - 120.49

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As ID: CCB Seq. No.: 00054 A/S Pos.: 0 Date: 11/04/

Replicate 1 Time: 17:00
Concentration (ug/L): 2.40

Replicate 2 Time: 17:03
Concentration (ug/L): 3.37

Mean Conc (ug/L): 2.88 SD: 0.689 RSD(%): 23.89

QC sample is within range -5.49 - 5.49
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SMA 400 Analysis Ver. 4.10 Fri 11/13/98 - 09:52:42

hod File Name: BA Replicates:3 Read Delay: 65
arks: BA ONLY Data File:

Wt file is 81101

ANDARD #1			REPLICATE	#1				0957	11/13/98
	BA455	EM	54			peak-noisy			
ANDARD #1			REPLICATE	#2					
	BA455	EM	52			peak-noisy			
ANDARD #1			REPLICATE	#3					
	BA455	EM	55			peak-noisy			
	BA455	AV	53.7	SD	1.5	CV	2.8	CONC	0.0200
ANDARD #2			REPLICATE	#1				0959	11/13/98
	BA455	EM	137						
ANDARD #2			REPLICATE	#2					
	BA455	EM	132						
ANDARD #2			REPLICATE	#3					
	BA455	EM	139						
	BA455	AV	136.0	SD	3.6	CV	2.7	CONC	0.1000
ANDARD #3			REPLICATE	#1				1001	11/13/98
	BA455	EM	1153						
ANDARD #3			REPLICATE	#2					
	BA455	EM	1187						
ANDARD #3			REPLICATE	#3					
	BA455	EM	1135						
	BA455	AV	1158.3	SD	26.4	CV	2.3	CONC	1.0000
ANDARD #4			REPLICATE	#1				1003	11/13/98
	BA455	EM	2478						
ANDARD #4			REPLICATE	#2					
	BA455	EM	2367						
ANDARD #4			REPLICATE	#3					
	BA455	EM	2364						
	BA455	AV	2403.0	SD	65.0	CV	2.7	CONC	2.0000
ANK			REPLICATE	#1				1005	11/13/98
	BA455	EM	15						
ANK			REPLICATE	#2					
	BA455	EM	19						

CHAN REPLICATE #3

BA455 EM 16

BA455 AV 16.7 SD 2.1 CV 12.5 CONC 0.0000

BA455 CC 0.9997 SLOPE 1184.2531 INT 14.5595

CV REPLICATE #1 1007 11/13/98

BA455 EM 1198 0.9993 mg/L

CV REPLICATE #2

BA455 EM 1323 1.1049 mg/L

CV REPLICATE #3

BA455 EM 1284 1.0719 mg/L

BA455 AV 1268.3 EM SD 64.0 CV 5.0

BA455 AV 1.0587 mg/L SD 0.0540 CV 5.10

CB REPLICATE #1 1009 11/13/98

BA455 EM 28 0.0113 mg/L peak-noisy

CB REPLICATE #2

BA455 EM 30 0.0130 mg/L peak-noisy

CB REPLICATE #3

BA455 EM 31 0.0139 mg/L peak-noisy

BA455 AV 29.7 EM SD 1.5 CV 5.1

BA455 AV 0.0128 mg/L SD 0.0013 CV 10.11

1101.BF REPLICATE #1 1011 11/13/98

BA455 EM 35 0.0173 mg/L

1101.BF REPLICATE #2

BA455 EM 34 0.0164 mg/L peak-noisy

1101.BF REPLICATE #3

BA455 EM 42 0.0232 mg/L peak-noisy

BA455 AV 37.0 EM SD 4.4 CV 11.8

BA455 AV 0.0189 mg/L SD 0.0037 CV 19.42

B REPLICATE #1 1013 11/13/98

BA455 EM 81 0.0561 mg/L

B REPLICATE #2

BA455 EM 83 0.0578 mg/L

B REPLICATE #3

BA455 EM 80 0.0553 mg/L

BA455 AV 81.3 EM SD 1.5 CV 1.9

BA455 AV 0.0564 mg/L SD 0.0013 CV 2.29

B REPLICATE #1 1015 11/13/98

BA455 EM 68 0.0451 mg/L

REPLICATE #2
BA455 EM 62 0.0401 mg/L

3 REPLICATE #3
BA455 EM 68 0.0451 mg/L peak-noisy

BA455 AV 66.0 EM SD 3.5 CV 5.2

BA455 AV 0.0434 mg/L SD 0.0029 CV 6.73

3 REPLICATE #1 1018 11/13/98
BA455 EM 66 0.0434 mg/L

3 REPLICATE #2
BA455 EM 57 0.0358 mg/L

3 REPLICATE #3
BA455 EM 56 0.0350 mg/L

BA455 AV 59.7 EM SD 5.5 CV 9.2

BA455 AV 0.0381 mg/L SD 0.0047 CV 12.21

L REPLICATE #1 1020 11/13/98
BA455 EM 71 0.0477 mg/L

L REPLICATE #2
BA455 EM 79 0.0544 mg/L peak-noisy

L REPLICATE #3
BA455 EM 69 0.0460 mg/L

BA455 AV 73.0 EM SD 5.3 CV 7.2

BA455 AV 0.0493 mg/L SD 0.0045 CV 9.05

L S REPLICATE #1 1022 11/13/98
BA455 EM 78 0.0536 mg/L peak-noisy

L S REPLICATE #2
BA455 EM 66 0.0434 mg/L

L S REPLICATE #3
BA455 EM 69 0.0460 mg/L peak-noisy

BA455 AV 71.0 EM SD 6.2 CV 8.8

BA455 AV 0.0477 mg/L SD 0.0053 CV 11.06

wrong std no.

2 REPLICATE #1 1024 11/13/98
BA455 EM 97 0.0696 mg/L

2 REPLICATE #2
BA455 EM 88 0.0620 mg/L

2 REPLICATE #3
BA455 EM 102 0.0738 mg/L peak-noisy

BA455 AV 95.7 EM SD 7.1 CV 7.4

BA455 AV 0.0685 mg/L SD 0.0060 CV 8.75

2D REPLICATE #1 1026 11/13/98
BA455 EM 90 0.0637 mg/L

2D REPLICATE #2

2D REPLICATE #3
BA455 EM 91 0.0645 mg/L peak-noisy

BA455 AV 91.3 EM SD 1.5 CV 1.7

BA455 AV 0.0648 mg/L SD 0.0013 CV 1.99

3 REPLICATE #1 1028 11/13/98
BA455 EM 106 0.0772 mg/L

3 REPLICATE #2
BA455 EM 106 0.0772 mg/L

3 REPLICATE #3
BA455 EM 108 0.0789 mg/L peak-noisy

BA455 AV 106.7 EM SD 1.2 CV 1.1

BA455 AV 0.0778 mg/L SD 0.0010 CV 1.25

>V REPLICATE #1 1030 11/13/98
BA455 EM 1432 1.1969 mg/L

>V REPLICATE #2
BA455 EM 1397 1.1674 mg/L

>V REPLICATE #3
BA455 EM 1333 1.1133 mg/L

BA455 AV 1387.3 EM SD 50.2 CV 3.6

BA455 AV 1.1592 mg/L SD 0.0424 CV 3.66

>B REPLICATE #1 1032 11/13/98
BA455 EM 34 0.0164 mg/L peak-noisy

>B REPLICATE #2
BA455 EM 49 0.0291 mg/L peak-noisy

>B REPLICATE #3
BA455 EM 34 0.0164 mg/L peak-noisy

BA455 AV 39.0 EM SD 8.7 CV 22.2

BA455 AV 0.0206 mg/L SD 0.0073 CV 35.43

1 REPLICATE #1 1034 11/13/98
BA455 EM 77 0.0527 mg/L

1 REPLICATE #2
BA455 EM 82 0.0569 mg/L

1 REPLICATE #3
BA455 EM 77 0.0527 mg/L

BA455 AV 78.7 EM SD 2.9 CV 3.7

BA455 AV 0.0541 mg/L SD 0.0024 CV 4.50

2 REPLICATE #1 1036 11/13/98
BA455 EM 166 0.1279 mg/L

2 REPLICATE #2
BA455 EM 146 0.1110 mg/L

2 REPLICATE #3
BA455 EM 161 0.1237 mg/L

BA455 AV 157.7 EM SD 10.4 CV 6.6

BA455 AV 0.1208 mg/L SD 0.0088 CV 7.27

3 REPLICATE #1 1038 11/13/98
BA455 EM 104 0.0755 mg/L

3 REPLICATE #2
BA455 EM 117 0.0865 mg/L peak-noisy

3 REPLICATE #3
BA455 EM 100 0.0721 mg/L

BA455 AV 107.0 EM SD 8.9 CV 8.3

BA455 AV 0.0781 mg/L SD 0.0075 CV 9.62

4 REPLICATE #1 1040 11/13/98
BA455 EM 111 0.0814 mg/L

4 REPLICATE #2
BA455 EM 121 0.0899 mg/L

4 REPLICATE #3
BA455 EM 107 0.0781 mg/L

BA455 AV 113.0 EM SD 7.2 CV 6.4

BA455 AV 0.0831 mg/L SD 0.0061 CV 7.33

L REPLICATE #1 1042 11/13/98
BA455 EM 413 0.3364 mg/L

L REPLICATE #2
BA455 EM 426 0.3474 mg/L

L REPLICATE #3
BA455 EM 490 0.4015 mg/L

BA455 AV 443.0 EM SD 41.2 CV 9.3

BA455 AV 0.3618 mg/L SD 0.0348 CV 9.62

2 REPLICATE #1 1044 11/13/98
BA455 EM 499 0.4091 mg/L

2 REPLICATE #2
BA455 EM 499 0.4091 mg/L

2 REPLICATE #3
BA455 EM 531 0.4361 mg/L

BA455 AV 509.7 EM SD 18.5 CV 3.6

BA455 AV 0.4181 mg/L SD 0.0156 CV 3.73

3 REPLICATE #1 1047 11/13/98
BA455 EM 439 0.3584 mg/L

3 REPLICATE #2
BA455 EM 442 0.3609 mg/L

BA455 EM 427 0.3483 mg/L

BA455 AV 436.0 EM SD 7.9 CV 1.8

BA455 AV 0.3559 mg/L SD 0.0067 CV 1.88

:V REPLICATE #1 1049 11/13/98
BA455 EM 1145 0.9546 mg/L

:V REPLICATE #2
BA455 EM 1149 0.9579 mg/L

:V REPLICATE #3
BA455 EM 1171 0.9765 mg/L

BA455 AV 1155.0 EM SD 14.0 CV 1.2

BA455 AV 0.9630 mg/L SD 0.0118 CV 1.23

:B REPLICATE #1 1051 11/13/98
BA455 EM 33 0.0156 mg/L peak-noisy

:B REPLICATE #2
BA455 EM 33 0.0156 mg/L peak-noisy

:B REPLICATE #3
BA455 EM 33 0.0156 mg/L peak-noisy

BA455 AV 33.0 EM SD 0.0 CV 0.0

BA455 AV 0.0156 mg/L SD 0.0000 CV 0.00

MPLE #23 REPLICATE #1 1053 11/13/98
BA455 EM 626 0.5163 mg/L

MPLE #23 0.15 SPK REPLICATE #2
BA455 EM 623 0.5138 mg/L

MPLE #23 REPLICATE #3
BA455 EM 636 0.5248 mg/L

BA455 AV 628.3 EM SD 6.8 CV 1.1

BA455 AV 0.5183 mg/L SD 0.0057 CV 1.11

MPLE #24 REPLICATE #1 1055 11/13/98
BA455 EM 1179 0.9833 mg/L

MPLE #24 CCV REPLICATE #2
BA455 EM 1129 0.9410 mg/L

MPLE #24 REPLICATE #3
BA455 EM 1162 0.9689 mg/L

BA455 AV 1156.7 EM SD 25.4 CV 2.2

BA455 AV 0.9644 mg/L SD 0.0215 CV 2.23

MPLE #25 REPLICATE #1 1057 11/13/98
BA455 EM 37 CCB 0.0189 mg/L peak-noisy

MPLE #25 REPLICATE #2
BA455 EM 33 0.0156 mg/L peak-noisy

MPLE #25 REPLICATE #3

BA455 AV 33.7 EM SD 3.1 CV 9.1

BA455 AV 0.0161 mg/L SD 0.0026 CV 15.99

MPLE #26 REPLICATE #1 1059 11/13/98
BA455 EM 36 0.0181 mg/L window-edge

MPLE #26 REPLICATE #2
BA455 EM 38 0.0198 mg/L peak-noisy

MPLE #26 REPLICATE #3
BA455 EM 43 0.0240 mg/L peak-noisy

BA455 AV 39.0 EM SD 3.6 CV 9.2

BA455 AV 0.0206 mg/L SD 0.0030 CV 14.75

MPLE #27 REPLICATE #1 1101 11/13/98
BA455 EM 39 0.0206 mg/L peak-noisy

MPLE #27 REPLICATE #2
BA455 EM 34 0.0164 mg/L peak-noisy

MPLE #27 REPLICATE #3
BA455 EM 33 0.0156 mg/L peak-noisy

BA455 AV 35.3 EM SD 3.2 CV 9.1

BA455 AV 0.0175 mg/L SD 0.0027 CV 15.47

Element File: BE.GEL | Element: Be | Wavelength: 234.9
Date: 11/10/98 | Time: 15:33 | Slit: 0.7 L
Data File: | ID/Wt File: 81017.IDW | Lamp Current: 30
Technique: HGA | Calib. Type: Linear | Energy: 65

~~~~~~

Be ID: BLANK Seq. No.: 00177 A/S Pos.: 0 Date: 11/10/

Replicate 1 Time: 15:33
Peak Area (A-s): -0.001 Peak Height (A): 0.003
Background Pk Area (A-s): 0.003 Background Pk Height (A): 0.005
Blank Corrected Pk Area (A-s): -0.001

Replicate 2 Time: 15:36
Peak Area (A-s): -0.003 Peak Height (A): 0.003
Background Pk Area (A-s): 0.003 Background Pk Height (A): 0.006
Blank Corrected Pk Area (A-s): -0.003

Mean Pk Area (A-s): -0.002 SD: 0.0013 RSD(%): 70.52

Auto-zero performed.

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Be ID: 0.5 PPB Seq. No.: 00178 A/S Pos.: 1 Date: 11/10/

Replicate 1 Time: 15:39
Peak Area (A-s): 0.012 Peak Height (A): 0.045
Background Pk Area (A-s): 0.028 Background Pk Height (A): 0.092
Blank Corrected Pk Area (A-s): 0.014

Replicate 2 Time: 15:42
Peak Area (A-s): 0.013 Peak Height (A): 0.040
Background Pk Area (A-s): 0.028 Background Pk Height (A): 0.087
Blank Corrected Pk Area (A-s): 0.014

Mean Pk Area (A-s): 0.014 SD: 0.0007 RSD(%): 4.83

Standard number 1 applied. [0.50]
Correlation coefficient: 1.00000 Slope: 0.0280

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Be ID: 2 PPB Seq. No.: 00179 A/S Pos.: 2 Date: 11/10/

Replicate 1 Time: 15:45
Peak Area (A-s): 0.043 Peak Height (A): 0.136
Background Pk Area (A-s): 0.104 Background Pk Height (A): 0.315
Blank Corrected Pk Area (A-s): 0.045
Concentration (ug/L): 1.60

Replicate 2 Time: 15:48
Peak Area (A-s): 0.046 Peak Height (A): 0.157
Background Pk Area (A-s): 0.107 Background Pk Height (A): 0.364
Blank Corrected Pk Area (A-s): 0.048
Concentration (ug/L): 1.70

Mean Conc (ug/L): 1.65 SD: 0.070 RSD(%): 4.21

Standard number 2 applied. [2.00]
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Correlation coefficient: 0.99549   Slope: 0.0235

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Be   ID: 5 PPB   Seq. No.: 00180   A/S Pos.: 3   Date: 11/10

Replicate 1   Time: 15:51
Peak Area (A-s): 0.099   Peak Height (A): 0.268
Background Pk Area (A-s): 0.257   Background Pk Height (A): 0.846
Blank Corrected Pk Area (A-s): 0.100
Concentration (ug/L): 4.28

Replicate 2   Time: 15:54
Peak Area (A-s): 0.104   Peak Height (A): 0.265
Background Pk Area (A-s): 0.272   Background Pk Height (A): 0.895
Blank Corrected Pk Area (A-s): 0.106
Concentration (ug/L): 4.50

Mean Conc (ug/L): 4.39   SD: 0.156   RSD(%): 3.56

Standard number 3 applied. [5.00]
Correlation coefficient: 0.99634   Slope: 0.0211

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Be   ID: 10 PPB   Seq. No.: 00181   A/S Pos.: 4   Date: 11/10

Replicate 1   Time: 15:57
Peak Area (A-s): 0.142   Peak Height (A): 0.255
Background Pk Area (A-s): 0.477   Background Pk Height (A): 1.365
Blank Corrected Pk Area (A-s): 0.144
Concentration (ug/L): 6.84

Replicate 2   Time: 16:00
Peak Area (A-s): 0.142   Peak Height (A): 0.251
Background Pk Area (A-s): 0.500   Background Pk Height (A): 1.456
Blank Corrected Pk Area (A-s): 0.144
Concentration (ug/L): 6.84

Mean Conc (ug/L): 6.84   SD: 0.001   RSD(%): 0.02

Standard number 4 applied. [10.00]
Correlation coefficient: 0.96222   Slope: 0.0164

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Be   ID: 10 PPB   Seq. No.: 00182   A/S Pos.: 4   Date: 11/10

Replicate 1   Time: 16:04
Peak Area (A-s): 0.136   Peak Height (A): 0.253
Background Pk Area (A-s): 0.504   Background Pk Height (A): 1.498
Blank Corrected Pk Area (A-s): 0.138
Concentration (ug/L): 8.42

Replicate 2   Time: 16:07
Peak Area (A-s): 0.141   Peak Height (A): 0.251
Background Pk Area (A-s): 0.500   Background Pk Height (A): 1.461
Blank Corrected Pk Area (A-s): 0.143
Concentration (ug/L): 8.72

Mean Conc (ug/L): 8.57   SD: 0.212   RSD(%): 2.48
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Standard number 4 applied. [10.00]
Correlation coefficient: 0.95673 Slope: 0.0162

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Replicate 2 Time: 16:28
Concentration (ug/L): 0.06

Mean Conc (ug/L): 0.04 SD: 0.018 RSD(%): 40.8

QC sample is within range -1.49 - 1.49

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Be ID: 81017.LCS Seq. No.: 00186 A/S Pos.: 21 Date: 11/10/

Replicate 1 Time: 16:31
Concentration (ug/L): 5.24

OTHER PROJECT

Replicate 2 Time: 16:34
Concentration (ug/L): 5.16

Mean Conc (ug/L): 5.20 SD: 0.056 RSD(%): 1.08

~~~~~~

Be ID: 81017.1-7 Seq. No.: 00187 A/S Pos.: 22 Date: 11/10

Replicate 1 Time: 16:37
Concentration (ug/L): 0.07

Replicate 2 Time: 16:40
Concentration (ug/L): 0.10

Mean Conc (ug/L): 0.09 SD: 0.019 RSD(%): 21.2

~~~~~~

Be ID: 81017.1-7S Seq. No.: 00188 A/S Pos.: 23 Date: 11/10

Replicate 1 Time: 16:43
Concentration (ug/L): 4.75

Replicate 2 Time: 16:46
Concentration (ug/L): 4.72

Mean Conc (ug/L): 4.74 SD: 0.021 RSD(%): 0.45

~~~~~~

Be ID: 81017.1-102S Seq. No.: 00191 A/S Pos.: 7 Date: 11/10.

Replicate 1 Time: 16:50
Concentration (ug/L): 4.22

Replicate 2 Time: 16:53
Concentration (ug/L): 4.35

Mean Conc (ug/L): 4.28 SD: 0.097 RSD(%): 2.26

~~~~~~

Be ID: 81011.BF Seq. No.: 00192 A/S Pos.: 6 Date: 11/10/9

Replicate 1 Time: 17:02
Concentration (ug/L): 0.04

Replicate 2 Time: 17:05
Concentration (ug/L): 0.03
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Mean Conc (ug/L): 0.04 SD: 0.005 RSD(%): 12.65

~~~~~~

Be ID: 81101.0B Seq. No.: 00193 A/S Pos.: 7 Date: 11/10/

Replicate 1 Time: 17:08
Concentration (ug/L): 0.21

Replicate 2 Time: 17:11
Concentration (ug/L): 0.26

Mean Conc (ug/L): 0.23 SD: 0.036 RSD(%): 15.63

~~~~~~

Be ID: 81101.UB Seq. No.: 00194 A/S Pos.: 8 Date: 11/10/

Replicate 1 Time: 17:14
Concentration (ug/L): 0.17

Replicate 2 Time: 17:17
Concentration (ug/L): 0.14

Mean Conc (ug/L): 0.16 SD: 0.016 RSD(%): 10.59

~~~~~~

Be ID: 81101.IB Seq. No.: 00195 A/S Pos.: 9 Date: 11/10

Replicate 1 Time: 17:20
Concentration (ug/L): 0.06

Replicate 2 Time: 17:23
Concentration (ug/L): 0.08

Mean Conc (ug/L): 0.07 SD: 0.013 RSD(%): 20.2

~~~~~~

Be ID: 81101.01 Seq. No.: 00196 A/S Pos.: 10 Date: 11/10

Replicate 1 Time: 17:26
Concentration (ug/L): 0.09

Replicate 2 Time: 17:29
Concentration (ug/L): 0.11

Mean Conc (ug/L): 0.10 SD: 0.021 RSD(%): 21.0

~~~~~~

Be ID: 81101.01 Seq. No.: 00197 A/S Pos.: 10 Date: 11/10

Replicate 1 Time: 17:32
Concentration (ug/L): 4.19

Replicate 2 Time: 17:35
Concentration (ug/L): 4.13

Mean Conc (ug/L): 4.16 SD: 0.039 RSD(%): 0.93

Recovery is 81.2%
~~~~~~

Be ID: CCV Seq. No.: 00198 A/S Pos.: 3 Date: 11/10/

Replicate 1 Time: 17:37
Concentration (ug/L): 4.37

Replicate 2 Time: 17:40
Concentration (ug/L): 4.45

Mean Conc (ug/L): 4.41 SD: 0.060 RSD(%): 1.35

QC sample is within range 3.5 - 6.49

Be ID: CCB Seq. No.: 00199 A/S Pos.: 0 Date: 11/10/

Replicate 1 Time: 17:43
Concentration (ug/L): 0.05

Replicate 2 Time: 17:46
Concentration (ug/L): 0.05

Mean Conc (ug/L): 0.05 SD: 0.005 RSD(%): 10.53

QC sample is within range -1.49 - 1.49

Be ID: 81101.02 Seq. No.: 00200 A/S Pos.: 11 Date: 11/10/

Replicate 1 Time: 17:49
Concentration (ug/L): 0.24

Replicate 2 Time: 17:52
Concentration (ug/L): 0.30

Mean Conc (ug/L): 0.27 SD: 0.045 RSD(%): 16.7

Be ID: 81101.03 Seq. No.: 00201 A/S Pos.: 12 Date: 11/10

Replicate 1 Time: 17:55
Concentration (ug/L): 0.34

Replicate 2 Time: 17:58
Concentration (ug/L): 0.37

Mean Conc (ug/L): 0.35 SD: 0.016 RSD(%): 4.58

Be ID: 81101.U1 Seq. No.: 00202 A/S Pos.: 13 Date: 11/10

Replicate 1 Time: 18:01
Concentration (ug/L): 0.25

Replicate 2 Time: 18:04
Concentration (ug/L): 0.23

Mean Conc (ug/L): 0.24 SD: 0.015 RSD(%): 6.36

Be ID: 81101.U2 Seq. No.: 00203 A/S Pos.: 14 Date: 11/10/

Replicate 1 Time: 18:06
Concentration (ug/L): 0.74

Replicate 2 Time: 18:09
Concentration (ug/L): 0.74

Mean Conc (ug/L): 0.74 SD: 0.006 RSD(%): 0.76

Be ID: 81101.U3 Seq. No.: 00204 A/S Pos.: 15 Date: 11/10/

Replicate 1 Time: 18:12
Concentration (ug/L): 0.29

Replicate 2 Time: 18:15
Concentration (ug/L): 0.29

Mean Conc (ug/L): 0.29 SD: 0.005 RSD(%): 1.80

Be ID: 81101.U4 Seq. No.: 00205 A/S Pos.: 16 Date: 11/10

Replicate 1 Time: 18:18
Concentration (ug/L): 0.37

Replicate 2 Time: 18:21
Concentration (ug/L): 0.30

Mean Conc (ug/L): 0.34 SD: 0.049 RSD(%): 14.4

Be ID: 81101.I1 Seq. No.: 00206 A/S Pos.: 17 Date: 11/1

Replicate 1 Time: 18:24
Concentration (ug/L): 3.43

Replicate 2 Time: 18:26
Concentration (ug/L): 3.50

Mean Conc (ug/L): 3.47 SD: 0.050 RSD(%): 1.44

Be ID: 81101.I2 Seq. No.: 00207 A/S Pos.: 18 Date: 11/10/

Replicate 1 Time: 18:29
Concentration (ug/L): 4.70

Replicate 2 Time: 18:32
Concentration (ug/L): 4.62

Mean Conc (ug/L): 4.66 SD: 0.056 RSD(%): 1.2

Be ID: 81101.I3 Seq. No.: 00208 A/S Pos.: 19 Date: 11/10/

Replicate 1 Time: 18:35

Concentration (ug/L): 4.68

Replicate 2 Time: 18:38
Concentration (ug/L): 4.81

Mean Conc (ug/L): 4.75 SD: 0.091 RSD(%): 1.91

Be ID: CCV Seq. No.: 00209 A/S Pos.: 3 Date: 11/10/

Replicate 1 Time: 18:41
Concentration (ug/L): 4.21

Replicate 2 Time: 18:44
Concentration (ug/L): 4.43

Mean Conc (ug/L): 4.32 SD: 0.158 RSD(%): 3.66

QC sample is within range 3.5 - 6.49

Be ID: CCB Seq. No.: 00210 A/S Pos.: 0 Date: 11/10/

Replicate 1 Time: 18:47
Concentration (ug/L): 0.04

Replicate 2 Time: 18:49
Concentration (ug/L): 0.01

Mean Conc (ug/L): 0.03 SD: 0.020 RSD(%): 73.96

QC sample is within range -1.49 - 1.49

Be ID: 81017.LB Seq. No.: 00211 A/S Pos.: 20 Date: 11/10/

Replicate 1 Time: 18:52
Concentration (ug/L): -0.01

Replicate 2 Time: 18:55
Concentration (ug/L): 0.05

Mean Conc (ug/L): 0.02 SD: 0.039 RSD(%): 197.0

Be ID: 81017.1-102 Seq. No.: 00212 A/S Pos.: 21 Date: 11/10/

Replicate 1 Time: 18:58
Concentration (ug/L): 0.09

Replicate 2 Time: 19:01
Concentration (ug/L): 0.06

Mean Conc (ug/L): 0.07 SD: 0.026 RSD(%): 34.77

Be ID: 81017.2-102 Seq. No.: 00213 A/S Pos.: 22 Date: 11/10/

Replicate 1 Time: 19:04

Element File: CD.GEL
Date: 11/09/98
Data File:
Technique: HGA

Element: Cd
Time: 15:26
ID/Wt File: 81017.IDW
Calib. Type: Linear

Wavelength: 228.6
Slit: 0.7 L
Lamp Current: 5
Energy: 38

Cd ID: BLANK Seq. No.: 00060 A/S Pos.: 0 Date: 11/09

Replicate 1
Peak Area (A-s): 0.166
Background Pk Area (A-s): 0.062
Blank Corrected Pk Area (A-s): 0.166
Concentration (ug/L): 3.87

Time: 15:26
Peak Height (A): 0.286
Background Pk Height (A): 0.051

Replicate 2
Peak Area (A-s): 0.172
Background Pk Area (A-s): 0.086
Blank Corrected Pk Area (A-s): 0.172
Concentration (ug/L): 4.00

Time: 15:28
Peak Height (A): 0.294
Background Pk Height (A): 0.055

Mean Conc (ug/L): 3.93 SD: 0.093 RSD(%): 2.37

Auto-zero performed.

Cd ID: BLANK Seq. No.: 00061 A/S Pos.: 0 Date: 11/0

Replicate 1
Peak Area (A-s): 0.159
Background Pk Area (A-s): 0.081
Blank Corrected Pk Area (A-s): -0.011
Concentration (ug/L): -0.25

Time: 15:31
Peak Height (A): 0.296
Background Pk Height (A): 0.047

Cd ID: BLANK Seq. No.: 00062 A/S Pos.: 0 Date: 11/09/

Replicate 1
Peak Area (A-s): 0.098
Background Pk Area (A-s): 0.065
Blank Corrected Pk Area (A-s): -0.071
Concentration (ug/L): -1.66

Time: 15:34
Peak Height (A): 0.166
Background Pk Height (A): 0.037

Replicate 2
Peak Area (A-s): 0.099
Background Pk Area (A-s): 0.070
Blank Corrected Pk Area (A-s): -0.070
Concentration (ug/L): -1.64

Time: 15:37
Peak Height (A): 0.171
Background Pk Height (A): 0.041

Mean Conc (ug/L): -1.65 SD: 0.011 RSD(%): 0.65

Auto-zero performed.

Cd ID: 0.5 PPB CD Seq. No.: 00063 A/S Pos.: 1 Date: 11/09/

Replicate 1
Peak Area (A-s): 0.124

Time: 15:40
Peak Height (A): 0.219

Background Pk Area (A-s): 0.066
Background Pk Height (A): 0.038
Blank Corrected Pk Area (A-s): 0.026
Concentration (ug/L): 0.60

Replicate 2
Time: 15:43
Peak Area (A-s): 0.120
Peak Height (A): 0.207
Background Pk Area (A-s): 0.072
Background Pk Height (A): 0.036
Blank Corrected Pk Area (A-s): 0.022
Concentration (ug/L): 0.50

Mean Conc (ug/L): 0.55 SD: 0.069 RSD(%): 12.51

Standard number 1 applied. [0.50]
Correlation coefficient: 1.00000 Slope: 0.0473

Characteristic Mass = 1.0 pg/0.0044 A-s

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Cd ID: 2 PPB CD Seq. No.: 00064 A/S Pos.: 2 Date: 11/09/

Replicate 1
Time: 15:45
Peak Area (A-s): 0.217
Peak Height (A): 0.367
Background Pk Area (A-s): 0.089
Background Pk Height (A): 0.061
Blank Corrected Pk Area (A-s): 0.119
Concentration (ug/L): 2.51

Replicate 2
Time: 15:48
Peak Area (A-s): 0.201
Peak Height (A): 0.349
Background Pk Area (A-s): 0.086
Background Pk Height (A): 0.054
Blank Corrected Pk Area (A-s): 0.103
Concentration (ug/L): 2.17

Mean Conc (ug/L): 2.34 SD: 0.237 RSD(%): 10.1

Standard number 2 applied. [2.00]
Correlation coefficient: 0.99777 Slope: 0.0549

~~~~~~

Cd ID: 6 PPB CD Seq. No.: 00065 A/S Pos.: 3 Date: 11/09

Replicate 1
Time: 15:51
Peak Area (A-s): 0.439
Peak Height (A): 0.719
Background Pk Area (A-s): 0.113
Background Pk Height (A): 0.111
Blank Corrected Pk Area (A-s): 0.340
Concentration (ug/L): 6.20

Replicate 2
Time: 15:54
Peak Area (A-s): 0.423
Peak Height (A): 0.706
Background Pk Area (A-s): 0.118
Background Pk Height (A): 0.112
Blank Corrected Pk Area (A-s): 0.325
Concentration (ug/L): 5.92

Mean Conc (ug/L): 6.06 SD: 0.195 RSD(%): 3.22

Standard number 3 applied. [6.00]
Correlation coefficient: 0.99983 Slope: 0.0554

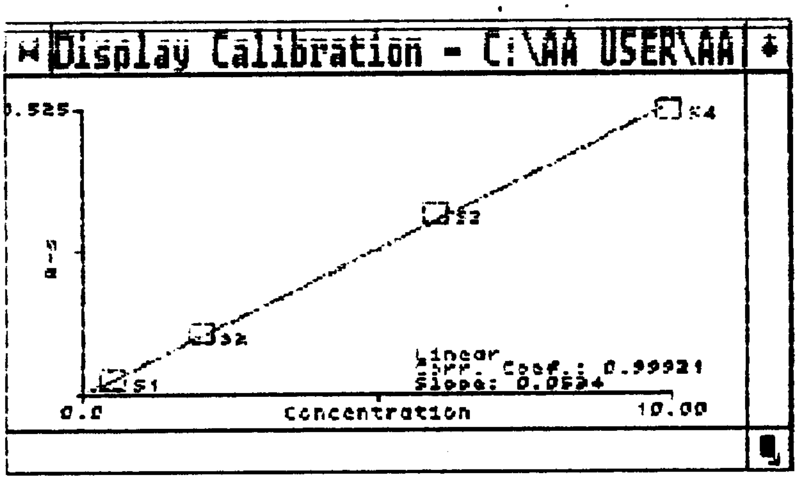
Cd ID: 10 PPB CD Seq. No.: 00066 A/S Pos.: 4 Date: 11/09/

Replicate 1 Time: 15:56
Peak Area (A-s): 0.630 Peak Height (A): 0.990
Background Pk Area (A-s): 0.154 Background Pk Height (A): 0.181
Blank Corrected Pk Area (A-s): 0.532
Concentration (ug/L): 9.60

Replicate 2 Time: 15:59
Peak Area (A-s): 0.617 Peak Height (A): 0.979
Background Pk Area (A-s): 0.155 Background Pk Height (A): 0.183
Blank Corrected Pk Area (A-s): 0.519
Concentration (ug/L): 9.37

Mean Conc (ug/L): 9.49 SD: 0.166 RSD(%): 1.75

Standard number 4 applied. [10.00]
Correlation coefficient: 0.99921 Slope: 0.0534



Cd ID: ICV Seq. No.: 00067 A/S Pos.: 5 Date: 11/0

Replicate 1 Time: 16:06
Concentration (ug/L): 6.07

Replicate 2 Time: 16:09
Concentration (ug/L): 6.04

Mean Conc (ug/L): 6.05 SD: 0.023 RSD(%): 0.3.

QC sample is within range

Cd ID: ICB Seq. No.: 00068 A/S Pos.: 0 Date: 11/0

Replicate 1 Time: 16:12
Concentration (ug/L): -0.14

Replicate 2 Time: 16:15
Concentration (ug/L): -0.00

Mean Conc (ug/L): -0.07 SD: 0.096 RSD(%): 134.62

QC sample is within range

Auto-zero performed.

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Cd ID: 81017.LCS Seq. No.: 00069 A/S Pos.: 21 Date: 11/09/9

Replicate 1 Time: 16:19
Concentration (ug/L): 5.25

Replicate 2 Time: 16:22
Concentration (ug/L): 5.28

Mean Conc (ug/L): 5.26 SD: 0.018 RSD(%): 0.34

~~~~~~

Cd ID: 81017.1-7 Seq. No.: 00070 A/S Pos.: 22 Date: 11/09/

Replicate 1 Time: 16:25
Concentration (ug/L): -0.02

Replicate 2 Time: 16:27
Concentration (ug/L): -0.02

Mean Conc (ug/L): -0.02 SD: 0.001 RSD(%): 6.90

~~~~~~

Cd ID: 81017.1-7S Seq. No.: 00071 A/S Pos.: 23 Date: 11/09/

Replicate 1 Time: 16:30
Concentration (ug/L): 5.08

Replicate 2 Time: 16:33
Concentration (ug/L): 5.06

Mean Conc (ug/L): 5.07 SD: 0.017 RSD(%): 0.34

~~~~~~

Cd ID: 81017.1-102 Seq. No.: 00072 A/S Pos.: 6 Date: 11/09/

Replicate 1 Time: 16:36
Concentration (ug/L): -0.23

Replicate 2 Time: 16:39
Concentration (ug/L): -0.32

Mean Conc (ug/L): -0.28 SD: 0.061 RSD(%): 22.23

~~~~~~

Cd ID: 81017.1-102S Seq. No.: 00073 A/S Pos.: 7 Date: 11/09/

Replicate 1 Time: 16:42
Concentration (ug/L): 4.30

Replicate 2 Time: 16:45
Concentration (ug/L): 3.92
~~~~~~

Mean Conc (ug/L): 4.11 SD: 0.267 RSD(%): 6.50

~~~~~~

Cd ID: 81017.2-102 Seq. No.: 00074 A/S Pos.: 8 Date: 11/09

Replicate 1 Time: 16:47
Concentration (ug/L): -0.25

Not detected. duplicate is not required.

Replicate 2 Time: 16:50
Concentration (ug/L): -0.15

Mean Conc (ug/L): -0.20 SD: 0.071 RSD(%): 35.4

~~~~~~

Cd ID: 81101.I1X2.5 Seq. No.: 00075 A/S Pos.: 17 Date: 11/09

Replicate 1 Time: 16:55
Concentration (ug/L): 1.36 Corrected Conc (ug/L): 3.41

Replicate 2 Time: 16:57
Concentration (ug/L): 1.67 Corrected Conc (ug/L): 4.17

Mean Conc (ug/L): 1.52 SD: 0.216 RSD(%): 14.2
Corrected Conc (ug/L): 3.79

~~~~~~

Cd ID: 81101.BF Seq. No.: 00077 A/S Pos.: 6 Date: 11/09

Replicate 1 Time: 17:02
Concentration (ug/L): 0.11

Replicate 2 Time: 17:05
Concentration (ug/L): 0.10

Mean Conc (ug/L): 0.10 SD: 0.010 RSD(%): 10.18

~~~~~~

Cd ID: 81101.OB Seq. No.: 00078 A/S Pos.: 7 Date: 11/09

Replicate 1 Time: 17:08
Concentration (ug/L): 0.29

Replicate 2 Time: 17:11
Concentration (ug/L): 0.40

Mean Conc (ug/L): 0.34 SD: 0.074 RSD(%): 21.

~~~~~~

Cd ID: CCV Seq. No.: 00079 A/S Pos.: 3 Date: 11/0

Replicate 1 Time: 17:13
Concentration (ug/L): 6.52

Replicate 2 Time: 17:16
~~~~~~

Concentration (ug/L): 6.70

Mean Conc (ug/L): 6.61 SD: 0.125 RSD(%): 1.90

QC sample is within range

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Cd ID: CCB Seq. No.: 00080 A/S Pos.: 0 Date: 11/09/

Replicate 1 Time: 17:19
Concentration (ug/L): 0.06

Replicate 2 Time: 17:22
Concentration (ug/L): -0.11

Mean Conc (ug/L): -0.03 SD: 0.123 RSD(%): 472.2

QC sample is within range

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Cd ID: 81101.UB Seq. No.: 00081 A/S Pos.: 8 Date: 11/09/

Replicate 1 Time: 17:24
Concentration (ug/L): 1.40

Replicate 2 Time: 17:27
Concentration (ug/L): 1.75

Mean Conc (ug/L): 1.57 SD: 0.245 RSD(%): 15.5

~~~~~~

Cd ID: 81101.IB Seq. No.: 00082 A/S Pos.: 9 Date: 11/09

Replicate 1 Time: 17:30
Concentration (ug/L): 0.46

Replicate 2 Time: 17:33
Concentration (ug/L): 0.36

Mean Conc (ug/L): 0.41 SD: 0.073 RSD(%): 17.8

~~~~~~

Cd ID: 81101.01 Seq. No.: 00083 A/S Pos.: 10 Date: 11/09

Replicate 1 Time: 17:36
Concentration (ug/L): 0.96

Replicate 2 Time: 17:38
Concentration (ug/L): 0.82

Mean Conc (ug/L): 0.89 SD: 0.098 RSD(%): 11.0

~~~~~~

Cd ID: 81101.01 Seq. No.: 00084 A/S Pos.: 10 Date: 11/09

Replicate 1 Time: 17:41
Concentration (ug/L): 6.37

Replicate 2 Time: 17:44
~~~~~~

Concentration (ug/L): 6.48

Mean Conc (ug/L): 6.42 SD: 0.077 RSD(%): 1.20

Recovery is 92.2%

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Cd ID: 81101.02 Seq. No.: 00085 A/S Pos.: 11 Date: 11/09

Replicate 1 Time: 17:47
Concentration (ug/L): 1.20

Replicate 2 Time: 17:50
Concentration (ug/L): 1.22

Mean Conc (ug/L): 1.21 SD: 0.015 RSD(%): 1.26

~~~~~~

Cd ID: 81101.03 Seq. No.: 00086 A/S Pos.: 12 Date: 11/09/

Replicate 1 Time: 17:52
Concentration (ug/L): 0.79

Replicate 2 Time: 17:55
Concentration (ug/L): 0.60

Mean Conc (ug/L): 0.70 SD: 0.140 RSD(%): 20.[illegible]

~~~~~~

Cd ID: 81101.U1 Seq. No.: 00087 A/S Pos.: 13 Date: 11/09/

Replicate 1 Time: 17:58
Concentration (ug/L): 3.04

Replicate 2 Time: 18:01
Concentration (ug/L): 3.11

Mean Conc (ug/L): 3.08 SD: 0.051 RSD(%): 1.6

~~~~~~

Cd ID: 81101.U2 Seq. No.: 00088 A/S Pos.: 14 Date: 11/0

Replicate 1 Time: 18:03
Concentration (ug/L): 3.41

Replicate 2 Time: 18:06
Concentration (ug/L): 3.62

Mean Conc (ug/L): 3.51 SD: 0.148 RSD(%): 4.2

~~~~~~

Cd ID: 81101.U3 Seq. No.: 00089 A/S Pos.: 15 Date: 11/0

Replicate 1 Time: 18:09
Concentration (ug/L): 4.44

Replicate 2 Time: 18:11
Concentration (ug/L): 4.60
~~~~~~

Mean Conc (ug/L): 4.52 SD: 0.114 RSD(%): 2.53

~~~~~~

Cd ID: 81101.U4 Seq. No.: 00090 A/S Pos.: 16 Date: 11/09/

Replicate 1 Time: 18:14
Concentration (ug/L): 4.56

Replicate 2 Time: 18:17
Concentration (ug/L): 4.92

Mean Conc (ug/L): 4.74 SD: 0.255 RSD(%): 5.39

~~~~~~

Cd ID: CCV Seq. No.: 00091 A/S Pos.: 3 Date: 11/09/

Replicate 1 Time: 18:20
Concentration (ug/L): 6.32

Replicate 2 Time: 18:22
Concentration (ug/L): 6.48

Mean Conc (ug/L): 6.40 SD: 0.113 RSD(%): 1.76

QC sample is within range

~~~~~~

Cd ID: CCB Seq. No.: 00092 A/S Pos.: 0 Date: 11/09/

Replicate 1 Time: 18:25
Concentration (ug/L): -0.07

Replicate 2 Time: 18:28
Concentration (ug/L): -0.29

Mean Conc (ug/L): -0.18 SD: 0.153 RSD(%): 86.6

QC sample is within range

~~~~~~

Cd ID: 81101.I2 Seq. No.: 00093 A/S Pos.: 18 Date: 11/09/

Replicate 1 Time: 18:30
Concentration (ug/L): 3.56

Replicate 2 Time: 18:33
Concentration (ug/L): 3.56

Mean Conc (ug/L): 3.56 SD: 0.001 RSD(%): 0.03

~~~~~~

Cd ID: 81101.I3 repeated at end of run Seq. No.: 00094 A/S Pos.: 19 Date: 11/09

Sample abs. is greater than that of the largest standard.
Replicate 1 Time: 18:36
Concentration (ug/L): 27.84

Sample abs. is greater than that of the largest standard.
Replicate 2 Time: 18:39
~~~~~~

~~~~~~

Cd ID: 81017.5-7 Seq. No.: 00100 A/S Pos.: 28 Date: 11/09/

Replicate 1 Time: 19:10
Concentration (ug/L): -0.12

Replicate 2 Time: 19:12
Concentration (ug/L): -0.12

Mean Conc (ug/L): -0.12 SD: 0.000 RSD(%): 0.0

~~~~~~

Cd ID: 81017.7-7 Seq. No.: 00101 A/S Pos.: 29 Date: 11/09/

Replicate 1 Time: 19:15
Concentration (ug/L): -0.07

Replicate 2 Time: 19:18
Concentration (ug/L): -0.34

Mean Conc (ug/L): -0.21 SD: 0.195 RSD(%): 94.

~~~~~~

Cd ID: CCV Seq. No.: 00102 A/S Pos.: 3 Date: 11/0

Replicate 1 Time: 19:21
Concentration (ug/L): 6.30

Replicate 2 Time: 19:23
Concentration (ug/L): 6.54

Mean Conc (ug/L): 6.42 ✓ SD: 0.165 RSD(%): 2.5

QC sample is within range

~~~~~~

Cd ID: CCB Seq. No.: 00103 A/S Pos.: 0 Date: 11/0

Replicate 1 Time: 19:26
Concentration (ug/L): -0.29

Replicate 2 Time: 19:29
Concentration (ug/L): -0.01

Mean Conc (ug/L): -0.15 ✓ SD: 0.196 RSD(%): 132

QC sample is within range

~~~~~~

Cd ID: 81017.8-7 Seq. No.: 00104 A/S Pos.: 30 Date: 11/09/

Replicate 1 Time: 19:31
Concentration (ug/L): -0.12

Replicate 2 Time: 19:34
Concentration (ug/L): -0.07

Mean Conc (ug/L): -0.10 SD: 0.040 RSD(%): 42.
~~~~~~

Concentration (ug/L): -0.27

Replicate 2 Time: 20:07
Concentration (ug/L): -0.31

Mean Conc (ug/L): -0.29 SD: 0.030 RSD(%): 10.38

~~~~~~

Cd ID: 81017.8-102 Seq. No.: 00111 A/S Pos.: 37 Date: 11/09/

Replicate 1 Time: 20:09
Concentration (ug/L): -0.28

Replicate 2 Time: 20:12
Concentration (ug/L): -0.25

Mean Conc (ug/L): -0.26 SD: 0.022 RSD(%): 8.46

~~~~~~

Cd ID: 81017.10-102 Seq. No.: 00112 A/S Pos.: 38 Date: 11/09/

Replicate 1 Time: 20:15
Concentration (ug/L): -0.26

Replicate 2 Time: 20:18
Concentration (ug/L): -0.27

Mean Conc (ug/L): -0.26 SD: 0.009 RSD(%): 3.33

~~~~~~

Cd ID: 81017.11-103 Seq. No.: 00113 A/S Pos.: 39 Date: 11/09/

Replicate 1 Time: 20:21
Concentration (ug/L): -0.47

Replicate 2 Time: 20:23
Concentration (ug/L): -0.31

Mean Conc (ug/L): -0.39 SD: 0.115 RSD(%): 29.3

~~~~~~

Cd ID: CCV Seq. No.: 00114 A/S Pos.: 3 Date: 11/09

Replicate 1 Time: 20:26
Concentration (ug/L): 6.58

Replicate 2 Time: 20:29
Concentration (ug/L): 6.40

Mean Conc (ug/L): 6.49 ✓ SD: 0.131 RSD(%): 2.02

QC sample is within range

~~~~~~

Cd ID: CCB Seq. No.: 00115 A/S Pos.: 0 Date: 11/09

Replicate 1 Time: 20:32
Concentration (ug/L): -0.17
~~~~~~

Replicate 2 Time: 20:34
Concentration (ug/L): -0.06

Mean Conc (ug/L): -0.12 SD: 0.080 RSD(%): 68.1?

QC sample is within range

~~~~~~

Cd ID: 81101.I3X5 Seq. No.: 00116 A/S Pos.: 19 Date: 11/10/9

Sample abs. is greater than that of the largest standard.
Replicate 1 Time: 08:34
Concentration (ug/L): 15.85 Corrected Conc (ug/L): 79.3

Sample abs. is greater than that of the largest standard.
Replicate 2 Time: 08:37
Concentration (ug/L): 15.77 Corrected Conc (ug/L): 78.8

Sample abs. is greater than that of the largest standard.
Mean Conc (ug/L): 15.81 SD: 0.063 RSD(%): 0.40
Corrected Conc (ug/L): 79.1

~~~~~~

Cd ID: 81101.I3X20 Seq. No.: 00117 A/S Pos.: 19 Date: 11/10

Replicate 1 Time: 08:40
Concentration (ug/L): 5.11 Corrected Conc (ug/L): 102.3

Replicate 2 Time: 08:42
Concentration (ug/L): 5.06 Corrected Conc (ug/L): 101.2

Mean Conc (ug/L): 5.09 SD: 0.038 RSD(%): 0.75
Corrected Conc (ug/L): 101.7

~~~~~~

Cd ID: CCV Seq. No.: 00118 A/S Pos.: 3 Date: 11/10/9

Replicate 1 Time: 08:45
Concentration (ug/L): 6.96

Replicate 2 Time: 08:48
Concentration (ug/L): 6.36

Mean Conc (ug/L): 6.66 SD: 0.422 RSD(%): 6.34

QC sample is within range

~~~~~~

Cd ID: CCB Seq. No.: 00119 A/S Pos.: 0 Date: 11/10/

Replicate 1 Time: 08:51
Concentration (ug/L): 0.11

Replicate 2 Time: 08:53
Concentration (ug/L): 0.09

Mean Conc (ug/L): 0.10 SD: 0.016 RSD(%): 15.65

QC sample is within range

Element File: CR.GEL
Date: 11/10/98
Data File:
Technique: HGA

Element: Cr
Time: 09:16
ID/Wt File: 81017.IDW
Calib. Type: Linear

Wavelength: 357.9
Slit: 0.7 L
Lamp Current: 14
Energy: 56

Cr ID: BLANK Seq. No.: 00120 A/S Pos.: 0 Date: 11/10/

Replicate 1
Time: 09:16
Peak Area (A-s): 0.028
Peak Height (A): 0.020
Background Pk Area (A-s): 0.030
Background Pk Height (A): 0.032
Blank Corrected Pk Area (A-s): 0.028

Replicate 2
Time: 09:19
Peak Area (A-s): 0.014
Peak Height (A): 0.020
Background Pk Area (A-s): 0.034
Background Pk Height (A): 0.026
Blank Corrected Pk Area (A-s): 0.014

Mean Pk Area (A-s): 0.021 SD: 0.0099 RSD(%): 46.92

Auto-zero performed.

Cr ID: 10 PPB Seq. No.: 00121 A/S Pos.: 1 Date: 11/10/

Replicate 1
Time: 09:22
Peak Area (A-s): 0.091
Peak Height (A): 0.064
Background Pk Area (A-s): 0.029
Background Pk Height (A): 0.026
Blank Corrected Pk Area (A-s): 0.070

Replicate 2
Time: 09:25
Peak Area (A-s): 0.094
Peak Height (A): 0.065
Background Pk Area (A-s): 0.032
Background Pk Height (A): 0.021
Blank Corrected Pk Area (A-s): 0.073

Mean Pk Area (A-s): 0.072 SD: 0.0020 RSD(%): 2.86

Standard number 1 applied. [10.0]
Correlation coefficient: 1.00000 Slope: 0.0072

Cr ID: 20 PPB Seq. No.: 00122 A/S Pos.: 2 Date: 11/10

Replicate 1
Time: 09:29
Peak Area (A-s): 0.178
Peak Height (A): 0.115
Background Pk Area (A-s): 0.038
Background Pk Height (A): 0.023
Blank Corrected Pk Area (A-s): 0.157
Concentration (ug/L): 21.9

Replicate 2
Time: 09:32
Peak Area (A-s): 0.182
Peak Height (A): 0.117
Background Pk Area (A-s): 0.040
Background Pk Height (A): 0.029
Blank Corrected Pk Area (A-s): 0.161
Concentration (ug/L): 22.5

Mean Conc (ug/L): 22.2 SD: 0.39 RSD(%): 1.76

Standard number 2 applied. [20.0]

Correlation coefficient: 0.99168   Slope: 0.0078

~~~~~~

Cr   ID: 50 PPB   Seq. No.: 00123   A/S Pos.: 3   Date: 11/10

Replicate 1   Time: 09:35
Peak Area (A-s): 0.415   Peak Height (A): 0.274
Background Pk Area (A-s): 0.048   Background Pk Height (A): 0.024
Blank Corrected Pk Area (A-s): 0.393
Concentration (ug/L): 50.4

Replicate 2   Time: 09:38
Peak Area (A-s): 0.424   Peak Height (A): 0.258
Background Pk Area (A-s): 0.049   Background Pk Height (A): 0.026
Blank Corrected Pk Area (A-s): 0.402
Concentration (ug/L): 51.6

Mean Conc (ug/L):   51.0   SD: 0.82   RSD(%): 1.61

Standard number 3 applied. [50.0]
Correlation coefficient: 0.99943   Slope: 0.0079

~~~~~~

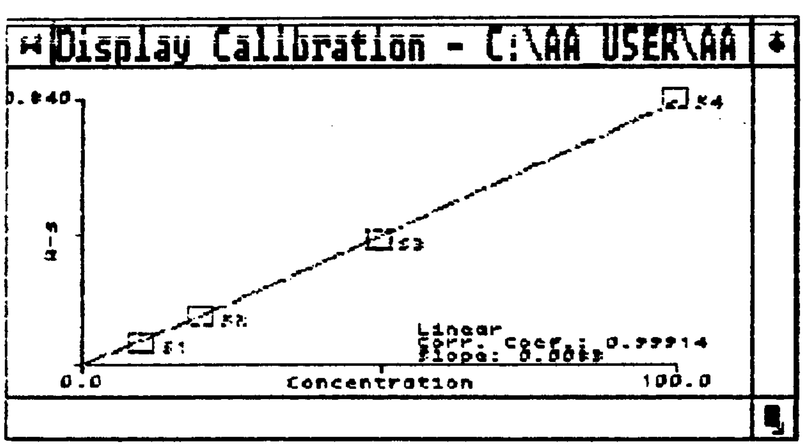
Cr   ID: 100 PPB   Seq. No.: 00124   A/S Pos.: 4   Date: 11/10

Replicate 1   Time: 09:41
Peak Area (A-s): 0.840   Peak Height (A): 0.483
Background Pk Area (A-s): 0.066   Background Pk Height (A): 0.031
Blank Corrected Pk Area (A-s): 0.819
Concentration (ug/L): 103.2

Replicate 2   Time: 09:44
Peak Area (A-s): 0.883   Peak Height (A): 0.502
Background Pk Area (A-s): 0.069   Background Pk Height (A): 0.033
Blank Corrected Pk Area (A-s): 0.862
Concentration (ug/L): 108.6

Mean Conc (ug/L):   105.9   SD: 3.83   RSD(%): 3.62

Standard number 4 applied. [100.0]
Correlation coefficient: 0.99914   Slope: 0.0083



~~~~~~

Cr ID: ICV Seq. No.: 00125 A/S Pos.: 5 Date: 11/10/

Replicate 1 Time: 09:57
Concentration (ug/L): 52.3

Replicate 2 Time: 10:00
Concentration (ug/L): 49.5

Mean Conc (ug/L): 50.9 SD: 1.94 RSD(%): 3.81

QC sample is within range 39.51 - 60.49

~~~~~~

Cr ID: ICB Seq. No.: 00126 A/S Pos.: 0 Date: 11/10/

Replicate 1 Time: 10:03
Concentration (ug/L): 2.0

Replicate 2 Time: 10:06
Concentration (ug/L): -0.0

Mean Conc (ug/L): 1.0 SD: 1.42 RSD(%): 143.1

QC sample is within range -10.49 - 10.49

~~~~~~

Cr ID: 81101.BF Seq. No.: 00127 A/S Pos.: 6 Date: 11/10/

Replicate 1 Time: 10:09
Concentration (ug/L): 3.6

Replicate 2 Time: 10:12
Concentration (ug/L): 3.5

Mean Conc (ug/L): 3.6 SD: 0.05 RSD(%): 1.40

~~~~~~

Cr ID: 81101.OB Seq. No.: 00128 A/S Pos.: 7 Date: 11/10/

Replicate 1 Time: 10:15
Concentration (ug/L): 18.8

Replicate 2 Time: 10:18
Concentration (ug/L): 19.2

Mean Conc (ug/L): 19.0 SD: 0.27 RSD(%): 1.40

~~~~~~

Cr ID: 81101.UB Seq. No.: 00129 A/S Pos.: 8 Date: 11/10/

Replicate 1 Time: 10:22
Concentration (ug/L): 14.8

Replicate 2 Time: 10:25
Concentration (ug/L): 13.5

Mean Conc (ug/L): 14.2 SD: 0.89 RSD(%): 6.31
~~~~~~

~~~~~~

Cr ID: 81101.IB Seq. No.: 00130 A/S Pos.: 9 Date: 11/10/

Replicate 1 Time: 10:28
Concentration (ug/L): 12.3

Replicate 2 Time: 10:31
Concentration (ug/L): 11.9

Mean Conc (ug/L): 12.1 SD: 0.26 RSD(%): 2.12

~~~~~~

Cr ID: 81101.01 Seq. No.: 00131 A/S Pos.: 10 Date: 11/10/

Replicate 1 Time: 10:34
Concentration (ug/L): 18.2

Replicate 2 Time: 10:37
Concentration (ug/L): 18.8

Mean Conc (ug/L): 18.5 SD: 0.43 RSD(%): 2.35

~~~~~~

Cr ID: 81101.01 Seq. No.: 00132 A/S Pos.: 10 Date: 11/10

Replicate 1 Time: 10:40
Concentration (ug/L): 63.3

Replicate 2 Time: 10:44
Concentration (ug/L): 66.1

Mean Conc (ug/L): 64.7 SD: 1.96 RSD(%): 3.04

Recovery is 92.5%

~~~~~~

Cr ID: 81101.02 Seq. No.: 00133 A/S Pos.: 11 Date: 11/10

Replicate 1 Time: 10:47
Concentration (ug/L): 30.4

Replicate 2 Time: 10:50
Concentration (ug/L): 30.0

Mean Conc (ug/L): 30.2 SD: 0.29 RSD(%): 0.97

~~~~~~

Cr ID: 81101.03 Seq. No.: 00134 A/S Pos.: 12 Date: 11/10

Replicate 1 Time: 10:53
Concentration (ug/L): 34.7

Replicate 2 Time: 10:56
Concentration (ug/L): 34.7

Mean Conc (ug/L): 34.7 SD: 0.01 RSD(%): 0.03
~~~~~~

~~~~~~

Cr ID: CCV Seq. No.: 00135 A/S Pos.: 3 Date: 11/10/

Replicate 1 Time: 10:59
Concentration (ug/L): 49.0

Replicate 2 Time: 11:02
Concentration (ug/L): 50.5

Mean Conc (ug/L): 49.8 SD: 1.02 RSD(%): 2.04

QC sample is within range 39.51 - 60.49

~~~~~~

Cr ID: CCB Seq. No.: 00136 A/S Pos.: 0 Date: 11/10/

Replicate 1 Time: 11:05
Concentration (ug/L): 0.7

Replicate 2 Time: 11:08
Concentration (ug/L): -0.6

Mean Conc (ug/L): 0.0 SD: 0.92 RSD(%): 2047.

QC sample is within range -10.49 - 10.49

~~~~~~

Cr ID: 81101.U1 Seq. No.: 00137 A/S Pos.: 13 Date: 11/10/

Replicate 1 Time: 11:11
Concentration (ug/L): 50.6

Replicate 2 Time: 11:14
Concentration (ug/L): 52.6

Mean Conc (ug/L): 51.6 SD: 1.40 RSD(%): 2.72

~~~~~~

Cr ID: 81101.U2 Seq. No.: 00138 A/S Pos.: 14 Date: 11/10/

Replicate 1 Time: 11:17
Concentration (ug/L): 106.0

Replicate 2 Time: 11:20
Concentration (ug/L): 108.2

Mean Conc (ug/L): 107.1 SD: 1.52 RSD(%): 1.42

~~~~~~

Cr ID: 81101.U3 Seq. No.: 00139 A/S Pos.: 15 Date: 11/10/

Replicate 1 Time: 11:23
Concentration (ug/L): 67.7

Replicate 2 Time: 11:26
Concentration (ug/L): 66.7

Mean Conc (ug/L): 67.2 SD: 0.69 RSD(%): 1.03
~~~~~~

~~~~~~

Cr ID: 81101.U4 Seq. No.: 00140 A/S Pos.: 16 Date: 11/10/

Replicate 1 Time: 11:29
Concentration (ug/L): 57.8

Replicate 2 Time: 11:32
Concentration (ug/L): 57.4

Mean Conc (ug/L): 57.6 SD: 0.24 RSD(%): 0.42

~~~~~~

Cr ID: 81101.I1X2.5 Seq. No.: 00141 A/S Pos.: 17 Date: 11/10/

Replicate 1 Time: 11:35
Concentration (ug/L): 52.4 Corrected Conc (ug/L): 131.0

Replicate 2 Time: 11:38
Concentration (ug/L): 50.5 Corrected Conc (ug/L): 126.2

Mean Conc (ug/L): 51.4 SD: 1.34 RSD(%): 2.61
Corrected Conc (ug/L): 128.6

~~~~~~

Cr ID: 81101.I2X2.5 Seq. No.: 00142 A/S Pos.: 18 Date: 11/10/

Replicate 1 Time: 11:41
Concentration (ug/L): 45.6 Corrected Conc (ug/L): 114.1

Replicate 2 Time: 11:44
Concentration (ug/L): 48.8 Corrected Conc (ug/L): 122.1

Mean Conc (ug/L): 47.2 SD: 2.26 RSD(%): 4.79
Corrected Conc (ug/L): 118.1

~~~~~~

Cr ID: 81101.I3X2.5 Seq. No.: 00143 A/S Pos.: 19 Date: 11/10

Replicate 1 Time: 11:47
Concentration (ug/L): 39.8 Corrected Conc (ug/L): 99.4

Replicate 2 Time: 11:50
Concentration (ug/L): 38.9 Corrected Conc (ug/L): 97.2

Mean Conc (ug/L): 39.3 SD: 0.63 RSD(%): 1.61
Corrected Conc (ug/L): 98.3

~~~~~~

Cr ID: CCV Seq. No.: 00144 A/S Pos.: 3 Date: 11/10/

Replicate 1 Time: 11:53
Concentration (ug/L): 50.1

Replicate 2 Time: 11:57
Concentration (ug/L): 51.5

Mean Conc (ug/L): 50.8 SD: 0.96 RSD(%): 1.90

QC sample is within range 39.51 - 60.49
~~~~~~

Cr ID: CCB Seq. No.: 00145 A/S Pos.: 0 Date: 11/10/

Replicate 1 Time: 12:00
Concentration (ug/L): 1.9

Replicate 2 Time: 12:03
Concentration (ug/L): 0.2

Mean Conc (ug/L): 1.0 SD: 1.20 RSD(%): 117.6

QC sample is within range -10.49 - 10.49

Cr ID: 81017.LB Seq. No.: 00146 A/S Pos.: 20 Date: 11/10/

Replicate 1 Time: 12:11
Concentration (ug/L): -0.3

Replicate 2 Time: 12:14
Concentration (ug/L): -0.4

Mean Conc (ug/L): -0.3 SD: 0.06 RSD(%): 19.06

Cr ID: 81017.LCS Seq. No.: 00147 A/S Pos.: 21 Date: 11/10/

Replicate 1 Time: 12:17
Concentration (ug/L): 49.2

Replicate 2 Time: 12:20
Concentration (ug/L): 51.5

Mean Conc (ug/L): 50.4 SD: 1.62 RSD(%): 3.22

Cr ID: 81017.1-7 Seq. No.: 00148 A/S Pos.: 22 Date: 11/10/

Replicate 1 Time: 12:23
Concentration (ug/L): 31.1

Replicate 2 Time: 12:26
Concentration (ug/L): 31.7

Mean Conc (ug/L): 31.4 SD: 0.43 RSD(%): 1.36

Cr ID: 81017.1-7S Seq. No.: 00149 A/S Pos.: 23 Date: 11/10/

Replicate 1 Time: 12:29
Concentration (ug/L): 77.1

Replicate 2 Time: 12:32
Concentration (ug/L): 78.1

Mean Conc (ug/L): 77.6 SD: 0.72 RSD(%): 0.92

3MA 400 Analysis Ver. 4.10 Tue 11/10/98 - 11:45:05

ıod File Name: CO Replicates:3 Read Delay: 60
arks: Data File:

Wt file is 81101

ANDARD #1		REPLICATE #1						1148	11/10/98
	CO228	EM	474				peak-noisy		
ANDARD #1		REPLICATE #2							
	CO228	EM	491						
ANDARD #1		REPLICATE #3							
	CO228	EM	482						
	CO228	AV	482.3	SD	8.5	CV	1.8	CONC	0.0200
ANDARD #2		REPLICATE #1						1150	11/10/98
	CO228	EM	691				peak-noisy		
ANDARD #2		REPLICATE #2							
	CO228	EM	663						
ANDARD #2		REPLICATE #3							
	CO228	EM	690				peak-noisy		
	CO228	AV	681.3	SD	15.9	CV	2.3	CONC	0.1000
ANDARD #3		REPLICATE #1						1152	11/10/98
	CO228	EM	1694						
ANDARD #3		REPLICATE #2							
	CO228	EM	1659						
ANDARD #3		REPLICATE #3							
	CO228	EM	1655						
	CO228	AV	1669.3	SD	21.5	CV	1.3	CONC	0.5000
ANDARD #4		REPLICATE #1						1153	11/10/98
	CO228	EM	2896						
ANDARD #4		REPLICATE #2							
	CO228	EM	2936						
ANDARD #4		REPLICATE #3							
	CO228	EM	2988						
	CO228	AV	2940.0	SD	46.1	CV	1.6	CONC	1.0000
ANK		REPLICATE #1						1155	11/10/98
	CO228	EM	365						
ANK		REPLICATE #2							
	CO228	EM	436						

.ANK REPLICATE #3
CO228 EM 385

CO228 AV 395.3 SD 36.6 CV 9.3 CONC 0.0000

CO228 CC 0.9999 SLOPE 2520.5386 INT 417.0122

:V REPLICATE #1 1157 11/10/98
CO228 EM 1703 0.5102 mg/L

:V REPLICATE #2
CO228 EM 1604 0.4709 mg/L

:V REPLICATE #3
CO228 EM 1708 0.5122 mg/L

CO228 AV 1671.7 EM SD 58.7 CV 3.5

CO228 AV 0.4978 mg/L SD 0.0233 CV 4.67

:B REPLICATE #1 1159 11/10/98
CO228 EM 436 0.0075 mg/L peak-noisy

:B REPLICATE #2
CO228 EM 419 0.0008 mg/L peak-noisy

:B REPLICATE #3
CO228 EM 417 -0.0000 mg/L peak-noisy

CO228 AV 424.0 EM SD 10.4 CV 2.5

CO228 AV 0.0028 mg/L SD 0.0041 CV 149.41

.101.BF REPLICATE #1 1200 11/10/98
CO228 EM 415 -0.0008 mg/L peak-noisy

.101.BF REPLICATE #2
CO228 EM 419 0.0008 mg/L peak-noisy

.101.BF REPLICATE #3
CO228 EM 390 -0.0107 mg/L peak-noisy

CO228 AV 408.0 EM SD 15.7 CV 3.9

CO228 AV -0.0036 mg/L SD 0.0062 CV 174.39

3 REPLICATE #1 1202 11/10/98
CO228 EM 417 -0.0000 mg/L peak-noisy

3 REPLICATE #2
CO228 EM 408 -0.0036 mg/L peak-noisy

3 REPLICATE #3
CO228 EM 426 0.0036 mg/L window-edge

CO228 AV 417.0 EM SD 9.0 CV 2.2

CO228 AV -0.0000 mg/L SD 0.0036 CV 73912.78

3 REPLICATE #1 1204 11/10/98
CO228 EM 402 -0.0060 mg/L window-edge

3 REPLICATE #2

REPLICATE #3
CO228 EM 398 -0.0075 mg/L peak-noisy

CO228 AV 403.3 EM SD 6.1 CV 1.5

CO228 AV -0.0054 mg/L SD 0.0024 CV 44.67

REPLICATE #1 1206 11/10/98
CO228 EM 411 -0.0024 mg/L peak-noisy

REPLICATE #2
CO228 EM 400 -0.0067 mg/L peak-noisy

REPLICATE #3
CO228 EM 395 -0.0087 mg/L peak-noisy

CO228 AV 402.0 EM SD 8.2 CV 2.0

CO228 AV -0.0060 mg/L SD 0.0032 CV 54.52

REPLICATE #1 1207 11/10/98
CO228 EM 437 0.0079 mg/L peak-noisy

REPLICATE #2
CO228 EM 412 -0.0020 mg/L peak-noisy

REPLICATE #3
CO228 EM 416 -0.0004 mg/L peak-noisy

CO228 AV 421.7 EM SD 13.4 CV 3.2

CO228 AV 0.0018 mg/L SD 0.0053 CV 288.51

S REPLICATE #1 1209 11/10/98
CO228 EM 2608 0.8693 mg/L

S REPLICATE #2
CO228 EM 2617 0.8728 mg/L

S REPLICATE #3
CO228 EM 2630 0.8780 mg/L

CO228 AV 2618.3 EM SD 11.1 CV 0.4

CO228 AV 0.8734 mg/L SD 0.0044 CV 0.50

REPLICATE #1 1211 11/10/98
CO228 EM 407 -0.0040 mg/L window-edge

REPLICATE #2
CO228 EM 410 -0.0028 mg/L peak-noisy

REPLICATE #3
CO228 EM 402 -0.0060 mg/L peak-noisy

CO228 AV 406.3 EM SD 4.0 CV 1.0

CO228 AV -0.0042 mg/L SD 0.0016 CV 37.85

D REPLICATE #1 1213 11/10/98

:D REPLICATE #2
CO228 EM 402 -0.0060 mg/L peak-noisy

:D REPLICATE #3
CO228 EM 424 0.0028 mg/L peak-noisy

CO228 AV 408.7 EM SD 13.3 CV 3.3

CO228 AV -0.0033 mg/L SD 0.0053 CV 159.57

: REPLICATE #1 1214 11/10/98
CO228 EM 391 -0.0103 mg/L peak-noisy

: REPLICATE #2
CO228 EM 391 -0.0103 mg/L peak-noisy

: REPLICATE #3
CO228 EM 394 -0.0091 mg/L peak-noisy

CO228 AV 392.0 EM SD 1.7 CV 0.4

CO228 AV -0.0099 mg/L SD 0.0007 CV 6.92

:V REPLICATE #1 1216 11/10/98
CO228 EM 1905 0.5903 mg/L

:V REPLICATE #2
CO228 EM 1907 0.5911 mg/L

:V REPLICATE #3
CO228 EM 1922 0.5971 mg/L

CO228 AV 1911.3 EM SD 9.3 CV 0.5

CO228 AV 0.5929 mg/L SD 0.0037 CV 0.62

:B REPLICATE #1 1218 11/10/98
CO228 EM 421 0.0016 mg/L window-edge

:B REPLICATE #2
CO228 EM 441 0.0095 mg/L peak-noisy

:B REPLICATE #3
CO228 EM 425 0.0032 mg/L peak-noisy

CO228 AV 429.0 EM SD 10.6 CV 2.5

CO228 AV 0.0048 mg/L SD 0.0042 CV 88.28

REPLICATE #1 1220 11/10/98
CO228 EM 389 -0.0111 mg/L window-edge

REPLICATE #2
CO228 EM 408 -0.0036 mg/L peak-noisy

REPLICATE #3
CO228 EM 434 0.0067 mg/L peak-noisy

CO228 AV 410.3 EM SD 22.6 CV 5.5

CO228 AV -0.0026 mg/L SD 0.0090 CV 338.24

≥ REPLICATE #1 1221 11/10/98
CO228 EM 416 -0.0004 mg/L window-edge

REPLICATE #2

CO228 EM 406 -0.0044 mg/L peak-noisy

REPLICATE #3

CO228 EM 425 0.0032 mg/L peak-noisy

CO228 AV 415.7 EM SD 9.5 CV 2.3

CO228 AV -0.0005 mg/L SD 0.0038 CV 706.37

REPLICATE #1 1223 11/10/98

CO228 EM 414 -0.0012 mg/L peak-noisy

REPLICATE #2

CO228 EM 443 0.0103 mg/L peak-noisy

REPLICATE #3

CO228 EM 404 -0.0052 mg/L peak-noisy

CO228 AV 420.3 EM SD 20.3 CV 4.8

CO228 AV 0.0013 mg/L SD 0.0080 CV 609.93

REPLICATE #1 1225 11/10/98

CO228 EM 408 -0.0036 mg/L peak-noisy

REPLICATE #2

CO228 EM 419 0.0008 mg/L window-edge

REPLICATE #3

CO228 EM 431 0.0055 mg/L peak-noisy

CO228 AV 419.3 EM SD 11.5 CV 2.7

CO228 AV 0.0009 mg/L SD 0.0046 CV 495.60

REPLICATE #1 1227 11/10/98

CO228 EM 525 0.0428 mg/L peak-noisy

REPLICATE #2

CO228 EM 446 0.0115 mg/L

REPLICATE #3

CO228 EM 465 0.0190 mg/L peak-noisy

CO228 AV 478.7 EM SD 41.2 CV 8.6

CO228 AV 0.0245 mg/L SD 0.0164 CV 66.88

REPLICATE #1 1228 11/10/98

CO228 EM 468 0.0202 mg/L peak-noisy

REPLICATE #2

CO228 EM 464 0.0186 mg/L

REPLICATE #3

CO228 EM 468 0.0202 mg/L peak-noisy

CO228 AV 466.7 EM SD 2.3 CV 0.5

CO228 AV 0.0197 mg/L SD 0.0009 CV 4.65

REPLICATE #1 1230 11/10/98

CO228 EM 444 0.0107 mg/L peak-noisy

CO228 EM 454 0.0147 mg/L peak-noisy

REPLICATE #3
CO228 EM 470 0.0210 mg/L peak-noisy

CO228 AV 456.0 EM SD 13.1 CV 2.9

CO228 AV 0.0155 mg/L SD 0.0052 CV 33.64

:V REPLICATE #1 1232 11/10/98
CO228 EM 1918 0.5955 mg/L

:V REPLICATE #2
CO228 EM 1969 0.6157 mg/L

:V REPLICATE #3
CO228 EM 1957 0.6110 mg/L

CO228 AV 1948.0 EM SD 26.7 CV 1.4

CO228 AV 0.6074 mg/L SD 0.0106 CV 1.74

:B REPLICATE #1 1234 11/10/98
CO228 EM 433 0.0063 mg/L peak-noisy

:B REPLICATE #2
CO228 EM 427 0.0040 mg/L peak-noisy

:B REPLICATE #3
CO228 EM 439 0.0087 mg/L peak-noisy

CO228 AV 433.0 EM SD 6.0 CV 1.4

CO228 AV 0.0063 mg/L SD 0.0024 CV 37.53

AMPLE #23 REPLICATE #1 1236 11/10/98
CO228 EM 443 0.0103 mg/L peak-noisy

AMPLE #23 REPLICATE #2
CO228 EM 433 0.0063 mg/L peak-noisy

AMPLE #23 REPLICATE #3
CO228 EM 433 0.0063 mg/L peak-noisy

CO228 AV 436.3 EM SD 5.8 CV 1.3

CO228 AV 0.0077 mg/L SD 0.0023 CV 29.88

AMPLE #24 REPLICATE #1 1237 11/10/98
CO228 EM 442 0.0099 mg/L peak-noisy

AMPLE #24 REPLICATE #2
CO228 EM 440 0.0091 mg/L peak-noisy

AMPLE #24 REPLICATE #3
CO228 EM 444 0.0107 mg/L peak-noisy

CO228 AV 442.0 EM SD 2.0 CV 0.5

CO228 AV 0.0099 mg/L SD 0.0008 CV 8.00

AMPLE #25 REPLICATE #1 1239 11/10/98
CO228 EM 435 0.0071 mg/L peak-noisy

AMPLE #25 REPLICATE #2

3MA 400 Analysis Ver. 4.10 Tue 11/10/98 - 10:35:45

ıod File Name: CU Replicates:3 Read Delay: 60
arks: CU ONLY Data File:

Jt file is B1101

ANDARD #1			REPLICATE	#1				1039	11/10/98
	CU324	EM	1584				peak-noisy		
ANDARD #1			REPLICATE	#2					
	CU324	EM	1541						
ANDARD #1			REPLICATE	#3					
	CU324	EM	1566						
	CU324	AV	1563.7	SD	21.6	CV	1.4	CONC	0.0200
ANDARD #2			REPLICATE	#1				1041	11/10/98
	CU324	EM	2695						
ANDARD #2			REPLICATE	#2					
	CU324	EM	2822						
ANDARD #2			REPLICATE	#3					
	CU324	EM	2763						
	CU324	AV	2760.0	SD	63.6	CV	2.3	CONC	0.1000
ANDARD #3			REPLICATE	#1				1042	11/10/98
	CU324	EM	9111						
ANDARD #3			REPLICATE	#2					
	CU324	EM	8706						
ANDARD #3			REPLICATE	#3					
	CU324	EM	9401						
	CU324	AV	9072.7	SD	349.1	CV	3.8	CONC	0.5000
ANDARD #4			REPLICATE	#1				1044	11/10/98
	CU324	EM	17138						
ANDARD #4			REPLICATE	#2					
	CU324	EM	17811						
ANDARD #4			REPLICATE	#3					
	CU324	EM	17786						
	CU324	AV	17578.3	SD	381.5	CV	2.2	CONC	1.0000
ANK			REPLICATE	#1				1046	11/10/98
	CU324	EM	1262						
ANK			REPLICATE	#2					
	CU324	EM	1156						

.HNR REPLICATE #3
CU324 EM 1268

CU324 AV 1228.7 SD 63.0 CV 5.1 CONC 0.0000

CU324 CC 0.9998 SLOPE 16298.754 INT 1159.8701

:V REPLICATE #1 1048 11/10/98
CU324 EM 9139 0.4896 mg/L

:V REPLICATE #2
CU324 EM 9198 0.4932 mg/L

:V REPLICATE #3
CU324 EM 9555 0.5151 mg/L

CU324 AV 9297.3 EM SD 225.1 CV 2.4

CU324 AV 0.4993 mg/L SD 0.0138 CV 2.77

:B REPLICATE #1 1049 11/10/98
CU324 EM 1296 0.0084 mg/L peak-noisy

:B REPLICATE #2
CU324 EM 1262 0.0063 mg/L peak-noisy

:B REPLICATE #3
CU324 EM 1328 0.0103 mg/L peak-noisy

CU324 AV 1295.3 EM SD 33.0 CV 2.5

CU324 AV 0.0083 mg/L SD 0.0020 CV 24.36

.101.BF REPLICATE #1 1051 11/10/98
CU324 EM 1329 0.0104 mg/L

.101.BF REPLICATE #2
CU324 EM 1313 0.0094 mg/L peak-noisy

101.BF REPLICATE #3
CU324 EM 1299 0.0085 mg/L

CU324 AV 1313.7 EM SD 15.0 CV 1.1

CU324 AV 0.0094 mg/L SD 0.0009 CV 9.76

3 REPLICATE #1 1053 11/10/98
CU324 EM 1576 0.0255 mg/L

3 REPLICATE #2
CU324 EM 1536 0.0231 mg/L

3 REPLICATE #3
CU324 EM 1578 0.0257 mg/L

CU324 AV 1563.3 EM SD 23.7 CV 1.5

CU324 AV 0.0248 mg/L SD 0.0015 CV 5.87

3 REPLICATE #1 1055 11/10/98
CU324 EM 1560 0.0245 mg/L

3 REPLICATE #2
CU324 EM 1553 0.0241 mg/L

REPLICATE #3

CU324 EM 1320 [illegible] mg/L

CU324 AV 1546.0 EM SD 18.5 CV 1.2

CU324 AV 0.0237 mg/L SD 0.0011 CV 4.80

3 REPLICATE #1 1056 11/10/98
CU324 EM 1412 0.0155 mg/L

3 REPLICATE #2
CU324 EM 1359 0.0122 mg/L

3 REPLICATE #3
CU324 EM 1418 0.0158 mg/L

CU324 AV 1396.3 EM SD 32.5 CV 2.3

CU324 AV 0.0145 mg/L SD 0.0020 CV 13.73

- REPLICATE #1 1058 11/10/98
CU324 EM 1588 0.0263 mg/L

- REPLICATE #2
CU324 EM 1605 0.0273 mg/L

L REPLICATE #3
CU324 EM 1634 0.0291 mg/L

CU324 AV 1609.0 EM SD 23.3 CV 1.4

CU324 AV 0.0276 mg/L SD 0.0014 CV 5.18

L S REPLICATE #1 1100 11/10/98
CU324 EM 9207 0.4937 mg/L

L S REPLICATE #2
CU324 EM 9255 0.4967 mg/L

L S REPLICATE #3
CU324 EM 9070 0.4853 mg/L

CU324 AV 9177.3 EM SD 96.0 CV 1.0

CU324 AV 0.4919 mg/L SD 0.0059 CV 1.20

2 REPLICATE #1 1102 11/10/98
CU324 EM 1747 0.0360 mg/L

2 REPLICATE #2
CU324 EM 1740 0.0356 mg/L peak-noisy

2 REPLICATE #3
CU324 EM 1731 0.0350 mg/L

CU324 AV 1739.3 EM SD 8.0 CV 0.5

CU324 AV 0.0356 mg/L SD 0.0005 CV 1.38

2D REPLICATE #1 1104 11/10/98
CU324 EM 1720 0.0344 mg/L

2D REPLICATE #2
CU324 EM 1788 0.0385 mg/L

2D REPLICATE #3
CU324 EM 1796 0.0390 mg/L

CU324 AV 1768.0 EM SD 41.8 CV 2.4

CU324 AV 0.0373 mg/L SD 0.0026 CV 6.87

3 REPLICATE #1 1105 11/10/98
CU324 EM 1824 0.0407 mg/L

3 REPLICATE #2
CU324 EM 1962 0.0492 mg/L

3 REPLICATE #3
CU324 EM 1825 0.0408 mg/L

CU324 AV 1870.3 EM SD 79.4 CV 4.2

CU324 AV 0.0436 mg/L SD 0.0049 CV 11.17

CV REPLICATE #1 1107 11/10/98
CU324 EM 10699 0.5853 mg/L

CV REPLICATE #2
CU324 EM 10313 0.5616 mg/L

CV REPLICATE #3
CU324 EM 10556 0.5765 mg/L

CU324 AV 10522.7 EM SD 195.1 CV 1.9

CU324 AV 0.5744 mg/L SD 0.0120 CV 2.08

CB REPLICATE #1 1109 11/10/98
CU324 EM 1301 0.0087 mg/L

CB REPLICATE #2
CU324 EM 1404 0.0150 mg/L

CB REPLICATE #3
CU324 EM 1300 0.0086 mg/L

CU324 AV 1335.0 EM SD 59.8 CV 4.5

CU324 AV 0.0107 mg/L SD 0.0037 CV 34.12

1 REPLICATE #1 1111 11/10/98
CU324 EM 1969 0.0496 mg/L

1 REPLICATE #2
CU324 EM 1915 0.0463 mg/L

1 REPLICATE #3
CU324 EM 1993 0.0511 mg/L

CU324 AV 1959.0 EM SD 39.9 CV 2.0

CU324 AV 0.0490 mg/L SD 0.0025 CV 5.00

2 REPLICATE #1 1112 11/10/98
CU324 EM 1975 0.0500 mg/L

2 REPLICATE #2
CU324 EM 2009 0.0521 mg/L

2 REPLICATE #3
CU324 EM 2001 0.0516 mg/L

CU324 AV 1953.0 EM SD 17.8 CV 0.9

CU324 AV 0.0512 mg/L SD 0.0011 CV 2.13

3 REPLICATE #1 1114 11/10/98
CU324 EM 1901 0.0455 mg/L

3 REPLICATE #2
CU324 EM 1878 0.0441 mg/L

3 REPLICATE #3
CU324 EM 1932 0.0474 mg/L

CU324 AV 1903.7 EM SD 27.1 CV 1.4

CU324 AV 0.0456 mg/L SD 0.0017 CV 3.64

1 REPLICATE #1 1116 11/10/98
CU324 EM 2104 0.0579 mg/L

1 REPLICATE #2
CU324 EM 2059 0.0552 mg/L

1 REPLICATE #3
CU324 EM 2093 0.0573 mg/L

CU324 AV 2085.3 EM SD 23.5 CV 1.1

CU324 AV 0.0568 mg/L SD 0.0014 CV 2.53

- REPLICATE #1 1118 11/10/98
CU324 EM 3721 0.1571 mg/L

- REPLICATE #2
CU324 EM 3798 0.1619 mg/L

- REPLICATE #3
CU324 EM 3814 0.1628 mg/L

CU324 AV 3777.7 EM SD 49.7 CV 1.3

CU324 AV 0.1606 mg/L SD 0.0031 CV 1.90

2 REPLICATE #1 1119 11/10/98
CU324 EM 3048 0.1158 mg/L

2 REPLICATE #2
CU324 EM 3006 0.1133 mg/L

2 REPLICATE #3
CU324 EM 3012 0.1136 mg/L

CU324 AV 3022.0 EM SD 22.7 CV 0.8

CU324 AV 0.1142 mg/L SD 0.0014 CV 1.22

3 REPLICATE #1 1121 11/10/98
CU324 EM 5298 0.2539 mg/L

3 REPLICATE #2
CU324 EM 5274 0.2524 mg/L

3 REPLICATE #3
CU324 EM 5453 0.2634 mg/L

CU324 AV 5341.7 EM SD 97.6 CV 1.8

CU324 AV 0.2566 mg/L SD 0.0060 CV 2.32

:V REPLICATE #1 1123 11/10/98
CU324 EM 9723 0.5254 mg/L

:V REPLICATE #2
CU324 EM 9407 0.5060 mg/L

:V REPLICATE #3
CU324 EM 9408 0.5061 mg/L

CU324 AV 9512.7 EM SD 182.2 CV 1.9

CU324 AV 0.5125 mg/L SD 0.0112 CV 2.18

:B REPLICATE #1 1125 11/10/98
CU324 EM 1346 0.0114 mg/L peak-noisy

:B REPLICATE #2
CU324 EM 1444 0.0174 mg/L peak-noisy

:B REPLICATE #3
CU324 EM 1318 0.0097 mg/L peak-noisy

CU324 AV 1369.3 EM SD 66.2 CV 4.8

CU324 AV 0.0129 mg/L SD 0.0041 CV 31.59

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---------------------------------------------------------------------------
lement File: PB.GEL          Element: Pb                    Wavelength: 283.3
ate: 11/06/98                Time: 09:12                    Slit: 0.7 L
ata File:                    ID/Wt File: B1101.IDW          Lamp Current: 10
echnique: HGA                Calib. Type: Linear            Energy: 46
---------------------------------------------------------------------------
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
b    ID: BLANK               Seq. No.: 00119    A/S Pos.: 0     Date: 11/06/'

eplicate  1                                Time: 09:12
eak Area (A-s): 0.112                      Peak Height (A): 0.211
ackground Pk Area (A-s): 0.060             Background Pk Height (A): 0.092
lank Corrected Pk Area (A-s): 0.109
oncentration (ug/L  ): 43.8

eplicate  2                                Time: 09:15
eak Area (A-s): 0.002                      Peak Height (A): 0.015
ackground Pk Area (A-s): 0.003             Background Pk Height (A): 0.009
lank Corrected Pk Area (A-s): -0.001
oncentration (ug/L  ): -0.5

ean Conc  (ug/L  ):        21.7           SD: 31.39                RSD(%): 144.95
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
b    ID: BLANK               Seq. No.: 00120    A/S Pos.: 0     Date: 11/06/'

eplicate  1                                Time: 09:19
eak Area (A-s): 0.002                      Peak Height (A): 0.013
ackground Pk Area (A-s): 0.001             Background Pk Height (A): 0.009
lank Corrected Pk Area (A-s): -0.001
oncentration (ug/L  ): -0.3
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
b    ID: BLANK               Seq. No.: 00121    A/S Pos.: 0     Date: 11/06/'

eplicate  1                                Time: 09:21
eak Area (A-s): 0.007                      Peak Height (A): 0.017
ackground Pk Area (A-s): 0.037             Background Pk Height (A): 0.043
lank Corrected Pk Area (A-s): 0.004
oncentration (ug/L  ): 1.4

eplicate  2                                Time: 09:24
eak Area (A-s): 0.007                      Peak Height (A): 0.014
ackground Pk Area (A-s): 0.044             Background Pk Height (A): 0.039
lank Corrected Pk Area (A-s): 0.004
oncentration (ug/L  ): 1.5

lean Conc  (ug/L  ):        1.5            SD: 0.05                 RSD(%): 3.73

uto-zero performed.
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
b    ID: 10 PPB PB           Seq. No.: 00122    A/S Pos.: 1     Date: 11/06/9

eplicate  1                                Time: 09:27
eak Area (A-s): 0.032                      Peak Height (A): 0.063
ackground Pk Area (A-s): 0.046             Background Pk Height (A): 0.039
lank Corrected Pk Area (A-s): 0.025
oncentration (ug/L  ): 10.2
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eplicate 2 Time: 09:30
eak Area (A-s): 0.030 Peak Height (A): 0.055
ackground Pk Area (A-s): 0.046 Background Pk Height (A): 0.039
lank Corrected Pk Area (A-s): 0.023
oncentration (ug/L): 9.3

ean Conc (ug/L): 9.7 SD: 0.64 RSD(%): 6.57

tandard number 1 applied. [10.0]
orrelation coefficient: 1.00000 Slope: 0.0024

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b ID: 50 PPB PB Seq. No.: 00123 A/S Pos.: 2 Date: 11/06/9

eplicate 1 Time: 09:33
eak Area (A-s): 0.117 Peak Height (A): 0.218
ackground Pk Area (A-s): 0.074 Background Pk Height (A): 0.054
lank Corrected Pk Area (A-s): 0.111
oncentration (ug/L): 45.7

eplicate 2 Time: 09:36
eak Area (A-s): 0.131 Peak Height (A): 0.229
ackground Pk Area (A-s): 0.068 Background Pk Height (A): 0.056
lank Corrected Pk Area (A-s): 0.125
oncentration (ug/L): 51.4

ean Conc (ug/L): 48.5 SD: 4.06 RSD(%): 8.36

tandard number 2 applied. [50.0]
orrelation coefficient: 0.99994 Slope: 0.0024

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b ID: 100 PPB PB Seq. No.: 00124 A/S Pos.: 3 Date: 11/06/9

eplicate 1 Time: 09:39
eak Area (A-s): 0.242 Peak Height (A): 0.413
ackground Pk Area (A-s): 0.095 Background Pk Height (A): 0.096
lank Corrected Pk Area (A-s): 0.236
oncentration (ug/L): 100.1

eplicate 2 Time: 09:42
eak Area (A-s): 0.245 Peak Height (A): 0.417
ackground Pk Area (A-s): 0.095 Background Pk Height (A): 0.099
lank Corrected Pk Area (A-s): 0.238
oncentration (ug/L): 101.2

ean Conc (ug/L): 100.7 SD: 0.80 RSD(%): 0.79

tandard number 3 applied. [100.0]
orrelation coefficient: 0.99998 Slope: 0.0024

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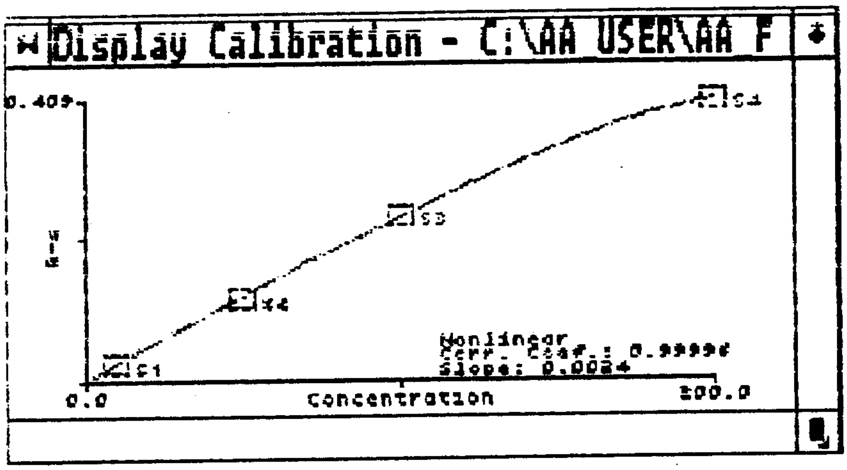
b ID: 200 PPB PB Seq. No.: 00125 A/S Pos.: 4 Date: 11/06/9

eplicate 1 Time: 09:45
eak Area (A-s): 0.415 Peak Height (A): 0.685
ackground Pk Area (A-s): 0.148 Background Pk Height (A): 0.180
lank Corrected Pk Area (A-s): 0.408
oncentration (ug/L): 172.5
~~~~~~

eplicate 2 Time: 09:48
eak Area (A-s): 0.416 Peak Height (A): 0.666
ackground Pk Area (A-s): 0.143 Background Pk Height (A): 0.179
lank Corrected Pk Area (A-s): 0.409
oncentration (ug/L): 172.9

ean Conc (ug/L): 172.7 SD: 0.26 RSD(%): 0.15

tandard number 4 applied. [200.0]
orrelation coefficient: 0.99452 Slope: 0.0021



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Pb ID: ICV Seq. No.: 00126 A/S Pos.: 5 Date: 11/06/-

Replicate 1 Time: 09:55
Concentration (ug/L): 97.0

Replicate 2 Time: 09:58
Concentration (ug/L): 102.2

Mean Conc (ug/L): 99.6 SD: 3.71 RSD(%): 3.73

QC sample is within range 79.5 - 120.49

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Pb ID: ICB Seq. No.: 00127 A/S Pos.: 0 Date: 11/06/

Replicate 1 Time: 10:01
Concentration (ug/L): 2.6

Replicate 2 Time: 10:04
Concentration (ug/L): 1.4

Mean Conc (ug/L): 2.0 SD: 0.80 RSD(%): 39.59

QC sample is within range -5.49 - 5.49

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Pb ID: 81101.B-F Seq. No.: 00128 A/S Pos.: 6 Date: 11/06/

Replicate 1 Time: 10:07
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Concentration (ug/L): 2.0

Replicate 2 Time: 10:10
Concentration (ug/L): 3.1

Mean Conc (ug/L): 2.5 SD: 0.77 RSD(%): 30.46

Pb ID: 81101.0B Seq. No.: 00129 A/S Pos.: 7 Date: 11/06/9

Replicate 1 Time: 10:13
Concentration (ug/L): 10.9

Replicate 2 Time: 10:16
Concentration (ug/L): 12.6

Mean Conc (ug/L): 11.8 SD: 1.21 RSD(%): 10.33

Pb ID: 81101.UB Seq. No.: 00130 A/S Pos.: 8 Date: 11/06/9

Replicate 1 Time: 10:19
Concentration (ug/L): 8.9

Replicate 2 Time: 10:22
Concentration (ug/L): 8.7

Mean Conc (ug/L): 8.8 SD: 0.16 RSD(%): 1.86

Pb ID: 81101.IB Seq. No.: 00131 A/S Pos.: 9 Date: 11/06/9

Replicate 1 Time: 10:25
Concentration (ug/L): 6.7

Replicate 2 Time: 10:28
Concentration (ug/L): 8.4

Mean Conc (ug/L): 7.5 SD: 1.21 RSD(%): 16.11

Pb ID: 81101.01 Seq. No.: 00132 A/S Pos.: 10 Date: 11/06/9

Replicate 1 Time: 10:31
Concentration (ug/L): 12.8

Replicate 2 Time: 10:34
Concentration (ug/L): 10.9

Mean Conc (ug/L): 11.9 SD: 1.35 RSD(%): 11.41

Pb ID: 81101.01 Seq. No.: 00133 A/S Pos.: 10 Date: 11/06/9

Replicate 1 Time: 10:37
Concentration (ug/L): 104.3

Replicate 2 Time: 10:40
Concentration (ug/L): 105.6

ean Conc (ug/L): 104.9 SD: 0.93 RSD(%): 0.88

ecovery is 93.1%

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b ID: 81101.02 Seq. No.: 00134 A/S Pos.: 11 Date: 11/06/9

eplicate 1 Time: 10:43
oncentration (ug/L): 27.0

eplicate 2 Time: 10:46
oncentration (ug/L): 23.8

ean Conc (ug/L): 25.4 SD: 2.22 RSD(%): 8.76

---

b ID: 81101.03 Seq. No.: 00135 A/S Pos.: 12 Date: 11/06/

eplicate 1 Time: 10:49
oncentration (ug/L): 15.1

eplicate 2 Time: 10:52
oncentration (ug/L): 16.0

ean Conc (ug/L): 15.5 SD: 0.63 RSD(%): 4.05

---

b ID: CCV Seq. No.: 00136 A/S Pos.: 3 Date: 11/06/

eplicate 1 Time: 10:55
oncentration (ug/L): 97.0

eplicate 2 Time: 10:58
oncentration (ug/L): 100.0

ean Conc (ug/L): 98.5 SD: 2.14 RSD(%): 2.18

C sample is within range 79.5 - 120.49

---

b ID: CCB Seq. No.: 00137 A/S Pos.: 0 Date: 11/06/

eplicate 1 Time: 11:01
oncentration (ug/L): 0.9

eplicate 2 Time: 11:04
oncentration (ug/L): 1.5

ean Conc (ug/L): 1.2 SD: 0.39 RSD(%): 32.12

C sample is within range -5.49 - 5.49

---

b ID: 81101.U1 Seq. No.: 00138 A/S Pos.: 13 Date: 11/06/

eplicate 1 Time: 11:07
oncentration (ug/L): 80.8

eplicate 2 Time: 11:10

oncentration (ug/L): 81.7

lean Conc (ug/L): 81.3 SD: 0.63 RSD(%): 0.77

---

b ID: 81101.U2 Seq. No.: 00139 A/S Pos.: 14 Date: 11/06/9

eplicate 1 Time: 11:13
oncentration (ug/L): 82.1

eplicate 2 Time: 11:16
oncentration (ug/L): 86.7

lean Conc (ug/L): 84.4 SD: 3.30 RSD(%): 3.92

---

b ID: 81101.U3 Seq. No.: 00140 A/S Pos.: 15 Date: 11/06/9

eplicate 1 Time: 11:20
oncentration (ug/L): 44.1

eplicate 2 Time: 11:23
oncentration (ug/L): 41.9

lean Conc (ug/L): 43.0 SD: 1.60 RSD(%): 3.72

---

b ID: 81101.U4 Seq. No.: 00141 A/S Pos.: 16 Date: 11/06/9

eplicate 1 Time: 11:26
oncentration (ug/L): 54.6

eplicate 2 Time: 11:29
oncentration (ug/L): 51.9

lean Conc (ug/L): 53.3 SD: 1.91 RSD(%): 3.59

---

b ID: 81101.I1X2.5 Seq. No.: 00142 A/S Pos.: 17 Date: 11/06/9

eplicate 1 Time: 11:32
oncentration (ug/L): 82.7 Corrected Conc (ug/L): 206.9

eplicate 2 Time: 11:35
oncentration (ug/L): 81.6 Corrected Conc (ug/L): 203.9

lean Conc (ug/L): 82.2 SD: 0.84 RSD(%): 1.02
orrected Conc (ug/L): 205.4

---

b ID: 81101.I2 Seq. No.: 00143 A/S Pos.: 18 Date: 11/06/9

eplicate 1 Time: 11:38
oncentration (ug/L): 176.8

eplicate 2 Time: 11:41
oncentration (ug/L): 174.7

lean Conc (ug/L): 175.7 SD: 1.53 RSD(%): 0.87

~~~~~~

'b ID: 81101.I3 Seq. No.: 00144 A/S Pos.: 19 Date: 11/06/9

Replicate 1 Time: 11:44
Concentration (ug/L): 169.3

Replicate 2 Time: 11:47
Concentration (ug/L): 172.0

Mean Conc (ug/L): 170.6 SD: 1.85 RSD(%): 1.08

~~~~~~

'b ID: CCV Seq. No.: 00145 A/S Pos.: 3 Date: 11/06/9

Replicate 1 Time: 11:50
Concentration (ug/L): 103.8

Replicate 2 Time: 11:53
Concentration (ug/L): 102.6

Mean Conc (ug/L): 103.2 SD: 0.84 RSD(%): 0.81

QC sample is within range 79.5 - 120.49

~~~~~~

'b ID: CCB Seq. No.: 00146 A/S Pos.: 0 Date: 11/06/9

Replicate 1 Time: 11:56
Concentration (ug/L): 2.0

Replicate 2 Time: 11:59
Concentration (ug/L): 0.8

Mean Conc (ug/L): 1.4 SD: 0.78 RSD(%): 56.06

QC sample is within range -5.49 - 5.49
~~~~~~

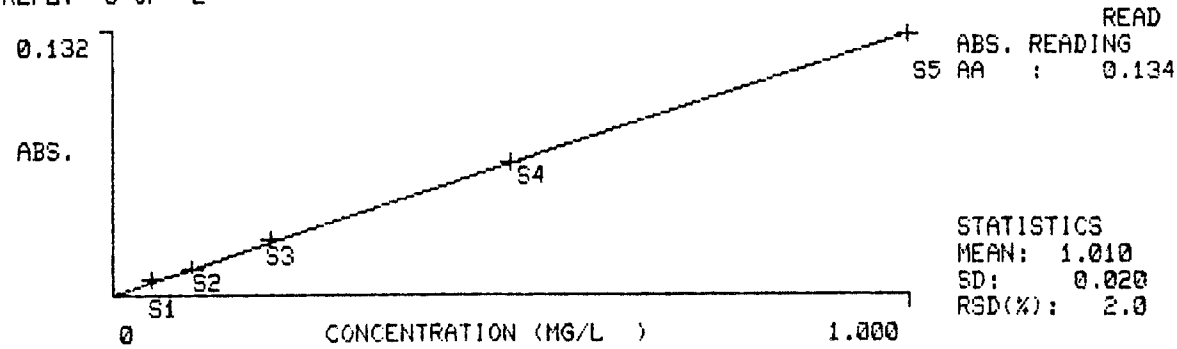
		AA				AA	
1:	0.001 MG/L	HO 0.000		MAIN:	0.006 MG/L	HO 0.001	
	MEAN: 0.003 MG/L		SD: 0.003	RSD: 99.9	AUTOZERO	0.000	
		AA				AA	
1:	0.057 MG/L	HO 0.008		MAIN:	0.068 MG/L	HO 0.009	
	MEAN: 0.063 MG/L		SD: 0.008	RSD: 12.4	1.STANDARD	0.052 MG/L	
		AA				AA	
1:	0.082 MG/L	HO 0.013		MAIN:	0.089 MG/L	HO 0.014	
	MEAN: 0.085 MG/L		SD: 0.005	RSD: 5.8	2.STANDARD	0.090 MG/L	
		AA				AA	
1:	0.185 MG/L	HO 0.028		MAIN:	0.185 MG/L	HO 0.028	
	MEAN: 0.185 MG/L		SD: 0.000	RSD: 0.2	3.STANDARD	0.188 MG/L	
		AA				AA	
1:	0.006 MG/L	HO 0.001		MAIN:	0.009 MG/L	HO 0.000	
	MEAN: 0.007 MG/L		SD: 0.002	RSD: 28.9	AUTOZERO	0.000	
		AA				AA	
1:	0.464 MG/L	HO 0.065		MAIN:	0.475 MG/L	HO 0.067	
	MEAN: 0.469 MG/L		SD: 0.008	RSD: 1.7	4.STANDARD	0.471 MG/L	
		AA				AA	
1:	0.996 MG/L	HO 0.130		MAIN:	1.024 MG/L	HO 0.134	
	MEAN: 1.010 MG/L		SD: 0.020	RSD: 2.0	5.STANDARD	1.041 MG/L	

FLAME DISPLAY CALIBRATION MODE
ELEMENT: MN

REPL. 0 OF 2

PRINTER: ON
BG CORR: OFF
UNITS : MG/L

1.041
READ



ABS. READING
S5 AA : 0.134

STATISTICS
MEAN: 1.010
SD: 0.020
RSD(%): 2.0

C2H2: 2.5 L/MIN OXIDANT: 3.0 L/MIN FLAME: C2H2-AIR

	AA		AA
MAIN: -0.014 MG/L	HO-0.002	MAIN: -0.018 MG/L	HO-0.000

MN MEAN: -0.016 MG/L SD: 0.003 RSD: 15.8 AUTOZERO 0.000

	AA		AA
MAIN: 0.513 MG/L	HO 0.068	MAIN: 0.504 MG/L	HO 0.067

MN ICV MEAN: 0.509 MG/L SD: 0.007 RSD: 1.3

	AA		AA
MAIN: 0.016 MG/L	HO 0.002	MAIN: 0.010 MG/L	HO 0.001

MN ICB MEAN: 0.013 MG/L SD: 0.004 RSD: 32.2

	AA		AA
MAIN: 0.004 MG/L	HO 0.001	MAIN: 0.003 MG/L	HO-0.000

MN AZ MEAN: 0.003 MG/L SD: 0.001 RSD: 15.3 AUTOZERO 0.000

	AA		AA
MAIN: 0.028 MG/L	HO 0.004	MAIN: 0.025 MG/L	HO 0.003

MN BF MEAN: 0.027 MG/L SD: 0.002 RSD: 6.0

	AA		AA
MAIN: 0.046 MG/L	HO 0.006	MAIN: 0.053 MG/L	HO 0.007

MN OB MEAN: 0.049 MG/L SD: 0.004 RSD: 8.9

	AA		AA
MAIN: 0.040 MG/L	HO 0.005	MAIN: 0.033 MG/L	HO 0.004

MN QB MEAN: 0.036 MG/L SD: 0.004 RSD: 12.0

	AA		AA
MAIN: 0.038 MG/L	HO 0.005	MAIN: 0.041 MG/L	HO 0.005

MN IB MEAN: 0.040 MG/L SD: 0.002 RSD: 4.9

	AA		AA
MAIN: 0.008 MG/L	HO 0.001	MAIN: 0.010 MG/L	HO 0.001

MN AZ MEAN: 0.009 MG/L SD: 0.001 RSD: 13.7 AUTOZERO 0.000

	AA		AA
MAIN: 0.047 MG/L	HO 0.006	MAIN: 0.057 MG/L	HO 0.007

MN OI MEAN: 0.052 MG/L SD: 0.006 RSD: 12.5

MAIN: 0.435 MG/L	AA HO 0.058		MAIN: 0.433 MG/L	AA HO 0.057	
MN 01S	MEAN: 0.434 MG/L	SD: 0.001	RSD: 0.2		
MAIN: 0.072 MG/L	AA HO 0.009		MAIN: 0.071 MG/L	AA HO 0.009	
MN 02	MEAN: 0.072 MG/L	SD: 0.000	RSD: 0.3		
MAIN: 0.066 MG/L	AA HO 0.009		MAIN: 0.063 MG/L	AA HO 0.008	
MN 02D	MEAN: 0.065 MG/L	SD: 0.002	RSD: 3.1		
MAIN: 0.081 MG/L	AA HO 0.011		MAIN: 0.081 MG/L	AA HO 0.011	
MN 03	MEAN: 0.081 MG/L	SD: 0.000	RSD: 0.2		
MAIN: 0.538 MG/L	AA HO 0.071		MAIN: 0.533 MG/L	AA HO 0.071	
MN CCV	MEAN: 0.536 MG/L	SD: 0.004	RSD: 0.7		
MAIN: 0.023 MG/L	AA HO 0.003		MAIN: 0.026 MG/L	AA HO 0.003	
MN CCB	MEAN: 0.024 MG/L	SD: 0.003	RSD: 10.7		
MAIN: 0.020 MG/L	AA HO 0.003		MAIN: 0.017 MG/L	AA HO-0.000	
MN AL	MEAN: 0.018 MG/L	SD: 0.002	RSD: 12.2	AUTOZERO	0.000
MAIN: 0.041 MG/L	AA HO 0.005		MAIN: 0.062 MG/L	AA HO 0.008	
MN U1	MEAN: 0.051 MG/L	SD: 0.015	RSD: 30.0		
MAIN: 0.084 MG/L	AA HO 0.011		MAIN: 0.081 MG/L	AA HO 0.011	
MN U2	MEAN: 0.083 MG/L	SD: 0.002	RSD: 2.1		
MAIN: 0.048 MG/L	AA HO 0.006		MAIN: 0.061 MG/L	AA HO 0.008	
MN U3	MEAN: 0.055 MG/L	SD: 0.009	RSD: 16.8		

MAIN:	0.088 MG/L	HO	AA 0.012	MAIN:	0.091 MG/L	HO	AA 0.012

MN 44 MEAN: 0.089 MG/L SD: 0.002 RSD: 2.3

MAIN:	0.362 MG/L	HO	AA 0.048	MAIN:	0.363 MG/L	HO	AA 0.048

MN I1 MEAN: 0.363 MG/L SD: 0.001 RSD: 0.2

MAIN:	0.185 MG/L	HO	AA 0.024	MAIN:	0.189 MG/L	HO	AA 0.025

MN I2 MEAN: 0.187 MG/L SD: 0.003 RSD: 1.6

MAIN:	0.209 MG/L	HO	AA 0.028	MAIN:	0.209 MG/L	HO	AA 0.028

MN I3 MEAN: 0.209 MG/L SD: 0.000 RSD: 0.1

MAIN:	0.024 MG/L	HO	AA 0.003	MAIN:	0.026 MG/L	HO	AA 0.003

MN MEAN: 0.025 MG/L SD: 0.001 RSD: 5.7 AUTOZERO 0.000

MAIN:	0.498 MG/L	HO	AA 0.066	MAIN:	0.510 MG/L	HO	AA 0.068

MN CON MEAN: 0.504 MG/L SD: 0.009 RSD: 1.8

MAIN:	0.006 MG/L	HO	AA 0.001	MAIN:	0.017 MG/L	HO	AA 0.002

MN CCB MEAN: 0.011 MG/L SD: 0.008 RSD: 67.1

```
HG                          AA-BG    BG
MAIN:   0.002          PA 0.015 -0.004
                       PH 0.002  0.001
```

0.000 AUTOZERO

```
HG                          AA-BG    BG
MAIN:   0.012          PA 0.234  0.005
                       PH 0.012 -0.000
```

0.50 1.STANDARD

```
HG                          AA-BG    BG
MAIN:    1.08 UG/L     PA 0.428  0.004
                       PH 0.026 -0.001
```

E61 Sample concentration greater than highest standard

1.01 2.STANDARD

```
HG                          AA-BG    BG
MAIN:    2.04 UG/L     PA 0.822  0.008
                       PH 0.052 -0.001
```

E61 Sample concentration greater than highest standard

2.01 3.STANDARD

```
HG                          AA-BG    BG
MAIN:    5.03 UG/L     PA 1.988  0.015
                       PH 0.131 -0.000
```

E61 Sample concentration greater than highest standard

5.01 4.STANDARD

```
HG                          AA-BG    BG
MAIN:    9.95 UG/L     PA 3.941  0.057
                       PH 0.253  0.003
```

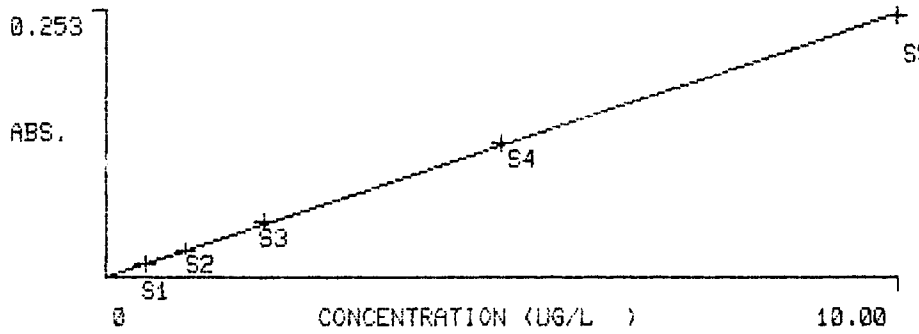
E61 Sample concentration greater than highest standard

9.91 5.STANDARD

HGA DISPLAY CALIBRATION MODE
ELEMENT: HG - PEAK HEIGHT

PRINTER: ON
BG CORR: ON
UNITS : UG/L
CH.MASS:

9.91



PEAK AREA (A-S)
AA-BG: 3.941
BG: 0.057

PEAK HEIGHT (A)
AA-BG: 0.253
BG: 0.003

HG ICV		AA-BG	BG	HG ICB		AA-BG	BG
MAIN:	5.08 UG/L	PA 1.978	0.024	MAIN:	-0.11 UG/L	PA-0.036	0.020
		PH 0.130	-0.000			PH-0.003	0.002
HG BF		AA-BG	BG	HG		AA-BG	BG
MAIN:	-0.08 UG/L	PA-0.036	0.007	MAIN:	-0.06 UG/L	PA-0.016	-0.004
		PH-0.002	0.000			PH-0.002	-0.002
HG OB		AA-BG	BG	HG		AA-BG	BG
MAIN:	-0.08 UG/L	PA-0.023	0.002	MAIN:	-0.09 UG/L	PA-0.048	0.019
		PH-0.002	-0.000			PH-0.002	0.002
HG UB		AA-BG	BG	HG		AA-BG	BG
MAIN:	-0.05 UG/L	PA-0.009	-0.002	MAIN:	-0.03 UG/L	PA 0.001	-0.009
		PH-0.001	-0.001			PH-0.001	-0.001
HG IB		AA-BG	BG	HG		AA-BG	BG
MAIN:	-0.03 UG/L	PA-0.016	0.015	MAIN:	-0.03 UG/L	PA 0.015	-0.012
		PH-0.001	-0.000			PH-0.001	-0.000
HG O1		AA-BG	BG	HG O1S		AA-BG	BG
MAIN:	-0.03 UG/L	PA-0.004	0.019	MAIN:	5.30 UG/L	PA 2.082	0.027
		PH-0.001	0.001			PH 0.135	0.000
HG O1		AA-BG	BG	HG O1S		AA-BG	BG
MAIN:	-0.03 UG/L	PA-0.033	0.014	MAIN:	5.07 UG/L	PA 1.915	0.028
		PH-0.001	-0.000			PH 0.129	0.000
HG O2		AA-BG	BG	HG		AA-BG	BG
MAIN:	0.02 UG/L	PA-0.008	-0.017	MAIN:	-0.06 UG/L	PA-0.016	0.014
		PH 0.000	0.001			PH-0.002	-0.000
HG O3		AA-BG	BG	HG CCV		AA-BG	BG
MAIN:	-0.03 UG/L	PA-0.006	-0.002	MAIN:	5.19 UG/L	PA 2.219	0.036
		PH-0.001	-0.002			PH 0.132	0.001
HG CCB		AA-BG	BG	HG O3		AA-BG	BG
MAIN:	-0.06 UG/L	PA-0.023	0.002	MAIN:	-0.09 UG/L	PA-0.019	0.008
		PH-0.002	0.000			PH-0.002	-0.001

HG	U1	AA-BG	BG	HG		AA-BG	BG
MAIN:	-0.06 UG/L	PA-0.000	-0.001	MAIN:	-0.06 UG/L	PA-0.008	-0.013
		PH-0.002	-0.001			PH-0.002	-0.002
HG	U2	AA-BG	BG	HG		AA-BG	BG
MAIN:	-0.03 UG/L	PA 0.006	-0.003	MAIN:	-0.11 UG/L	PA-0.030	0.042
		PH-0.001	-0.000			PH-0.003	0.001
HG	U3	AA-BG	BG	HG		AA-BG	BG
MAIN:	-0.08 UG/L	PA-0.024	0.023	MAIN:	-0.03 UG/L	PA-0.007	0.016
		PH-0.002	0.000			PH-0.001	0.001
HG	U4	AA-BG	BG	HG		AA-BG	BG
MAIN:	-0.05 UG/L	PA 0.003	0.045	MAIN:	-0.02 UG/L	PA-0.011	0.015
		PH-0.001	0.004			PH-0.000	0.000
HG	I1	AA-BG	BG	HG		AA-BG	BG
MAIN:	0.11 UG/L	PA-0.004	0.025	MAIN:	-0.09 UG/L	PA-0.014	0.021
		PH 0.003	0.001			PH-0.002	0.000
HG	I2	AA-BG	BG	HG		AA-BG	BG
MAIN:	0.03 UG/L	PA-0.010	-0.011	MAIN:	-0.02 UG/L	PA-0.026	0.030
		PH 0.001	-0.001			PH-0.000	0.000
HG	I3	AA-BG	BG	HG		AA-BG	BG
MAIN:	-0.05 UG/L	PA-0.010	0.003	MAIN:	-0.08 UG/L	PA 0.001	-0.003
		PH-0.001	-0.001			PH-0.002	-0.001
HG	CCV	AA-BG	BG	HG	CCB	AA-BG	BG
MAIN:	4.99 UG/L	PA 1.964	0.019	MAIN:	-0.14 UG/L	PA-0.022	0.027
		PH 0.127	0.001			PH-0.004	0.000

```
---------------------------------------------------------------------------
lement File: NI.GEL          Element: Ni                    Wavelength: 232.0
ate: 11/05/98                Time: 08:49                    Slit: 0.20 L
ata File:                    ID/Wt File: 81101.IDW          Lamp Current: 25
echnique: HGA                Calib. Type: Linear            Energy: 49
---------------------------------------------------------------------------
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
i    ID: BLANK               Seq. No.: 00055    A/S Pos.: 0     Date: 11/05/9

eplicate  1                              Time: 08:49
eak Area (A-s): 0.018                    Peak Height (A): 0.035
ackground Pk Area (A-s): 0.049           Background Pk Height (A): 0.049
lank Corrected Pk Area (A-s): 0.018

eplicate  2                              Time: 08:52
eak Area (A-s): 0.012                    Peak Height (A): 0.024
ackground Pk Area (A-s): 0.041           Background Pk Height (A): 0.043
lank Corrected Pk Area (A-s): 0.012

ean Pk Area (A-s):       0.015           SD: 0.0043                RSD(%): 28.67

uto-zero performed.

~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
i    ID: 20 PPB NI           Seq. No.: 00056    A/S Pos.: 1     Date: 11/05/9

eplicate  1                              Time: 08:55
eak Area (A-s): 0.027                    Peak Height (A): 0.028
ackground Pk Area (A-s): 0.050           Background Pk Height (A): 0.046
lank Corrected Pk Area (A-s): 0.012

~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
i    ID: BLANK               Seq. No.: 00057    A/S Pos.: 0     Date: 11/05/98

eplicate  1                              Time: 08:59
eak Area (A-s): 0.006                    Peak Height (A): 0.011
ackground Pk Area (A-s): 0.042           Background Pk Height (A): 0.048
lank Corrected Pk Area (A-s): -0.009

eplicate  2                              Time: 09:02
eak Area (A-s): 0.006                    Peak Height (A): 0.017
ackground Pk Area (A-s): 0.045           Background Pk Height (A): 0.048
lank Corrected Pk Area (A-s): -0.009

lean Pk Area (A-s):      -0.009          SD: 0.0001                RSD(%): 0.58

uto-zero performed.

~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
li   ID: 20 PPB NI           Seq. No.: 00058    A/S Pos.: 1     Date: 11/05/98

eplicate  1                              Time: 09:05
eak Area (A-s): 0.026                    Peak Height (A): 0.025
lackground Pk Area (A-s): 0.048          Background Pk Height (A): 0.047
llank Corrected Pk Area (A-s): 0.019

eplicate  2                              Time: 09:08
eak Area (A-s): 0.024                    Peak Height (A): 0.026
lackground Pk Area (A-s): 0.046          Background Pk Height (A): 0.040
```

lank Corrected Pk Area (A-s): 0.018

ean Pk Area (A-s): 0.019 SD: 0.0011 RSD(%): 5.70

tandard number 1 applied. [20.0]
orrelation coefficient: 1.00000 Slope: 0.0009

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i ID: 50 PPB NI Seq. No.: 00059 A/S Pos.: 2 Date: 11/05/9

eplicate 1 Time: 09:11
eak Area (A-s): 0.111 Peak Height (A): 0.078
ackground Pk Area (A-s): 0.066 Background Pk Height (A): 0.049
lank Corrected Pk Area (A-s): 0.105
oncentration (ug/L): 111.5

eplicate 2 Time: 09:14
eak Area (A-s): 0.110 Peak Height (A): 0.075
ackground Pk Area (A-s): 0.066 Background Pk Height (A): 0.051
lank Corrected Pk Area (A-s): 0.104
oncentration (ug/L): 111.0

ean Conc (ug/L): 111.3 SD: 0.39 RSD(%): 0.35

tandard number 2 applied. [50.0]
orrelation coefficient: 0.85962 Slope: 0.0020

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li ID: 100 PPB NI Seq. No.: 00060 A/S Pos.: 3 Date: 11/05/9

eplicate 1 Time: 09:17
'eak Area (A-s): 0.210 Peak Height (A): 0.136
ackground Pk Area (A-s): 0.088 Background Pk Height (A): 0.063
lank Corrected Pk Area (A-s): 0.204
oncentration (ug/L): 101.5

eplicate 2 Time: 09:20
'eak Area (A-s): 0.204 Peak Height (A): 0.134
ackground Pk Area (A-s): 0.086 Background Pk Height (A): 0.064
lank Corrected Pk Area (A-s): 0.198
oncentration (ug/L): 98.6

lean Conc (ug/L): 100.1 SD: 2.11 RSD(%): 2.10

itandard number 3 applied. [100.0]
orrelation coefficient: 0.98185 Slope: 0.0020

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li ID: 200 PPB NI Seq. No.: 00061 A/S Pos.: 4 Date: 11/05/9

eplicate 1 Time: 09:23
'eak Area (A-s): 0.400 Peak Height (A): 0.243
ackground Pk Area (A-s): 0.136 Background Pk Height (A): 0.090
lank Corrected Pk Area (A-s): 0.394
oncentration (ug/L): 196.3

eplicate 2 Time: 09:26
'eak Area (A-s): 0.403 Peak Height (A): 0.244
ackground Pk Area (A-s): 0.142 Background Pk Height (A): 0.090
~~~~~~

lank Corrected Pk Area (A-s): 0.397
oncentration (ug/L): 197.7

ean Conc (ug/L): 197.0 SD: 1.05 RSD(%): 0.53

tandard number 4 applied. [200.0]
orrelation coefficient: 0.99679 Slope: 0.0020

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Ni ID: ICB Seq. No.: 00064 A/S Pos.: 0 Date: 11/05/9

Replicate 1 Time: 09:42
Concentration (ug/L): -0.5

Replicate 2 Time: 09:45
Concentration (ug/L): -2.3

Mean Conc (ug/L): -1.4 SD: 1.28 RSD(%): 92.42

QC sample is within range -15.49 - 15.49

~~~~~~

Ni ID: 81101.B-F Seq. No.: 00065 A/S Pos.: 6 Date: 11/05/9

Replicate 1 Time: 09:48
Concentration (ug/L): -2.0

Replicate 2 Time: 09:51
Concentration (ug/L): 1.9

Mean Conc (ug/L): -0.0 SD: 2.81 RSD(%): 5959.9

~~~~~~

Ni ID: 81101.OB Seq. No.: 00066 A/S Pos.: 7 Date: 11/05/9

Replicate 1 Time: 09:53
Concentration (ug/L): 7.8

Replicate 2 Time: 09:56
Concentration (ug/L): 3.2

Mean Conc (ug/L): 5.5 SD: 3.23 RSD(%): 58.60

~~~~~~

Ni ID: 81101.UB Seq. No.: 00067 A/S Pos.: 8 Date: 11/05/9

Replicate 1 Time: 09:59
Concentration (ug/L): 3.4

Replicate 2 Time: 10:02
Concentration (ug/L): 1.3

Mean Conc (ug/L): 2.3 SD: 1.47 RSD(%): 62.92

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Ni ID: 81101.IB Seq. No.: 00068 A/S Pos.: 9 Date: 11/05/9

Replicate 1 Time: 10:05
Concentration (ug/L): 2.1

Replicate 2 Time: 10:08
Concentration (ug/L): 1.5

Mean Conc (ug/L): 1.8 SD: 0.40 RSD(%): 22.79
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i ID: 81101.01 Seq. No.: 00069 A/S Pos.: 10 Date: 11/05/98

eplicate 1 Time: 10:11
oncentration (ug/L): 8.3

eplicate 2 Time: 10:13
oncentration (ug/L): 7.3

ean Conc (ug/L): 7.8 SD: 0.69 RSD(%): 8.84

~~~~~~

i ID: 81101.01 Seq. No.: 00070 A/S Pos.: 10 Date: 11/05/98

eplicate 1 Time: 10:16
oncentration (ug/L): 105.4

eplicate 2 Time: 10:19
oncentration (ug/L): 104.8

ean Conc (ug/L): 105.1 SD: 0.41 RSD(%): 0.39

ecovery is 97.3%

~~~~~~

i ID: 81101.02 Seq. No.: 00071 A/S Pos.: 11 Date: 11/05/98

eplicate 1 Time: 10:22
oncentration (ug/L): 18.9

eplicate 2 Time: 10:25
oncentration (ug/L): 17.2

ean Conc (ug/L): 18.0 SD: 1.21 RSD(%): 6.70

~~~~~~

i ID: 81101.03 Seq. No.: 00072 A/S Pos.: 12 Date: 11/05/9

eplicate 1 Time: 10:28
oncentration (ug/L): 12.1

eplicate 2 Time: 10:31
oncentration (ug/L): 12.2

ean Conc (ug/L): 12.1 SD: 0.07 RSD(%): 0.57

~~~~~~

i ID: CCV Seq. No.: 00073 A/S Pos.: 3 Date: 11/05/

eplicate 1 Time: 10:34
oncentration (ug/L): 93.0

eplicate 2 Time: 10:37
oncentration (ug/L): 98.8

lean Conc (ug/L): 95.9 SD: 4.14 RSD(%): 4.32

C sample is within range 79.5 - 120.49
~~~~~~

Ni ID: CCB Seq. No.: 00074 A/S Pos.: 0 Date: 11/05/9

Replicate 1 Time: 10:40
Concentration (ug/L): -4.1

Replicate 2 Time: 10:42
Concentration (ug/L): -4.5

Mean Conc (ug/L): -4.3 SD: 0.30 RSD(%): 7.00

QC sample is within range -15.49 - 15.49

Ni ID: 81101.U1 Seq. No.: 00075 A/S Pos.: 13 Date: 11/05/9

Replicate 1 Time: 10:45
Concentration (ug/L): 10.5

Replicate 2 Time: 10:48
Concentration (ug/L): 11.3

Mean Conc (ug/L): 10.9 SD: 0.60 RSD(%): 5.52

Ni ID: 81101.U2 Seq. No.: 00076 A/S Pos.: 14 Date: 11/05/9

Replicate 1 Time: 10:51
Concentration (ug/L): 29.0

Replicate 2 Time: 10:54
Concentration (ug/L): 28.2

Mean Conc (ug/L): 28.6 SD: 0.61 RSD(%): 2.12

Ni ID: 81101.U3 Seq. No.: 00077 A/S Pos.: 15 Date: 11/05/9

Replicate 1 Time: 10:57
Concentration (ug/L): 18.5

Replicate 2 Time: 11:00
Concentration (ug/L): 19.3

Mean Conc (ug/L): 18.9 SD: 0.60 RSD(%): 3.19

Ni ID: 81101.U4 Seq. No.: 00078 A/S Pos.: 16 Date: 11/05/9

Replicate 1 Time: 11:03
Concentration (ug/L): 15.9

Replicate 2 Time: 11:06
Concentration (ug/L): 15.9

Mean Conc (ug/L): 15.9 SD: 0.04 RSD(%): 0.25

i ID: 81101.I1X2.5 Seq. No.: 00079 A/S Pos.: 17 Date: 11/05/90

eplicate 1 Time: 11:09
oncentration (ug/L): 76.6 Corrected Conc (ug/L): 191.6

eplicate 2 Time: 11:12
oncentration (ug/L): 79.9 Corrected Conc (ug/L): 199.7

ean Conc (ug/L): 78.3 SD: 2.30 RSD(%): 2.94
orrected Conc (ug/L): 195.7

i ID: 81101.I2 Seq. No.: 00080 A/S Pos.: 18 Date: 11/05/

eplicate 1 Time: 11:15
oncentration (ug/L): 136.7

eplicate 2 Time: 11:18
oncentration (ug/L): 142.9

lean Conc (ug/L): 139.8 SD: 4.34 RSD(%): 3.11

Ni ID: 81101.I3 Seq. No.: 00081 A/S Pos.: 19 Date: 11/05/

Sample abs. is greater than that of the largest standard.
Replicate 1 Time: 11:21
Concentration (ug/L): 225.0

Sample abs. is greater than that of the largest standard.
Replicate 2 Time: 11:24
Concentration (ug/L): 225.9

Sample abs. is greater than that of the largest standard.
Mean Conc (ug/L): 225.4 SD: 0.61 RSD(%): 0.27

Ni ID: 81101.I3X2.5 Seq. No.: 00083 A/S Pos.: 19 Date: 11/05/90

Replicate 1 Time: 11:31
Concentration (ug/L): 97.4 Corrected Conc (ug/L): 243.6

Replicate 2 Time: 11:34
Concentration (ug/L): 97.2 Corrected Conc (ug/L): 243.0

Mean Conc (ug/L): 97.3 SD: 0.15 RSD(%): 0.16
Corrected Conc (ug/L): 243.3

Ni ID: CCV Seq. No.: 00084 A/S Pos.: 3 Date: 11/05/

Replicate 1 Time: 11:37
Concentration (ug/L): 106.0

Replicate 2 Time: 11:40
Concentration (ug/L): 105.6

Mean Conc (ug/L): 105.8 SD: 0.30 RSD(%): 0.28

QC sample is within range 79.5 - 120.49

Ni ID: CCB Seq. No.: 00085 A/S Pos.: 0 Date: 11/05/9

Replicate 1 Time: 11:43
Concentration (ug/L): 3.1

Replicate 2 Time: 11:46
Concentration (ug/L): -1.1

Mean Conc (ug/L): 1.0 SD: 2.95 RSD(%): 294.25

QC sample is within range -15.49 - 15.49

Phos Run 1

It file is 81101

ANDARD #1			REPLICATE	#1				1345	11/10/98
	P214	EM	292				peak-noisy		
ANDARD #1			REPLICATE	#2					
	P214	EM	288				peak-noisy		
ANDARD #1			REPLICATE	#3					
	P214	EM	295						
	P214	AV	291.7	SD	3.5	CV	1.2	CONC	0.2000
ANDARD #2			REPLICATE	#1				1347	11/10/98
	P214	EM	449						
ANDARD #2			REPLICATE	#2					
	P214	EM	453						
ANDARD #2			REPLICATE	#3					
	P214	EM	451						
	P214	AV	451.0	SD	2.0	CV	0.4	CONC	1.0000
ANDARD #3			REPLICATE	#1				1349	11/10/98
	P214	EM	667						
ANDARD #3			REPLICATE	#2					
	P214	EM	663						
ANDARD #3			REPLICATE	#3					
	P214	EM	676						
	P214	AV	668.7	SD	6.7	CV	1.0	CONC	2.0000
ANDARD #4			REPLICATE	#1				1351	11/10/98
	P214	EM	1261						
ANDARD #4			REPLICATE	#2					
	P214	EM	1274						
ANDARD #4			REPLICATE	#3					
	P214	EM	1305						
	P214	AV	1280.0	SD	22.6	CV	1.8	CONC	5.0000
LANK			REPLICATE	#1				1353	11/10/98
	P214	EM	256						
LANK			REPLICATE	#2					
	P214	EM	249						
LANK			REPLICATE	#3					
	P214	EM	252						
	P214	AV	252.3	SD	3.5	CV	1.4	CONC	0.0000

P214 CC 0.9999 SLOPE 206.0664 INT 250.7845

CV			REPLICATE	#1		1355 11/10/98
P214	EM	657	1.9713 mg/L			

:V REPLICATE #2
P214 EM 675 2.0586 mg/L

:V REPLICATE #3
P214 EM 658 1.9761 mg/L

P214 AV 663.3 EM SD 10.1 CV 1.5

P214 AV 2.0020 mg/L SD 0.0491 CV 2.45

:B REPLICATE #1 1357 11/10/98
P214 EM 264 0.0641 mg/L peak-noisy

:B REPLICATE #2
P214 EM 270 0.0932 mg/L peak-noisy

:B REPLICATE #3
P214 EM 283 0.1563 mg/L window-edge

P214 AV 272.3 EM SD 9.7 CV 3.6

P214 AV 0.1046 mg/L SD 0.0471 CV 45.07

101.BF REPLICATE #1 1359 11/10/98
P214 EM 264 0.0641 mg/L peak-noisy

101.BF REPLICATE #2
P214 EM 265 0.0690 mg/L peak-noisy

101.BF REPLICATE #3
P214 EM 257 0.0302 mg/L peak-noisy

P214 AV 262.0 EM SD 4.4 CV 1.7

P214 AV 0.0544 mg/L SD 0.0212 CV 38.86

: REPLICATE #1 1401 11/10/98
P214 EM 279 0.1369 mg/L peak-noisy

: REPLICATE #2
P214 EM 290 0.1903 mg/L peak-noisy

: REPLICATE #3
P214 EM 280 0.1418 mg/L peak-noisy

P214 AV 283.0 EM SD 6.1 CV 2.1

P214 AV 0.1563 mg/L SD 0.0295 CV 18.88

3 REPLICATE #1 1403 11/10/98
P214 EM 263 0.0593 mg/L peak-noisy

3 REPLICATE #2
P214 EM 282 0.1515 mg/L window-edge

3 REPLICATE #3
P214 EM 277 0.1272 mg/L peak-noisy

P214 AV 274.0 EM SD 9.8 CV 3.6

P214 AV 0.1127 mg/L SD 0.0478 CV 42.42

3 REPLICATE #1 1405 11/10/98
P214 EM 271 0.0981 mg/L peak-noisy

P214 EM 271 0.0981 mg/L peak-noisy

REPLICATE #3
P214 EM 262 0.0544 mg/L peak-noisy

P214 AV 268.0 EM SD 5.2 CV 1.9

P214 AV 0.0835 mg/L SD 0.0252 CV 30.18

REPLICATE #1 1407 11/10/98
P214 EM 297 0.2243 mg/L peak-noisy

REPLICATE #2
P214 EM 272 0.1030 mg/L peak-noisy

REPLICATE #3
P214 EM 284 0.1612 mg/L peak-noisy

P214 AV 284.3 EM SD 12.5 CV 4.4

P214 AV 0.1628 mg/L SD 0.0607 CV 37.27

S REPLICATE #1 1409 11/10/98
P214 EM 635 1.8645 mg/L

S REPLICATE #2
P214 EM 636 1.8694 mg/L

S REPLICATE #3
P214 EM 657 1.9713 mg/L

P214 AV 642.7 EM SD 12.4 CV 1.9

P214 AV 1.9017 mg/L SD 0.0603 CV 3.17

2 REPLICATE #1 1411 11/10/98
P214 EM 287 0.1757 mg/L peak-noisy

2 REPLICATE #2
P214 EM 276 0.1224 mg/L peak-noisy

2 REPLICATE #3
P214 EM 283 0.1563 mg/L peak-noisy

P214 AV 282.0 EM SD 5.6 CV 2.0

P214 AV 0.1515 mg/L SD 0.0270 CV 17.84

2D REPLICATE #1 1413 11/10/98
P214 EM 275 0.1175 mg/L peak-noisy

2D REPLICATE #2
P214 EM 299 0.2340 mg/L peak-noisy

2D REPLICATE #3
P214 EM 281 0.1466 mg/L peak-noisy

P214 AV 285.0 EM SD 12.5 CV 4.4

P214 AV 0.1660 mg/L SD 0.0606 CV 36.50

3 REPLICATE #1 1415 11/10/98
P214 EM 311 0.2922 mg/L

REPLICATE #2

P214 EM 276 0.1224 mg/L peak-noisy

REPLICATE #3

P214 EM 286 0.1709 mg/L

P214 AV 291.0 EM SD 18.0 CV 6.2

P214 AV 0.1952 mg/L SD 0.0875 CV 44.83

✓ REPLICATE #1 1417 11/10/98

P214 EM 748 2.4129 mg/L

✓ REPLICATE #2

P214 EM 733 2.3401 mg/L

✓ REPLICATE #3

P214 EM 735 2.3498 mg/L

P214 AV 738.7 EM SD 8.1 CV 1.1

P214 AV 2.3676 mg/L SD 0.0395 CV 1.67

:B REPLICATE #1 1419 11/10/98

P214 EM 253 0.0108 mg/L

ıma has gone off.

Phos Run 2

3MA 400 Analysis Ver. 4.10 Tue 11/10/98 - 14:41:48

ıod File Name: P Replicates:3 Read Delay: 65
arks: Data File:

Jt file is PART2

ANDARD #1			REPLICATE #1					1443	11/10/98
	P214	EM	328						
ANDARD #1			REPLICATE #2						
	P214	EM	320						
ANDARD #1			REPLICATE #3						
	P214	EM	338			peak-noisy			
	P214	AV	328.7	SD	9.0	CV	2.7	CONC	0.2000
ANDARD #2			REPLICATE #1					1445	11/10/98
	P214	EM	501						
ANDARD #2			REPLICATE #2						
	P214	EM	523						
ANDARD #2			REPLICATE #3						
	P214	EM	514						
	P214	AV	512.7	SD	11.1	CV	2.2	CONC	1.0000
ANDARD #3			REPLICATE #1					1447	11/10/98
	P214	EM	733						
ANDARD #3			REPLICATE #2						
	P214	EM	759						
ANDARD #3			REPLICATE #3						
	P214	EM	752						
	P214	AV	748.0	SD	13.5	CV	1.8	CONC	2.0000
ANDARD #4			REPLICATE #1					1449	11/10/98
	P214	EM	1424						
ANDARD #4			REPLICATE #2						
	P214	EM	1407						
ANDARD #4			REPLICATE #3						
	P214	EM	1426						
	P214	AV	1419.0	SD	10.4	CV	0.7	CONC	5.0000
ANK			REPLICATE #1					1451	11/10/98
	P214	EM	276						
ANK			REPLICATE #2						
	P214	EM	278						

.ANR REPLICATE #3

P214 EM 275

P214 AV 276.3 SD 1.5 CV 0.6 CONC 0.0000

P214 CC 0.9999 SLOPE 227.9741 INT 283.0558

:V REPLICATE #1 1453 11/10/98

P214 EM 826 2.3816 mg/L

:V REPLICATE #2

P214 EM 720 1.9166 mg/L

:V REPLICATE #3

P214 EM 736 1.9868 mg/L

P214 AV 760.7 EM SD 57.1 CV 7.5

P214 AV 2.0950 mg/L SD 0.2507 CV 11.96

:B REPLICATE #1 1455 11/10/98

P214 EM 288 0.0217 mg/L window-edge

:B REPLICATE #2

P214 EM 301 0.0787 mg/L peak-noisy

:B REPLICATE #3

P214 EM 320 0.1621 mg/L peak-noisy

P214 AV 303.0 EM SD 16.1 CV 5.3

P214 AV 0.0875 mg/L SD 0.0706 CV 80.69

.101.U1 REPLICATE #1 1457 11/10/98

P214 EM 326 0.1884 mg/L peak-noisy

.101.U1 REPLICATE #2

P214 EM 319 0.1577 mg/L peak-noisy

.101.U1 REPLICATE #3

P214 EM 306 0.1006 mg/L

P214 AV 317.0 EM SD 10.1 CV 3.2

P214 AV 0.1489 mg/L SD 0.0445 CV 29.90

≥ REPLICATE #1 1459 11/10/98

P214 EM 364 0.3551 mg/L peak-noisy

≥ REPLICATE #2

P214 EM 361 0.3419 mg/L peak-noisy

≥ REPLICATE #3

P214 EM 370 0.3814 mg/L

P214 AV 365.0 EM SD 4.6 CV 1.3

P214 AV 0.3594 mg/L SD 0.0201 CV 5.59

3 REPLICATE #1 1501 11/10/98

P214 EM 318 0.1533 mg/L peak-noisy

3 REPLICATE #2

REPLICATE #3

P214 EM 324 0.1796 mg/L peak-noisy

P214 AV 323.0 EM SD 4.6 CV 1.4

P214 AV 0.1752 mg/L SD 0.0201 CV 11.47

REPLICATE #1 1503 11/10/98

P214 EM 342 0.2586 mg/L peak-noisy

REPLICATE #2

P214 EM 337 0.2366 mg/L peak-noisy

REPLICATE #3

P214 EM 376 0.4077 mg/L peak-noisy

P214 AV 351.7 EM SD 21.2 CV 6.0

P214 AV 0.3010 mg/L SD 0.0931 CV 30.93

REPLICATE #1 1505 11/10/98

P214 EM 418 0.5919 mg/L peak-noisy

REPLICATE #2

P214 EM 410 0.5568 mg/L peak-noisy

REPLICATE #3

P214 EM 427 0.6314 mg/L peak-noisy

P214 AV 418.3 EM SD 8.5 CV 2.0

P214 AV 0.5934 mg/L SD 0.0373 CV 6.29

REPLICATE #1 1507 11/10/98

P214 EM 406 0.5393 mg/L

REPLICATE #2

P214 EM 412 0.5656 mg/L

REPLICATE #3

P214 EM 413 0.5700 mg/L

P214 AV 410.3 EM SD 3.8 CV 0.9

P214 AV 0.5583 mg/L SD 0.0166 CV 2.97

REPLICATE #1 1509 11/10/98

P214 EM 447 0.7191 mg/L

REPLICATE #2

P214 EM 441 0.6928 mg/L

REPLICATE #3

P214 EM 440 0.6884 mg/L

P214 AV 442.7 EM SD 3.8 CV 0.9

P214 AV 0.7001 mg/L SD 0.0166 CV 2.37

REPLICATE #1 1511 11/10/98

P214 EM 762 2.1009 mg/L

REPLICATE #2

P214 EM 826 2.3816 mg/L

REPLICATE #3

P214	EM	769	2.1316 mg/L

P214	AV	785.7	EM	SD	35.1	CV	4.5
P214	AV	2.2047	mg/L	SD	0.1540	CV	6.98

:B REPLICATE #1 1513 11/10/98

P214	EM	295	0.0524 mg/L	peak-noisy

:B REPLICATE #2

P214	EM	296	0.0568 mg/L	peak-noisy

:B REPLICATE #3

P214	EM	318	0.1533 mg/L	peak-noisy

P214	AV	303.0	EM	SD	13.0	CV	4.3
P214	AV	0.0875	mg/L	SD	0.0570	CV	65.18

```
-----------------------------------------------------------------------------
lement File: SE.GEL          Element: Se                    Wavelength: 196.0
ate: 11/06/98                Time: 12:32                    Slit: 2.00 L
ata File:                    ID/Wt File: 81101.IDW          Lamp Current: 0
echnique: HGA                Calib. Type: Linear            Energy: 37
-----------------------------------------------------------------------------
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
e    ID: 0 PPB               Seq. No.: 00148    A/S Pos.: 0     Date: 11/06/9_

eplicate  1                              Time: 12:32
eak Area (A-s): 0.002                    Peak Height (A): 0.027
ackground Pk Area (A-s): 0.213           Background Pk Height (A): 0.098
lank Corrected Pk Area (A-s): 0.005
oncentration (ug/L  ): 2.73

eplicate  2                              Time: 12:35
eak Area (A-s): 0.006                    Peak Height (A): 0.036
ackground Pk Area (A-s): 0.211           Background Pk Height (A): 0.096
lank Corrected Pk Area (A-s): 0.009
oncentration (ug/L  ): 4.91

ean Conc  (ug/L  ):        3.82         SD: 1.539                RSD(%): 40.28

uto-zero performed.

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e    ID: 10 PPB              Seq. No.: 00149    A/S Pos.: 1     Date: 11/06/9

eplicate  1                              Time: 12:38
eak Area (A-s): 0.024                    Peak Height (A): 0.048
ackground Pk Area (A-s): 0.212           Background Pk Height (A): 0.092
lank Corrected Pk Area (A-s): 0.020
oncentration (ug/L  ): 11.17

eplicate  2                              Time: 12:41
eak Area (A-s): 0.026                    Peak Height (A): 0.057
ackground Pk Area (A-s): 0.212           Background Pk Height (A): 0.090
lank Corrected Pk Area (A-s): 0.022
oncentration (ug/L  ): 12.25

ean Conc  (ug/L  ):       11.71          SD: 0.760                RSD(%): 6.49

tandard number 1 applied.  [10.00]
orrelation coefficient: 1.00000          Slope: 0.0021

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e    ID: 25 PPB              Seq. No.: 00150    A/S Pos.: 2     Date: 11/06/99

eplicate  1                              Time: 12:44
eak Area (A-s): 0.048                    Peak Height (A): 0.104
ackground Pk Area (A-s): 0.207           Background Pk Height (A): 0.091
lank Corrected Pk Area (A-s): 0.044
oncentration (ug/L  ): 20.63

eplicate  2                              Time: 12:47
eak Area (A-s): 0.055                    Peak Height (A): 0.097
ackground Pk Area (A-s): 0.204           Background Pk Height (A): 0.089
lank Corrected Pk Area (A-s): 0.052
oncentration (ug/L  ): 24.22
```

ean Conc (ug/L): 22.43 SD: 2.539 RSD(%): 11.32

tandard number 2 applied. [25.00]
orrelation coefficient: 0.99510 Slope: 0.0019

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e ID: 50 PPB Seq. No.: 00151 A/S Pos.: 3 Date: 11/06/9

eplicate 1 Time: 12:50
eak Area (A-s): 0.104 Peak Height (A): 0.173
ackground Pk Area (A-s): 0.208 Background Pk Height (A): 0.106
lank Corrected Pk Area (A-s): 0.100
oncentration (ug/L): 51.32

eplicate 2 Time: 12:53
eak Area (A-s): 0.103 Peak Height (A): 0.178
ackground Pk Area (A-s): 0.194 Background Pk Height (A): 0.096
lank Corrected Pk Area (A-s): 0.099
oncentration (ug/L): 50.83

ean Conc (ug/L): 51.07 SD: 0.351 RSD(%): 0.69

tandard number 3 applied. [50.00]
orrelation coefficient: 0.99917 Slope: 0.0020

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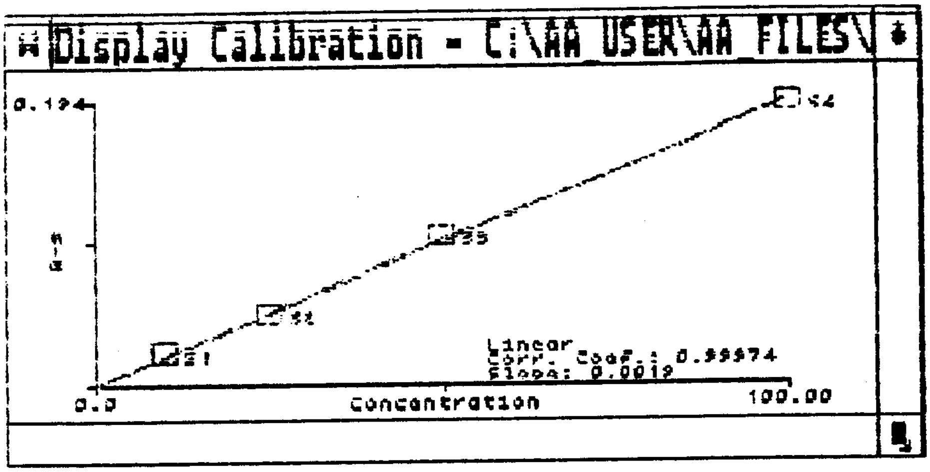
e ID: 100 PPB Seq. No.: 00152 A/S Pos.: 4 Date: 11/06/9

eplicate 1 Time: 12:57
eak Area (A-s): 0.196 Peak Height (A): 0.316
ackground Pk Area (A-s): 0.211 Background Pk Height (A): 0.127
lank Corrected Pk Area (A-s): 0.192
oncentration (ug/L): 96.88

eplicate 2 Time: 13:00
eak Area (A-s): 0:200 Peak Height (A): 0.329
ackground Pk Area (A-s): 0.214 Background Pk Height (A): 0.130
lank Corrected Pk Area (A-s): 0.196
oncentration (ug/L): 98.91

ean Conc (ug/L): 97.89 SD: 1.436 RSD(%): 1.47

tandard number 4 applied. [100.00]
orrelation coefficient: 0.99974 Slope: 0.0019



e ID: ICV Seq. No.: 00153 A/S Pos.: 5 Date: 11/06/9

eplicate 1 Time: 13:12
oncentration (ug/L): 56.62

eplicate 2 Time: 13:15
oncentration (ug/L): 49.30

ean Conc (ug/L): 52.96 SD: 5.174 RSD(%): 9.77

C sample is within range

e ID: ICB Seq. No.: 00154 A/S Pos.: 0 Date: 11/06/9

eplicate 1 Time: 13:18
oncentration (ug/L): -5.23

eplicate 2 Time: 13:21
oncentration (ug/L): -2.42

ean Conc (ug/L): -3.82 SD: 1.989 RSD(%): 52.01

C sample is within range

uto-zero performed.

e ID: 81101.B-F Seq. No.: 00155 A/S Pos.: 6 Date: 11/06/9

eplicate 1 Time: 13:24
oncentration (ug/L): 1.37

eplicate 2 Time: 13:27
oncentration (ug/L): 2.46

lean Conc (ug/L): 1.92 SD: 0.774 RSD(%): 40.37

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e ID: 81101.OB Seq. No.: 00156 A/S Pos.: 7 Date: 11/06/9

eplicate 1 Time: 13:31
oncentration (ug/L): 5.10

eplicate 2 Time: 13:34
oncentration (ug/L): 2.14

ean Conc (ug/L): 3.62 SD: 2.095 RSD(%): 57.93

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e ID: 81101.UB Seq. No.: 00157 A/S Pos.: 8 Date: 11/06/9

eplicate 1 Time: 13:37
oncentration (ug/L): 6.13

eplicate 2 Time: 13:40
oncentration (ug/L): 0.53

ean Conc (ug/L): 3.33 SD: 3.962 RSD(%): 119.01

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e ID: 81101.IB Seq. No.: 00158 A/S Pos.: 9 Date: 11/06/9

eplicate 1 Time: 13:43
oncentration (ug/L): -0.41

eplicate 2 Time: 13:46
oncentration (ug/L): -2.63

ean Conc (ug/L): -1.52 SD: 1.570 RSD(%): 103.10

~~~~~~

e ID: 81101.01 Seq. No.: 00159 A/S Pos.: 10 Date: 11/06/9

eplicate 1 Time: 13:49
oncentration (ug/L): -0.37

eplicate 2 Time: 13:52
oncentration (ug/L): 1.51

ean Conc (ug/L): 0.57 SD: 1.327 RSD(%): 233.36

~~~~~~

e ID: 81101.01 Seq. No.: 00160 A/S Pos.: 10 Date: 11/06/9

eplicate 1 Time: 13:56
oncentration (ug/L): 52.06

eplicate 2 Time: 13:59
oncentration (ug/L): 52.19

ean Conc (ug/L): 52.12 SD: 0.090 RSD(%): 0.17

ecovery is 103.1%
~~~~~~

~~~~~~

e ID: 81101.02 Seq. No.: 00161 A/S Pos.: 11 Date: 11/06/9

eplicate 1 Time: 14:02
oncentration (ug/L): 3.81

eplicate 2 Time: 14:05
oncentration (ug/L): 7.89

ean Conc (ug/L): 5.85 SD: 2.889 RSD(%): 49.39

~~~~~~

e ID: 81101.03 Seq. No.: 00162 A/S Pos.: 12 Date: 11/06/9

eplicate 1 Time: 14:08
oncentration (ug/L): 0.04

eplicate 2 Time: 14:11
oncentration (ug/L): 3.04

ean Conc (ug/L): 1.54 SD: 2.118 RSD(%): 137.5

~~~~~~

e ID: CCV Seq. No.: 00163 A/S Pos.: 3 Date: 11/06/

eplicate 1 Time: 14:14
oncentration (ug/L): 57.31

eplicate 2 Time: 14:17
oncentration (ug/L): 56.59

ean Conc (ug/L): 56.95 SD: 0.508 RSD(%): 0.89

C sample is within range

~~~~~~

e ID: CCB Seq. No.: 00164 A/S Pos.: 0 Date: 11/06/9

eplicate 1 Time: 14:20
oncentration (ug/L): -3.05

eplicate 2 Time: 14:23
oncentration (ug/L): -0.27

ean Conc (ug/L): -1.66 SD: 1.966 RSD(%): 118.5

C sample is within range

~~~~~~

e ID: 81101.U1 Seq. No.: 00165 A/S Pos.: 13 Date: 11/06/9

eplicate 1 Time: 14:27
oncentration (ug/L): 20.52

eplicate 2 Time: 14:30
oncentration (ug/L): 19.85

ean Conc (ug/L): 20.18 SD: 0.472 RSD(%): 2.34
~~~~~~

~~~~~~

e ID: 81101.U2 Seq. No.: 00166 A/S Pos.: 14 Date: 11/06/9

eplicate 1 Time: 14:33
oncentration (ug/L): 44.91

eplicate 2 Time: 14:36
oncentration (ug/L): 41.69

ean Conc (ug/L): 43.30 SD: 2.276 RSD(%): 5.26

~~~~~~

e ID: 81101.U3 Seq. No.: 00167 A/S Pos.: 15 Date: 11/06/9

eplicate 1 Time: 14:39
oncentration (ug/L): 44.62

eplicate 2 Time: 14:42
oncentration (ug/L): 44.48

ean Conc (ug/L): 44.55 SD: 0.103 RSD(%): 0.23

~~~~~~

e ID: 81101.U4 Seq. No.: 00168 A/S Pos.: 16 Date: 11/06/9

eplicate 1 Time: 14:45
oncentration (ug/L): 55.16

eplicate 2 Time: 14:48
oncentration (ug/L): 49.25

ean Conc (ug/L): 52.20 SD: 4.177 RSD(%): 8.00

~~~~~~

e ID: 81101.I1X2.5 Seq. No.: 00169 A/S Pos.: 17 Date: 11/06/9

eplicate 1 Time: 14:51
oncentration (ug/L): 20.08 Corrected Conc (ug/L): 50.19

eplicate 2 Time: 14:54
oncentration (ug/L): 15.08 Corrected Conc (ug/L): 37.71

ean Conc (ug/L): 17.58 SD: 3.531 RSD(%): 20.08
orrected Conc (ug/L): 43.95

~~~~~~

e ID: 81101.I2 Seq. No.: 00170 A/S Pos.: 18 Date: 11/06/9

eplicate 1 Time: 14:57
oncentration (ug/L): 33.23

eplicate 2 Time: 15:00
oncentration (ug/L): 37.75

ean Conc (ug/L): 35.49 SD: 3.196 RSD(%): 9.00
~~~~~~

~~~~~~

e ID: B1101.I3 Seq. No.: 00171 A/S Pos.: 19 Date: 11/06/98

eplicate 1 Time: 15:03
oncentration (ug/L): 43.52

eplicate 2 Time: 15:06
oncentration (ug/L): 42.98

ean Conc (ug/L): 43.25 SD: 0.381 RSD(%): 0.88

~~~~~~

e ID: CCV Seq. No.: 00172 A/S Pos.: 3 Date: 11/06/98

eplicate 1 Time: 15:09
oncentration (ug/L): 55.14

eplicate 2 Time: 15:12
oncentration (ug/L): 60.78

ean Conc (ug/L): 57.96 SD: 3.985 RSD(%): 6.87

C sample is within range

~~~~~~

e ID: CCB Seq. No.: 00173 A/S Pos.: 0 Date: 11/06/98

eplicate 1 Time: 15:15
oncentration (ug/L): 2.62

eplicate 2 Time: 15:18
oncentration (ug/L): 4.03

ean Conc (ug/L): 3.33 SD: 0.997 RSD(%): 29.97

C sample is within range
~~~~~~

```
-----------------------------------------------------------------------------
Element File: AG.GEL          Element: Ag                    Wavelength: 328.1
Date: 11/09/98                Time: 09:26                    Slit: 0.7 L
Data File:                    ID/Wt File: 81101.IDW          Lamp Current: 10
Technique: HGA                Calib. Type: Linear            Energy: 56
-----------------------------------------------------------------------------
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
Ag    ID: BLANK               Seq. No.: 00001    A/S Pos.: 0     Date: 11/09/

Replicate  1                              Time: 09:26
Peak Area (A-s): 0.079                    Peak Height (A): 0.095
Background Pk Area (A-s): 0.058           Background Pk Height (A): 0.028
Blank Corrected Pk Area (A-s): -0.016
Concentration (ug/L  ): -1.13

Replicate  2                              Time: 09:29
Peak Area (A-s): 0.076                    Peak Height (A): 0.091
Background Pk Area (A-s): 0.062           Background Pk Height (A): 0.027
Blank Corrected Pk Area (A-s): -0.019
Concentration (ug/L  ): -1.31

Mean Conc  (ug/L  ):       -1.22          SD: 0.129                RSD(%): 10.58

Auto-zero performed.

~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
Ag    ID: 5 PPB AG            Seq. No.: 00002    A/S Pos.: 1     Date: 11/09/

Replicate  1                              Time: 09:32
Peak Area (A-s): 0.171                    Peak Height (A): 0.197
Background Pk Area (A-s): 0.069           Background Pk Height (A): 0.029
Blank Corrected Pk Area (A-s): 0.093
Concentration (ug/L  ): 4.82

Replicate  2                              Time: 09:35
Peak Area (A-s): 0.171                    Peak Height (A): 0.201
Background Pk Area (A-s): 0.072           Background Pk Height (A): 0.031
Blank Corrected Pk Area (A-s): 0.093
Concentration (ug/L  ): 4.81

Mean Conc  (ug/L  ):        4.82          SD: 0.006                RSD(%): 0.12

Standard number 1 applied.  [5.00]
Correlation coefficient: 1.00000          Slope: 0.0186            Int: -0.000

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Ag    ID: 10 PPB AG           Seq. No.: 00003    A/S Pos.: 2     Date: 11/09/

Replicate  1                              Time: 09:38
Peak Area (A-s): 0.259                    Peak Height (A): 0.297
Background Pk Area (A-s): 0.076           Background Pk Height (A): 0.033
Blank Corrected Pk Area (A-s): 0.181
Concentration (ug/L  ): 9.73

Replicate  2                              Time: 09:41
Peak Area (A-s): 0.269                    Peak Height (A): 0.311
Background Pk Area (A-s): 0.077           Background Pk Height (A): 0.033
Blank Corrected Pk Area (A-s): 0.191
Concentration (ug/L  ): 10.27
```

Mean Conc (ug/L): 10.00 SD: 0.380 RSD(%): 3.80

Standard number 2 applied. [10.00]
Correlation coefficient: 1.00000 Slope: 0.0186 Int: -0.000

~~~~~~

Ag ID: 20 PPB AG Seq. No.: 00004 A/S Pos.: 3 Date: 11/09

Replicate 1 Time: 09:44
Peak Area (A-s): 0.437 Peak Height (A): 0.502
Background Pk Area (A-s): 0.088 Background Pk Height (A): 0.046
Blank Corrected Pk Area (A-s): 0.359
Concentration (ug/L): 19.32

Characteristic Mass = 2.4 pg/0.0044 A-s

Replicate 2 Time: 09:47
Peak Area (A-s): 0.446 Peak Height (A): 0.513
Background Pk Area (A-s): 0.087 Background Pk Height (A): 0.045
Blank Corrected Pk Area (A-s): 0.368
Concentration (ug/L): 19.79

Mean Conc (ug/L): 19.56 SD: 0.330 RSD(%): 1.69

Standard number 3 applied. [20.00]
Correlation coefficient: 0.99992 Slope: 0.0182 Int: 0.002

~~~~~~

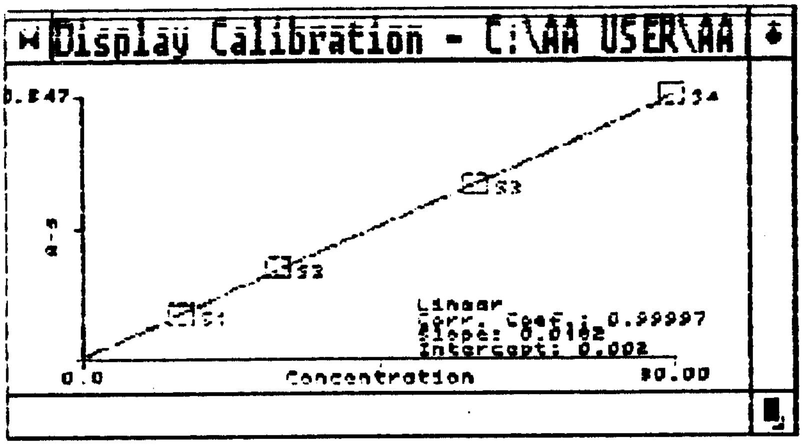
Ag ID: 30 PPB AG Seq. No.: 00005 A/S Pos.: 4 Date: 11/09

Replicate 1 Time: 09:50
Peak Area (A-s): 0.622 Peak Height (A): 0.699
Background Pk Area (A-s): 0.099 Background Pk Height (A): 0.058
Blank Corrected Pk Area (A-s): 0.545
Concentration (ug/L): 29.89

Replicate 2 Time: 09:53
Peak Area (A-s): 0.627 Peak Height (A): 0.712
Background Pk Area (A-s): 0.102 Background Pk Height (A): 0.060
Blank Corrected Pk Area (A-s): 0.549
Concentration (ug/L): 30.15

Mean Conc (ug/L): 30.02 SD: 0.179 RSD(%): 0.60

Standard number 4 applied. [30.00]
Correlation coefficient: 0.99997 Slope: 0.0182 Int: 0.002



~~~~~~

Ag ID: ICV Seq. No.: 00006 A/S Pos.: 5 Date: 11/09/

Replicate 1 Time: 09:59
Concentration (ug/L): 21.59

Replicate 2 Time: 10:02
Concentration (ug/L): 20.77

Mean Conc (ug/L): 21.18 SD: 0.575 RSD(%): 2.72

QC sample is within range 15.5 - 24.49

~~~~~~

Ag ID: ICB Seq. No.: 00007 A/S Pos.: 0 Date: 11/09/

Replicate 1 Time: 10:05
Concentration (ug/L): 0.42

Replicate 2 Time: 10:08
Concentration (ug/L): 0.20

Mean Conc (ug/L): 0.31 SD: 0.156 RSD(%): 50.27

QC sample is within range -5.49 - 5.49

~~~~~~

Ag ID: 81101.B-F Seq. No.: 00008 A/S Pos.: 6 Date: 11/09/

Replicate 1 Time: 10:11
Concentration (ug/L): 0.13

Replicate 2 Time: 10:14
Concentration (ug/L): 0.11

Mean Conc (ug/L): 0.12 SD: 0.010 RSD(%): 8.57

~~~~~~

Ag ID: 81101.0B Seq. No.: 00009 A/S Pos.: 7 Date: 11/09/

Replicate 1 Time: 10:17
Concentration (ug/L): 0.20

Replicate 2 Time: 10:20
Concentration (ug/L): 0.29

Mean Conc (ug/L): 0.25 SD: 0.060 RSD(%): 24.56

~~~~~~

Ag ID: 81101.UB Seq. No.: 00010 A/S Pos.: 8 Date: 11/09/

Replicate 1 Time: 10:24
Concentration (ug/L): 0.41

Replicate 2 Time: 10:27
Concentration (ug/L): 0.32

Mean Conc (ug/L): 0.36 SD: 0.063 RSD(%): 17.61

~~~~~~

Ag ID: 81101.IB Seq. No.: 00011 A/S Pos.: 9 Date: 11/09/

Replicate 1 Time: 10:30
Concentration (ug/L): 0.08

Replicate 2 Time: 10:33
Concentration (ug/L): 0.02

Mean Conc (ug/L): 0.05 SD: 0.043 RSD(%): 81.38

~~~~~~

Ag ID: 81101.01 Seq. No.: 00012 A/S Pos.: 10 Date: 11/09/

Replicate 1 Time: 10:36
Concentration (ug/L): 0.74

Replicate 2 Time: 10:39
Concentration (ug/L): 0.50

Mean Conc (ug/L): 0.62 SD: 0.171 RSD(%): 27.50

~~~~~~

Ag ID: 81101.01 Seq. No.: 00013 A/S Pos.: 10 Date: 11/09/

Replicate 1 Time: 10:42
Concentration (ug/L): 9.03

Replicate 2 Time: 10:45
Concentration (ug/L): 9.31

Mean Conc (ug/L): 9.17 SD: 0.199 RSD(%): 2.17

Recovery is 85.4%

~~~~~~

Ag ID: 81101.02 Seq. No.: 00014 A/S Pos.: 11 Date: 11/09/

Replicate 1 Time: 10:49
Concentration (ug/L): 0.29

Replicate 2 Time: 10:52
Concentration (ug/L): 0.38
~~~~~~

Mean Conc (ug/L): 0.33 SD: 0.063 RSD(%): 19.01

~~~~~~

Ag ID: 81101.03 Seq. No.: 00015 A/S Pos.: 12 Date: 11/09/

Replicate 1 Time: 10:55
Concentration (ug/L): 0.14

Replicate 2 Time: 10:58
Concentration (ug/L): 0.24

Mean Conc (ug/L): 0.19 SD: 0.068 RSD(%): 35.80

~~~~~~

Ag ID: CCV Seq. No.: 00016 A/S Pos.: 3 Date: 11/09/

Replicate 1 Time: 11:01
Concentration (ug/L): 20.76

Replicate 2 Time: 11:04
Concentration (ug/L): 20.20

Mean Conc (ug/L): 20.48 SD: 0.394 RSD(%): 1.92

QC sample is within range 15.5 - 24.49

~~~~~~

Ag ID: CCB Seq. No.: 00017 A/S Pos.: 0 Date: 11/09/

Replicate 1 Time: 11:07
Concentration (ug/L): 0.03

Replicate 2 Time: 11:10
Concentration (ug/L): -0.12

Mean Conc (ug/L): -0.05 SD: 0.104 RSD(%): 228.9

QC sample is within range -5.49 - 5.49

~~~~~~

Ag ID: 81101.U1 Seq. No.: 00018 A/S Pos.: 13 Date: 11/09/

Replicate 1 Time: 11:13
Concentration (ug/L): 0.75

Replicate 2 Time: 11:16
Concentration (ug/L): 0.75

Mean Conc (ug/L): 0.75 SD: 0.001 RSD(%): 0.10

~~~~~~

Ag ID: 81101.U2 Seq. No.: 00019 A/S Pos.: 14 Date: 11/09/

Replicate 1 Time: 11:19
Concentration (ug/L): 0.59

Replicate 2 Time: 11:22
Concentration (ug/L): 0.46
~~~~~~

Mean Conc (ug/L): 0.52 SD: 0.087 RSD(%): 16.5f

~~~~~~

Ag ID: 81101.U3 Seq. No.: 00020 A/S Pos.: 15 Date: 11/09/

Replicate 1 Time: 11:25
Concentration (ug/L): 0.37

Replicate 2 Time: 11:28
Concentration (ug/L): 0.38

Mean Conc (ug/L): 0.37 SD: 0.003 RSD(%): 0.84

~~~~~~

Ag ID: 81101.U4 Seq. No.: 00021 A/S Pos.: 16 Date: 11/09/

Replicate 1 Time: 11:31
Concentration (ug/L): 0.87

Replicate 2 Time: 11:34
Concentration (ug/L): 0.73

Mean Conc (ug/L): 0.80 SD: 0.099 RSD(%): 12.27

~~~~~~

Ag ID: 81017.LCS Seq. No.: 00022 A/S Pos.: 21 Date: 11/09/

Replicate 1 Time: 11:37
Concentration (ug/L): 7.61

Replicate 2 Time: 11:40
Concentration (ug/L): 7.84

Mean Conc (ug/L): 7.72 SD: 0.160 RSD(%): 2.08

~~~~~~

Ag ID: 81017.1-7 Seq. No.: 00024 A/S Pos.: 22 Date: 11/09/

Replicate 1 Time: 11:44
Concentration (ug/L): 0.24

Replicate 2 Time: 11:47
Concentration (ug/L): 0.38

Mean Conc (ug/L): 0.31 SD: 0.100 RSD(%): 32.6

~~~~~~

Ag ID: 81017.1-7S Seq. No.: 00025 A/S Pos.: 23 Date: 11/09/

Replicate 1 Time: 11:50
Concentration (ug/L): 8.06

Replicate 2 Time: 11:53
Concentration (ug/L): 7.98

Mean Conc (ug/L): 8.02 SD: 0.059 RSD(%): 0.73
~~~~~~

Ag ID: 81017.1-102 Seq. No.: 00028 A/S Pos.: 6 Date: 11/09/

Replicate 1 Time: 11:58
Concentration (ug/L): 0.02

Replicate 2 Time: 12:01
Concentration (ug/L): -0.14

Mean Conc (ug/L): -0.06 SD: 0.113 RSD(%): 178.7

Ag ID: 81017.1-102S Seq. No.: 00029 A/S Pos.: 7 Date: 11/09/

Replicate 1 Time: 12:05
Concentration (ug/L): 7.87

Replicate 2 Time: 12:08
Concentration (ug/L): 7.54

Mean Conc (ug/L): 7.70 SD: 0.238 RSD(%): 3.09

Ag ID: CCV Seq. No.: 00030 A/S Pos.: 3 Date: 11/09/

Replicate 1 Time: 12:11
Concentration (ug/L): 19.90

Replicate 2 Time: 12:15
Concentration (ug/L): 19.36

Mean Conc (ug/L): 19.63 SD: 0.381 RSD(%): 1.94

QC sample is within range 15.5 - 24.49

Ag ID: CCB Seq. No.: 00031 A/S Pos.: 0 Date: 11/09/

Replicate 1 Time: 12:18
Concentration (ug/L): 0.00

Replicate 2 Time: 12:21
Concentration (ug/L): -0.25

Mean Conc (ug/L): -0.13 SD: 0.183 RSD(%): 146.02

QC sample is within range -5.49 - 5.49

Ag ID: 81101.I1 Seq. No.: 00032 A/S Pos.: 17 Date: 11/09/

Replicate 1 Time: 12:24
Concentration (ug/L): 2.66

Replicate 2 Time: 12:27
Concentration (ug/L): 2.85

Mean Conc (ug/L): 2.75 SD: 0.134 RSD(%): 4.86

Ag ID: 81101.I2 Seq. No.: 00033 A/S Pos.: 18 Date: 11/09/

Replicate 1 Time: 12:30
Concentration (ug/L): 1.35

Replicate 2 Time: 12:33
Concentration (ug/L): 1.40

Mean Conc (ug/L): 1.38 SD: 0.034 RSD(%): 2.49

Ag ID: 81101.I3 Seq. No.: 00034 A/S Pos.: 19 Date: 11/09/

Replicate 1 Time: 12:36
Concentration (ug/L): 0.25

Replicate 2 Time: 12:39
Concentration (ug/L): 0.35

Mean Conc (ug/L): 0.30 SD: 0.069 RSD(%): 23.2

Ag ID: 81017.2-102 Seq. No.: 00035 A/S Pos.: 8 Date: 11/09/

Replicate 1 Time: 12:46
Concentration (ug/L): -1.42

Replicate 2 Time: 12:49
Concentration (ug/L): -0.48

Mean Conc (ug/L): -0.95 SD: 0.660 RSD(%): 69.52

Ag ID: 81017.2-102D Seq. No.: 00036 A/S Pos.: 9 Date: 11/09.

Replicate 1 Time: 12:52
Concentration (ug/L): -0.97

Replicate 2 Time: 12:55
Concentration (ug/L): -1.10

Mean Conc (ug/L): -1.03 SD: 0.094 RSD(%): 9.07

Ag ID: 81017.3-102 Seq. No.: 00037 A/S Pos.: 10 Date: 11/09/

Replicate 1 Time: 12:58
Concentration (ug/L): -1.09

Replicate 2 Time: 13:02
Concentration (ug/L): -1.20

Mean Conc (ug/L): -1.15 SD: 0.081 RSD(%): 7.06

Ag ID: 81017.5-103 Seq. No.: 00038 A/S Pos.: 11 Date: 11/09/

Replicate 1 Time: 13:05

Concentration (ug/L): -0.50

Replicate 2 Time: 13:08
Concentration (ug/L): -0.68

Mean Conc (ug/L): -0.59 SD: 0.126 RSD(%): 21.53

Ag ID: 81017.7-102 Seq. No.: 00039 A/S Pos.: 12 Date: 11/09/

Replicate 1 Time: 13:11
Concentration (ug/L): -1.08

Replicate 2 Time: 13:14
Concentration (ug/L): -1.42

Mean Conc (ug/L): -1.25 SD: 0.241 RSD(%): 19.29

Ag ID: 81017.8-102 Seq. No.: 00040 A/S Pos.: 13 Date: 11/09/

Replicate 1 Time: 13:17
Concentration (ug/L): -1.48

Replicate 2 Time: 13:20
Concentration (ug/L): -1.04

Mean Conc (ug/L): -1.26 SD: 0.310 RSD(%): 24.57

Ag ID: CCV Seq. No.: 00041 A/S Pos.: 3 Date: 11/09/

Replicate 1 Time: 13:23
Concentration (ug/L): 17.98

Replicate 2 Time: 13:26
Concentration (ug/L): 18.23

Mean Conc (ug/L): 18.10 SD: 0.180 RSD(%): 0.99

QC sample is within range 15.5 - 24.49

Ag ID: CCB Seq. No.: 00042 A/S Pos.: 0 Date: 11/09/

Replicate 1 Time: 13:29
Concentration (ug/L): -0.54

Replicate 2 Time: 13:32
Concentration (ug/L): -0.66

Mean Conc (ug/L): -0.60 SD: 0.089 RSD(%): 14.76

QC sample is within range -5.49 - 5.49

Ag ID: 81017.10-102 Seq. No.: 00043 A/S Pos.: 14 Date: 11/09/

Replicate 1 Time: 13:35

```
---------------------------------------------------------------------------
:lement File: TL.GEL          Element: Tl                    Wavelength: 276.8
)ate: 11/04/98                Time: 10:58                    Slit: 2.00 H
)ata File:                    ID/Wt File: UNTITLED           Lamp Current: 7
'echnique: HGA                Calib. Type: Linear            Energy: 44
---------------------------------------------------------------------------
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
'l    ID: BLANK               Seq. No.: 00001    A/S Pos.: 0     Date: 11/04/'

{eplicate  1                                  Time: 10:58
'eak Area (A-s): -0.000                       Peak Height (A): 0.013
{ackground Pk Area (A-s): 0.045               Background Pk Height (A): 0.031
{lank Corrected Pk Area (A-s): -0.000

{eplicate  2                                  Time: 11:01
'eak Area (A-s): 0.001                        Peak Height (A): 0.017
{ackground Pk Area (A-s): 0.057               Background Pk Height (A): 0.034
{lank Corrected Pk Area (A-s): 0.001

{ean Pk Area (A-s):       0.000               SD: 0.0011              RSD(%): 358.37

{uto-zero performed.

~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
'l    ID: 10 PPB TL           Seq. No.: 00002    A/S Pos.: 1     Date: 11/04/'

{eplicate  1                                  Time: 11:04
'eak Area (A-s): 0.021                        Peak Height (A): 0.046
{ackground Pk Area (A-s): 0.076               Background Pk Height (A): 0.034
{lank Corrected Pk Area (A-s): 0.020

{eplicate  2                                  Time: 11:07
'eak Area (A-s): 0.025                        Peak Height (A): 0.043
{ackground Pk Area (A-s): 0.074               Background Pk Height (A): 0.036
{lank Corrected Pk Area (A-s): 0.024

{ean Pk Area (A-s):       0.022               SD: 0.0030              RSD(%): 13.22

{tandard number 1 applied.  [10.00]
:orrelation coefficient: 1.00000              Slope: 0.0022

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'l    ID: 20 PPB TL           Seq. No.: 00003    A/S Pos.: 2     Date: 11/04/98

{eplicate  1                                  Time: 11:10
'eak Area (A-s): 0.045                        Peak Height (A): 0.076
{ackground Pk Area (A-s): 0.096               Background Pk Height (A): 0.050
{lank Corrected Pk Area (A-s): 0.045
:oncentration (ug/L  ): 20.14

{eplicate  2                                  Time: 11:13
'eak Area (A-s): 0.038                        Peak Height (A): 0.078
{ackground Pk Area (A-s): 0.094               Background Pk Height (A): 0.054
{lank Corrected Pk Area (A-s): 0.038
:oncentration (ug/L  ): 17.06

{ean Conc  (ug/L  ):      18.60               SD: 2.178               RSD(%): 11.71

{tandard number 2 applied.  [20.00]
```

Correlation coefficient: 0.99561 Slope: 0.0021

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1 ID: 50 PPB TL Seq. No.: 00004 A/S Pos.: 3 Date: 11/04/98

Replicate 1 Time: 11:16
Peak Area (A-s): 0.103 Peak Height (A): 0.172
Background Pk Area (A-s): 0.137 Background Pk Height (A): 0.121
Blank Corrected Pk Area (A-s): 0.103
Concentration (ug/L): 48.83

Replicate 2 Time: 11:19
Peak Area (A-s): 0.100 Peak Height (A): 0.166
Background Pk Area (A-s): 0.136 Background Pk Height (A): 0.121
Blank Corrected Pk Area (A-s): 0.100
Concentration (ug/L): 47.26

Mean Conc (ug/L): 48.05 SD: 1.115 RSD(%): 2.32

Standard number 3 applied. [50.00]
Correlation coefficient: 0.99935 Slope: 0.0020

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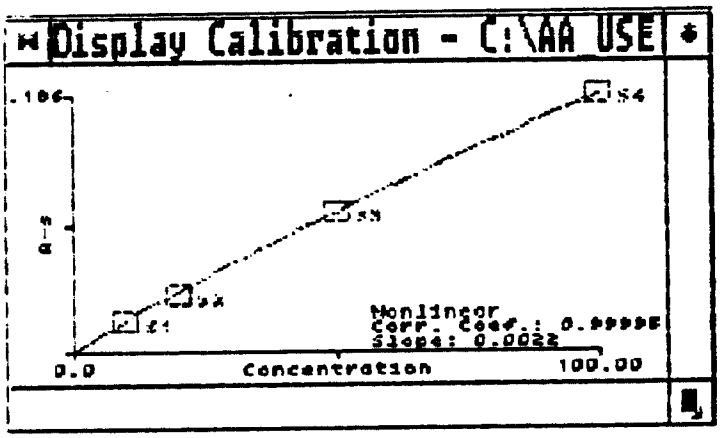
1 ID: 100 PPB TL Seq. No.: 00005 A/S Pos.: 4 Date: 11/04/98

Replicate 1 Time: 11:22
Peak Area (A-s): 0.185 Peak Height (A): 0.280
Background Pk Area (A-s): 0.214 Background Pk Height (A): 0.243
Blank Corrected Pk Area (A-s): 0.185
Concentration (ug/L): 90.48

Replicate 2 Time: 11:25
Peak Area (A-s): 0.188 Peak Height (A): 0.299
Background Pk Area (A-s): 0.203 Background Pk Height (A): 0.238
Blank Corrected Pk Area (A-s): 0.187
Concentration (ug/L): 91.81

Mean Conc (ug/L): 91.14 SD: 0.945 RSD(%): 1.04

Standard number 4 applied. [100.00]
Correlation coefficient: 0.99776 Slope: 0.0019



~~~~~~

1 ID: ICV Seq. No.: 00006 A/S Pos.: 5 Date: 11/04/9

eplicate 1 Time: 11:32
oncentration (ug/L): 52.24

eplicate 2 Time: 11:35
oncentration (ug/L): 50.36

lean Conc (ug/L): 51.30 SD: 1.331 RSD(%): 2.59

C sample is within range

~~~~~~

1 ID: ICB Seq. No.: 00007 A/S Pos.: 0 Date: 11/04/9

eplicate 1 Time: 11:38
oncentration (ug/L): -0.15

eplicate 2 Time: 11:41
oncentration (ug/L): 0.61

lean Conc (ug/L): 0.23 SD: 0.539 RSD(%): 231.25

IC sample is within range

~~~~~~

1 ID: 81101.B-F Seq. No.: 00008 A/S Pos.: 6 Date: 11/04/'

eplicate 1 Time: 11:44
oncentration (ug/L): 0.33

eplicate 2 Time: 11:47
oncentration (ug/L): -0.18

lean Conc (ug/L): 0.08 SD: 0.360 RSD(%): 452.84

~~~~~~

1 ID: 81101.DB Seq. No.: 00009 A/S Pos.: 7 Date: 11/04/98

eplicate 1 Time: 11:50
oncentration (ug/L): -0.75

eplicate 2 Time: 11:53
oncentration (ug/L): 1.73

lean Conc (ug/L): 0.49 SD: 1.756 RSD(%): 357.0

~~~~~~

1 ID: 81101.UB Seq. No.: 00010 A/S Pos.: 8 Date: 11/04/98

eplicate 1 Time: 11:56
oncentration (ug/L): 1.04

eplicate 2 Time: 11:59
oncentration (ug/L): 2.85

lean Conc (ug/L): 1.94 SD: 1.282 RSD(%): 66.04
~~~~~~

1 ID: 81101.IB Seq. No.: 00011 A/S Pos.: 9 Date: 11/04/98

Replicate 1 Time: 12:03
Concentration (ug/L): 1.01

Replicate 2 Time: 12:06
Concentration (ug/L): 0.40

Mean Conc (ug/L): 0.70 SD: 0.429 RSD(%): 60.86

1 ID: 81101.01 Seq. No.: 00012 A/S Pos.: 10 Date: 11/04/98

Replicate 1 Time: 12:09
Concentration (ug/L): -1.38

Replicate 2 Time: 12:12
Concentration (ug/L): 1.90

Mean Conc (ug/L): 0.26 SD: 2.318 RSD(%): 878.83

1 ID: 81101.01 Seq. No.: 00013 A/S Pos.: 10 Date: 11/04/98

Replicate 1 Time: 12:15
Concentration (ug/L): 49.94

Replicate 2 Time: 12:18
Concentration (ug/L): 52.18

Mean Conc (ug/L): 51.06 SD: 1.578 RSD(%): 3.09

Recovery is 101.6%

1 ID: 81101.02 Seq. No.: 00014 A/S Pos.: 11 Date: 11/04/98

Replicate 1 Time: 12:21
Concentration (ug/L): 1.00

Replicate 2 Time: 12:24
Concentration (ug/L): 0.13

Mean Conc (ug/L): 0.56 SD: 0.611 RSD(%): 108.38

1 ID: 81101.03 Seq. No.: 00015 A/S Pos.: 12 Date: 11/04/98

Replicate 1 Time: 12:27
Concentration (ug/L): 1.11

Replicate 2 Time: 12:30
Concentration (ug/L): 0.07

Mean Conc (ug/L): 0.59 SD: 0.735 RSD(%): 124.25

~~~~~~

ˉl ID: CCV Seq. No.: 00016 A/S Pos.: 3 Date: 11/04/9

Replicate 1 Time: 12:33
Concentration (ug/L): 49.28

Replicate 2 Time: 12:36
Concentration (ug/L): 48.57

Mean Conc (ug/L): 48.92 SD: 0.505 RSD(%): 1.03

QC sample is within range

~~~~~~

ˉl ID: CCB Seq. No.: 00017 A/S Pos.: 0 Date: 11/04/

Replicate 1 Time: 12:39
Concentration (ug/L): -0.61

Replicate 2 Time: 12:42
Concentration (ug/L): 0.79

Mean Conc (ug/L): 0.09 SD: 0.987 RSD(%): 1084.9

QC sample is within range

~~~~~~

ˉl ID: 81101.U1 Seq. No.: 00018 A/S Pos.: 13 Date: 11/04/

Replicate 1 Time: 12:45
Concentration (ug/L): 9.43

Replicate 2 Time: 12:48
Concentration (ug/L): 8.74

Mean Conc (ug/L): 9.09 SD: 0.490 RSD(%): 5.40

~~~~~~

Fl ID: 81101.U2 Seq. No.: 00019 A/S Pos.: 14 Date: 11/04/9

Replicate 1 Time: 12:51
Concentration (ug/L): 10.92

Replicate 2 Time: 12:54
Concentration (ug/L): 9.70

Mean Conc (ug/L): 10.31 SD: 0.862 RSD(%): 8.36

~~~~~~

Fl ID: 81101.U3 Seq. No.: 00020 A/S Pos.: 15 Date: 11/04/9

Replicate 1 Time: 12:57
Concentration (ug/L): 8.10

Replicate 2 Time: 13:00
Concentration (ug/L): 4.01

Mean Conc (ug/L): 6.05 SD: 2.894 RSD(%): 47.80
~~~~~~

~~~~~~

'1 ID: 81101.U4 Seq. No.: 00021 A/S Pos.: 16 Date: 11/04/9

Replicate 1 Time: 13:03
Concentration (ug/L): 9.00

Replicate 2 Time: 13:05
Concentration (ug/L): 7.74

Mean Conc (ug/L): 8.37 SD: 0.888 RSD(%): 10.60

~~~~~~

'1 ID: 81101.I1 Seq. No.: 00022 A/S Pos.: 17 Date: 11/04/9

Replicate 1 Time: 13:08
Concentration (ug/L): 11.77

Replicate 2 Time: 13:11
Concentration (ug/L): 9.95

Mean Conc (ug/L): 10.86 SD: 1.291 RSD(%): 11.89

~~~~~~

'1 ID: 81101.I2 Seq. No.: 00023 A/S Pos.: 18 Date: 11/04/9

Replicate 1 Time: 13:14
Concentration (ug/L): 12.53

Replicate 2 Time: 13:17
Concentration (ug/L): 9.97

Mean Conc (ug/L): 11.24 SD: 1.810 RSD(%): 16.10

~~~~~~

'1 ID: 81101.I3 Seq. No.: 00024 A/S Pos.: 19 Date: 11/04/9

Replicate 1 Time: 13:20
Concentration (ug/L): 12.11

Replicate 2 Time: 13:23
Concentration (ug/L): 11.12

Mean Conc (ug/L): 11.61 SD: 0.694 RSD(%): 5.98

~~~~~~

'1 ID: CCV Seq. No.: 00025 A/S Pos.: 3 Date: 11/04/9

Replicate 1 Time: 13:26
Concentration (ug/L): 54.72

Replicate 2 Time: 13:29
Concentration (ug/L): 50.90

Mean Conc (ug/L): 52.80 SD: 2.697 RSD(%): 5.11

QC sample is within range
~~~~~~

~~~~~~

'1 ID: CCB Seq. No.: 00026 A/S Pos.: 0 Date: 11/04/9

Replicate 1 Time: 13:32
Concentration (ug/L): 0.21

Replicate 2 Time: 13:35
Concentration (ug/L): 0.38

Mean Conc (ug/L): 0.29 SD: 0.120 RSD(%): 40.90

QC sample is within range
~~~~~~

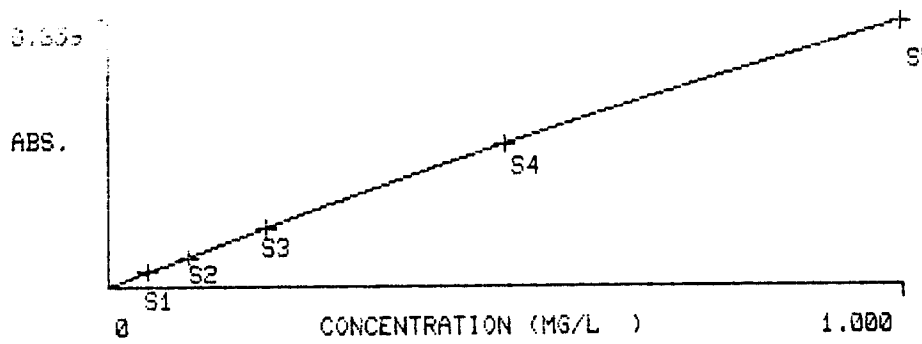
MAIN: 0.001	HO 0.001 (AA)		MAIN: 0.001	HO 0.000 (AA)	
ZN	MEAN: 0.001	SD: 0.000	RSD: 11.5	AUTOZERO	0.000
MAIN: 0.020	HO 0.020 (AA)		MAIN: 0.021	HO 0.021 (AA)	
ZN	MEAN: 0.020	SD: 0.000	RSD: 0.3	1.STANDARD	0.050 MG/L
MAIN: 0.100 MG/L	HO 0.041 (AA)		MAIN: 0.101 MG/L	HO 0.041 (AA)	
ZN	MEAN: 0.101 MG/L	SD: 0.001	RSD: 0.8	2.STANDARD	0.100 MG/L
MAIN: 0.195 MG/L	HO 0.080 (AA)		MAIN: 0.196 MG/L	HO 0.081 (AA)	
ZN	MEAN: 0.196 MG/L	SD: 0.001	RSD: 0.4	3.STANDARD	0.199 MG/L
MAIN: 0.479 MG/L	HO 0.194 (AA)		MAIN: 0.478 MG/L	HO 0.193 (AA)	
ZN	MEAN: 0.479 MG/L	SD: 0.001	RSD: 0.2	4.STANDARD	0.496 MG/L
MAIN: 0.913 MG/L	HO 0.356 (AA)		MAIN: 0.927 MG/L	HO 0.362 (AA)	
ZN	MEAN: 0.920 MG/L	SD: 0.010	RSD: 1.1	5.STANDARD	0.979 MG/L

FLAME DISPLAY CALIBRATION MODE
ELEMENT: ZN

PRINTER: ON
BG CORR: OFF
UNITS : MG/L

REPL. 0 OF 1

0.979
READ



ABS. READING
S5 AA : 0.362

STATISTICS
MEAN: 0.920
SD: 0.010
RSD(%): 1.1

C2H2: 2.5 L/MIN OXIDANT: 8.0 L/MIN FLAME: C2H2-AIR

MAIN: 0.009 MG/L	HO 0.000 (AA)		MAIN: 0.010 MG/L	HO 0.000 (AA)	
ZN	MEAN: 0.010 MG/L	SD: 0.000	RSD: 3.2	AUTOZERO	0.000

MAIN:	0.489 MG/L	AA HO 0.189	MAIN:	0.483 MG/L	AA HO 0.187

ZN ICV MEAN: 0.486 MG/L SD: 0.005 RSD: 1.0

MAIN:	0.005 MG/L	AA HO 0.002	MAIN:	0.005 MG/L	AA HO 0.002

ZN ICB MEAN: 0.005 MG/L SD: 0.000 RSD: 6.1

MAIN:	0.044 MG/L	AA HO 0.018	MAIN:	0.049 MG/L	AA HO 0.020

ZN BF MEAN: 0.047 MG/L SD: 0.004 RSD: 7.9

MAIN:	0.082 MG/L	AA HO 0.034	MAIN:	0.081 MG/L	AA HO 0.033

ZN OB MEAN: 0.082 MG/L SD: 0.001 RSD: 0.9

MAIN:	0.102 MG/L	AA HO 0.042	MAIN:	0.118 MG/L	AA HO 0.048

ZN UB MEAN: 0.110 MG/L SD: 0.011 RSD: 9.7

MAIN:	0.123 MG/L	AA HO 0.050	MAIN:	0.119 MG/L	AA HO 0.049

ZN IB MEAN: 0.121 MG/L SD: 0.002 RSD: 2.0

MAIN:	0.015 MG/L	AA HO 0.006	MAIN:	0.015 MG/L	AA HO 0.006

ZN AZ MEAN: 0.015 MG/L SD: 0.000 RSD: 0.8 AUTOZERO 0.000

MAIN:	0.154 MG/L	AA HO 0.062	MAIN:	0.157 MG/L	AA HO 0.064

ZN O1 MEAN: 0.155 MG/L SD: 0.002 RSD: 1.2

MAIN:	0.525 MG/L	AA HO 0.202	MAIN:	0.511 MG/L	AA HO 0.197

ZN O1S MEAN: 0.518 MG/L SD: 0.010 RSD: 1.9

MAIN:	0.157 MG/L	AA HO 0.063	MAIN:	0.198 MG/L	AA HO 0.080

ZN O2 MEAN: 0.177 MG/L SD: 0.030 RSD: 16.7

MAIN: 0.162 MG/L HO AA 0.065 MAIN: 0.169 MG/L HO AA 0.068

ZN 02D MEAN: 0.165 MG/L SD: 0.005 RSD: 3.2

MAIN: 0.201 MG/L HO AA 0.081 MAIN: 0.206 MG/L HO AA 0.083

ZN 03 MEAN: 0.204 MG/L SD: 0.003 RSD: 1.5

MAIN: 0.002 MG/L HO AA 0.001 MAIN: 0.002 MG/L HO AA 0.001

ZN A2 MEAN: 0.002 MG/L SD: 0.000 RSD: 1.3 AUTOZERO 0.000

MAIN: 0.510 MG/L HO AA 0.196 MAIN: 0.518 MG/L HO AA 0.199

ZN CCV MEAN: 0.514 MG/L SD: 0.005 RSD: 1.0

MAIN: 0.002 MG/L HO AA 0.001 MAIN: 0.007 MG/L HO AA 0.003

ZN CCB MEAN: 0.004 MG/L SD: 0.004 RSD: 88.9

MAIN: 0.305 MG/L HO AA 0.121 MAIN: 0.319 MG/L HO AA 0.126

ZN 41 MEAN: 0.312 MG/L SD: 0.010 RSD: 3.1

MAIN: 0.359 MG/L HO AA 0.141 MAIN: 0.388 MG/L HO AA 0.152

ZN 42 MEAN: 0.373 MG/L SD: 0.021 RSD: 5.6

MAIN: 0.345 MG/L HO AA 0.136 MAIN: 0.339 MG/L HO AA 0.134

ZN 43 MEAN: 0.342 MG/L SD: 0.004 RSD: 1.2

MAIN: 0.361 MG/L HO AA 0.142 MAIN: 0.346 MG/L HO AA 0.136

ZN 44 MEAN: 0.354 MG/L SD: 0.010 RSD: 2.9

MAIN: 0.258 MG/L HO AA 0.103 MAIN: 0.068 MG/L HO AA 0.028

ZN I1X2.5 MEAN: 0.162 MG/L SD: 0.134 RSD: 82.3

MAIN:	0.701 MG/L	AA HO 0.263	MAIN:	0.699 MG/L	AA HO 0.262

ZN I1 undil MEAN: 0.700 MG/L SD: 0.002 RSD: 0.2

MAIN:	0.468 MG/L	AA HO 0.181	MAIN:	0.472 MG/L	AA HO 0.183

ZN I2 undil MEAN: 0.470 MG/L SD: 0.003 RSD: 0.6

MAIN:	0.529 MG/L	AA HO 0.203	MAIN:	0.550 MG/L	AA HO 0.210

ZN I3 undil MEAN: 0.540 MG/L SD: 0.015 RSD: 2.7

MAIN:	0.523 MG/L	AA HO 0.201	MAIN:	0.517 MG/L	AA HO 0.199

ZN CCV MEAN: 0.520 MG/L SD: 0.004 RSD: 0.8

MAIN:	0.012 MG/L	AA HO 0.005	MAIN:	0.011 MG/L	AA HO 0.005

ZN CCB MEAN: 0.012 MG/L SD: 0.000 RSD: 3.4

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Analytics Division

Laboratory Corporation of America™ Holdings
PO Box 25249
Richmond, Virginia 23260

Telephone: 800-888-8061

Group No. C282090
Account No. 34419005
Report Date: 10/19/98

CHEFFEL
FIC ENVIRONMENTAL SERVICES
SCHEFFEL
EAST KEMPER RD
INNATI, OH 45249-1030

Final Report

Received: 10/09/98
le Type: 12 - Air Sample(s)
ect: 5512.000

PO Number:

ytical Results

Client ID	Parameter	Volume	Amount	Concentration
A-I-5506-1 Samp Date: 09/21/98	MALEIC ANHYDRIDE			
	Acnapth-Front		< 5.0 ug	
	Acnapth-Rear		ND	
	Acnapht-Total	NVG	< 5.0 ug	-- --
	Acnthy-Front		13.9 ug	
	Acnthy-Rear		ND	
	Acnthy-Total	NVG	13.9 ug	-- --
	Anthr-Front		1.95 ug	
	Anthr-Rear		ND	
	Anthr-Total	NVG	1.95 ug	-- --
	Bz(a)ant-Front		< 1.0 ug	
	Bz(a)ant-Rear		ND	
	Bz(a)ant-Total	NVG	< 1.0 ug	-- --
	Bz(a)pyr-Front		< 1.0 ug	
	Bz(a)pyr-Rear		ND	
	Bz(a)pyr-Total	NVG	< 1.0 ug	-- --
	Bz(b)fnt-Front		< 1.0 ug	
	Bz(b)fnt-Rear		ND	
	Bz(b)fnt-Total	NVG	< 1.0 ug	-- --
	Bzpery-Front		< 1.0 ug	
	Bzpery-Rear		ND	
	Bzpery-Total	NVG	< 1.0 ug	-- --
	Bz(k)fnt-Front		< 1.0 ug	
	Bz(k)fnt-Rear		ND	
	Bz(k)fnt-Total	NVG	< 1.0 ug	-- --
	Chy-Front		2.37 ug	

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le Type: 12 - Air Sample(s)
ect: 5512.000 PO Number:

ytical Results

Client ID	Parameter	Volume	Amount	Concentration
	Chy-Rear		ND	
	Chy-Total	NVG	2.37 ug	-- --
	Dbzanthr-Front		< 1.0 ug	
	Dbzanthr-Rear		ND	
	Dbzanthr-Total	NVG	< 1.0 ug	-- --
	Flanthr-Front		< 5.0 ug	
	Flanthr-Rear		ND	
	Flanthr-Total	NVG	< 5.0 ug	-- --
	Fluorene-Front		< 5.0 ug	
	Fluorene-Rear		ND	
	Fluorene-Total	NVG	< 5.0 ug	-- --
	Indpyene-Front		< 1.0 ug	
	Indpyene-Rear		ND	
	Indpyene-Total	NVG	< 1.0 ug	-- --
	Napth-Front		31.3 ug	
	Napth-Rear		4.6 ug	
	Napth-Total	NVG	35.9 ug	-- --
	Panthr-Front		16.2 ug	
	Panthr-Rear		ND	
	Panthr-Total	NVG	16.2 ug	-- --
	Pyrene-Front		40.4 ug	
	Pyrene-Rear		ND	
	Pyrene-Total	NVG	40.4 ug	-- --

? A-I-5506-2 Samp Date: 09/22/98 MALEIC ANHYDRIDE

	Acnapth-Front		< 5.0 ug	
	Acnapth-Rear		ND	

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Final Report

Received: 10/09/98
le Type: 12 - Air Sample(s)
ect: 5512.000 PO Number:

ytical Results

Client ID	Parameter	Volume	Amount	Concentration
	Acnapht-Total	NVG	< 5.0 ug	-- --
	Acnthy-Front		< 5.0 ug	
	Acnthy-Rear		ND	
	Acnthy-Total	NVG	< 5.0 ug	-- --
	Anthr-Front		< 1.0 ug	
	Anthr-Rear		ND	
	Anthr-Total	NVG	< 1.0 ug	-- --
	Bz(a)ant-Front		< 1.0 ug	
	Bz(a)ant-Rear		ND	
	Bz(a)ant-Total	NVG	< 1.0 ug	-- --
	Bz(a)pyr-Front		< 1.0 ug	
	Bz(a)pyr-Rear		ND	
	Bz(a)pyr-Total	NVG	< 1.0 ug	-- --
	Bz(b)fnt-Front		< 1.0 ug	
	Bz(b)fnt-Rear		ND	
	Bz(b)fnt-Total	NVG	< 1.0 ug	-- --
	Bzpery-Front		< 1.0 ug	
	Bzpery-Rear		ND	
	Bzpery-Total	NVG	< 1.0 ug	-- --
	Bz(k)fnt-Front		< 1.0 ug	
	Bz(k)fnt-Rear		ND	
	Bz(k)fnt-Total	NVG	< 1.0 ug	-- --
	Chy-Front		< 1.0 ug	
	Chy-Rear		ND	
	Chy-Total	NVG	< 1.0 ug	-- --
	Dbzanthr-Front		< 1.0 ug	
	Dbzanthr-Rear		ND	

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le Type: 12 - Air Sample(s)
ect: 5512.000 PO Number:

ytical Results

Client ID	Parameter	Volume	Amount	Concentration
	Dbzanthr-Total	NVG	< 1.0 ug	-- --
	Flanthr-Front		< 5.0 ug	
	Flanthr-Rear		ND	
	Flanthr-Total	NVG	< 5.0 ug	-- --
	Fluorene-Front		< 5.0 ug	
	Fluorene-Rear		ND	
	Fluorene-Total	NVG	< 5.0 ug	-- --
	Indpyene-Front		< 1.0 ug	
	Indpyene-Rear		ND	
	Indpyene-Total	NVG	< 1.0 ug	-- --
	Napth-Front		< 5.0 ug	
	Napth-Rear		ND	
	Napth-Total	NVG	< 5.0 ug	-- --
	Panthr-Front		< 1.0 ug	
	Panthr-Rear		ND	
	Panthr-Total	NVG	< 1.0 ug	-- --
	Pyrene-Front		< 1.0 ug	
	Pyrene-Rear		ND	
	Pyrene-Total	NVG	< 1.0 ug	-- --
A-I-5506-3 Samp Date: 09/23/98	MALEIC ANHYDRIDE			
	Acnapth-Front		< 5.0 ug	
	Acnapth-Rear		ND	
	Acnapht-Total	NVG	< 5.0 ug	-- --
	Acnthy-Front		< 5.0 ug	
	Acnthy-Rear		ND	
	Acnthy-Total	NVG	< 5.0 ug	-- --

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INNATI, OH 45249-1030

Final Report

Received: 10/09/98
le Type: 12 - Air Sample(s)
ect: 5512.000

PO Number:

ytical Results

Client ID	Parameter	Volume	Amount	Concentration
	Anthr-Front		< 1.0 ug	
	Anthr-Rear		ND	
	Anthr-Total	NVG	< 1.0 ug	-- --
	Bz(a)ant-Front		< 1.0 ug	
	Bz(a)ant-Rear		ND	
	Bz(a)ant-Total	NVG	< 1.0 ug	-- --
	Bz(a)pyr-Front		< 1.0 ug	
	Bz(a)pyr-Rear		ND	
	Bz(a)pyr-Total	NVG	< 1.0 ug	-- --
	Bz(b)fnt-Front		< 1.0 ug	
	Bz(b)fnt-Rear		ND	
	Bz(b)fnt-Total	NVG	< 1.0 ug	-- --
	Bzpery-Front		< 1.0 ug	
	Bzpery-Rear		ND	
	Bzpery-Total	NVG	< 1.0 ug	-- --
	Bz(k)fnt-Front		< 1.0 ug	
	Bz(k)fnt-Rear		ND	
	Bz(k)fnt-Total	NVG	< 1.0 ug	-- --
	Chy-Front		< 1.0 ug	
	Chy-Rear		ND	
	Chy-Total	NVG	< 1.0 ug	-- --
	Dbzanthr-Front		< 1.0 ug	
	Dbzanthr-Rear		ND	
	Dbzanthr-Total	NVG	< 1.0 ug	-- --
	Flanthr-Front		< 5.0 ug	
	Flanthr-Rear		ND	
	Flanthr-Total	NVG	< 5.0 ug	-- --

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Final Report

Received: 10/09/98
le Type: 12 - Air Sample(s)
ect: 5512.000 PO Number:

ytical Results

Client ID	Parameter	Volume	Amount	Concentration
	Fluorene-Front		< 5.0 ug	
	Fluorene-Rear		ND	
	Fluorene-Total	NVG	< 5.0 ug	-- --
	Indpyene-Front		< 1.0 ug	
	Indpyene-Rear		ND	
	Indpyene-Total	NVG	< 1.0 ug	-- --
	Napth-Front		< 5.0 ug	
	Napth-Rear		ND	
	Napth-Total	NVG	< 5.0 ug	-- --
	Panthr-Front		< 1.0 ug	
	Panthr-Rear		ND	
	Panthr-Total	NVG	< 1.0 ug	-- --
	Pyrene-Front		< 1.0 ug	
	Pyrene-Rear		ND	
	Pyrene-Total	NVG	< 1.0 ug	-- --
: A-O-5506-1 Samp Date: 09/21/98	MALEIC ANHYDRIDE			
	Acnapth-Front		< 5.0 ug	
	Acnapth-Rear		ND	
	Acnapht-Total	0	< 5.0 ug	< 1
	Acnthy-Front		< 5.0 ug	
	Acnthy-Rear		ND	
	Acnthy-Total	0	< 5.0 ug	< 5
	Anthr-Front		< 1.0 ug	
	Anthr-Rear		ND	
	Anthr-Total	0	< 1.0 ug	< 1
	Bz(a)ant-Front		< 1.0 ug	

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Group No. C282090
Account No. 34419005
Report Date: 10/19/98

:CHEFFEL
FIC ENVIRONMENTAL SERVICES
SCHEFFEL
EAST KEMPER RD
:INNATI, OH 45249-1030

Final Report

: Received: 10/09/98
le Type: 12 - Air Sample(s)
ect: 5512.000

PO Number:

ytical Results

Client ID	Parameter	Volume	Amount	Concentration
	Bz(a)ant-Rear		ND	
	Bz(a)ant-Total	0	< 1.0 ug	< 1
	Bz(a)pyr-Front		< 1.0 ug	
	Bz(a)pyr-Rear		ND	
	Bz(a)pyr-Total	0	< 1.0 ug	< 1
	Bz(b)fnt-Front		< 1.0 ug	
	Bz(b)fnt-Rear		ND	
	Bz(b)fnt-Total	0	< 1.0 ug	< 1
	Bzpery-Front		< 1.0 ug	
	Bzpery-Rear		ND	
	Bzpery-Total	0	< 1.0 ug	< 1
	Bz(k)fnt-Front		< 1.0 ug	
	Bz(k)fnt-Rear		ND	
	Bz(k)fnt-Total	0	< 1.0 ug	< 1
	Chy-Front		< 1.0 ug	
	Chy-Rear		ND	
	Chy-Total	0	< 1.0 ug	< 1
	Dbzanthr-Front		< 1.0 ug	
	Dbzanthr-Rear		ND	
	Dbzanthr-Total	0	< 1.0 ug	< 1
	Flanthr-Front		< 5.0 ug	
	Flanthr-Rear		ND	
	Flanthr-Total	0	< 5.0 ug	< 5
	Fluorene-Front		< 5.0 ug	
	Fluorene-Rear		ND	
	Fluorene-Total	0	< 5.0 ug	< 5
	Indpyene-Front		< 1.0 ug	

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Group No. C282090
Account No. 34419005
Report Date: 10/19/98

CHEFFEL
FIC ENVIRONMENTAL SERVICES
SCHEFFEL
EAST KEMPER RD
INNATI, OH 45249-1030

Final Report

Received: 10/09/98
le Type: 12 - Air Sample(s)
ect: 5512.000 PO Number:

ytical Results

Client ID	Parameter	Volume	Amount	Concentration
	Indpyene-Rear		ND	
	Indpyene-Total	0	< 1.0 ug	< 1
	Napth-Front		< 5.0 ug	
	Napth-Rear		ND	
	Napth-Total	0	< 5.0 ug	< 5
	Panthr-Front		< 1.0 ug	
	Panthr-Rear		ND	
	Panthr-Total	0	< 1.0 ug	< 1
	Pyrene-Front		< 1.0 ug	
	Pyrene-Rear		ND	
	Pyrene-Total	0	< 1.0 ug	< 1
A-O-5506-2 Samp Date: 09/22/98	MALEIC ANHYDRIDE			
	Acnapth-Front		< 5.0 ug	
	Acnapth-Rear		ND	
	Acnapht-Total	NTG	< 5.0 ug	-- --
	Acnthy-Front		< 5.0 ug	
	Acnthy-Rear		ND	
	Acnthy-Total	NTG	< 5.0 ug	-- --
	Anthr-Front		< 1.0 ug	
	Anthr-Rear		ND	
	Anthr-Total	NTG	< 1.0 ug	-- --
	Bz(a)ant-Front		< 1.0 ug	
	Bz(a)ant-Rear		ND	
	Bz(a)ant-Total	NTG	< 1.0 ug	-- --
	Bz(a)pyr-Front		< 1.0 ug	
	Bz(a)pyr-Rear		ND	

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INNATI, OH 45249-1030

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Received: 10/09/98
le Type: 12 - Air Sample(s)
ect: 5512.000 PO Number:

ytical Results

Client ID	Parameter	Volume	Amount	Concentration
	Bz(a)pyr-Total	NTG	< 1.0 ug	-- --
	Bz(b)fnt-Front		< 1.0 ug	
	Bz(b)fnt-Rear		ND	
	Bz(b)fnt-Total	NTG	< 1.0 ug	-- --
	Bzpery-Front		< 1.0 ug	
	Bzpery-Rear		ND	
	Bzpery-Total	NTG	< 1.0 ug	-- --
	Bz(k)fnt-Front		< 1.0 ug	
	Bz(k)fnt-Rear		ND	
	Bz(k)fnt-Total	NTG	< 1.0 ug	-- --
	Chy-Front		< 1.0 ug	
	Chy-Rear		ND	
	Chy-Total	NTG	< 1.0 ug	-- --
	Dbzanthr-Front		< 1.0 ug	
	Dbzanthr-Rear		ND	
	Dbzanthr-Total	NTG	< 1.0 ug	-- --
	Flanthr-Front		< 5.0 ug	
	Flanthr-Rear		ND	
	Flanthr-Total	NTG	< 5.0 ug	-- --
	Fluorene-Front		< 5.0 ug	
	Fluorene-Rear		ND	
	Fluorene-Total	NTG	< 5.0 ug	-- --
	Indpyene-Front		< 1.0 ug	
	Indpyene-Rear		ND	
	Indpyene-Total	NTG	< 1.0 ug	-- --
	Napth-Front		6.58 ug	
	Napth-Rear		ND	

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le Type: 12 - Air Sample(s)
ect: 5512.000 PO Number:

ytical Results

Client ID	Parameter	Volume	Amount	Concentration
	Napth-Total	NTG	6.58 ug	-- --
	Panthr-Front		4.0 ug	
	Panthr-Rear		ND	
	Panthr-Total	NTG	4.0 ug	-- --
	Pyrene-Front		9.2 ug	
	Pyrene-Rear		ND	
	Pyrene-Total	NTG	9.2 ug	-- --
A-O-5506-3 Samp Date: 09/23/98	MALEIC ANHYDRIDE			
	Acnapth-Front		< 5.0 ug	
	Acnapth-Rear		ND	
	Acnapht-Total	0	< 5.0 ug	< 1
	Acnthy-Front		< 5.0 ug	
	Acnthy-Rear		ND	
	Acnthy-Total	0	< 5.0 ug	< 5
	Anthr-Front		< 1.0 ug	
	Anthr-Rear		ND	
	Anthr-Total	0	< 1.0 ug	< 1
	Bz(a)ant-Front		< 1.0 ug	
	Bz(a)ant-Rear		ND	
	Bz(a)ant-Total	0	< 1.0 ug	< 1
	Bz(a)pyr-Front		< 1.0 ug	
	Bz(a)pyr-Rear		ND	
	Bz(a)pyr-Total	0	< 1.0 ug	< 1
	Bz(b)fnt-Front		< 1.0 ug	
	Bz(b)fnt-Rear		ND	
	Bz(b)fnt-Total	0	< 1.0 ug	< 1

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Received: 10/09/98
le Type: 12 - Air Sample(s)
ect: 5512.000 PO Number:

ytical Results

Client ID	Parameter	Volume	Amount	Concentration
	Bzpery-Front		< 1.0 ug	
	Bzpery-Rear		ND	
	Bzpery-Total	0	< 1.0 ug	< 1
	Bz(k)fnt-Front		< 1.0 ug	
	Bz(k)fnt-Rear		ND	
	Bz(k)fnt-Total	0	< 1.0 ug	< 1
	Chy-Front		< 1.0 ug	
	Chy-Rear		ND	
	Chy-Total	0	< 1.0 ug	< 1
	Dbzanthr-Front		< 1.0 ug	
	Dbzanthr-Rear		ND	
	Dbzanthr-Total	0	< 1.0 ug	< 1
	Flanthr-Front		< 5.0 ug	
	Flanthr-Rear		ND	
	Flanthr-Total	0	< 5.0 ug	< 5
	Fluorene-Front		< 5.0 ug	
	Fluorene-Rear		ND	
	Fluorene-Total	0	< 5.0 ug	< 5
	Indpyene-Front		< 1.0 ug	
	Indpyene-Rear		ND	
	Indpyene-Total	0	< 1.0 ug	< 1
	Napth-Front		8.87 ug	
	Napth-Rear		ND	
	Napth-Total	0	8.87 ug	--
	Panthr-Front		3.78 ug	
	Panthr-Rear		ND	
	Panthr-Total	0	3.78 ug	--

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le Type: 12 - Air Sample(s)
ect: 5512.000 PO Number:

ytical Results

Client ID	Parameter	Volume	Amount	Concentration
	Pyrene-Front		6.34 ug	
	Pyrene-Rear		ND	
	Pyrene-Total	0	6.34 ug	--
A-U-5506-1 Samp Date: 09/25/98	MALEIC ANHYDRIDE			
	Acnapth-Front		< 5.0 ug	
	Acnapth-Rear		ND	
	Acnapht-Total	NVG	< 5.0 ug	-- --
	Acnthy-Front		< 5.0 ug	
	Acnthy-Rear		ND	
	Acnthy-Total	NVG	< 5.0 ug	-- --
	Anthr-Front		< 1.0 ug	
	Anthr-Rear		ND	
	Anthr-Total	NVG	< 1.0 ug	-- --
	Bz(a)ant-Front		< 1.0 ug	
	Bz(a)ant-Rear		ND	
	Bz(a)ant-Total	NVG	< 1.0 ug	-- --
	Bz(a)pyr-Front		< 1.0 ug	
	Bz(a)pyr-Rear		ND	
	Bz(a)pyr-Total	NVG	< 1.0 ug	-- --
	Bz(b)fnt-Front		< 1.0 ug	
	Bz(b)fnt-Rear		ND	
	Bz(b)fnt-Total	NVG	< 1.0 ug	-- --
	Bzpery-Front		< 1.0 ug	
	Bzpery-Rear		ND	
	Bzpery-Total	NVG	< 1.0 ug	-- --
	Bz(k)fnt-Front		< 1.0 ug	

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Received: 10/09/98
le Type: 12 - Air Sample(s)
ect: 5512.000 PO Number:

ytical Results

Client ID	Parameter	Volume	Amount	Concentration
	Bz(k)fnt-Rear		ND	
	Bz(k)fnt-Total	NVG	< 1.0 ug	-- --
	Chy-Front		< 1.0 ug	
	Chy-Rear		ND	
	Chy-Total	NVG	< 1.0 ug	-- --
	Dbzanthr-Front		< 1.0 ug	
	Dbzanthr-Rear		ND	
	Dbzanthr-Total	NVG	< 1.0 ug	-- --
	Flanthr-Front		< 5.0 ug	
	Flanthr-Rear		ND	
	Flanthr-Total	NVG	< 5.0 ug	-- --
	Fluorene-Front		< 5.0 ug	
	Fluorene-Rear		ND	
	Fluorene-Total	NVG	< 5.0 ug	-- --
	Indpyene-Front		< 1.0 ug	
	Indpyene-Rear		ND	
	Indpyene-Total	NVG	< 1.0 ug	-- --
	Napth-Front		< 5.0 ug	
	Napth-Rear		ND	
	Napth-Total	NVG	< 5.0 ug	-- --
	Panthr-Front		< 1.0 ug	
	Panthr-Rear		ND	
	Panthr-Total	NVG	< 1.0 ug	-- --
	Pyrene-Front		< 1.0 ug	
	Pyrene-Rear		ND	
	Pyrene-Total	NVG	< 1.0 ug	-- --

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le Type: 12 - Air Sample(s)
ect: 5512.000 PO Number:

ytical Results

Client ID	Parameter	Volume	Amount	Concentration
A-I-5506-FB Samp Date: 09/23/98	MALEIC ANHYDRIDE			
	Acnapth-Front		< 5.0 ug	
	Acnapth-Rear		ND	
	Acnapht-Total	0	< 5.0 ug	< 1
	Acnthy-Front		< 5.0 ug	
	Acnthy-Rear		ND	
	Acnthy-Total	0	< 5.0 ug	< 5
	Anthr-Front		< 1.0 ug	
	Anthr-Rear		ND	
	Anthr-Total	0	< 1.0 ug	< 1
	Bz(a)ant-Front		< 1.0 ug	
	Bz(a)ant-Rear		ND	
	Bz(a)ant-Total	0	< 1.0 ug	< 1
	Bz(a)pyr-Front		< 1.0 ug	
	Bz(a)pyr-Rear		ND	
	Bz(a)pyr-Total	0	< 1.0 ug	< 1
	Bz(b)fnt-Front		< 1.0 ug	
	Bz(b)fnt-Rear		ND	
	Bz(b)fnt-Total	0	< 1.0 ug	< 1
	Bzpery-Front		< 1.0 ug	
	Bzpery-Rear		ND	
	Bzpery-Total	0	< 1.0 ug	< 1
	Bz(k)fnt-Front		< 1.0 ug	
	Bz(k)fnt-Rear		ND	
	Bz(k)fnt-Total	0	< 1.0 ug	< 1
	Chy-Front		< 1.0 ug	
	Chy-Rear		ND	

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INNATI, OH 45249-1030

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Received: 10/09/98
le Type: 12 - Air Sample(s)
ect: 5512.000 PO Number:

ytical Results

Client ID	Parameter	Volume	Amount	Concentration
	Chy-Total	0	< 1.0 ug	< 1
	Dbzanthr-Front		< 1.0 ug	
	Dbzanthr-Rear		ND	
	Dbzanthr-Total	0	< 1.0 ug	< 1
	Flanthr-Front		< 5.0 ug	
	Flanthr-Rear		ND	
	Flanthr-Total	0	< 5.0 ug	< 5
	Fluorene-Front		< 5.0 ug	
	Fluorene-Rear		ND	
	Fluorene-Total	0	< 5.0 ug	< 5
	Indpyene-Front		< 1.0 ug	
	Indpyene-Rear		ND	
	Indpyene-Total	0	< 1.0 ug	< 1
	Napth-Front		< 5.0 ug	
	Napth-Rear		ND	
	Napth-Total	0	< 5.0 ug	< 5
	Panthr-Front		< 1.0 ug	
	Panthr-Rear		ND	
	Panthr-Total	0	< 1.0 ug	< 1
	Pyrene-Front		< 1.0 ug	
	Pyrene-Rear		ND	
	Pyrene-Total	0	< 1.0 ug	< 1
LAB BLANK 1 Samp Date: 09/28/98 BLANK MALEIC ANHYDRIDE				
	Acnapth-Front		< 5.0 ug	
	Acnapth-Rear		ND	
	Acnapht-Total	0	< 5.0 ug	--

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Received: 10/09/98
le Type: 12 - Air Sample(s)
ect: 5512.000 PO Number:

ytical Results

Client ID	Parameter	Volume	Amount	Concentration
	Acnthy-Front		< 5.0 ug	
	Acnthy-Rear		ND	
	Acnthy-Total	0	< 5.0 ug	--
	Anthr-Front		< 1.0 ug	
	Anthr-Rear		ND	
	Anthr-Total	0	< 1.0 ug	--
	Bz(a)ant-Front		< 1.0 ug	
	Bz(a)ant-Rear		ND	
	Bz(a)ant-Total	0	< 1.0 ug	--
	Bz(a)pyr-Front		< 1.0 ug	
	Bz(a)pyr-Rear		ND	
	Bz(a)pyr-Total	0	< 1.0 ug	--
	Bz(b)fnt-Front		< 1.0 ug	
	Bz(b)fnt-Rear		ND	
	Bz(b)fnt-Total	0	< 1.0 ug	--
	Bzpery-Front		< 1.0 ug	
	Bzpery-Rear		ND	
	Bzpery-Total	0	< 1.0 ug	--
	Bz(k)fnt-Front		< 1.0 ug	
	Bz(k)fnt-Rear		ND	
	Bz(k)fnt-Total	0	< 1.0 ug	--
	Chy-Front		< 1.0 ug	
	Chy-Rear		ND	
	Chy-Total	0	< 1.0 ug	--
	Dbzanthr-Front		< 1.0 ug	
	Dbzanthr-Rear		ND	
	Dbzanthr-Total	0	< 1.0 ug	--

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Received: 10/09/98
le Type: 12 - Air Sample(s)
ect: 5512.000 PO Number:

ytical Results

Client ID	Parameter	Volume	Amount	Concentration
	Flanthr-Front		< 5.0 ug	
	Flanthr-Rear		ND	
	Flanthr-Total	0	< 5.0 ug	--
	Fluorene-Front		< 5.0 ug	
	Fluorene-Rear		ND	
	Fluorene-Total	0	< 5.0 ug	--
	Indpyene-Front		< 1.0 ug	
	Indpyene-Rear		ND	
	Indpyene-Total	0	< 1.0 ug	--
	Napth-Front		< 5.0 ug	
	Napth-Rear		ND	
	Napth-Total	0	< 5.0 ug	--
	Panthr-Front		< 1.0 ug	
	Panthr-Rear		ND	
	Panthr-Total	0	< 1.0 ug	--
	Pyrene-Front		< 1.0 ug	
	Pyrene-Rear		ND	
	Pyrene-Total	0	< 1.0 ug	--
LAB BLANK 2 Samp Date: 09/28/98 BLANK MALEIC ANHYDRIDE				
	Acnapth-Front		< 5.0 ug	
	Acnapth-Rear		ND	
	Acnapht-Total	0	< 5.0 ug	--
	Acnthy-Front		< 5.0 ug	
	Acnthy-Rear		ND	
	Acnthy-Total	0	< 5.0 ug	--
	Anthr-Front		< 1.0 ug	

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ytical Results

Client ID	Parameter	Volume	Amount	Concentration
	Anthr-Rear		ND	
	Anthr-Total	0	< 1.0 ug	--
	Bz(a)ant-Front		< 1.0 ug	
	Bz(a)ant-Rear		ND	
	Bz(a)ant-Total	0	< 1.0 ug	--
	Bz(a)pyr-Front		< 1.0 ug	
	Bz(a)pyr-Rear		ND	
	Bz(a)pyr-Total	0	< 1.0 ug	--
	Bz(b)fnt-Front		< 1.0 ug	
	Bz(b)fnt-Rear		ND	
	Bz(b)fnt-Total	0	< 1.0 ug	--
	Bzpery-Front		< 1.0 ug	
	Bzpery-Rear		ND	
	Bzpery-Total	0	< 1.0 ug	--
	Bz(k)fnt-Front		< 1.0 ug	
	Bz(k)fnt-Rear		ND	
	Bz(k)fnt-Total	0	< 1.0 ug	--
	Chy-Front		< 1.0 ug	
	Chy-Rear		ND	
	Chy-Total	0	< 1.0 ug	--
	Dbzanthr-Front		< 1.0 ug	
	Dbzanthr-Rear		ND	
	Dbzanthr-Total	0	< 1.0 ug	--
	Flanthr-Front		< 5.0 ug	
	Flanthr-Rear		ND	
	Flanthr-Total	0	< 5.0 ug	--
	Fluorene-Front		< 5.0 ug	

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le Type: 12 - Air Sample(s)
ect: 5512.000 PO Number:

ytical Results

Client ID	Parameter	Volume	Amount	Concentration
	Fluorene-Rear		ND	
	Fluorene-Total	0	< 5.0 ug	--
	Indpyene-Front		< 1.0 ug	
	Indpyene-Rear		ND	
	Indpyene-Total	0	< 1.0 ug	--
	Napth-Front		< 5.0 ug	
	Napth-Rear		ND	
	Napth-Total	0	< 5.0 ug	--
	Panthr-Front		< 1.0 ug	
	Panthr-Rear		ND	
	Panthr-Total	0	< 1.0 ug	--
	Pyrene-Front		< 1.0 ug	
	Pyrene-Rear		ND	
	Pyrene-Total	0	< 1.0 ug	--
SPIKE 1 Samp Date: 09/28/98 SPIKE MALEIC ANHYDRIDE				
	Acnapth-Front		23.9 ug	
	Acnapht-Total	0	23.9 ug	--
	Acnthy-Front		31.4 ug	
	Acnthy-Total	0	31.4 ug	--
	Anthr-Front		1.35 ug	
	Anthr-Total	0	1.35 ug	--
	Bz(a)ant-Front		2.16 ug	
	Bz(a)ant-Total	0	2.16 ug	--
	Bz(a)pyr-Front		0.73 ug	
	Bz(a)pyr-Total	0	0.73 ug	--
	Bz(b)fnt-Front		1.85 ug	

LabCorp
Analytics Division
Laboratory Corporation of America™ Holdings
PO Box 25249
Richmond, Virginia 23260
Telephone: 800-888-8061

Group No. C282090
Account No. 34419005
Report Date: 10/19/98

CHEFFEL
FIC ENVIRONMENTAL SERVICES
SCHEFFEL
EAST KEMPER RD
INNATI, OH 45249-1030

Final Report

Received: 10/09/98
le Type: 12 - Air Sample(s)
ect: 5512.000 PO Number:

ytical Results

Client ID	Parameter	Volume	Amount	Concentration
	Bz(b)fnt-Total	0	1.85 ug	--
	Bzpery-Front		0.96 ug	
	Bzpery-Total	0	0.96 ug	--
	Bz(k)fnt-Front		1.71 ug	
	Bz(k)fnt-Total	0	1.71 ug	--
	Chy-Front		2.10 ug	
	Chy-Total	0	2.10 ug	--
	Dbzanthr-Front		1.43 ug	
	Dbzanthr-Total	0	1.43 ug	--
	Flanthr-Front		1.20 ug	
	Flanthr-Total	0	1.20 ug	--
	Fluorene-Front		18.3 ug	
	Fluorene-Total	0	18.3 ug	--
	Indpyene-Front		1.29 ug	
	Indpyene-Total	0	1.29 ug	--
	Napth-Front		33.3 ug	
	Napth-Total	0	33.3 ug	--
	Panthr-Front		1.31 ug	
	Panthr-Total	0	1.31 ug	--
	Pyrene-Front		11.0 ug	
	Pyrene-Total	0	11.0 ug	--
SPIKE 2 Samp Date: 09/28/98 SPIKE MALEIC ANHYDRIDE				
	Acnapth-Front		24.8 ug	
	Acnapht-Total	0	24.8 ug	--
	Acnthy-Front		33.1 ug	
	Acnthy-Total	0	33.1 ug	--

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Group No. C282090
Account No. 34419005
Report Date: 10/19/98

CHEFFEL
FIC ENVIRONMENTAL SERVICES
SCHEFFEL
EAST KEMPER RD
INNATI, OH 45249-1030

Final Report

Received: 10/09/98
le Type: 12 - Air Sample(s)
ect: 5512.000 PO Number:

ytical Results

Client ID	Parameter	Volume	Amount	Concentration
	Anthr-Front		1.40 ug	
	Anthr-Total	0	1.40 ug	--
	Bz(a)ant-Front		2.24 ug	
	Bz(a)ant-Total	0	2.24 ug	--
	Bz(a)pyr-Front		0.73 ug	
	Bz(a)pyr-Total	0	0.73 ug	--
	Bz(b)fnt-Front		2.06 ug	
	Bz(b)fnt-Total	0	2.06 ug	--
	Bzpery-Front		1.00 ug	
	Bzpery-Total	0	1.00 ug	--
	Bz(k)fnt-Front		1.95 ug	
	Bz(k)fnt-Total	0	1.95 ug	--
	Chy-Front		1.22 ug	
	Chy-Total	0	1.22 ug	--
	Dbzanthr-Front		1.49 ug	
	Dbzanthr-Total	0	1.49 ug	--
	Flanthr-Front		1.24 ug	
	Flanthr-Total	0	1.24 ug	--
	Fluorene-Front		19.1 ug	
	Fluorene-Total	0	19.1 ug	--
	Indpyene-Front		1.35 ug	
	Indpyene-Total	0	1.35 ug	--
	Napth-Front		34.8 ug	
	Napth-Total	0	34.8 ug	--
	Panthr-Front		1.44 ug	
	Panthr-Total	0	1.44 ug	--
	Pyrene-Front		6.72 ug	

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CHEFFEL
FIC ENVIRONMENTAL SERVICES
SCHEFFEL
EAST KEMPER RD
INNATI, OH 45249-1030

Final Report

Received: 10/09/98
le Type: 12 - Air Sample(s)
ect: 5512.000 PO Number:

ytical Results

Client ID	Parameter	Volume	Amount	Concentration
	Pyrene-Total	0	6.72 ug	--

eviations: ug = micrograms, mg = milligrams, mg/M3 = milligrams per
ic meter of air, g = grams, ug/M3 = micrograms per cubic meter of air,
liters, w/w = percent weight basis, all Volumes given in liters,
= parts per million, ppb = parts per billion, Areas given in square
t; ND = Not Detected.

ary of Analytical Methods

ound Name	Analytical Method	Abbreviation
aphthene	NIOSH 5506	Acnapht
aphthylene	NIOSH 5506	Acnthy
racene	NIOSH 5506	Anthr
(a)anthracene	NIOSH 5506	Bz(a)ant
o(a)pyrene	NIOSH 5506	Bz(a)pyr
o(b)fluoranthene	NIOSH 5506	Bz(b)fnt
o(ghi)perylene	NIOSH 5506	Bzpery
o(k)fluoranthene	NIOSH 5506	Bz(k)fnt
sene	NIOSH 5506	Chy
nz(a,h)anthracene	NIOSH 5506	Dbzanthr
ranthene	NIOSH 5506	Flanthr
rene	NIOSH 5506	----
no(1,2,3-cd)pyrene	NIOSH 5506	Indpyene

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CHEFFEL
FIC ENVIRONMENTAL SERVICES
SCHEFFEL
EAST KEMPER RD
INNATI, OH 45249-1030

Final Report

Received: 10/09/98
le Type: 12 - Air Sample(s)
ect: 5512.000 PO Number:

ytical Method - continued

thalene	NIOSH 5506	Napth
anthrene	NIOSH 5506	Panthr
ne	NIOSH 5506	----

s

Attached are the results we obtained on the analysis of your samples. Any Chains-of-Custody associated with this sample group are also enclosed. Air concentrations are calculated as a convenience to the client and the overall accuracy of this result depends on both the accuracy of the air volume and the amount found by analysis. Theoretical Air Volumes for passive monitors are calculated using the sampling time submitted and the manufacturer's listed sampling rate for each compound.

We appreciate your confidence in allowing Analytics to be your testing laboratory. Any questions regarding this report can be addressed by calling our client services department (800-888-8061).

James A. Calpin, CIH
Laboratory Director

PACIFIC ENVIRONMENTAL SERVICES, INC.

Cincinnati, OH 45249-1030
513.489.6611
FAX: 513.489.6619

Chain of Custody Record

Project Number: 5512.000 ~~5505.000~~

Project Name: EPA Coke ABC Coke

Samplers: D. Scheffel, S. Blaine, P. Siegel

Purchase Order No.: 103-99-358

Analysis Requested: NIOSH method 5506 for PAH's

PES Field Sample ID	Date	Time	Sample Description	Number of Containers	NIOSH method 5506 for PAH's				Comments
A-I-5506-1	9/21/98		Inlet NIOSH RUN 1	3	X				Please fax
A-I-5506-2	9/22/98		Inlet NIOSH RUN 2	3	X				results to
A-I-5506-3	9/23/98		Inlet NIOSH RUN 3	3	X				Dan Scheffel
A-O-5506-1	9/21/98		Outlet NIOSH RUN 1	3	X				or Ron Kolde
A-O-5506-2	9/22/98		Outlet NIOSH RUN 2	3	X				
A-O-5506-3	9/23/98		Outlet NIOSH RUN 3	3	X				HPLC analysis
A-UI-5506-1	9/25/98		Underfire NIOSH RUN 1	3	X				fluorescence/UV
A-I-5506-FB	9/23/98		Inlet NIOSH Field Blank	3	X				detection
*LAB Blanks	9/28/98			12	X				17 PAH's
See following page for instructions									per analysis
* spare tubes also included for spiking -									
desorption efficiencies. Spike and analyze for two desorption efficiencies.									Standard
4 Lab blanks have more material (Tube 2)									analytical
8 Lab blanks have less material									turnaround
(Analyze one set of three tubes together for a blank)									time.

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
[signature]	10/8/98 1400				
Relinquished by: (Signature)	Date/Time 10-9-98 17:3-	Received for lab by: (Signature) [signature]	REMARKS INTACT, w/ ice packs, cold		

CARB 429

TABLE 4.3

PAH IN-STACK DETECTION LIMITS

Analyte	In-Stack Detection Limit ng/dscm[a]	
	Sample Volume, dscm	
	1	2
Naphthalene	1,000	500
2-Methylnaphthalene	1,000	500
Acenaphthylene	2-10	1-5
Acenaphthene	2-10	1-5
fluorene	200	100
Phenanthree	500	250
Anthracene	2-10	1-5
Fluoranthene	100	50
Pyrene	2-10	1-5
Benzo(a)anthracene	100	50
Chrysene	2-10	1-5
Benzo(b)fluoranthene	2-10	1-5
Benzo(k)fluoranthene	2-10	1-5
Benzo(e)pyrene	2-10	1-5
Benzo(a)pyrene	2-10	1-5
Perylene	2-10	1-5
Indeno(1,2,3-cd)pyrene	2-10	1-5
Dibenz(a,h)anthracene	2-10	1-5
Benzo(g,h,i)perylene	2-10	1-5

[a] Nanograms per dry standard cubic meter.

PACIFIC ENVIRONMENTAL SERVICES, INC.

Purchase order # 103-99-358

Project No.	Page	of
S512.000	1	1

Client: EPA Coke ABC Coke Birmingham AL

~~Location~~ Contact: Don Scheffel / Ron Kolde

Prepared By	Date	Checked By	Date	~~Sheet Title~~ Phone Number
Steven Blaine	10/8/98	—	—	(513) - 398 - 2556

Special Instructions: Sample type XAD tubes.
No filters retained / Submitted - Gaseous PAH's only
Analysis by NIOSH 5506 - HPLC, fluorescence/UV detection.

Following page details sample I.D.#'s collection dates etc. Extra tubes are included for desorption efficiency/recoveries. Sample configuration was 2-300mg tubes (Tube A + B) followed by a 600 mg tube (Tube C).

Analyze two Blanks with tubes supplied.
Conduct two Spikes total at PAH levels consistent with A-I-5506 sample levels, follow with desorption efficiency.

Follow other Q.A guidelines as noted in NIOSH method 5506 (attached).

Any questions please confer with Don Scheffel or Ron Kolde - PES (513) - 398 - 2556.

* Analyze Tube A + Tube B separately to determine breakthrough
Do not analyze tube C if tube B is at dection limit.

First Analytical Laboratories

ANALYSIS REPORT

Metals in Dust

Project # S512.000

Prepared for:

Pacific Environmental Services, Inc.
7209 E. Kemper Road
Cincinnati, OH 45249

Reviewed and Approved by:

William H. Wadlin, Ph. D.
Laboratory Manager

October 27, 1998

First Analytical Laboratories

ANALYSIS REPORT

Metals in Dust

Project # S512.000

Prepared for:

Pacific Environmental Services, Inc.
7209 E. Kemper Road
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Reviewed and Approved by:

William H. Wadlin, Ph. D.
Laboratory Manager

October 27, 1998

Quality Control:

The spike recoveries were all within the normal range of 70% to 130%, except that beryllium and silver were slightly low, which is not unusual. The duplicates were all within the normal limit of 20% for all cases in which the sample level is more than five times the detection limit. Below this level it is not possible to make a meaningful evaluation of the deviation between duplicates.

First Analytical Laboratories
1126 Burning Tree Dr. Chapel Hill, NC 27514
Tel. (919) 942-8607
FAX (919) 929-8688

ANALYSIS REPORT

Project #: 81006
Client: Pacific Environmental Services
Client Project ID: S512.000

Report Date: 27-Oct-98
Date Received: 09-Oct-98

Parts per million in original sample
µg/g

Sample	Sb GFAA	As GFAA	Ba ICP	Be GFAA	Cd FLAA	Cr ICP
BD-AC-1	< 0.2	13.4	27.6	0.33	1.2	16.3
BD-AC-2	< 0.2	11.2	37.1	0.36	1.0	10.2
BD-AC-3	< 0.2	9.1	27.6	0.35	1.2	10.0

QC SUMMARY

Spikes						
% Recovery	102%	102%	80%	61%	96%	76%
Duplicates						
%RPD			4.2%		10.5%	2.4%

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ANALYSIS REPORT

Project #: 81006
Client: Pacific Environmental Services
Client Project ID: S512.000

Report Date: 27-Oct-98
Date Received: 09-Oct-98

Parts per million in original sample
µg/g

Sample	Cu ICP	Mn FLAA	Hg CVAA	Pb FLAA	Ni GFAA
BD-AC-1	10.6	24.1	< 0.07	21	20
BD-AC-2	9.5	16.1	< 0.07	16	13
BD-AC-3	9.4	16.6	< 0.07	16	13

QC SUMMARY

Spikes % Recovery	83%	94%		98%	84%
Duplicates %RPD	1.0%	0.0%		6.1%	

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ANALYSIS REPORT

Project #: 81006
Client: Pacific Environmental Services
Client Project ID: S512.000

Report Date: 27-Oct-98
Date Received: 09-Oct-98

Parts per million in original sample
µg/g

Sample	P ICP	Se GFAA	Ag GFAA	Tl GFAA	Zn FLAA
BD-AC-1	39	3.8	< 0.1	0.84	50.0
BD-AC-2	41	3.2	< 0.1	0.73	33.2
BD-AC-3	36	3.7	< 0.1	0.61	34.5

QC SUMMARY

Spikes % Recovery	115%	89%	62%	78%	98%
Duplicates %RPD	4.2%				0.7%

ANTIMONY

GFAA ANALYSIS RUN SUMMARY AND CALCULATION WORKSHEET

Client: PES
Proj. #: 81006
Date: 26-Oct-98

IDL = 5 µg/L
Postdig'n spike conc. 100 µg/L

Sample ID Client	FAL	Test Sol'n µg/L	Dig'te Conc µg/L	FV ml	Dil'n Factor	Init. Vol. ml	Vol. Dig'd ml	ppm µg/g
BD-AC-1	81006.1	3.2	3.2	100	1	2.0915		< 0.24
BD-AC-2	81006.2	-3.2	-3.2	100	1	2.0800		< 0.24
BD-AC-3	81006.3	0.6	0.6	100	1	2.1574		< 0.23
SPIKE	81006.1 S	101.5			% REC	101.5%		

ARSENIC

GFAA ANALYSIS RUN SUMMARY AND CALCULATION WORKSHEET

Client: PES
Proj. #: 81006
Date: 26-Oct-98

IDL = 5 µg/L
Postdig'n spike conc. 100 µg/L

Sample ID Client	FAL	Test Sol'n µg/L	Dig'te Conc µg/L	FV ml	Dil'n Factor	Init. Vol. ml	Vol. Dig'd ml	ppm µg/g
BD-AC-1	81006.1	55.9	279.5	100	5	2.0915		13.36
BD-AC-2	81006.2	46.4	232.0	100	5	2.0800		11.15
BD-AC-3	81006.3	39.4	197.0	100	5	2.1574		9.13
SPIKE	81006.3 S	157.8			% REC	101.9%		

BARIUM

ICP ANALYSIS RUN SUMMARY AND CALCULATION WORKSHEET

Client: PES
Proj. #: 81006
Date: 26-Oct-98

IDL = 2 µg/L
Postdig'n spike conc. 1000 µg/L

Sample ID Client	FAL	Test Sol'n µg/L	Dig'te Conc µg/L	FV ml	Dil'n Factor	Init. Vol. ml	Vol. Dig'd ml	ppm µg/g
BD-AC-1	81006.1	578	578	100	1	2.0915		27.64
BD-AC-2	81006.2	772	772	100	1	2.0800		37.12
BD-AC-3	81006.3	596	596	100	1	2.1574		27.63
SPIKE	81006.3 S	1378			% REC	80.0%		
DUPLICATE	81006.2 D	740			% RPD	4.2%		

B E R Y L L I U M

GFAA ANALYSIS RUN SUMMARY AND CALCULATION WORKSHEET

Client: PES
Proj. #: 81006
Date: 26-Oct-98

IDL = 0.15 µg/L
Postdig'n spike conc. 5.00 µg/L

Sample ID Client	FAL	Test Sol'n µg/L	Dig'te Conc µg/L	FV ml	Dil'n Factor	Init. Vol. ml	Vol. Dig'd ml	ppm µg/g
BD-AC-1	81006.1	7.00	7.00	100	1	2.0915		0.33
BD-AC-2	81006.2	7.40	7.40	100	1	2.0800		0.36
BD-AC-3	81006.3	7.52	7.52	100	1	2.1574		0.35
SPIKE	81006.1 S	10.05			% REC	61.0%		

CADMIUM

FLAA ANALYSIS RUN SUMMARY AND CALCULATION WORKSHEET

Client: PES
Proj. #: 81006
Date: 26-Oct-98

IDL = 3 µg/L
Postdig'n spike conc. 100 µg/L

Sample ID Client	FAL	Test Sol'n µg/L	Dig'te Conc µg/L	FV ml	Dil'n Factor	Init. Vol. ml	Vol. Dig'd ml	ppm ~~Total~~ µg/g
BD-AC-1	81006.1	25	25	100	1	2.0915		1.20
BD-AC-2	81006.2	20	20	100	1	2.0800		0.96
BD-AC-3	81006.3	25	25	100	1	2.1574		1.16
SPIKE	81006.1 S	409			% REC	96.0%		
DUPLICATE	81006.2 D	18			% RPD	10.5%		

CHROMIUM

ICP ANALYSIS RUN SUMMARY AND CALCULATION WORKSHEET

Client: PES
Proj. #: 81006
Date: 26-Oct-98

IDL = 25 µg/L
Postdig'n spike conc. 2000 µg/L

Sample ID Client	FAL	Test Sol'n µg/L	Dig'te Conc µg/L	FV ml	Dil'n Factor	Init. Vol. ml	Vol. Dig'd ml	ppm µg/g
BD-AC-1	81006.1	341	341	100	1	2.0915		16.30
BD-AC-2	81006.2	213	213	100	1	2.0800		10.24
BD-AC-3	81006.3	215	215	100	1	2.1574		9.97
SPIKE	81006.3 S	1729			% REC	75.7%		
DUPLICATE	81006.2 D	208			% RPD	2.4%		

COPPER

ICP ANALYSIS RUN SUMMARY AND CALCULATION WORKSHEET

Client: PES
Proj. #: 81006
Date: 26-Oct-98

IDL = 20 µg/L
Postdig'n spike conc. 2000 µg/L

Sample ID Client	FAL	Test Sol'n µg/L	Dig'te Conc µg/L	FV ml	Dil'n Factor	Init. Vol. ml	Vol. Dig'd ml	ppm µg/g
BD-AC-1	81006.1	221	221	100	1	2.0915		10.57
BD-AC-2	81006.2	197	197	100	1	2.0800		9.47
BD-AC-3	81006.3	203	203	100	1	2.1574		9.41
SPIKE	81006.3 S	1881			% REC	83.0%		
DUPLICATE	81006.2 D	199			% RPD	1.0%		

LEAD

FLAA ANALYSIS RUN SUMMARY AND CALCULATION WORKSHEET

Client: PES
Proj. #: 81006
Date: 26-Oct-98

Sample ID Client	FAL	Test Sol'n µg/L	Dig'te Conc µg/L	FV ml	Dil'n Factor	Init. Vol. ml	Vol. Dig'd ml	ppm µg/g
BD-AC-1	81006.1	430	430	100	1	2.0915		20.56
BD-AC-2	81006.2	340	340	100	1	2.0800		16.35
BD-AC-3	81006.3	350	350	100	1	2.1574		16.22
SPIKE	81006.1 S	2380			% REC	97.5%		
DUPLICATE	81006.2 D	320			% RPD	6.1%		

MANGANESE

FLAA ANALYSIS RUN SUMMARY AND CALCULATION WORKSHEET

Client: PES
Proj. #: 81006
Date: 26-Oct-98

IDL = 3 µg/L
Postdig'n spike conc. 100 µg/L

Sample ID Client	FAL	Test Sol'n µg/L	Dig'te Conc µg/L	FV ml	Dil'n Factor	Init. Vol. ml	Vol. Dig'd ml	ppm µg/g
BD-AC-1	81006.1	505	505	100	1	2.0915		24.15
BD-AC-2	81006.2	334	334	100	1	2.0800		16.06
BD-AC-3	81006.3	358	358	100	1	2.1574		16.59
SPIKE	81006.1 S	882			% REC	94.3%		
DUPLICATE	81006.2 D	334			% RPD	0.0%		

MERCURY

CVAA ANALYSIS RUN SUMMARY AND CALCULATION WORKSHEET

Client: PES
Proj. #: 81006
Date: 26-Oct-98

IDL = 0.20 µg/L
Postdig'n spike conc. 5.00 µg/L

Sample ID Client	FAL	Test Sol'n µg/L	Dig'te Conc µg/L	FV ml	Dil'n Factor	Init. Vol. ml	Vol. Dig'd ml		ppm µg/g
BD-AC-1	81006.1	0.03	0.03	100	1	0.2284		<	0.07
BD-AC-1	81006.1	0.09	0.09	100	1	0.3054		<	0.07
							Average =	<	**0.07**
BD-AC-2	81006.2	0.01	0.01	100	1	0.3874		<	0.07
BD-AC-2	81006.2	0.12	0.12	100	1	0.2626		<	0.07
							Average =	<	**0.07**
BD-AC-3	81006.3	0.09	0.09	100	1	0.3017		<	0.07
BD-AC-3	81006.3	-0.01	-0.01	100	1	0.2843		<	0.07
							Average =	<	**0.07**

NICKEL

GFAA ANALYSIS RUN SUMMARY AND CALCULATION WORKSHEET

Client: PES
Proj. #: 81006
Date: 26-Oct-98

IDL = 5 µg/L
Postdig'n spike conc. 100 µg/L

Sample ID Client	FAL	Test Sol'n µg/L	Dig'te Conc µg/L	FV ml	Dil'n Factor	Init. Vol. ml	Vol. Dig'd ml	ppm µg/g
BD-AC-1	81006.1	82.2	411.0	100	5	2.0915		19.65
BD-AC-2	81006.2	56.0	280.0	100	5	2.0800		13.46
BD-AC-3	81006.3	58.2	291.0	100	5	2.1574		13.49
SPIKE	81006.1 S	166.1			% REC	83.9%		

PHOSPHORUS

ICP ANALYSIS RUN SUMMARY AND CALCULATION WORKSHEET

Client: PES
Proj. #: 81006
Date: 26-Oct-98

IDL = 100 µg/L
Postdig'n spike conc. 1000 µg/L

Sample ID Client	FAL	Test Sol'n µg/L	Dig'te Conc µg/L	FV ml	Dil'n Factor	Init. Vol. ml	Vol. Dig'd ml	ppm µg/g
BD-AC-1	81006.1	815	815	100	1	2.0915		38.97
BD-AC-2	81006.2	859	859	100	1	2.0800		41.30
BD-AC-3	81006.3	779	779	100	1	2.1574		36.11
SPIKE	81006.3 S	1960			% REC	114.5%		
DUPLICATE	81006.2 D	896			% RPD	4.2%		

SELENIUM

GFAA ANALYSIS RUN SUMMARY AND CALCULATION WORKSHEET

Client: PES
Proj. #: 81006
Date: 26-Oct-98

IDL = 3 µg/L
Postdig'n spike conc. 50 µg/L

Sample ID Client	FAL	Test Sol'n µg/L	Dig'te Conc µg/L	FV ml	Dil'n Factor	Init. Vol. ml	Vol. Dig'd ml	ppm µg/g
BD-AC-1	81006.1	80.3	80.3	100	1	2.0915		3.84
BD-AC-2	81006.2	67.3	67.3	100	1	2.0800		3.24
BD-AC-3	81006.3	79.9	79.9	100	1	2.1574		3.70
SPIKE	81006.1 S	124.5			% REC	88.5%		

SILVER

GFAA ANALYSIS RUN SUMMARY AND CALCULATION WORKSHEET

Client: PES
Proj. #: 81006
Date: 26-Oct-98

IDL = 2 µg/L
Postdig'n spike conc. 10 µg/L

Sample ID Client	FAL	Test Sol'n µg/L	Dig'te Conc µg/L	FV ml	Dil'n Factor	Init. Vol. ml	Vol. Dig'd ml	ppm µg/g
BD-AC-1	81006.1	-0.44	-0.44	100	1	2.0915		< 0.10
BD-AC-2	81006.2	-1.06	-1.06	100	1	2.0800		< 0.10
BD-AC-3	81006.3	-0.67	-0.67	100	1	2.1574		< 0.09
SPIKE	81006.1 S	6.24			% REC	62.4%		

THALLIUM

GFAA ANALYSIS RUN SUMMARY AND CALCULATION WORKSHEET

Client: PES
Proj. #: 81006
Date: 26-Oct-98

IDL = 3 µg/L
Postdig'n spike conc. 50 µg/L

Sample ID Client	FAL	Test Sol'n µg/L	Dig'te Conc µg/L	FV ml	Dil'n Factor	Init. Vol. ml	Vol. Dig'd ml	ppm µg/g
BD-AC-1	81006.1	17.6	17.6	100	1	2.0915		0.84
BD-AC-2	81006.2	15.1	15.1	100	1	2.0800		0.73
BD-AC-3	81006.3	13.2	13.2	100	1	2.1574		0.61
SPIKE	81006.3 S	56.4			% REC	77.6%		

ZINC

FLAA ANALYSIS RUN SUMMARY AND CALCULATION WORKSHEET

Client: PES
Proj. #: 81006
Date: 26-Oct-98

IDL = 3 µg/L
Postdig'n spike conc. 100 µg/L

Sample ID Client	FAL	Test Sol'n µg/L	Dig'te Conc µg/L	FV ml	Dil'n Factor	Init. Vol. ml	Vol. Dig'd ml	ppm µg/g
BD-AC-1	81006.1	209	1045	100	5	2.0915		49.96
BD-AC-2	81006.2	138	690	100	5	2.0800		33.17
BD-AC-3	81006.3	149	745	100	5	2.1574		34.53
SPIKE	81006.1 S	600			% REC	97.8%		
DUPLICATE	81006.2 D	137			% RPD	0.7%		

ANTIMONY

QUALITY CONTROL DATA

Client: PES
Proj. #: 81003 and 81006
Date: 26-Oct-98

Calibration Data

	Abs.	True conc., µg/L
Blank	0.000	0.0
Standard 1	0.016	10.0
Standard 2	0.081	50.0
Standard 3	0.153	100.0
Standard 4	0.285	200.0

Calibration Verifications

ICV = 100	97.3	CCV2 = 100	104.1
ICB = 0	3.2	CCB2 = 0	-0.8
CCV1 = 100	97.6	CCV3 = 100	111.0
CCB1 = 0	-3.9	CCB3 = 0	-5.7
		CCV4 = 100	101.0
		CCB4 = 0	-5.9

ARSENIC

QUALITY CONTROL DATA

Client: PES
Proj. #: 81003 and 81006
Date: 26-Oct-98

Calibration Data

	Abs.	True conc., µg/L
Blank	0.000	0.0
Standard 1	0.028	10.0
Standard 2	0.128	50.0
Standard 3	0.238	100.0
Standard 4	0.441	200.0

Calibration Verifications

ICV = 100	103.1	CCV2 = 100	107.2
ICB = 0	2.1	CCB2 = 0	4.6
CCV1 = 100	110.0	CCV3 = 100	111.2
CCB1 = 0	0.9	CCB3 = 0	2.8

BARIUM

QUALITY CONTROL DATA

Client: PES
Proj. #: 81002 and 81006
Date: 26-Oct-98

Calibration Data

	Emiss.	True conc., µg/L
Blank	32	0
Standard 1	54	20
Standard 2	739	500
Standard 3	1397	1000
Standard 4	2754	2000

Calibration Verifications

ICV = 1000	967	CCV2 = 1000	1116
ICB = 0	0	CCB2 = 0	0
CCV1 = 1000	1057		
CCB1 = 0	1		

BERYLLIUM

QUALITY CONTROL DATA

Client: PES
Proj. #: 81003 and 81006
Date: 26-Oct-98

Calibration Data

	Abs.	True conc., µg/L
Blank	0.000	0.0
Standard 1	0.012	0.5
Standard 2	0.043	2.0
Standard 3	0.105	5.0
Standard 4	0.175	10.0

Calibration Verifications

ICV = 5	5.07	CCV2 = 5	5.15
ICB = 0	0.16	CCB2 = 0	0.05
CCV1 = 5	4.83	CCV3 = 5	5.07
CCB1 = 0	-0.01	CCB3 = 0	0.08
		CCV4 = 5	
		CCB4 = 0	

CADMIUM

FLAA ANALYSIS RUN SUMMARY AND CALCULATION WORKSHEE

Client: PES
Proj. #: 81002
Date: 26-Oct-98

Calibration Data

	Abs.	True conc., µg/L
Blank	0.000	0
Standard 1	0.017	50
Standard 2	0.032	100
Standard 3	0.064	200
Standard 4	0.151	500
Standard 5	0.295	1000

Calibration Verifications

ICV = 500	522	CCV2 = 500	511
ICB = 0	3	CCB2 = 0	3
CCV1 = 500	495		
CCB1 = 0	1		

CHROMIUM

QUALITY CONTROL DATA

Client: PES
Proj. #: 81002 and 81006
Date: 26-Oct-98

Calibration Data

	Emiss.	True conc., µg/L
Blank	603	0
Standard 1	758	100
Standard 2	3049	1000
Standard 3	5860	2000
Standard 4	13550	5000

Calibration Verifications

ICV = 2000	1829	CCV2 = 2000	2107
ICB = 0	-14	CCB2 = 0	-14
CCV1 = 2000	2124		
CCB1 = 0	-9		

CHROMIUM

QUALITY CONTROL DATA

Client: PES
Proj. #: 81002 and 81006
Date: 26-Oct-98

Calibration Data

	Emiss.	True conc., µg/L
Blank	510	0
Standard 1	679	100
Standard 2	2957	1000
Standard 3	5337	2000
Standard 4	12453	5000

Calibration Verifications

ICV = 2000	1981	CCV2 = 2000	2121
ICB = 0	-20	CCB2 = 0	-25
CCV1 = 2000	1842		
CCB1 = 0	-24		

COPPER

QUALITY CONTROL DATA

Client: PES
Proj. #: 81003 and 81006
Date: 26-Oct-98

Calibration Data

	Emiss.	True conc., µg/L
Blank	1285	0
Standard 1	2949	100
Standard 2	18473	1000
Standard 3	36484	2000
Standard 4	89349	5000

Calibration Verifications

ICV = 2000	1998	CCV2 = 2000	2248
ICB = 0	8	CCB2 = 0	11
CCV1 = 2000	2127	CCV3 = 2000	2106
CCB1 = 0	13	CCB3 = 0	13
		CCV4 = 2000	2017
		CCB4 = 0	11

LEAD

FLAA ANALYSIS RUN SUMMARY AND CALCULATION WORKSHEET

Client: PES
Proj. #: 81002
Date: 26-Oct-98

Calibration Data

	Abs.	True conc., µg/L
Blank	0.000	0
Standard 1	0.003	200
Standard 2	0.007	500
Standard 3	0.015	1000
Standard 4	0.029	2000
Standard 5	0.073	5000

Calibration Verifications

ICV = 2000	1950	CCV2 = 2000	1940
ICB = 0	10	CCB2 = 0	-30
CCV1 = 2000	1950	CCV3 = 2000	
CCB1 = 0	-20	CCB3 = 0	

LEAD

FLAA ANALYSIS RUN SUMMARY AND CALCULATION WORKSHEE

Client: PES
Proj. #: 81002
Date: 26-Oct-98

Calibration Data

	Abs.	True conc., µg/L
Blank	0.000	0
Standard 1	0.022	10
Standard 2	0.120	50
Standard 3	0.233	100
Standard 4	0.414	200

Calibration Verifications

ICV = 100	101.4	CCV2 = 100	99.4
ICB = 0	1.6	CCB2 = 0	1.1
CCV1 = 100	101.7	CCV3 = 100	107.4
CCB1 = 0	-1.4	CCB3 = 0	5.1

MANGANESE

QUALITY CONTROL DATA

Client: PES
Proj. #: 81002 and 81006
Date: 26-Oct-98

Calibration Data

	Abs.	True conc., µg/L
Blank	0.000	0
Standard 1	0.006	50
Standard 2	0.013	100
Standard 3	0.026	200
Standard 4	0.065	500
Standard 5	0.125	1000

Calibration Verifications

ICV = 500	496	CCV2 = 500	497
ICB = 0	0	CCB2 = 0	-7
CCV1 = 500	483		
CCB1 = 0	1		

MERCURY

QUALITY CONTROL DATA

Client: PES
Proj. #: 81003 and 81006
Date: 26-Oct-98

Calibration Data

	Abs.	True conc., µg/L
Blank	0.000	0.00
Standard 1	0.010	0.50
Standard 2	0.025	1.00
Standard 3	0.042	2.00
Standard 4	0.125	5.00
Standard 5	0.278	10.00

Calibration Verifications

ICV = 5	4.79	CCV2 = 5	4.76
ICB = 0	-0.13	CCB2 = 0	-0.06
CCV1 = 5	4.53	CCV3 = 5	4.42
CCB1 = 0	-0.18	CCB3 = 0	-0.09
		CCV4 = 5	4.95
		CCB4 = 0	-0.09

NICKEL

QUALITY CONTROL DATA

Client: PES
Proj. #: 81003 and 81006
Date: 26-Oct-98

Calibration Data

	Abs.	True conc., µg/L
Blank	0.000	0.0
Standard 1	0.030	20.0
Standard 2	0.082	50.0
Standard 3	0.173	100.0
Standard 4	0.340	200.0

Calibration Verifications

ICV = 100	108.0	CCV2 = 100	89.7
ICB = 0	3.1	CCB2 = 0	-3.3
CCV1 = 100	87.4	CCV3 = 100	88.4
CCB1 = 0	-1.0	CCB3 = 0	-4.2

PHOSPHORUS

QUALITY CONTROL DATA

Client: PES
Proj. #: 81003 and 81006
Date: 26-Oct-98

Calibration Data

	Emiss.	True conc., µg/L
Blank	316	0
Standard 1	369	200
Standard 2	558	1000
Standard 3	518	2000
Standard 4	1567	5000
Standard 5	6099	20000

Calibration Verifications

ICV = 2000	2010	CCV2 = 2000	2043
ICB = 0	21	CCB2 = 0	61
CCV1 = 2000	1934	CCV3 = 2000	2039
CCB1 = 0	99	CCB3 = 0	-56
		CCV4 = 2000	1960
		CCB4 = 0	-43

SELENIUM

QUALITY CONTROL DATA

Client: PES
Proj. #: 81003 and 81006
Date: 26-Oct-98

Calibration Data

	Abs.	True conc., µg/L
Blank	0.000	0.0
Standard 1	0.017	10.0
Standard 2	0.049	25.0
Standard 3	0.097	50.0
Standard 4	0.206	100.0

Calibration Verifications

ICV = 50	50.4	CCV2 = 50	53.3
ICB = 0	-4.3	CCB2 = 0	-0.3
CCV1 = 50	51.7	CCV3 = 50	54.1
CCB1 = 0	2.1	CCB3 = 0	6.4

SELENIUM

QUALITY CONTROL DATA

Client: PES
Proj. #: 81003 and 81006
Date: 26-Oct-98

Calibration Data

	Abs.	True conc., µg/L
Blank	0.000	0.0
Standard 1	0.008	10.0
Standard 2	0.046	25.0
Standard 3	0.086	50.0
Standard 4	0.171	100.0

Calibration Verifications

ICV = 50	50.8	CCV2 = 50
ICB = 0	2.1	CCB2 = 0
CCV1 = 50	50.9	CCV3 = 50
CCB1 = 0	1.7	CCB3 = 0

SILVER

QUALITY CONTROL DATA

Client: PES
Proj. #: 81003 and 81006
Date: 26-Oct-98

Calibration Data

	Abs.	True conc., µg/L
Blank	0.000	0.0
Standard 1	0.096	5.0
Standard 2	0.191	10.0
Standard 3	0.383	20.0
Standard 4	0.544	30.0

Calibration Verifications

ICV = 20	20.2	CCV2 = 20	18.6
ICB = 0	-1.0	CCB2 = 0	-1.1
CCV1 = 20	19.5	CCV3 = 20	18.6
CCB1 = 0	-1.1	CCB3 = 0	-1.3

THALLIUM

QUALITY CONTROL DATA

Client: PES
Proj. #: 81003 and 81006
Date: 26-Oct-98

Calibration Data

	Abs.	True conc., µg/L
Blank	0.000	0.0
Standard 1	0.017	10.0
Standard 2	0.030	20.0
Standard 3	0.079	50.0
Standard 4	0.149	100.0

Calibration Verifications

ICV = 50	48.9	CCV2 = 50	49.7
ICB = 0	-2.6	CCB2 = 0	-0.5
CCV1 = 50	48.6	CCV3 = 50	46.9
CCB1 = 0	-0.3	CCB3 = 0	-0.3
		CCV4 = 50	54.3
		CCB4 = 0	-2.0

ZINC

QUALITY CONTROL DATA

Client: PES
Proj. #: 81002 and 81006
Date: 26-Oct-98

Calibration Data

	Abs.	True conc., µg/L
Blank	0.000	0
Standard 1	0.035	50
Standard 2	0.056	100
Standard 3	0.091	200
Standard 4	0.205	500
Standard 5	0.367	1000

Calibration Verifications

ICV = 500	488	CCV2 = 500	478
ICB = 0	3	CCB2 = 0	0
CCV1 = 500	501		
CCB1 = 0	-4		

PACIFIC ENVIRONMENTAL SERVICES, INC.

7200 E. Kemper Rd.
Cincinnati, OH 45249-1030
513.489.6611
FAX: 513.489.6619

8100F

Chain of Custody Record

Project Number: ~~5505.000~~ 5512.000

Project Name: EPA Coke - ABC Coke Birmingham, AL

Samplers: D. Schoffel, S. Blaine

Purchase Order No.: 103-99-357

PES Field Sample ID	Date	Time	Sample Description	Number of Containers	Analysis Requested: metals by ICAP				Comments
BD-AC-1	9/21/98		Baghouse Dust - Run 1	1	x				If greater sensitivity is required, GFAAS will be used for the following metals: antimony, arsenic, beryllium, cadmium, chromium, lead, and selenium. Mercury will be by CVAAS
BD-AC-2	9/22/98		Baghouse Dust - Run 2	1	x				
BD-AC-3	9/23/98		Baghouse Dust Run 3	1	x				
			Analyze for the following metals: antimony, arsenic, barium, beryllium, cadmium, chromium, copper, lead, manganese, mercury, nickel, phosphorus, selenium, silver, thallium, zinc (16 metals total)						

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Steven B. Blaine	10/8/98 1400				

Relinquished by: (Signature)	Date/Time	Received for lab by: (Signature)	REMARKS
		W.W. Wade 10/9/98	

Page: 1 of 1

[illegible]: [illegible]
ate: 10/15/98
ata File:
echnique: HGA

Element: Sb
Time: 10:00
ID/Wt File: B1002.IDW
Calib. Type: Linear

Wavelength: 217.6
Slit: 0.7 L
Lamp Current: 0
Energy: 38

---

b ID: BLANK Seq. No.: 00148 A/S Pos.: 0 Date: 10/15/98

eplicate 1
eak Area (A-s): 0.010
lackground Pk Area (A-s): 0.127
lank Corrected Pk Area (A-s): -0.000
oncentration (ug/L): -0.1

Time: 10:02
Peak Height (A): 0.020
Background Pk Height (A): 0.082

eplicate 2
eak Area (A-s): -0.004
ackground Pk Area (A-s): 0.138
lank Corrected Pk. Area (A-s): -0.014
oncentration (ug/L): -9.1

Time: 10:06
Peak Height (A): 0.018
Background Pk Height (A): 0.088

ean Conc (ug/L): -4.6 SD: 6.35 RSD(%): 139.00

uto-zero performed.

---

b ID: 10 PPB Seq. No.: 00149 A/S Pos.: 1 Date: 10/15/9

Replicate 1
eak Area (A-s): 0.024
ackground Pk Area (A-s): 0.123
lank Corrected Pk Area (A-s): 0.021
oncentration (ug/L): 12.9

Time: 10:09
Peak Height (A): 0.040
Background Pk Height (A): 0.083

Replicate 2
eak Area (A-s): 0.014
Background Pk Area (A-s): 0.134
Blank Corrected Pk Area (A-s): 0.011
Concentration (ug/L): 7.0

Time: 10:12
Peak Height (A): 0.035
Background Pk Height (A): 0.073

Mean Conc (ug/L): 9.9 SD: 4.20 RSD(%): 42.30

Standard number 1 applied. [10.0]
Correlation coefficient: 1.00000 Slope: 0.0016

Sb ID: 50 PPB Seq. No.: 00150 A/S Pos.: 2 Date: 10/15/

Replicate 1
Peak Area (A-s): 0.083
Background Pk Area (A-s): 0.129
Blank Corrected Pk Area (A-s): 0.080
Concentration (ug/L): 50.2

Time: 10:15
Peak Height (A): 0.127
Background Pk Height (A): 0.078

Replicate 2
Peak Area (A-s): 0.085
Background Pk Area (A-s): 0.136
Blank Corrected Pk Area (A-s): 0.081
Concentration (ug/L): 51.2

Time: 10:19
Peak Height (A): 0.130
Background Pk Height (A): 0.075

Mean Conc (ug/L): 50.7 SD: 0.73 RSD(%): 1.44

Standard number 2 applied. [50.0]
Correlation coefficient: 0.99999 Slope: 0.0016

~~~~~~

Sb ID: 100 PPB Seq. No.: 00151 A/S Pos.: 3 Date: 10/15/9

Replicate 1
Time: 10:22
Peak Area (A-s): 0.153
Peak Height (A): 0.220
Background Pk Area (A-s): 0.143
Background Pk Height (A): 0.087
Blank Corrected Pk Area (A-s): 0.150
Concentration (ug/L): 93.2

Replicate 2
Time: 10:25
Peak Area (A-s): 0.159
Peak Height (A): 0.241
Background Pk Area (A-s): 0.136
Background Pk Height (A): 0.072
Blank Corrected Pk Area (A-s): 0.155
Concentration (ug/L): 96.4

Mean Conc (ug/L): 94.8 SD: 2.26 RSD(%): 2.38

Standard number 3 applied. [100.0]
Correlation coefficient: 0.99925 Slope: 0.0015

~~~~~~

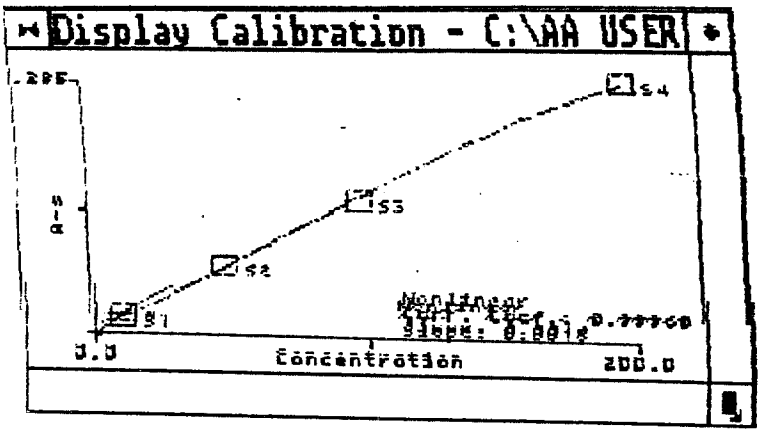
Sb ID: 200 PPB Seq. No.: 00152 A/S Pos.: 4 Date: 10/15/9

Replicate 1
Time: 10:28
Peak Area (A-s): 0.291
Peak Height (A): 0.396
Background Pk Area (A-s): 0.151
Background Pk Height (A): 0.078
Blank Corrected Pk Area (A-s): 0.288
Concentration (ug/L): 186.4

Replicate 2
Time: 10:32
Peak Area (A-s): 0.285
Peak Height (A): 0.396
Background Pk Area (A-s): 0.152
Background Pk Height (A): 0.081
Blank Corrected Pk Area (A-s): 0.281
Concentration (ug/L): 182.0

Mean Conc (ug/L): 184.2 SD: 3.07 RSD(%): 1.67

Standard number 4 applied. [200.0]
Correlation coefficient: 0.99817 Slope: 0.0015


Display Calibration - C:\AA USER
.295
A-S
S1
S2
S3
S4
Nonlinear
Curve Fit:
Slope: 0.001
0.0
Concentration
200.0

~~~~~~

Sb ID: ICV Seq. No.: 00153 A/S Pos.: 5 Date: 10/15/9

Replicate 1 Time: 10:38
Concentration (ug/L): 100.5

Replicate 2 Time: 10:41
Concentration (ug/L): 94.1

Mean Conc (ug/L): 97.3 SD: 4.54 RSD(%): 4.67

QC sample is within range 79.5 - 120.49

~~~~~~

Sb ID: ICB Seq. No.: 00154 A/S Pos.: 0 Date: 10/15/9

Replicate 1 Time: 10:45
Concentration (ug/L): 4.6

Replicate 2 Time: 10:48
Concentration (ug/L): 1.8

Mean Conc (ug/L): 3.2 SD: 1.95 RSD(%): 61.00

QC sample is within range -15.49 - 15.49

~~~~~~

Sb ID: 81002.B-1 Seq. No.: 00155 A/S Pos.: 6 Date: 10/15/

Replicate 1 Time: 10:51
Concentration (ug/L): 2.1

Replicate 2 Time: 10:54
Concentration (ug/L): -4.1

Mean Conc (ug/L): -1.0 SD: 4.36 RSD(%): 430.91

~~~~~~

Sb ID: 81002.8-1 Seq. No.: 00156 A/S Pos.: 7 Date: 10/15/9

Replicate 1 Time: 10:58
Concentration (ug/L): -0.3

Replicate 2 Time: 11:01
Concentration (ug/L): 4.8

Mean Conc (ug/L): 2.3 SD: 3.63 RSD(%): 159.(

~~~~~~

Sb ID: 81002.8-1 Seq. No.: 00157 A/S Pos.: 7 Date: 10/15/9

Replicate 1 Time: 11:04
Concentration (ug/L): 94.9

Replicate 2 Time: 11:08
Concentration (ug/L): 104.6

Mean Conc (ug/L): 99.7 SD: 6.85 RSD(%): 6.86
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b ID: 81003.I1 Seq. No.: 00183 A/S Pos.: 25 Date: 10/15/98

eplicate 1 Time: 13:54
oncentration (ug/L): 46.4

eplicate 2 Time: 13:57
oncentration (ug/L): 38.8

lean Conc (ug/L): 42.6 SD: 5.39 RSD(%): 12.65

~~~~~~

;b ID: 81003.I2 Seq. No.: 00184 A/S Pos.: 26 Date: 10/15/98

eplicate 1 Time: 14:01
oncentration (ug/L): 36.0

eplicate 2 Time: 14:04
oncentration (ug/L): 38.3

lean Conc (ug/L): 37.2 SD: 1.65 RSD(%): 4.44

~~~~~~

;b ID: 81003.I3 Seq. No.: 00185 A/S Pos.: 27 Date: 10/15/98

eplicate 1 Time: 14:07
oncentration (ug/L): 38.1

eplicate 2 Time: 14:10
oncentration (ug/L): 29.2

lean Conc (ug/L): 33.7 SD: 6.29 RSD(%): 18.69

~~~~~~

Sb ID: CCV Seq. No.: 00186 A/S Pos.: 3 Date: 10/15/9

Replicate 1 Time: 14:14
Concentration (ug/L): 106.3

Replicate 2 Time: 14:17
Concentration (ug/L): 115.8

Mean Conc (ug/L): 111.0 SD: 6.72 RSD(%): 6.05

QC sample is within range 79.5 - 120.49

~~~~~~

Sb ID: CCB Seq. No.: 00187 A/S Pos.: 0 Date: 10/15/9

Replicate 1 Time: 14:20
Concentration (ug/L): 0.2

Replicate 2 Time: 14:23
Concentration (ug/L): -11.5

Mean Conc (ug/L): -5.7 SD: 8.29 RSD(%): 146.7

QC sample is within range -15.49 - 15.49
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b ID: 81006.1 Seq. No.: 00188 A/S Pos.: 28 Date: 10/15/9

Replicate 1 Time: 14:26
Concentration (ug/L): 0.4

Replicate 2 Time: 14:30
Concentration (ug/L): 6.0

Mean Conc (ug/L): 3.2 SD: 3.97 RSD(%): 122.5

~~~~~~

Sb ID: 81006.1 Seq. No.: 00189 A/S Pos.: 28 Date: 10/15/9

Replicate 1 Time: 14:33
Concentration (ug/L): 100.3

Replicate 2 Time: 14:36
Concentration (ug/L): 102.8

Mean Conc (ug/L): 101.5 SD: 1.82 RSD(%): 1.79

Recovery is 98.3%

~~~~~~

Sb ID: 81006.2 Seq. No.: 00190 A/S Pos.: 29 Date: 10/15/9

Replicate 1 Time: 14:40
Concentration (ug/L): -3.7

Replicate 2 Time: 14:43
[illegible] : -2.8

Mean Conc [illegible] : -3.2 SD: 0.63 RSD(%): 19.58

~~~~~~

Sb ID: 81006.3 Seq. No.: 00191 A/S Pos.: 30 Date: 10/15/

Replicate 1 Time: 14:46
Concentration (ug/L): 0.7

Replicate 2 Time: 14:49
Concentration (ug/L): 0.6

Mean Conc (ug/L): 0.6 SD: 0.08 RSD(%): 13.33

~~~~~~

Sb ID: CCV Seq. No.: 00192 A/S Pos.: 3 Date: 10/15/

Replicate 1 Time: 14:52
Concentration (ug/L): 98.8

Replicate 2 Time: 14:56
Concentration (ug/L): 103.1

Mean Conc (ug/L): 101.0 SD: 3.07 RSD(%): 3.04

QC sample is within range 79.5 - 120.49
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h ID: CCB Seq. No.: 00193 A/S Pos.: 0 Date: 10/15/98

eplicate 1 Time: 14:59
oncentration (ug/L): -6.7

eplicate 2 Time: 15:02
oncentration (ug/L): -5.1

lean Conc (ug/L): -5.9 SD: 1.12 RSD(%): 18.88

IC sample is within range -15.49 - 15.49
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-----------------------------------------------------------------------------
Element File: AS.GEL          Element: As                    Wavelength: 193.7
Date: 10/20/98                Time: 09:30                    Slit: 0.70 L
Data File:                    ID/Wt File: 81002.IDW          Lamp Current: 0
Technique: HGA                Calib. Type: Linear            Energy: 33
-----------------------------------------------------------------------------
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
As    ID: BLANK               Seq. No.: 00104    A/S Pos.: 0     Date: 10/20/

Replicate  1                              Time: 09:30
Peak Area (A-s): 0.007                    Peak Height (A): 0.040
Background Pk Area (A-s): 0.135           Background Pk Height (A): 0.149
Blank Corrected Pk Area (A-s): 0.006
Concentration (ug/L  ): 2.60

Replicate  2                              Time: 09:33
Peak Area (A-s): -0.010                   Peak Height (A): 0.039
Background Pk Area (A-s): 0.130           Background Pk Height (A): 0.119
Blank Corrected Pk Area (A-s): -0.010
Concentration (ug/L  ): -4.07

Mean Conc  (ug/L  ):       -0.74          SD: 4.715                RSD(%): 639.0

Auto-zero performed.

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As    ID: 10 PPB AS           Seq. No.: 00105    A/S Pos.: 1     Date: 10/20

Replicate  1                              Time: 09:36
Peak Area (A-s): 0.026                    Peak Height (A): 0.057
Background Pk Area (A-s): 0.129           Background Pk Height (A): 0.100
Blank Corrected Pk Area (A-s): 0.028
Concentration (ug/L  ): 11.24

Replicate  2                              Time: 09:40
Peak Area (A-s): 0.026                    Peak Height (A): 0.047
Background Pk Area (A-s): 0.114           Background Pk Height (A): 0.096
Blank Corrected Pk Area (A-s): 0.028
Concentration (ug/L  ): 11.26

Mean Conc  (ug/L  ):       11.25          SD: 0.012                RSD(%): 0.11

Standard number 1 applied.  [10.00]
Correlation coefficient: 1.00000          Slope: 0.0028

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As    ID: 50 PPB AS           Seq. No.: 00106    A/S Pos.: 2     Date: 10/20

Replicate  1                              Time: 09:43
Peak Area (A-s): 0.118                    Peak Height (A): 0.208
Background Pk Area (A-s): 0.105           Background Pk Height (A): 0.094
Blank Corrected Pk Area (A-s): 0.119
Concentration (ug/L  ): 42.59

Replicate  2                              Time: 09:46
Peak Area (A-s): 0.088                    Peak Height (A): 0.175
Background Pk Area (A-s): 0.119           Background Pk Height (A): 0.112
Blank Corrected Pk Area (A-s): 0.090
Concentration (ug/L  ): 32.05
```

Wavelength: 217.6
Slit: 0.7 L
Lamp Current: 0
Energy: 38

Element: Sb
Time: 10:00
ID/Wt File: 81002.IDW
Calib. Type: Linear

... : ...DSL
ate: 10/15/98
ata File:
echnique: HGA

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b ID: BLANK Seq. No.: 00148 A/S Pos.: 0 Date: 10/15/98

eplicate 1
eak Area (A-s): 0.010
ackground Pk Area (A-s): 0.127
lank Corrected Pk Area (A-s): -0.000
oncentration (ug/L): -0.1

Time: 10:02
Peak Height (A): 0.020
Background Pk Height (A): 0.082

eplicate 2
eak Area (A-s): -0.004
ackground Pk Area (A-s): 0.138
lank Corrected Pk Area (A-s): -0.014
oncentration (ug/L): -9.1

Time: 10:06
Peak Height (A): 0.018
Background Pk Height (A): 0.088

lean Conc (ug/L): -4.6 SD: 6.35 RSD(%): 139.00

uto-zero performed.

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b ID: 10 PPB Seq. No.: 00149 A/S Pos.: 1 Date: 10/15/9

eplicate 1
eak Area (A-s): 0.024
ackground Pk Area (A-s): 0.123
lank Corrected Pk Area (A-s): 0.021
oncentration (ug/L): 12.9

Time: 10:09
Peak Height (A): 0.040
Background Pk Height (A): 0.083

eplicate 2
eak Area (A-s): 0.014
ackground Pk Area (A-s): 0.134
lank Corrected Pk Area (A-s): 0.011
oncentration (ug/L): 7.0

Time: 10:12
Peak Height (A): 0.035
Background Pk Height (A): 0.073

lean Conc (ug/L): 9.9 SD: 4.20 RSD(%): 42.30

tandard number 1 applied. [10.0]
orrelation coefficient: 1.00000 Slope: 0.0016

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b ID: 50 PPB Seq. No.: 00150 A/S Pos.: 2 Date: 10/15/9

eplicate 1
eak Area (A-s): 0.083
ackground Pk Area (A-s): 0.129
lank Corrected Pk Area (A-s): 0.080
oncentration (ug/L): 50.2

Time: 10:15
Peak Height (A): 0.127
Background Pk Height (A): 0.078

eplicate 2
eak Area (A-s): 0.085
ackground Pk Area (A-s): 0.136
lank Corrected Pk Area (A-s): 0.081
oncentration (ug/L): 51.2

Time: 10:19
Peak Height (A): 0.130
Background Pk Height (A): 0.075

Mean Conc (ug/L): 50.7 SD: 0.73 RSD(%): 1.44

Standard number 2 applied. [50.0]
Correlation coefficient: 0.99999 Slope: 0.0016

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Sb ID: 100 PPB Seq. No.: 00151 A/S Pos.: 3 Date: 10/15/9

Replicate 1 Time: 10:22
Peak Area (A-s): 0.153 Peak Height (A): 0.220
Background Pk Area (A-s): 0.143 Background Pk Height (A): 0.087
Blank Corrected Pk Area (A-s): 0.150
Concentration (ug/L): 93.2

Replicate 2 Time: 10:25
Peak Area (A-s): 0.159 Peak Height (A): 0.241
Background Pk Area (A-s): 0.136 Background Pk Height (A): 0.072
Blank Corrected Pk Area (A-s): 0.155
Concentration (ug/L): 96.4

Mean Conc (ug/L): 94.8 SD: 2.26 RSD(%): 2.38

Standard number 3 applied. [100.0]
Correlation coefficient: 0.99925 Slope: 0.0015

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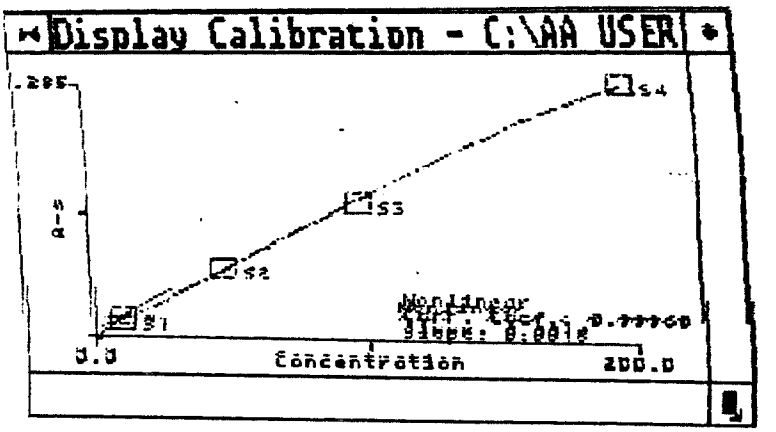
Sb ID: 200 PPB Seq. No.: 00152 A/S Pos.: 4 Date: 10/15/9

Replicate 1 Time: 10:28
Peak Area (A-s): 0.291 Peak Height (A): 0.396
Background Pk Area (A-s): 0.151 Background Pk Height (A): 0.078
Blank Corrected Pk Area (A-s): 0.288
Concentration (ug/L): 186.4

Replicate 2 Time: 10:32
Peak Area (A-s): 0.285 Peak Height (A): 0.396
Background Pk Area (A-s): 0.152 Background Pk Height (A): 0.081
Blank Corrected Pk Area (A-s): 0.281
Concentration (ug/L): 182.0

Mean Conc (ug/L): 184.2 SD: 3.07 RSD(%): 1.67

Standard number 4 applied. [200.0]
Correlation coefficient: 0.99817 Slope: 0.0015


Display Calibration - C:\AA USER
.285
S4
S3
S2
S1
Nonlinear
0.0
Concentration
200.0

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Sb ID: ICV Seq. No.: 00153 A/S Pos.: 5 Date: 10/15/9

Replicate 1 Time: 10:38
Concentration (ug/L): 100.5

Replicate 2 Time: 10:41
Concentration (ug/L): 94.1

Mean Conc (ug/L): 97.3 SD: 4.54 RSD(%): 4.67

QC sample is within range 79.5 - 120.49

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Sb ID: ICB Seq. No.: 00154 A/S Pos.: 0 Date: 10/15/9

Replicate 1 Time: 10:45
Concentration (ug/L): 4.6

Replicate 2 Time: 10:48
Concentration (ug/L): 1.8

Mean Conc (ug/L): 3.2 SD: 1.95 RSD(%): 61.00

QC sample is within range -15.49 - 15.49

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Sb ID: 81002.B-1 Seq. No.: 00155 A/S Pos.: 6 Date: 10/15/

Replicate 1 Time: 10:51
Concentration (ug/L): 2.1

Replicate 2 Time: 10:54
Concentration (ug/L): -4.1

Mean Conc (ug/L): -1.0 SD: 4.36 RSD(%): 430.9

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Sb ID: 81002.8-1 Seq. No.: 00156 A/S Pos.: 7 Date: 10/15/9

Replicate 1 Time: 10:58
Concentration (ug/L): -0.3

Replicate 2 Time: 11:01
Concentration (ug/L): 4.8

Mean Conc (ug/L): 2.3 SD: 3.63 RSD(%): 159.0

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Sb ID: 81002.8-1 Seq. No.: 00157 A/S Pos.: 7 Date: 10/15/9

Replicate 1 Time: 11:04
Concentration (ug/L): 94.9

Replicate 2 Time: 11:08
Concentration (ug/L): 104.6

Mean Conc (ug/L): 99.7 SD: 6.85 RSD(%): 6.86
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Sb ID: 81003.I1 Seq. No.: 00183 A/S Pos.: 25 Date: 10/15/98

Replicate 1 Time: 13:54
Concentration (ug/L): 46.4

Replicate 2 Time: 13:57
Concentration (ug/L): 38.8

Mean Conc (ug/L): 42.6 SD: 5.39 RSD(%): 12.65

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Sb ID: 81003.I2 Seq. No.: 00184 A/S Pos.: 26 Date: 10/15/98

Replicate 1 Time: 14:01
Concentration (ug/L): 36.0

Replicate 2 Time: 14:04
Concentration (ug/L): 38.3

Mean Conc (ug/L): 37.2 SD: 1.65 RSD(%): 4.44

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Sb ID: 81003.I3 Seq. No.: 00185 A/S Pos.: 27 Date: 10/15/9

Replicate 1 Time: 14:07
Concentration (ug/L): 38.1

Replicate 2 Time: 14:10
Concentration (ug/L): 29.2

Mean Conc (ug/L): 33.7 SD: 6.29 RSD(%): 18.69

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Sb ID: CCV Seq. No.: 00186 A/S Pos.: 3 Date: 10/15/9

Replicate 1 Time: 14:14
Concentration (ug/L): 106.3

Replicate 2 Time: 14:17
Concentration (ug/L): 115.8

Mean Conc (ug/L): 111.0 SD: 6.72 RSD(%): 6.05

QC sample is within range 79.5 - 120.49

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Sb ID: CCB Seq. No.: 00187 A/S Pos.: 0 Date: 10/15/9

Replicate 1 Time: 14:20
Concentration (ug/L): 0.2

Replicate 2 Time: 14:23
Concentration (ug/L): -11.5

Mean Conc (ug/L): -5.7 SD: 8.29 RSD(%): 146.7

QC sample is within range -15.49 - 15.49
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Sb ID: 81006.1 Seq. No.: 00188 A/S Pos.: 28 Date: 10/15/9

Replicate 1 Time: 14:26
Concentration (ug/L): 0.4

Replicate 2 Time: 14:30
Concentration (ug/L): 6.0

Mean Conc (ug/L): 3.2 SD: 3.97 RSD(%): 122.5

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Sb ID: 81006.1 Seq. No.: 00189 A/S Pos.: 28 Date: 10/15/9

Replicate 1 Time: 14:33
Concentration (ug/L): 100.3

Replicate 2 Time: 14:36
Concentration (ug/L): 102.8

Mean Conc (ug/L): 101.5 SD: 1.82 RSD(%): 1.79

Recovery is 98.3%

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Sb ID: 81006.2 Seq. No.: 00190 A/S Pos.: 29 Date: 10/15/9

Replicate 1 Time: 14:40
Concentration (ug/L): -3.7

Replicate 2 Time: 14:43
Concentration (ug/L): -2.8

Mean Conc (ug/L): -3.2 SD: 0.63 RSD(%): 19.58

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Sb ID: 81006.3 Seq. No.: 00191 A/S Pos.: 30 Date: 10/15/

Replicate 1 Time: 14:46
Concentration (ug/L): 0.7

Replicate 2 Time: 14:49
Concentration (ug/L): 0.6

Mean Conc (ug/L): 0.6 SD: 0.08 RSD(%): 13.33

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Sb ID: CCV Seq. No.: 00192 A/S Pos.: 3 Date: 10/15/

Replicate 1 Time: 14:52
Concentration (ug/L): 98.8

Replicate 2 Time: 14:56
Concentration (ug/L): 103.1

Mean Conc (ug/L): 101.0 SD: 3.07 RSD(%): 3.04

QC sample is within range 79.5 - 120.49
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ih ID: CCB Seq. No.: 00193 A/S Pos.: 0 Date: 10/15/98

Time: 14:59

'eplicate 1
Concentration (ug/L): -6.7

Time: 15:02

'eplicate 2
Concentration (ug/L): -5.1

lean Conc (ug/L): -5.9 SD: 1.12 RSD(%): 18.88

QC sample is within range -15.49 - 15.49
~~~~~~

Element File: AS.GEL   Element: As   Wavelength: 193.7
Date: 10/20/98   Time: 09:30   Slit: 0.70 L
Data File: ID/Wt File: 81002.IDW   Lamp Current: 0
Technique: HGA   Calib. Type: Linear   Energy: 33

As   ID: BLANK   Seq. No.: 00104   A/S Pos.: 0   Date: 10/20/

Replicate 1   Time: 09:30
Peak Area (A-s): 0.007   Peak Height (A): 0.040
Background Pk Area (A-s): 0.135   Background Pk Height (A): 0.149
Blank Corrected Pk Area (A-s): 0.006
Concentration (ug/L): 2.60

Replicate 2   Time: 09:33
Peak Area (A-s): -0.010   Peak Height (A): 0.039
Background Pk Area (A-s): 0.130   Background Pk Height (A): 0.119
Blank Corrected Pk Area (A-s): -0.010
Concentration (ug/L): -4.07

Mean Conc (ug/L): -0.74   SD: 4.715   RSD(%): 639.0

Auto-zero performed.

As   ID: 10 PPB AS   Seq. No.: 00105   A/S Pos.: 1   Date: 10/20

Replicate 1   Time: 09:36
Peak Area (A-s): 0.026   Peak Height (A): 0.057
Background Pk Area (A-s): 0.129   Background Pk Height (A): 0.100
Blank Corrected Pk Area (A-s): 0.028
Concentration (ug/L): 11.24

Replicate 2   Time: 09:40
Peak Area (A-s): 0.026   Peak Height (A): 0.047
Background Pk Area (A-s): 0.114   Background Pk Height (A): 0.096
Blank Corrected Pk Area (A-s): 0.028
Concentration (ug/L): 11.26

Mean Conc (ug/L): 11.25   SD: 0.012   RSD(%): 0.11

Standard number 1 applied. [10.00]
Correlation coefficient: 1.00000   Slope: 0.0028

As   ID: 50 PPB AS   Seq. No.: 00106   A/S Pos.: 2   Date: 10/20

Replicate 1   Time: 09:43
Peak Area (A-s): 0.118   Peak Height (A): 0.208
Background Pk Area (A-s): 0.105   Background Pk Height (A): 0.094
Blank Corrected Pk Area (A-s): 0.119
Concentration (ug/L): 42.59

Replicate 2   Time: 09:46
Peak Area (A-s): 0.088   Peak Height (A): 0.175
Background Pk Area (A-s): 0.119   Background Pk Height (A): 0.112
Blank Corrected Pk Area (A-s): 0.090
Concentration (ug/L): 32.05

Mean Conc (ug/L): 37.32 SD: 7.451 RSD(%): 19.97

Standard number 2 applied. [50.00]
Correlation coefficient: 0.99324 Slope: 0.0021

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As ID: 100 PPB AS Seq. No.: 00107 A/S Pos.: 3 Date: 10/20/9

Replicate 1
Time: 09:49
Peak Area (A-s): 0.232
Peak Height (A): 0.362
Background Pk Area (A-s): 0.120
Background Pk Height (A): 0.085
Blank Corrected Pk Area (A-s): 0.234
Concentration (ug/L): 109.75

Replicate 2
Time: 09:53
Peak Area (A-s): 0.239
Peak Height (A): 0.428
Background Pk Area (A-s): 0.114
Background Pk Height (A): 0.084
Blank Corrected Pk Area (A-s): 0.241
Concentration (ug/L): 113.04

Mean Conc (ug/L): 111.40 SD: 2.326 RSD(%): 2.09

Standard number 3 applied. [100.00]
Correlation coefficient: 0.99591 Slope: 0.0023

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As ID: 200 PPB AS Seq. No.: 00108 A/S Pos.: 4 Date: 10/20/

Replicate 1
Time: 09:56
Peak Area (A-s): 0.429
Peak Height (A): 0.723
Background Pk Area (A-s): 0.121
Background Pk Height (A): 0.070
Blank Corrected Pk Area (A-s): 0.431
Concentration (ug/L): 185.23

Replicate 2
Time: 09:59
Peak Area (A-s): 0.449
Peak Height (A): 0.738
Background Pk Area (A-s): 0.121
Background Pk Height (A): 0.079
Blank Corrected Pk Area (A-s): 0.451
Concentration (ug/L): 194.04

Mean Conc (ug/L): 189.64 SD: 6.233 RSD(%): 3.29

Standard number 4 applied. [200.00]
Correlation coefficient: 0.99849 Slope: 0.0022

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As ID: 50 PPB AS Seq. No.: 00109 A/S Pos.: 2 Date: 10/20.

Replicate 1
Time: 10:09
Peak Area (A-s): 0.138
Peak Height (A): 0.222
Background Pk Area (A-s): 0.100
Background Pk Height (A): 0.068
Blank Corrected Pk Area (A-s): 0.139
Concentration (ug/L): 56.73

Replicate 2
Time: 10:12
Peak Area (A-s): 0.115
Peak Height (A): 0.199
Background Pk Area (A-s): 0.094
Background Pk Height (A): 0.064
Blank Corrected Pk Area (A-s): 0.117
Concentration (ug/L): 47.22
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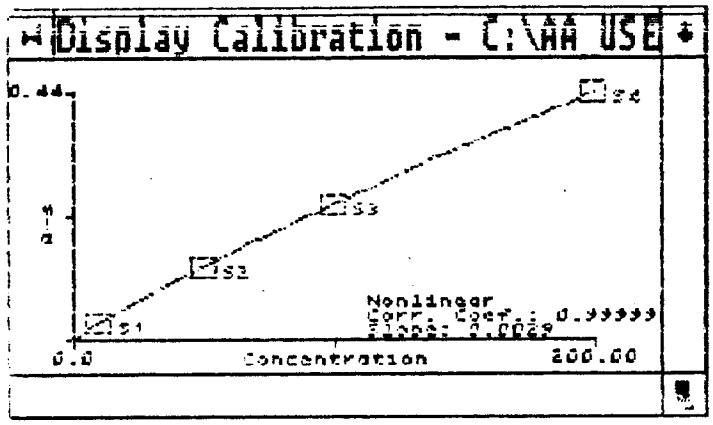
Mean Conc (ug/L): 51.95 SD: 6.724 RSD(%): 12.94

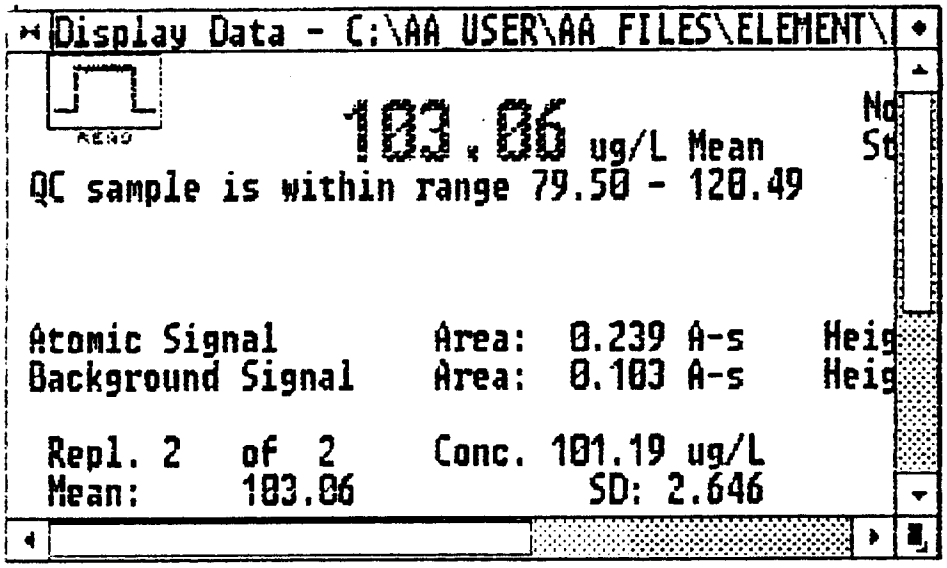
Standard number 2 applied. [50.00]
Correlation coefficient: 0.99999 Slope: 0.0029



As ID: [illegible] Sec. [illegible] AB Flag: [illegible] Date: [illegible]

Replicate 1 Time: [illegible]
Concentration ug/L : [illegible]

Time: [illegible]



As ID: ICB Seq. No.: 00111

Replicate 1 Time: 10:26
Concentration (ug/L): 0.98

Replicate 2 Time: 10:29
Concentration (ug/L): 3.21

Mean Conc (ug/L): 2.09 SD: 1.576 RSD(%): 75.35

QC sample is within range -5.49 - 5.49

As ID: 81003.RB-AP Seq. No.: 00112 A/S Pos.: 14 Date: 10/20/

Replicate 1 Time: 10:32
Concentration (ug/L): 3.39

Replicate 2 Time: 10:35
Concentration (ug/L): 0.24

Mean Conc (ug/L): 1.81 SD: 2.234 RSD(%): 123.0

As ID: 81003.RB-F Seq. No.: 00113 A/S Pos.: 15 Date: 10/20/

Replicate 1 Time: 10:39
Concentration (ug/L): -0.48

Replicate 2 Time: 10:42
Concentration (ug/L): -3.37

Mean Conc (ug/L): -1.93 SD: 2.048 RSD(%): 106.4

As ID: 81003.OB Seq. No.: 00114 A/S Pos.: 16 Date: 10/20/

Replicate 1 Time: 10:45
Concentration (ug/L): 0.75

Replicate 2 Time: 10:48
Concentration (ug/L): 3.06

Mean Conc (ug/L): 1.90 SD: 1.635 RSD(%): 85.9

As ID: 81003.UB Seq. No.: 00115 A/S Pos.: 17 Date: 10/20

Replicate 1 Time: 10:51
Concentration (ug/L): 3.46

Replicate 2 Time: 10:54
Concentration (ug/L): 0.78

Mean Conc (ug/L): 2.11 SD: 1.894 RSD(%): 89.2

As ID: 81003.I2 X5 Seq. No.: 00131 A/S Pos.: 26 Date: 10/20/

Replicate 1 Time: 12:35
Concentration (ug/L): 138.93

Replicate 2 Time: 12:39
Concentration (ug/L): 188.76

Mean Conc (ug/L): 163.63 SD: 35.236 RSD(%): 21.51

As ID: 81003.I3x5 Seq. No.: 00132 A/S Pos.: 27 Date: 10/20/

Replicate 1 Time: 12:42
Concentration (ug/L): 122.71

Replicate 2 Time: 12:45
Concentration (ug/L): 183.04

Mean Conc (ug/L): 152.82 SD: 42.660 RSD(%): 27.91

As ID: 81003.I3x5 Seq. No.: 00133 A/S Pos.: 27 Date: 10/20/

Replicate 1 Time: 12:49
Concentration (ug/L): 186.06

The signal is too large for the range of the electronics.
Replicate 2 Time: 12:52
Concentration (ug/L): --------

Mean Conc (ug/L): ---- SD: ---- RSD(%): ----

As ID: CCV Seq. No.: 00134 A/S Pos.: 3 Date: 10/20/

Replicate 1 Time: 13:01
Concentration (ug/L): 103.60

Replicate 2 Time: 13:04
Concentration (ug/L): 110.83

Mean Conc (ug/L): 107.21 SD: 5.116 RSD(%): 4.77

QC sample is within range 79.50 - 120.49

As ID: CCB Seq. No.: 00135 A/S Pos.: 0 Date: 10/20/

Replicate 1 Time: 13:07
Concentration (ug/L): 7.84

Replicate 2 Time: 13:11
Concentration (ug/L): 1.49

Mean Conc (ug/L): 4.63 SD: 4.488 RSD(%): 96.19

QC sample is within range -5.49 - 5.49

As ID: 81006.1x5 Seq. No.: 00136 A/S Pos.: 28 Date: 10/20/98

Replicate 1 Time: 13:14
Concentration (ug/L): 56.87

Replicate 2 Time: 13:17
Concentration (ug/L): 54.95

Mean Conc (ug/L): 55.91 SD: 1.355 RSD(%): 2.42

As ID: 81006.1x5 Seq. No.: 00137 A/S Pos.: 28 Date: 10/20/9

Replicate 1 Time: 13:20
Concentration (ug/L): 157.80

Replicate 2 Time: 13:24
Concentration (ug/L): 157.70

Mean Conc (ug/L): 157.75 SD: 0.074 RSD(%): 0.05

Recovery is 101.8%

As ID: 81006.2x5 Seq. No.: 00138 A/S Pos.: 29 Date: 10/20/9

Replicate 1 Time: 13:27
Concentration (ug/L): 45.94

Replicate 2 Time: 13:30
Concentration (ug/L): 46.76

Mean Conc (ug/L): 46.35 SD: 0.575 RSD(%): 1.24

As ID: 81006.3x5 Seq. No.: 00139 A/S Pos.: 30 Date: 10/20/9

Replicate 1 Time: 13:33
Concentration (ug/L): 39.42

Replicate 2 Time: 13:37
Concentration (ug/L): 39.41

Mean Conc (ug/L): 39.42 SD: 0.008 RSD(%): 0.02

As ID: CCV Seq. No.: 00140 A/S Pos.: 3 Date: 10/20/9

Replicate 1 Time: 13:40
Concentration (ug/L): 107.92

Replicate 2 Time: 13:43
Concentration (ug/L): 114.56

Mean Conc (ug/L): 111.23 SD: 4.696 RSD(%): 4.22

QC sample is within range 79.50 - 120.49

As ID: CCB Seq. No.: 00141 A/S Pos.: 0 Date: 10/20/

Replicate 1 Time: 13:46
Concentration (ug/L): 4.86

Replicate 2 Time: 13:50
Concentration (ug/L): 0.86

Mean Conc (ug/L): 2.84 SD: 2.824 RSD(%): 98.81

QC sample is within range -5.49 - 5.49

A 400 Analysis Ver. 4.10 Thu 10/15/98 - 11:06:51

d File Name: BA Replicates:3 Read Delay: 65
ks: BA ONLY Data File:

; file is 10236

ANDARD #1	BA455	EM	REPLICATE #1					1108 10/15/98	
			49						
ANDARD #1	BA455	EM	REPLICATE #2						
			53						
ANDARD #1	BA455	EM	REPLICATE #3						
			60				peak-noisy		
	BA455	AV	54.0	SD	5.6	CV	10.3	CONC	0.0200
ANDARD #2	BA455	EM	REPLICATE #1					1111 10/15/98	
			788						
ANDARD #2	BA455	EM	REPLICATE #2						
			709						
ANDARD #2	BA455	EM	REPLICATE #3						
			719						
	BA455	AV	738.7	SD	43.0	CV	5.8	CONC	0.5000
ANDARD #3	BA455	EM	REPLICATE #1					1113 10/15/98	
			1410						
ANDARD #3	BA455	EM	REPLICATE #2						
			1360						
ANDARD #3	BA455	EM	REPLICATE #3						
			1420						
	BA455	AV	1396.7	SD	32.1	CV	2.3	CONC	1.0000
ANDARD #4	BA455	EM	REPLICATE #1					1115 10/15/98	
			2707						
ANDARD #4	BA455	EM	REPLICATE #2						
			2803						
ANDARD #4	BA455	EM	REPLICATE #3						
			2751						
	BA455	AV	2753.7	SD	48.1	CV	1.7	CONC	2.0000
ANK	BA455	EM	REPLICATE #1					1117 10/15/98	
			36						
ANK	BA455	EM	REPLICATE #2						
			26						

TINR REPLICATE #3
BA455 EM 34

BA455 AV 32.0 SD 5.3 CV 16.5 CONC 0.0000

BA455 CC 0.9999 SLOPE 1360.5981 INT 37.1389

V REPLICATE #1 1119 10/15/98
BA455 EM 1358 0.9708 mg/L

V REPLICATE #2
BA455 EM 1360 0.9723 mg/L

V REPLICATE #3
BA455 EM 1342 0.9590 mg/L

BA455 AV 1353.3 EM SD 9.9 CV 0.7

BA455 AV 0.9674 mg/L SD 0.0073 CV 0.75

B REPLICATE #1 1121 10/15/98
BA455 EM 39 0.0014 mg/L peak-noisy

B REPLICATE #2
BA455 EM 37 -0.0001 mg/L peak-noisy

B REPLICATE #3
BA455 EM 34 -0.0023 mg/L peak-noisy

BA455 AV 36.7 EM SD 2.5 CV 6.9

BA455 AV -0.0003 mg/L SD 0.0018 CV 532.91

002.B-1 REPLICATE #1 1123 10/15/98
BA455 EM 999 0.7069 mg/L

002.B-1 REPLICATE #2
BA455 EM 1009 0.7143 mg/L

002.B-1 REPLICATE #3
BA455 EM 1039 0.7363 mg/L

BA455 AV 1015.7 EM SD 20.8 CV 2.0

BA455 AV 0.7192 mg/L SD 0.0153 CV 2.13

·1X2 REPLICATE #1 1125 10/15/98
BA455 EM 572 0.3931 mg/L

·1X2 REPLICATE #2
BA455 EM 596 0.4107 mg/L

·1X2 REPLICATE #3
BA455 EM 584 0.4019 mg/L

BA455 AV 584.0 EM SD 12.0 CV 2.1

BA455 AV 0.4019 mg/L SD 0.0088 CV 2.19

·1X2S REPLICATE #1 1127 10/15/98
BA455 EM 1330 0.9502 mg/L

·1X2S REPLICATE #2

REPLICATE #3

BA455 EM 54 0.0124 mg/L peak-noisy

BA455 AV 55.0 EM SD 1.0 CV 1.8

BA455 AV 0.0131 mg/L SD 0.0007 CV 5.60

REPLICATE #1 1221 10/15/98

BA455 EM 402 0.2682 mg/L

L REPLICATE #2

BA455 EM 431 0.2895 mg/L

L REPLICATE #3

BA455 EM 398 0.2652 mg/L

BA455 AV 410.3 EM SD 18.0 CV 4.4

BA455 AV 0.2743 mg/L SD 0.0132 CV 4.83

2 REPLICATE #1 1223 10/15/98

BA455 EM 523 0.3571 mg/L

2 REPLICATE #2

BA455 EM 536 0.3666 mg/L

2 REPLICATE #3

BA455 EM 510 0.3475 mg/L

BA455 AV 523.0 EM SD 13.0 CV 2.5

BA455 AV 0.3571 mg/L SD 0.0096 CV 2.68

3 REPLICATE #1 1225 10/15/98

BA455 EM 408 0.2726 mg/L

3 REPLICATE #2

BA455 EM 455 0.3071 mg/L

3 REPLICATE #3

BA455 EM 406 0.2711 mg/L

BA455 AV 423.0 EM SD 27.7 CV 6.6

BA455 AV 0.2836 mg/L SD 0.0204 CV 7.19

>V REPLICATE #1 1227 10/15/98

BA455 EM 1515 1.0862 mg/L

>V REPLICATE #2

BA455 EM 1611 1.1567 mg/L

>V REPLICATE #3

BA455 EM 1498 1.0737 mg/L

BA455 AV 1541.3 EM SD 60.9 CV 4.0

BA455 AV 1.1055 mg/L SD 0.0448 CV 4.05

>B REPLICATE #1 1230 10/15/98

BA455 EM 42 0.0036 mg/L peak-noisy

>B REPLICATE #2

BA455 EM 41 0.0028 mg/L peak-noisy

BA455 EM 39 0.0014 mg/L peak-noisy

BA455 AV 40.7 EM SD 1.5 CV 3.8

BA455 AV 0.0026 mg/L SD 0.0011 CV 43.30

006-1 REPLICATE #1 1232 10/15/98
BA455 EM 813 0.5702 mg/L

006-1 REPLICATE #2
BA455 EM 835 0.5864 mg/L

006-1 REPLICATE #3
BA455 EM 824 0.5783 mg/L

BA455 AV 824.0 EM SD 11.0 CV 1.3

BA455 AV 0.5783 mg/L SD 0.0081 CV 1.40

REPLICATE #1 1234 10/15/98
BA455 EM 1841 1.3258 mg/L

REPLICATE #2
BA455 EM 1996 1.4397 mg/L

REPLICATE #3
BA455 EM 1899 1.3684 mg/L

BA455 AV 1912.0 EM SD 78.3 CV 4.1

BA455 AV 1.3780 mg/L SD 0.0576 CV 4.18

REPLICATE #1 1236 10/15/98
BA455 EM 1079 0.7657 mg/L

REPLICATE #2
BA455 EM 1024 0.7253 mg/L

REPLICATE #3
BA455 EM 1160 0.8253 mg/L

BA455 AV 1087.7 EM SD 68.4 CV 6.3

BA455 AV 0.7721 mg/L SD 0.0503 CV 6.51

REPLICATE #1 1238 10/15/98
BA455 EM 1034 0.7327 mg/L

REPLICATE #2
BA455 EM 1058 0.7503 mg/L

REPLICATE #3
BA455 EM 1038 0.7356 mg/L

BA455 AV 1043.3 EM SD 12.9 CV 1.2

BA455 AV 0.7395 mg/L SD 0.0095 CV 1.28

REPLICATE #1 1240 10/15/98
BA455 EM 836 0.5871 mg/L

REPLICATE #2
BA455 EM 853 0.5996 mg/L

REPLICATE #3

	BA455	AV	847.3 EM	SD	9.8	CV	1.2	
	BA455	AV	0.5955 mg/L	SD	0.0072	CV	1.21	

:V REPLICATE #1 1242 10/15/98

BA455	EM	1508	1.0810 mg/L

:V REPLICATE #2

BA455	EM	1531	1.0979 mg/L

:V REPLICATE #3

BA455	EM	1501	1.0759 mg/L

	BA455	AV	1513.3 EM	SD	15.7	CV	1.0	
	BA455	AV	1.0850 mg/L	SD	0.0115	CV	1.06	

:B REPLICATE #1 1244 10/15/98

BA455	EM	39	0.0014 mg/L	peak-noisy

:B REPLICATE #2

BA455	EM	41	0.0028 mg/L	peak-noisy

:B REPLICATE #3

BA455	EM	35	-0.0016 mg/L	peak-noisy

	BA455	AV	38.3 EM	SD	3.1	CV	8.0	
	BA455	AV	0.0009 mg/L	SD	0.0022	CV	255.78	

```
---------------------------------------------------------------------------
iement File: BE.GEL          Element: Be                    Wavelength: 234.9
ate: 10/22/98                Time: 16:30                    Slit: 0.7 L
ata File:                    ID/Wt File: 81013.IDW          Lamp Current: 30
echnique: HGA                Calib. Type: Linear            Energy: 65
---------------------------------------------------------------------------
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
e    ID: BLANK               Seq. No.: 00050    A/S Pos.: 0     Date: 10/22/9

eplicate  1                              Time: 16:30
eak Area (A-s): -0.003                   Peak Height (A): 0.003
ackground Pk Area (A-s): 0.550           Background Pk Height (A): 0.195
lank Corrected Pk Area (A-s): -0.006
oncentration (ug/L  ): -0.37

eplicate  2                              Time: 16:33
eak Area (A-s): -0.003                   Peak Height (A): 0.002
ackground Pk Area (A-s): 0.288           Background Pk Height (A): 0.101
lank Corrected Pk Area (A-s): -0.006
oncentration (ug/L  ): -0.36

ean Conc  (ug/L  ):       -0.37          SD: 0.005                RSD(%): 1.39

uto-zero performed.

~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
e    ID: 0.5 PPB             Seq. No.: 00051    A/S Pos.: 1     Date: 10/22/9

eplicate  1                              Time: 16:36
eak Area (A-s): 0.008                    Peak Height (A): 0.023
ackground Pk Area (A-s): 0.180           Background Pk Height (A): 0.122
lank Corrected Pk Area (A-s): 0.011
oncentration (ug/L  ): 0.68

eplicate  2                              Time: 16:40
eak Area (A-s): 0.010                    Peak Height (A): 0.029
ackground Pk Area (A-s): 0.149           Background Pk Height (A): 0.121
lank Corrected Pk Area (A-s): 0.013
oncentration (ug/L  ): 0.79

ean Conc  (ug/L  ):        0.73          SD: 0.079                RSD(%): 10.74

tandard number 1 applied.  [0.50]
orrelation coefficient: 1.00000          Slope: 0.0237

~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
e    ID: 2 PPB               Seq. No.: 00052    A/S Pos.: 2     Date: 10/22/99

eplicate  1                              Time: 16:43
eak Area (A-s): 0.039                    Peak Height (A): 0.096
ackground Pk Area (A-s): 0.186           Background Pk Height (A): 0.245
lank Corrected Pk Area (A-s): 0.042
oncentration (ug/L  ): 1.76

eplicate  2                              Time: 16:46
eak Area (A-s): 0.041                    Peak Height (A): 0.118
ackground Pk Area (A-s): 0.182           Background Pk Height (A): 0.276
lank Corrected Pk Area (A-s): 0.044
oncentration (ug/L  ): 1.87
```

ean Conc (ug/L): 1.81 SD: 0.082 RSD(%): 4.52

tandard number 2 applied. [2.00]
orrelation coefficient: 0.99891 Slope: 0.0216

---

e ID: 5 PPB Seq. No.: 00053 A/S Pos.: 3 Date: 10/22/98

eplicate 1 Time: 16:49
eak Area (A-s): 0.100 Peak Height (A): 0.255
ackground Pk Area (A-s): 0.305 Background Pk Height (A): 0.632
lank Corrected Pk Area (A-s): 0.103
oncentration (ug/L): 4.76

eplicate 2 Time: 16:52
eak Area (A-s): 0.103 Peak Height (A): 0.250
ackground Pk Area (A-s): 0.297 Background Pk Height (A): 0.630
lank Corrected Pk Area (A-s): 0.106
oncentration (ug/L): 4.88

ean Conc (ug/L): 4.82 SD: 0.085 RSD(%): 1.77

tandard number 3 applied. [5.00]
orrelation coefficient: 0.99966 Slope: 0.0210

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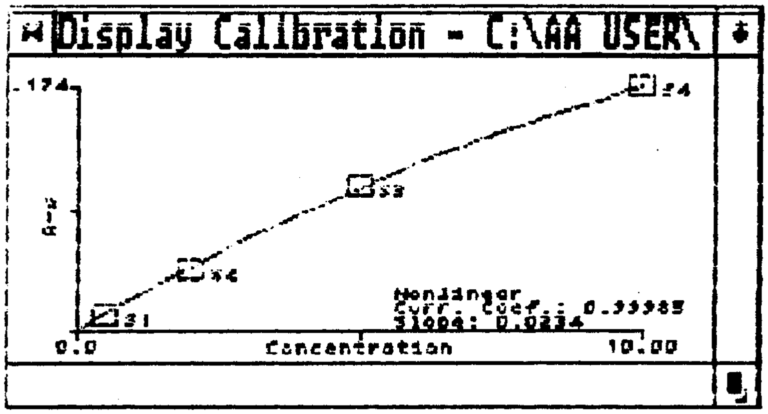
e ID: 10 PPB Seq. No.: 00054 A/S Pos.: 4 Date: 10/22/98

eplicate 1 Time: 16:55
eak Area (A-s): 0.173 Peak Height (A): 0.286
ackground Pk Area (A-s): 0.505 Background Pk Height (A): 1.139
lank Corrected Pk Area (A-s): 0.176
oncentration (ug/L): 8.39

eplicate 2 Time: 16:58
eak Area (A-s): 0.170 Peak Height (A): 0.268
ackground Pk Area (A-s): 0.500 Background Pk Height (A): 1.194
lank Corrected Pk Area (A-s): 0.173
oncentration (ug/L): 8.23

ean Conc (ug/L): 8.31 SD: 0.113 RSD(%): 1.36

tandard number 4 applied. [10.00]
orrelation coefficient: 0.99183 Slope: 0.0184



~~~~~~

e ID: ICV Seq. No.: 00055 A/S Pos.: 5 Date: 10/22/9

eplicate 1 Time: 17:05
oncentration (ug/L): 5.12

eplicate 2 Time: 17:08
oncentration (ug/L): 5.01

ean Conc (ug/L): 5.07 SD: 0.077 RSD(%): 1.51

C sample is within range 3.5 - 6.49

~~~~~~

e ID: ICB Seq. No.: 00056 A/S Pos.: 0 Date: 10/22/98

eplicate 1 Time: 17:11
oncentration (ug/L): 0.16

eplicate 2 Time: 17:14
oncentration (ug/L): 0.16

ean Conc (ug/L): 0.16 SD: 0.002 RSD(%): 1.25

C sample is within range -1.49 - 1.49

uto-zero performed.

~~~~~~

e ID: 81003.RB-AP Seq. No.: 00057 A/S Pos.: 14 Date: 10/22/'

eplicate 1 Time: 17:17
oncentration (ug/L): -0.01

eplicate 2 Time: 17:20
oncentration (ug/L): -0.02

ean Conc (ug/L): -0.02 SD: 0.008 RSD(%): 44.56

~~~~~~

e ID: 81003.RB-F Seq. No.: 00058 A/S Pos.: 15 Date: 10/22/9

eplicate 1 Time: 17:24

~~~~~~

3e ID: CCV Seq. No.: 00074 A/S Pos.: 3 Date: 10/22/9

Replicate 1 Time: 19:04
Concentration (ug/L): 5.36

Replicate 2 Time: 19:07
Concentration (ug/L): 4.95

Mean Conc (ug/L): 5.15 SD: 0.297 RSD(%): 5.75

QC sample is within range 3.5 - 6.49

~~~~~~

3e ID: CCB Seq. No.: 00075 A/S Pos.: 0 Date: 10/22/9

Replicate 1 Time: 19:10
Concentration (ug/L): 0.06

Replicate 2 Time: 19:13
Concentration (ug/L): 0.03

Mean Conc (ug/L): 0.05 SD: 0.021 RSD(%): 44.39

QC sample is within range -1.49 - 1.49

~~~~~~

3e ID: 81006.1 Seq. No.: 00076 A/S Pos.: 28 Date: 10/22/9

Replicate 1 Time: 19:16
Concentration (ug/L): 6.62

Replicate 2 Time: 19:19
Concentration (ug/L): 7.39

Mean Conc (ug/L): 7.00 SD: 0.546 RSD(%): 7.80

~~~~~~

3e ID: 81006.1 Seq. No.: 00077 A/S Pos.: 28 Date: 10/22/9

Replicate 1 Time: 19:22
Concentration (ug/L): 9.59

Replicate 2 Time: 19:26
Concentration (ug/L): 10.54

Mean Conc (ug/L): 10.05 SD: 0.671 RSD(%): 6.66

Recovery is 61.1%

~~~~~~

3e ID: 81006.2 Seq. No.: 00078 A/S Pos.: 29 Date: 10/22/9

Replicate 1 Time: 19:29
Concentration (ug/L): 7.16

Replicate 2 Time: 19:32
Concentration (ug/L): 7.66
~~~~~~

lean Conc (ug/L): 7.40 SD: 0.355 RSD(%): 4.79

~~~~~~

Se ID: 81006.3 Seq. No.: 00079 A/S Pos.: 30 Date: 10/22/'

Replicate 1 Time: 19:35
Concentration (ug/L): 7.51

Replicate 2 Time: 19:38
Concentration (ug/L): 7.53

Mean Conc (ug/L): 7.52 SD: 0.017 RSD(%): 0.22

~~~~~~

Se ID: CCV Seq. No.: 00080 A/S Pos.: 3 Date: 10/22/.

Replicate 1 Time: 19:41
Concentration (ug/L): 5.06

Replicate 2 Time: 19:44
Concentration (ug/L): 5.09

Mean Conc (ug/L): 5.07 SD: 0.023 RSD(%): 0.45

QC sample is within range 3.5 - 6.49

~~~~~~

Se ID: CCB Seq. No.: 00081 A/S Pos.: 0 Date: 10/22/

Replicate 1 Time: 19:47
Concentration (ug/L): 0.07

Replicate 2 Time: 19:50
Concentration (ug/L): 0.08

Mean Conc (ug/L): 0.08 SD: 0.005 RSD(%): 6.00

QC sample is within range -1.49 - 1.49
~~~~~~

MAIN: 0.001	AA HO 0.001		MAIN: 0.000	AA HO-0.000	
CD	MEAN: 0.000	SD: 0.000	RSD: 80.4	AUTOZERO	0.000

MAIN: 0.017	AA HO 0.017		MAIN: 0.016	AA HO 0.016	
CD	MEAN: 0.016	SD: 0.000	RSD: 2.6	1.STANDARD	0.050 MG/L

MAIN: 0.097 MG/L	AA HO 0.032		MAIN: 0.098 MG/L	AA HO 0.032	
CD	MEAN: 0.098 MG/L	SD: 0.001	RSD: 1.0	2.STANDARD	0.100 MG/L

MAIN: 0.197 MG/L	AA HO 0.063		MAIN: 0.199 MG/L	AA HO 0.064	
CD	MEAN: 0.198 MG/L	SD: 0.002	RSD: 0.8	3.STANDARD	0.200 MG/L

MAIN: 0.477 MG/L	AA HO 0.152		MAIN: 0.471 MG/L	AA HO 0.150	
CD	MEAN: 0.474 MG/L	SD: 0.005	RSD: 1.0	4.STANDARD	0.495 MG/L

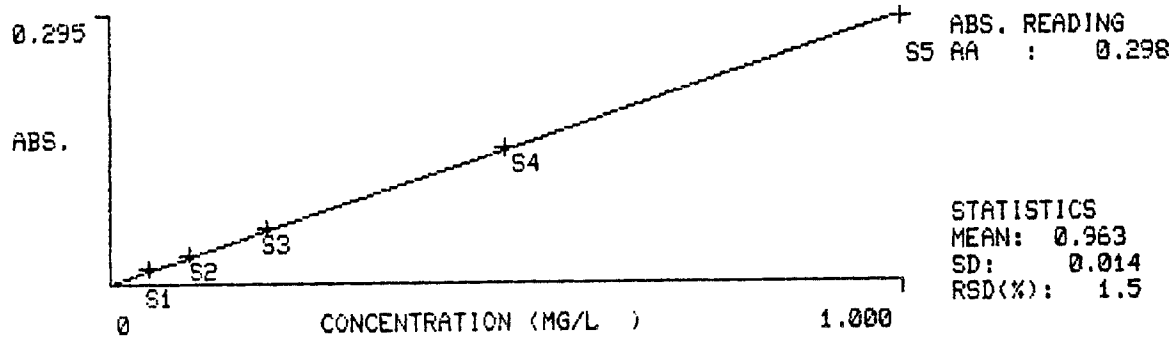
MAIN: 0.953 MG/L	AA HO 0.291		MAIN: 0.974 MG/L	AA HO 0.298	
CD	MEAN: 0.963 MG/L	SD: 0.014	RSD: 1.5	5.STANDARD	0.991 MG/L

FLAME DISPLAY CALIBRATION MODE
ELEMENT: CD

PRINTER: ON
BG CORR: OFF
UNITS : MG/L

0.991

REPL. 0 OF 2



C2H2: 2.5 L/MIN OXIDANT: 8.0 L/MIN FLAME: C2H2-AIR

MAIN: 0.008 MG/L	AA HO 0.000		MAIN: 0.008 MG/L	AA HO 0.000	
CD	MEAN: 0.008 MG/L	SD: 0.000	RSD: 1.5	AUTOZERO	0.000

MAIN: 0.520 MG/L	HO 0.155 (AA)		MAIN: 0.524 MG/L	HO 0.156 (AA)	
CD ICV	MEAN: 0.522 MG/L	SD: 0.002	RSD: 0.5		
MAIN: 0.003 MG/L	HO 0.001 (AA)		MAIN: 0.003 MG/L	HO 0.001 (AA)	
CD ICB	MEAN: 0.003 MG/L	SD: 0.001	RSD: 22.1		
MAIN: 0.004 MG/L	HO 0.001 (AA)		MAIN: 0.003 MG/L	HO 0.001 (AA)	
CD Set Ø	MEAN: 0.004 MG/L	SD: 0.001	RSD: 18.5	AUTOZERO	0.000
MAIN: 0.020 MG/L	HO 0.006 (AA)		MAIN: 0.019 MG/L	HO 0.006 (AA)	
1002 CD B-1	MEAN: 0.020 MG/L	SD: 0.001	RSD: 3.6		
MAIN: 0.012 MG/L	HO 0.004 (AA)		MAIN: 0.013 MG/L	HO 0.004 (AA)	
CD 8-1	MEAN: 0.013 MG/L	SD: 0.001	RSD: 6.0		
MAIN: 0.414 MG/L	HO 0.123 (AA)		MAIN: 0.418 MG/L	HO 0.124 (AA)	
CD 8-1S	MEAN: 0.416 MG/L	SD: 0.003	RSD: 0.6		
MAIN: 0.017 MG/L	HO 0.005 (AA)		MAIN: 0.018 MG/L	HO 0.005 (AA)	
CD 9-1	MEAN: 0.017 MG/L	SD: 0.000	RSD: 2.8		
MAIN: 0.018 MG/L	HO 0.005 (AA)		MAIN: 0.017 MG/L	HO 0.005 (AA)	
CD 9-1D	MEAN: 0.017 MG/L	SD: 0.000	RSD: 2.6		
MAIN: 0.021 MG/L	HO 0.006 (AA)		MAIN: 0.021 MG/L	HO 0.006 (AA)	
CD 10-1	MEAN: 0.021 MG/L	SD: 0.000	RSD: 2.3		
MAIN: 0.024 MG/L	HO 0.007 (AA)		MAIN: 0.026 MG/L	HO 0.008 (AA)	
CD B-2A	MEAN: 0.025 MG/L	SD: 0.001	RSD: 3.9		

MAIN:	0.016 MG/L	AA HO 0.005	MAIN:	0.017 MG/L	AA HO 0.005
CD U2	MEAN: 0.016 MG/L	SD: 0.001 RSD: 7.0			
MAIN:	0.011 MG/L	AA HO 0.003	MAIN:	0.012 MG/L	AA HO 0.003
CD U3	MEAN: 0.011 MG/L	SD: 0.001 RSD: 5.9			
MAIN:	0.499 MG/L	AA HO 0.148	MAIN:	0.500 MG/L	AA HO 0.149
CD CCV	MEAN: 0.500 MG/L	SD: 0.001 RSD: 0.2			
MAIN:	0.001 MG/L	AA HO 0.000	MAIN:	0.002 MG/L	AA HO 0.001
CD CCB	MEAN: 0.002 MG/L	SD: 0.001 RSD: 35.5			
MAIN:	0.030 MG/L	AA HO 0.009	MAIN:	0.030 MG/L	AA HO 0.009
CD I1	MEAN: 0.030 MG/L	SD: 0.000 RSD: 0.6			
MAIN:	0.415 MG/L	AA HO 0.123	MAIN:	0.421 MG/L	AA HO 0.125
CD ILS	MEAN: 0.418 MG/L	SD: 0.004 RSD: 0.9			
MAIN:	0.038 MG/L	AA HO 0.011	MAIN:	0.038 MG/L	AA HO 0.011
CD I2	MEAN: 0.038 MG/L	SD: 0.000 RSD: 0.9			
MAIN:	0.041 MG/L	AA HO 0.012	MAIN:	0.044 MG/L	AA HO 0.013
CD I3	MEAN: 0.043 MG/L	SD: 0.002 RSD: 5.3			
MAIN:	0.024 MG/L	AA HO 0.007	MAIN:	0.026 MG/L	AA HO 0.008
CD 1	MEAN: 0.025 MG/L	SD: 0.001 RSD: 5.8			
MAIN:	0.412 MG/L	AA HO 0.122	MAIN:	0.406 MG/L	AA HO 0.121
CD 1S	MEAN: 0.409 MG/L	SD: 0.005 RSD: 1.1			

MAIN:	0.020 MG/L	AA HO 0.006	MAIN:	0.020 MG/L	AA HO 0.006
CD 2	MEAN: 0.020 MG/L	SD: 0.000 RSD: 0.1			
MAIN:	0.018 MG/L	AA HO 0.005	MAIN:	0.018 MG/L	AA HO 0.005
CD 2D	MEAN: 0.018 MG/L	SD: 0.000 RSD: 0.8			
MAIN:	0.025 MG/L	AA HO 0.007	MAIN:	0.025 MG/L	AA HO 0.007
CD 3	MEAN: 0.025 MG/L	SD: 0.000 RSD: 0.1			
MAIN:	0.511 MG/L	AA HO 0.152	MAIN:	0.514 MG/L	AA HO 0.153
CD CCV	MEAN: 0.513 MG/L	SD: 0.002 RSD: 0.5			
MAIN:	0.005 MG/L	AA HO 0.002	MAIN:	0.005 MG/L	AA HO 0.001
CD CCB	MEAN: 0.005 MG/L	SD: 0.000 RSD: 7.0			

1A 400 Analysis Ver. 4.10 Mon 10/19/98 - 14:34:28

d File Name: CR Replicates:4 Read Delay: 65
ks: CR ONLY Data File:

; file is 1036

ANDARD #1 REPLICATE #1 1437 10/19/98
cr267 EM 819

ANDARD #1 REPLICATE #2
cr267 EM 733

ANDARD #1 REPLICATE #3
cr267 EM 738

ANDARD #1 REPLICATE #4
cr267 EM 742 peak-noisy

cr267 AV 758.0 SD 40.8 CV 5.4 CONC 0.1000

ANDARD #2 REPLICATE #1 1439 10/19/98
cr267 EM 3063

ANDARD #2 REPLICATE #2
cr267 EM 3043

ANDARD #2 REPLICATE #3
cr267 EM 2965

ANDARD #2 REPLICATE #4
cr267 EM 3123

cr267 AV 3048.5 SD 65.2 CV 2.1 CONC 1.0000

ANDARD #3 REPLICATE #1 1441 10/19/98
cr267 EM 6422

ANDARD #3 REPLICATE #2
cr267 EM 5739

ANDARD #3 REPLICATE #3
cr267 EM 5782

ANDARD #3 REPLICATE #4
cr267 EM 5498

cr267 AV 5860.3 SD 394.8 CV 6.7 CONC 2.0000

ANDARD #4 REPLICATE #1 1443 10/19/98
cr267 EM 13437

ANDARD #4 REPLICATE #2
cr267 EM 13568

ANDARD #4 REPLICATE #3

ANDARD #4 REPLICATE #4
cr267 EM 13968

cr267 AV 13549.8 SD 312.4 CV 2.3 CONC 5.0000

ANK REPLICATE #1 1445 10/19/98
cr267 EM 587

ANK REPLICATE #2
cr267 EM 694

ANK REPLICATE #3
cr267 EM 580

ANK REPLICATE #4
cr267 EM 552

cr267 AV 603.3 SD 62.4 CV 10.3 CONC 0.0000

cr267 CC 0.9999 SLOPE 2605.7290 INT 542.6687

✓ REPLICATE #1 1447 10/19/98
cr267 EM 5227 1.7977 mg/L

✓ REPLICATE #2
cr267 EM 5265 1.8123 mg/L

✓ REPLICATE #3
cr267 EM 5353 1.8461 mg/L

✓ REPLICATE #4
cr267 EM 5384 1.8580 mg/L

cr267 AV 5307.3 EM SD 73.5 CV 1.4

cr267 AV 1.8285 mg/L SD 0.0282 CV 1.54

B REPLICATE #1 1449 10/19/98
cr267 EM 493 -0.0191 mg/L peak-noisy

B REPLICATE #2
cr267 EM 493 -0.0191 mg/L peak-noisy

B REPLICATE #3
cr267 EM 482 -0.0233 mg/L peak-noisy

B REPLICATE #4
cr267 EM 560 0.0067 mg/L peak-noisy

cr267 AV 507.0 EM SD 35.7 CV 7.0

cr267 AV -0.0137 mg/L SD 0.0137 CV 100.12

003.01 REPLICATE #1 1451 10/19/98
cr267 EM 479 -0.0244 mg/L peak-noisy

003.01 REPLICATE #2
cr267 EM 497 -0.0175 mg/L peak-noisy

003.01 REPLICATE #3
cr267 EM 521 -0.0083 mg/L

cr267 AV 0.0968 mg/L SD 0.0097 CV 9.98

REPLICATE #1 1508 10/19/98
cr267 EM 692 0.0573 mg/L

REPLICATE #2
cr267 EM 724 0.0696 mg/L

REPLICATE #3
cr267 EM 687 0.0554 mg/L

REPLICATE #4
cr267 EM 780 0.0911 mg/L

cr267 AV 720.8 EM SD 42.8 CV 5.9

cr267 AV 0.0683 mg/L SD 0.0164 CV 24.01

V REPLICATE #1 1510 10/19/98
cr267 EM 6026 2.1043 mg/L

V REPLICATE #2
cr267 EM 6188 2.1665 mg/L

V REPLICATE #3
cr267 EM 6083 2.1262 mg/L

V REPLICATE #4
cr267 EM 6012 2.0990 mg/L

cr267 AV 6077.3 EM SD 80.0 CV 1.3

cr267 AV 2.1240 mg/L SD 0.0307 CV 1.44

B REPLICATE #1 1512 10/19/98
cr267 EM 546 0.0013 mg/L

B REPLICATE #2
cr267 EM 516 -0.0102 mg/L

B REPLICATE #3
cr267 EM 516 -0.0102 mg/L peak-noisy

B REPLICATE #4
cr267 EM 495 -0.0183 mg/L peak-noisy

cr267 AV 518.3 EM SD 21.0 CV 4.0

cr267 AV -0.0094 mg/L SD 0.0081 CV 85.93

006.1 REPLICATE #1 1514 10/19/98
cr267 EM 1414 0.3344 mg/L

006.1 REPLICATE #2
cr267 EM 1402 0.3298 mg/L

006.1 REPLICATE #3
cr267 EM 1396 0.3275 mg/L

006.1 REPLICATE #4
cr267 EM 1508 0.3705 mg/L

cr267 AV 1430.0 EM SD 52.5 CV 3.7

cr267 AV 0.3405 mg/L SD 0.0202 CV 5.92

2, 2D, 3, 3S

REPLICATE #1 1516 10/19/98

cr267 EM 1135 0.2273 mg/L

REPLICATE #2

cr267 EM 1076 0.2047 mg/L

REPLICATE #3

cr267 EM 1095 0.2120 mg/L

REPLICATE #4

cr267 EM 1081 0.2066 mg/L

cr267 AV 1096.8 EM SD 26.7 CV 2.4

cr267 AV 0.2126 mg/L SD 0.0103 CV 4.83

REPLICATE #1 1518 10/19/98

cr267 EM 1044 0.1924 mg/L

REPLICATE #2

cr267 EM 2D 1080 0.2062 mg/L

REPLICATE #3

cr267 EM 1108 0.2170 mg/L

REPLICATE #4

cr267 EM 1105 0.2158 mg/L

cr267 AV 1084.3 EM SD 29.6 CV 2.7

cr267 AV 0.2078 mg/L SD 0.0114 CV 5.47

REPLICATE #1 1520 10/19/98

cr267 EM 1098 0.2131 mg/L

REPLICATE #2

cr267 EM 1104 0.2154 mg/L

REPLICATE #3

cr267 EM 3 1147 0.2319 mg/L

REPLICATE #4

cr267 EM 1062 0.1993 mg/L

cr267 AV 1102.8 EM SD 34.8 CV 3.2

cr267 AV 0.2149 mg/L SD 0.0134 CV 6.22

REPLICATE #1 1522 10/19/98

cr267 EM 5037 1.7248 mg/L

REPLICATE #2

cr267 EM 4910 1.6760 mg/L

REPLICATE #3

cr267 EM 3S 5089 1.7447 mg/L

REPLICATE #4

cr267 EM 5151 1.7685 mg/L

cr267 AV 5046.8 EM SD 102.4 CV 2.0

cr267 AV 1.7285 mg/L SD 0.0393 CV 2.27

			REPLICATE #1		1524 10/19/98
cr267	EM	5695	1.9773 mg/L		
			REPLICATE #2		
cr267	EM	5877	2.0472 mg/L		
			REPLICATE #3		
cr267	EM	6603	2.3258 mg/L		
			REPLICATE #4		
cr267	EM	5959	2.0786 mg/L		

cr267 AV 6033.5 EM SD 395.4 CV 6.6

cr267 AV 2.1072 mg/L SD 0.1517 CV 7.20

B			REPLICATE #1		1525 10/19/98
cr267	EM	512	-0.0118 mg/L	peak-noisy	
B			REPLICATE #2		
cr267	EM	487	-0.0214 mg/L	peak-noisy	
B			REPLICATE #3		
cr267	EM	508	-0.0133 mg/L	peak-noisy	
B			REPLICATE #4		
cr267	EM	522	-0.0079 mg/L	window-edge	

cr267 AV 507.3 EM SD 14.7 CV 2.9

cr267 AV -0.0136 mg/L SD 0.0057 CV 41.58

			REPLICATE #1		1527 10/19/98
cr267	EM	547	0.0017 mg/L	peak-noisy	
			REPLICATE #2		
cr267	EM	551	0.0032 mg/L	window-edge	
			REPLICATE #3		
cr267	EM	548	0.0020 mg/L	peak-noisy	
			REPLICATE #4		
cr267	EM	541	-0.0006 mg/L	peak-noisy	

cr267 AV 546.8 EM SD 4.2 CV 0.8

cr267 AV 0.0016 mg/L SD 0.0016 CV 102.74

MPLE #23			REPLICATE #1		1529 10/19/98
cr267	EM	543	0.0001 mg/L	window-edge	
MPLE #23			REPLICATE #2		
cr267	EM	534	-0.0033 mg/L	peak-noisy	
MPLE #23			REPLICATE #3		
cr267	EM	575	0.0124 mg/L	peak-noisy	
MPLE #23			REPLICATE #4		
cr267	EM	541	-0.0006 mg/L	peak-noisy	

cr267 AV 548.3 EM SD 18.2 CV 3.3

cr267 AV 0.0021 mg/L SD 0.0070 CV 328.91

MPLE #24 REPLICATE #1 1531 10/19/98

3MA 400 Analysis Ver. 4.10 Thu 10/15/98 - 14:52:14

ıod File Name: CU Replicates:3 Read Delay: 60
ırks: CU ONLY Data File:

Vt file is 10236

ANDARD #1			REPLICATE	#1				1455	10/15/98
	CU324	EM	2893						
ANDARD #1			REPLICATE	#2					
	CU324	EM	2922						
ANDARD #1			REPLICATE	#3					
	CU324	EM	3032						
	CU324	AV	2949.0	SD	73.3	CV	2.5	CONC	0.1000
ANDARD #2			REPLICATE	#1				1457	10/15/98
	CU324	EM	18716						
ANDARD #2			REPLICATE	#2					
	CU324	EM	18102						
ANDARD #2			REPLICATE	#3					
	CU324	EM	18600						
	CU324	AV	18472.7	SD	326.2	CV	1.8	CONC	1.0000
ANDARD #3			REPLICATE	#1				1459	10/15/98
	CU324	EM	36619						
ANDARD #3			REPLICATE	#2					
	CU324	EM	36754						
ANDARD #3			REPLICATE	#3					
	CU324	EM	36078						
	CU324	AV	36483.7	SD	357.7	CV	1.0	CONC	2.0000
ANDARD #4			REPLICATE	#1				1501	10/15/98
	CU324	EM	87901						
ANDARD #4			REPLICATE	#2					
	CU324	EM	89983						
ANDARD #4			REPLICATE	#3					
	CU324	EM	90163						
	CU324	AV	89349.0	SD	1257.2	CV	1.4	CONC	5.0000
ANK			REPLICATE	#1				1502	10/15/98
	CU324	EM	1381						
ANK			REPLICATE	#2					
	CU324	EM	1310						

ANK REPLICATE #3

CU324 EM 1164

CU324 AV 1285.0 SD 110.6 CV 8.6 CONC 0.0000

CU324 CC 1.0000 SLOPE 17636.554 INT 1136.6479

:V REPLICATE #1 1504 10/15/98

CU324 EM 36059 1.9801 mg/L

:V REPLICATE #2

CU324 EM 36151 1.9853 mg/L

:V REPLICATE #3

CU324 EM 36900 2.0278 mg/L

CU324 AV 36370.0 EM SD 461.3 CV 1.3

CU324 AV 1.9977 mg/L SD 0.0262 CV 1.31

:B REPLICATE #1 1506 10/15/98

CU324 EM 1289 0.0086 mg/L peak-noisy

:B REPLICATE #2

CU324 EM 1294 0.0089 mg/L peak-noisy

:B REPLICATE #3

CU324 EM 1229 0.0052 mg/L peak-noisy

CU324 AV 1270.7 EM SD 36.2 CV 2.8

CU324 AV 0.0076 mg/L SD 0.0021 CV 26.99

002.B-1 REPLICATE #1 1508 10/15/98

CU324 EM 1792 0.0372 mg/L

002.B-1 REPLICATE #2

CU324 EM 1852 0.0406 mg/L

002.B-1 REPLICATE #3

CU324 EM 1842 0.0400 mg/L

CU324 AV 1828.7 EM SD 32.1 CV 1.8

CU324 AV 0.0392 mg/L SD 0.0018 CV 4.65

-1 REPLICATE #1 1509 10/15/98

CU324 EM 3593 0.1393 mg/L

-1 REPLICATE #2

CU324 EM 3780 0.1499 mg/L

-1 REPLICATE #3

CU324 EM 3746 0.1480 mg/L

CU324 AV 3706.3 EM SD 99.6 CV 2.7

CU324 AV 0.1457 mg/L SD 0.0056 CV 3.88

-1 REPLICATE #1 1511 10/15/98

CU324 EM 3459 0.1317 mg/L

REPLICATE #3
CU324 EM 1470 0.0189 mg/L

CU324 AV 1510.0 EM SD 34.7 CV 2.3

CU324 AV 0.0212 mg/L SD 0.0020 CV 9.28

REPLICATE #1 1557 10/15/98
CU324 EM 3679 0.1442 mg/L

REPLICATE #2
CU324 EM 3654 0.1427 mg/L

REPLICATE #3
CU324 EM 3624 0.1410 mg/L

CU324 AV 3652.3 EM SD 27.5 CV 0.8

CU324 AV 0.1426 mg/L SD 0.0016 CV 1.09

REPLICATE #1 1559 10/15/98
CU324 EM 4844 0.2102 mg/L

REPLICATE #2
CU324 EM 4875 0.2120 mg/L

REPLICATE #3
CU324 EM 4907 0.2138 mg/L

CU324 AV 4875.3 EM SD 31.5 CV 0.6

CU324 AV 0.2120 mg/L SD 0.0018 CV 0.84

REPLICATE #1 1601 10/15/98
CU324 EM 4641 0.1987 mg/L

REPLICATE #2
CU324 EM 4695 0.2018 mg/L

REPLICATE #3
CU324 EM 4789 0.2071 mg/L

CU324 AV 4708.3 EM SD 74.9 CV 1.6

CU324 AV 0.2025 mg/L SD 0.0042 CV 2.10

REPLICATE #1 1602 10/15/98
CU324 EM 37874 2.0830 mg/L

REPLICATE #2
CU324 EM 38366 2.1109 mg/L

REPLICATE #3
CU324 EM 38573 2.1227 mg/L

CU324 AV 38271.0 EM SD 359.1 CV 0.9

CU324 AV 2.1055 mg/L SD 0.0204 CV 0.97

REPLICATE #1 1604 10/15/98
CU324 EM 1442 0.0173 mg/L

REPLICATE #2
CU324 EM 1333 0.0111 mg/L

CU324 EM 1318 0.0102 mg/L peak-noisy

CU324 AV 1363.7 EM SD 68.4 CV 5.0

CU324 AV 0.0129 mg/L SD 0.0039 CV 30.12

.006-1 REPLICATE #1 1606 10/15/98
CU324 EM 5058 0.2223 mg/L

.006-1 REPLICATE #2
CU324 EM 4994 0.2187 mg/L

.006-1 REPLICATE #3
CU324 EM 5053 0.2221 mg/L

CU324 AV 5035.0 EM SD 35.6 CV 0.7

CU324 AV 0.2210 mg/L SD 0.0020 CV 0.91

REPLICATE #1 1608 10/15/98
CU324 EM 4587 0.1956 mg/L

REPLICATE #2
CU324 EM 4592 0.1959 mg/L

REPLICATE #3
CU324 EM 4651 0.1993 mg/L

CU324 AV 4610.0 EM SD 35.6 CV 0.8

CU324 AV 0.1969 mg/L SD 0.0020 CV 1.02

REPLICATE #1 1609 10/15/98
CU324 EM 4625 0.1978 mg/L

REPLICATE #2
CU324 EM 4659 0.1997 mg/L

REPLICATE #3
CU324 EM 4633 0.1982 mg/L

CU324 AV 4639.0 EM SD 17.8 CV 0.4

CU324 AV 0.1986 mg/L SD 0.0010 CV 0.51

REPLICATE #1 1611 10/15/98
CU324 EM 4718 0.2031 mg/L

REPLICATE #2
CU324 EM 4626 0.1978 mg/L

REPLICATE #3
CU324 EM 4785 0.2069 mg/L

CU324 AV 4709.7 EM SD 79.8 CV 1.7

CU324 AV 0.2026 mg/L SD 0.0045 CV 2.23

REPLICATE #1 1613 10/15/98
CU324 EM 34111 1.8697 mg/L

REPLICATE #2
CU324 EM 35403 1.9429 mg/L

REPLICATE #3

CU324 AV 34303.3 EM SD 1017.2 CV 3.0

CU324 AV 1.8806 mg/L SD 0.0577 CV 3.07

:V REPLICATE #1 1615 10/15/98
CU324 EM 35849 1.9682 mg/L

:V REPLICATE #2
CU324 EM 37568 2.0657 mg/L

:V REPLICATE #3
CU324 EM 36700 2.0165 mg/L

CU324 AV 36705.7 EM SD 859.5 CV 2.3

CU324 AV 2.0168 mg/L SD 0.0487 CV 2.42

:B REPLICATE #1 1616 10/15/98
CU324 EM 1441 0.0173 mg/L peak-noisy

:B REPLICATE #2
CU324 EM 1263 0.0072 mg/L peak-noisy

:B REPLICATE #3
CU324 EM 1276 0.0079 mg/L

CU324 AV 1326.7 EM SD 99.2 CV 7.5

CU324 AV 0.0108 mg/L SD 0.0056 CV 52.22

MPLE #43 REPLICATE #1 1618 10/15/98
CU324 EM 1369 0.0132 mg/L

MPLE #43 REPLICATE #2
CU324 EM 1337 0.0114 mg/L

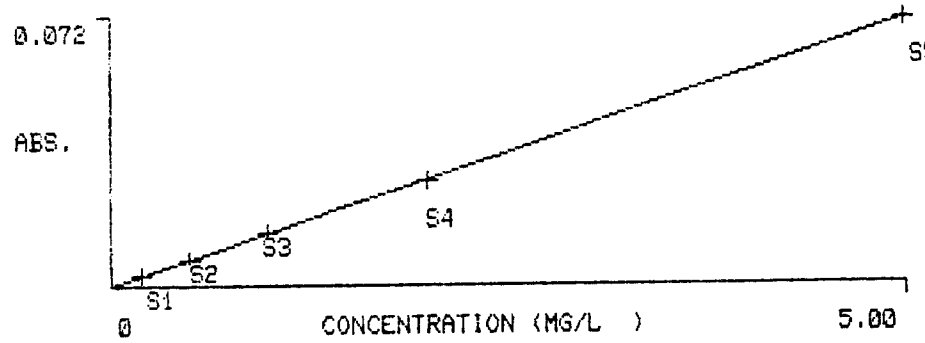
MAIN: -0.000	AA HO-0.000		MAIN: -0.000	AA HO 0.000	
PB	MEAN: -0.000	SD: 0.000	RSD: 99.9	AUTOZERO	0.000
MAIN: 0.003	AA HO 0.003		MAIN: 0.003	AA HO 0.003	
PB	MEAN: 0.003	SD: 0.000	RSD: 2.2	1.STANDARD	0.20 MG/L
MAIN: 0.48 MG/L	AA HO 0.007		MAIN: 0.48 MG/L	AA HO 0.007	
PB	MEAN: 0.48 MG/L	SD: 0.001	RSD: 0.3	2.STANDARD	0.50 MG/L
MAIN: 0.98 MG/L	AA HO 0.014		MAIN: 1.00 MG/L	AA HO 0.015	
PB	MEAN: 0.99 MG/L	SD: 0.017	RSD: 1.7	3.STANDARD	1.00 MG/L
MAIN: 1.97 MG/L	AA HO 0.029		MAIN: 1.95 MG/L	AA HO 0.029	
PB	MEAN: 1.96 MG/L	SD: 0.015	RSD: 0.8	4.STANDARD	1.99 MG/L
MAIN: 5.00 MG/L	AA HO 0.072		MAIN: 5.01 MG/L	AA HO 0.073	
PB	MEAN: 5.00 MG/L	SD: 0.007	RSD: 0.1	5.STANDARD	5.00 MG/L

FLAME DISPLAY CALIBRATION MODE
ELEMENT: PB

PRINTER: ON
BG CORR: OFF
UNITS : MG/L

5.00

REPL. 0 OF 2



ABS. READING
S5 AA : 0.073

STATISTICS
MEAN: 5.00
SD: 0.007
RSD(%): 0.1

C2H2: 2.5 L/MIN OXIDANT: 8.0 L/MIN FLAME: C2H2-AIR

MAIN: -0.01 MG/L	AA HO-0.000		MAIN: 0.02 MG/L	AA HO 0.000	
PB	MEAN: -0.01 MG/L	SD: 0.024	RSD: 99.9	AUTOZERO	0.00

MAIN:	1.98 MG/L	AA HO 0.029	MAIN:	1.92 MG/L	AA HO 0.028

PB IrV MEAN: 1.95 MG/L SD: 0.039 RSD: 2.0

MAIN:	0.01 MG/L	AA HO 0.000	MAIN:	0.00 MG/L	AA HO 0.000

PB ICB MEAN: 0.01 MG/L SD: 0.007 RSD: 99.9

MAIN:	1.02 MG/L	AA HO 0.015	MAIN:	1.04 MG/L	AA HO 0.015

03 PB I1 MEAN: 1.03 MG/L SD: 0.018 RSD: 1.7

MAIN:	3.00 MG/L	AA HO 0.044	MAIN:	2.95 MG/L	AA HO 0.043

PB I1S MEAN: 2.98 MG/L SD: 0.036 RSD: 1.2

MAIN:	1.54 MG/L	AA HO 0.022	MAIN:	1.53 MG/L	AA HO 0.022

PB I2 MEAN: 1.53 MG/L SD: 0.010 RSD: 0.6

MAIN:	1.55 MG/L	AA HO 0.022	MAIN:	1.60 MG/L	AA HO 0.023

PB I2D MEAN: 1.57 MG/L SD: 0.038 RSD: 2.4

MAIN:	1.28 MG/L	AA HO 0.019	MAIN:	1.50 MG/L	AA HO 0.019

PB I3 MEAN: 1.28 MG/L SD: 0.001 RSD: 0.1

MAIN:	1.98 MG/L	AA HO 0.029	MAIN:	1.93 MG/L	AA HO 0.028

PB ccV MEAN: 1.95 MG/L SD: 0.039 RSD: 2.0

MAIN:	-0.02 MG/L	AA HO-0.000	MAIN:	-0.01 MG/L	AA HO-0.000

PB ccB MEAN: -0.02 MG/L SD: 0.009 RSD: 55.4

06 MAIN:	0.46 MG/L	AA HO 0.007	MAIN:	0.41 MG/L	AA HO 0.006

PB 1 MEAN: 0.43 MG/L SD: 0.036 RSD: 8.2

MAIN:	2.41 MG/L	AA HO 0.035	MAIN:	2.36 MG/L	AA HO 0.034

PB 1S MEAN: 2.38 MG/L SD: 0.034 RSD: 1.4

MAIN:	0.33 MG/L	AA HO 0.005	MAIN:	0.36 MG/L	AA HO 0.005

PB 2 MEAN: 0.34 MG/L SD: 0.021 RSD: 6.1

MAIN:	0.35 MG/L	AA HO 0.005	MAIN:	0.30 MG/L	AA HO 0.004

PB 2D MEAN: 0.32 MG/L SD: 0.037 RSD: 11.4

MAIN:	0.33 MG/L	AA HO 0.005	MAIN:	0.38 MG/L	AA HO 0.005

PB 3 MEAN: 0.35 MG/L SD: 0.036 RSD: 10.1

MAIN:	1.94 MG/L	AA HO 0.028	MAIN:	1.94 MG/L	AA HO 0.028

PB CCV MEAN: 1.94 MG/L SD: 0.005 RSD: 0.3

MAIN:	-0.02 MG/L	AA HO-0.000	MAIN:	-0.05 MG/L	AA HO-0.001

PB CCB MEAN: -0.03 MG/L SD: 0.023 RSD: 69.5

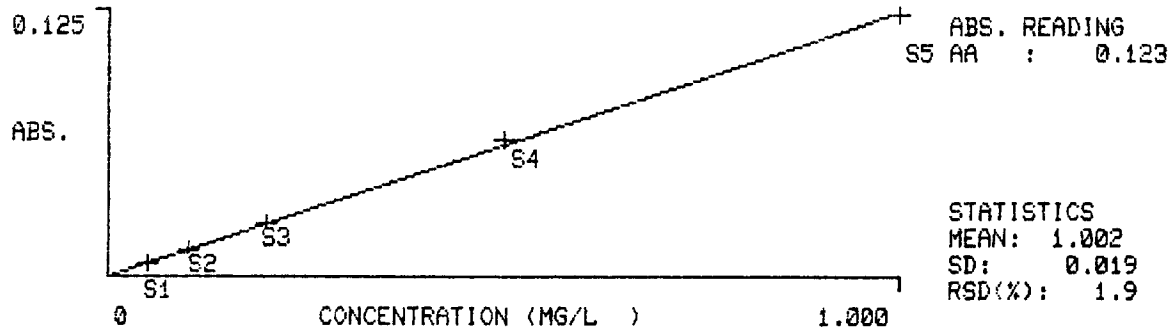
MAIN: -0.000	AA HO-0.000		MAIN: -0.000	AA HO 0.000	
MN	MEAN: -0.000	SD: 0.000	RSD: 52.8	AUTOZERO	0.000
MAIN: 0.006	AA HO 0.006		MAIN: 0.006	AA HO 0.006	
MN	MEAN: 0.006	SD: 0.000	RSD: 1.1	1.STANDARD	0.050 MG/L
MAIN: 0.101 MG/L	AA HO 0.013		MAIN: 0.102 MG/L	AA HO 0.013	
MN	MEAN: 0.101 MG/L	SD: 0.000	RSD: 0.3	2.STANDARD	0.100 MG/L
MAIN: 0.194 MG/L	AA HO 0.025		MAIN: 0.200 MG/L	AA HO 0.026	
MN	MEAN: 0.197 MG/L	SD: 0.005	RSD: 2.3	3.STANDARD	0.199 MG/L
MAIN: 0.516 MG/L	AA HO 0.065		MAIN: 0.514 MG/L	AA HO 0.065	
MN	MEAN: 0.515 MG/L	SD: 0.002	RSD: 0.3	4.STANDARD	0.503 MG/L
MAIN: 0.943 MG/L	AA HO 0.122		MAIN: 0.950 MG/L	AA HO 0.123	
MN	MEAN: 0.947 MG/L	SD: 0.005	RSD: 0.6	5.STANDARD	0.987 MG/L
MAIN: 1.015 MG/L	AA HO 0.126		MAIN: 0.988 MG/L	AA HO 0.123	
MN	MEAN: 1.002 MG/L	SD: 0.019	RSD: 1.9	5.STANDARD	0.990 MG/L

FLAME DISPLAY CALIBRATION MODE
ELEMENT: MN

REPL. 0 OF 2

PRINTER: ON
BG CORR: OFF
UNITS : MG/L

0.990



ABS. READING
S5 AA : 0.123

STATISTICS
MEAN: 1.002
SD: 0.019
RSD(%): 1.9

C2H2: 2.5 L/MIN OXIDANT: 8.0 L/MIN FLAME: C2H2-AIR

	AA		AA
MAIN: 0.005 MG/L	HO-0.000	MAIN: 0.004 MG/L	HO-0.000

MN MEAN: 0.005 MG/L SD: 0.001 RSD: 18.9 AUTOZERO 0.000

	AA		AA
MAIN: 0.494 MG/L	HO 0.062	MAIN: 0.499 MG/L	HO 0.063

MN ICV MEAN: 0.496 MG/L SD: 0.004 RSD: 0.7

	AA		AA
MAIN: 0.001 MG/L	HO 0.000	MAIN: -0.001 MG/L	HO-0.000

MN ICB MEAN: -0.000 MG/L SD: 0.002 RSD: 99.9

	AA		AA
MAIN: 0.050 MG/L	HO 0.006	MAIN: 0.057 MG/L	HO 0.007

002 MN B-1 MEAN: 0.053 MG/L SD: 0.005 RSD: 9.9

	AA
MAIN: 4.074 MG/L	HO 0.513

E61 Sample concentration greater than highest standard

	AA
MAIN: 4.113 MG/L	HO 0.518

E61 Sample concentration greater than highest standard

MN 8-1 MEAN: 4.094 MG/L SD: 0.027 RSD: 0.7

	AA		AA
MAIN: 0.004 MG/L	HO 0.001	MAIN: 0.005 MG/L	HO 0.000

MN set Ø MEAN: 0.005 MG/L SD: 0.001 RSD: 19.8 AUTOZERO 0.000

	AA		AA
MAIN: 0.352 MG/L	HO 0.044	MAIN: 0.360 MG/L	HO 0.045

MN 8-1x10 MEAN: 0.356 MG/L SD: 0.006 RSD: 1.6

	AA		AA
MAIN: 0.848 MG/L	HO 0.107	MAIN: 0.845 MG/L	HO 0.106

MN 8-1S (400) MEAN: 0.847 MG/L SD: 0.002 RSD: 0.3

	AA		AA
MAIN: 0.680 MG/L	HO 0.086	MAIN: 0.687 MG/L	HO 0.087

MN 8-1x5 MEAN: 0.684 MG/L SD: 0.005 RSD: 0.8

MAIN:	0.064 MG/L	HO AA 0.008	MAIN:	0.067 MG/L	HO AA 0.008

MN 02 MEAN: 0.065 MG/L SD: 0.003 RSD: 3.9

MAIN:	0.062 MG/L	HO AA 0.008	MAIN:	0.067 MG/L	HO AA 0.008

MN 02D MEAN: 0.065 MG/L SD: 0.004 RSD: 6.2

MAIN:	0.033 MG/L	HO AA 0.004	MAIN:	0.034 MG/L	HO AA 0.004

MN 03 MEAN: 0.034 MG/L SD: 0.000 RSD: 1.4

MAIN:	0.027 MG/L	HO AA 0.003	MAIN:	0.031 MG/L	HO AA 0.004

MN 41 MEAN: 0.029 MG/L SD: 0.003 RSD: 10.8

MAIN:	0.032 MG/L	HO AA 0.004	MAIN:	0.029 MG/L	HO AA 0.004

MN 42 MEAN: 0.031 MG/L SD: 0.002 RSD: 5.6

MAIN:	0.014 MG/L	HO AA 0.002	MAIN:	0.013 MG/L	HO AA 0.002

MN 43 MEAN: 0.014 MG/L SD: 0.001 RSD: 6.5

MAIN:	0.489 MG/L	HO AA 0.062	MAIN:	0.480 MG/L	HO AA 0.060

MN CCV MEAN: 0.484 MG/L SD: 0.007 RSD: 1.4

MAIN:	-0.007 MG/L	HO AA -0.001	MAIN:	-0.008 MG/L	HO AA -0.001

MN CCB MEAN: -0.008 MG/L SD: 0.000 RSD: 5.1

MAIN:	0.416 MG/L	HO AA 0.052	MAIN:	0.427 MG/L	HO AA 0.054

MN I1 MEAN: 0.421 MG/L SD: 0.008 RSD: 1.9

MAIN:	0.800 MG/L	HO AA 0.101	MAIN:	0.799 MG/L	HO AA 0.101

MN I1S MEAN: 0.800 MG/L SD: 0.001 RSD: 0.1

	AA		AA
MAIN: 0.451 MG/L	HO 0.057	MAIN: 0.465 MG/L	HO 0.059

MN I2 MEAN: 0.458 MG/L SD: 0.010 RSD: 2.2

	AA		AA
MAIN: 0.446 MG/L	HO 0.056	MAIN: 0.442 MG/L	HO 0.056

MN I3 MEAN: 0.444 MG/L SD: 0.003 RSD: 0.6

	AA		AA
MAIN: 0.494 MG/L	HO 0.062	MAIN: 0.516 MG/L	HO 0.065

066 MN 1 MEAN: 0.505 MG/L SD: 0.016 RSD: 3.1

	AA		AA
MAIN: 0.879 MG/L	HO 0.111	MAIN: 0.885 MG/L	HO 0.111

MN 1S MEAN: 0.882 MG/L SD: 0.004 RSD: 0.5

	AA		AA
MAIN: 0.345 MG/L	HO 0.043	MAIN: 0.322 MG/L	HO 0.041

MN 2 MEAN: 0.334 MG/L SD: 0.017 RSD: 5.0

	AA		AA
MAIN: 0.333 MG/L	HO 0.042	MAIN: 0.336 MG/L	HO 0.042

MN 2D MEAN: 0.334 MG/L SD: 0.002 RSD: 0.6

	AA		AA
MAIN: 0.359 MG/L	HO 0.045	MAIN: 0.356 MG/L	HO 0.045

MN 3 MEAN: 0.358 MG/L SD: 0.003 RSD: 0.7

	AA		AA
MAIN: 0.473 MG/L	HO 0.060	MAIN: 0.475 MG/L	HO 0.060

MN CCV MEAN: 0.474 MG/L SD: 0.001 RSD: 0.2

	AA		AA
MAIN: -0.016 MG/L	HO-0.002	MAIN: -0.020 MG/L	HO-0.003

MN CCB MEAN: 0.018 MG/L SD: 0.003 RSD: 17.7

81003 ALL(-I3)
81006
81011(-43)

HG AA-BG BG
MAIN: 0.001 PA 0.030 0.005
PH 0.001 0.000

0.000 AUTOZERO

HG AA-BG BG
MAIN: 0.010 PA 0.141 0.018
PH 0.010 0.000

0.50 1.STANDARD

HG AA-BG BG
MAIN: 1.21 UG/L PA 0.428 -0.040
PH 0.025 -0.001

E61 Sample concentration greater than highest standard

1.03 2.STANDARD

HG AA-BG BG
MAIN: 1.70 UG/L PA 0.657 -0.025
PH 0.042 -0.001

E61 Sample concentration greater than highest standard

1.91 3.STANDARD

HG AA-BG BG
MAIN: 5.75 UG/L PA 2.020 0.024
PH 0.125 0.002

E61 Sample concentration greater than highest standard

5.10 4.STANDARD

HG AA-BG BG
MAIN: 11.31 UG/L PA 4.198 0.031
PH 0.278 0.003

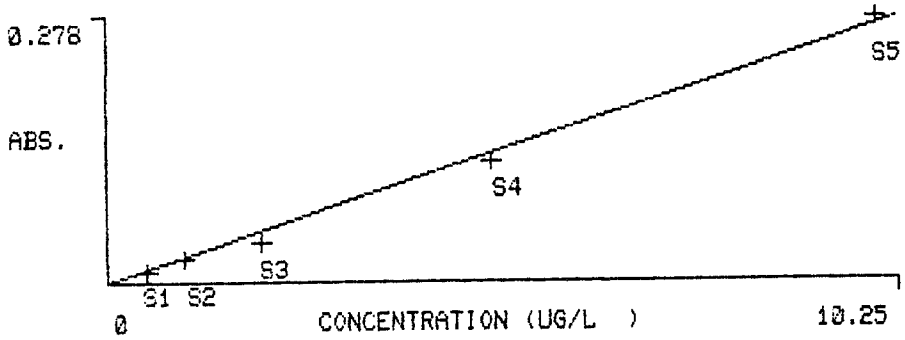
E61 Sample concentration greater than highest standard

10.25 5.STANDARD

HGA DISPLAY CALIBRATION MODE
ELEMENT: HG - PEAK HEIGHT

PRINTER: ON
BG CORR: ON
UNITS : UG/L
CH.MASS:

10.25
READ



PEAK AREA (A-S)
AA-BG: 4.198
BG: 0.021

PEAK HEIGHT (A)
AA-BG: 0.278
BG: 0.003

HG ICV		AA-BG	BG	HG ICB		AA-BG	BG
MAIN:	4.79 UG/L	PA 2.088	0.011	MAIN:	-0.13 UG/L	PA-0.098	-0.000
		PH 0.130	0.001			PH-0.004	-0.000
HG RB AP		AA-BG	BG	HG		AA-BG	BG
MAIN:	-0.07 UG/L	PA-0.033	-0.021	MAIN:	-0.01 UG/L	PA-0.004	-0.024
		PH-0.002	-0.002			PH-0.000	-0.001
HG RB-F		AA-BG	BG	HG		AA-BG	BG
MAIN:	0.00 UG/L	PA-0.005	-0.041	MAIN:	0.03 UG/L	PA-0.019	-0.040
		PH 0.000	-0.002			PH 0.001	-0.001
HG OB		AA-BG	BG	HG		AA-BG	BG
MAIN:	-0.04 UG/L	PA-0.026	-0.044	MAIN:	0.03 UG/L	PA-0.019	-0.018
		PH-0.001	-0.002			PH 0.001	-0.001
HG 4B		AA-BG	BG	HG		AA-BG	BG
MAIN:	-0.03 UG/L	PA-0.014	-0.011	MAIN:	0.01 UG/L	PA-0.029	-0.015
		PH-0.001	0.000			PH 0.000	-0.002
HG IB		AA-BG	BG	HG		AA-BG	BG
MAIN:	0.04 UG/L	PA 0.014	-0.007	MAIN:	-0.04 UG/L	PA-0.011	-0.029
		PH 0.001	-0.001			PH-0.001	-0.002
HG 01		AA-BG	BG	HG		AA-BG	BG
MAIN:	0.01 UG/L	PA 0.017	-0.017	MAIN:	0.03 UG/L	PA 0.007	-0.016
		PH 0.000	0.000			PH 0.001	-0.000
HG 01S		AA-BG	BG	HG		AA-BG	BG
MAIN:	4.43 UG/L	PA 1.985	-0.011	MAIN:	5.04 UG/L	PA 2.323	0.008
		PH 0.120	-0.000			PH 0.136	0.000
HG ~~02~~ CCV ✓		AA-BG	BG	HG CCB		AA-BG	BG
MAIN:	4.53 UG/L	PA 2.022	-0.010	MAIN:	-0.18 UG/L	PA-0.104	-0.012
		PH 0.123	0.000			PH-0.005	-0.001
HG 02		AA-BG	BG	HG		AA-BG	BG
MAIN:	-0.03 UG/L	PA-0.031	-0.020	MAIN:	-0.01 UG/L	PA-0.032	-0.020
		PH-0.001	-0.001			PH-0.000	0.000

HG	03		AA-BG	BG	HG			AA-BG	BG
MAIN:	-0.06 UG/L	PA	-0.008	-0.029	MAIN:	-0.06 UG/L	PA	-0.022	-0.003
		PH	-0.002	-0.000			PH	-0.002	0.001
HG	U1		AA-BG	BG	HG			AA-BG	BG
MAIN:	0.19 UG/L	PA	0.023	-0.012	MAIN:	0.12 UG/L	PA	0.048	0.000
		PH	0.005	-0.000			PH	0.003	0.000
HG	U2		AA-BG	BG	HG			AA-BG	BG
MAIN:	0.00 UG/L	PA	0.005	-0.010	MAIN:	-0.01 UG/L	PA	-0.006	-0.010
		PH	0.000	0.001			PH	-0.000	-0.001
HG	U3		AA-BG	BG	HG			AA-BG	BG
MAIN:	0.19 UG/L	PA	0.101	-0.004	MAIN:	0.15 UG/L	PA	0.080	0.006
		PH	0.005	0.002			PH	0.004	0.000
HG	I1		AA-BG	BG	HG			AA-BG	BG
MAIN:	0.22 UG/L	PA	0.089	-0.013	MAIN:	0.24 UG/L	PA	0.121	-0.007
		PH	0.006	-0.001			PH	0.006	0.000
HG	I2		AA-BG	BG	HG			AA-BG	BG
MAIN:	0.27 UG/L	PA	0.124	0.020	MAIN:	0.32 UG/L	PA	0.128	-0.002
		PH	0.007	0.002			PH	0.009	-0.001
HG	CCV		AA-BG	BG	HG	CCB		AA-BG	BG
MAIN:	4.76 UG/L	PA	2.145	0.012	MAIN:	-0.06 UG/L	PA	-0.052	-0.008
		PH	0.129	0.001			PH	-0.002	0.001
HG	1		AA-BG	BG	HG			AA-BG	BG
MAIN:	0.03 UG/L	PA	0.003	-0.002	MAIN:	0.09 UG/L	PA	0.026	0.005
		PH	0.001	-0.001			PH	0.002	-0.000
HG	2		AA-BG	BG	HG			AA-BG	BG
MAIN:	0.01 UG/L	PA	0.024	-0.003	MAIN:	0.12 UG/L	PA	0.026	-0.016
		PH	0.000	0.001			PH	0.003	-0.000
HG	3		AA-BG	BG	HG			AA-BG	BG
MAIN:	0.09 UG/L	PA	0.039	-0.012	MAIN:	-0.01 UG/L	PA	-0.004	0.010
		PH	0.002	-0.000			PH	-0.000	0.000
HG	B-2B		AA-BG	BG	HG			AA-BG	BG
MAIN:	-0.04 UG/L	PA	-0.019	0.018	MAIN:	0.07 UG/L	PA	-0.016	0.004
		PH	-0.001	0.000			PH	0.002	-0.000
HG	11-2B		AA-BG	BG	HG			AA-BG	BG
MAIN:	3.01 UG/L	PA	1.295	0.049	MAIN:	3.13 UG/L	PA	1.365	-0.006
		PH	0.082	0.003			PH	0.085	-0.000
HG	11-2BS		AA-BG	BG	HG			AA-BG	BG
MAIN:	7.39 UG/L	PA	3.307	0.008	MAIN:	7.34 UG/L	PA	3.355	0.050
		PH	0.200	0.001			PH	0.199	0.002
HG	12-2B		AA-BG	BG	HG			AA-BG	BG
MAIN:	2.19 UG/L	PA	0.935	0.021	MAIN:	2.29 UG/L	PA	0.951	0.011
		PH	0.059	0.002			PH	0.062	0.002
HG	CCV		AA-BG	BG	HG	CCB		AA-BG	BG
MAIN:	4.42 UG/L	PA	2.141	0.007	MAIN:	-0.09 UG/L	PA	-0.066	-0.009
		PH	0.120	0.002			PH	-0.002	-0.001

```
-----------------------------------------------------------------------------
Element File: NI.GEL          Element: Ni                    Wavelength: 232.0
Date: 10/19/98                Time: 10:09                    Slit: 0.20 L
Data File:                    ID/Wt File: 81002.IDW          Lamp Current: 25
Technique: HGA                Calib. Type: Linear            Energy: 47
-----------------------------------------------------------------------------
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
Ni    ID: BLANK               Seq. No.: 00001    A/S Pos.: 0     Date: 10/19/9

Replicate  1                                Time: 10:09
Peak Area (A-s): 0.041                      Peak Height (A): 0.048
Background Pk Area (A-s): 0.096             Background Pk Height (A): 0.045
Blank Corrected Pk Area (A-s): 0.041

Replicate  2                                Time: 10:12
Peak Area (A-s): 0.019                      Peak Height (A): 0.026
Background Pk Area (A-s): 0.069             Background Pk Height (A): 0.029
Blank Corrected Pk Area (A-s): 0.019

Mean Pk Area (A-s):       0.030             SD: 0.0160              RSD(%): 53.40

Auto-zero performed.
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
Ni    ID: BLANK               Seq. No.: 00002    A/S Pos.: 0     Date: 10/19/9

Replicate  1                                Time: 10:15
Peak Area (A-s): 0.016                      Peak Height (A): 0.020
Background Pk Area (A-s): 0.063             Background Pk Height (A): 0.026
Blank Corrected Pk Area (A-s): -0.014

Replicate  2                                Time: 10:19
Peak Area (A-s): 0.020                      Peak Height (A): 0.022
Background Pk Area (A-s): 0.060             Background Pk Height (A): 0.027
Blank Corrected Pk Area (A-s): -0.009

Mean Pk Area (A-s):      -0.012             SD: 0.0030              RSD(%): 25.81

Auto-zero performed.
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
Ni    ID: 20 PPB NI           Seq. No.: 00003    A/S Pos.: 1     Date: 10/19/9

Replicate  1                                Time: 10:22
Peak Area (A-s): 0.047                      Peak Height (A): 0.032
Background Pk Area (A-s): 0.074             Background Pk Height (A): 0.030
Blank Corrected Pk Area (A-s): 0.028

Replicate  2                                Time: 10:25
Peak Area (A-s): 0.050                      Peak Height (A): 0.037
Background Pk Area (A-s): 0.078             Background Pk Height (A): 0.035
Blank Corrected Pk Area (A-s): 0.032

Mean Pk Area (A-s):       0.030             SD: 0.0026              RSD(%): 8.71

Standard number 1 applied.  [20.0]
Correlation coefficient: 1.00000            Slope: 0.0015
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Ni ID: 50 PPB NI Seq. No.: 00004 A/S Pos.: 2 Date: 10/19/9

Replicate 1 Time: 10:28
Peak Area (A-s): 0.103 Peak Height (A): 0.056
Background Pk Area (A-s): 0.093 Background Pk Height (A): 0.037
Blank Corrected Pk Area (A-s): 0.085
Concentration (ug/L): 56.3

Replicate 2 Time: 10:32
Peak Area (A-s): 0.097 Peak Height (A): 0.054
Background Pk Area (A-s): 0.102 Background Pk Height (A): 0.041
Blank Corrected Pk Area (A-s): 0.079
Concentration (ug/L): 52.6

Mean Conc (ug/L): 54.4 SD: 2.62 RSD(%): 4.82

Standard number 2 applied. [50.0]
Correlation coefficient: 0.99739 Slope: 0.0016

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Ni ID: 100 PPB NI Seq. No.: 00005 A/S Pos.: 3 Date: 10/19/9

Replicate 1 Time: 10:35
Peak Area (A-s): 0.190 Peak Height (A): 0.097
Background Pk Area (A-s): 0.125 Background Pk Height (A): 0.046
Blank Corrected Pk Area (A-s): 0.172
Concentration (ug/L): 106.0

Replicate 2 Time: 10:38
Peak Area (A-s): 0.191 Peak Height (A): 0.100
Background Pk Area (A-s): 0.133 Background Pk Height (A): 0.048
Blank Corrected Pk Area (A-s): 0.173
Concentration (ug/L): 106.5

Mean Conc (ug/L): 106.3 SD: 0.37 RSD(%): 0.35

Standard number 3 applied. [100.0]
Correlation coefficient: 0.99841 Slope: 0.0017

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Ni ID: 200 PPB NI Seq. No.: 00006 A/S Pos.: 4 Date: 10/19/9

Replicate 1 Time: 10:41
Peak Area (A-s): 0.350 Peak Height (A): 0.171
Background Pk Area (A-s): 0.171 Background Pk Height (A): 0.066
Blank Corrected Pk Area (A-s): 0.332
Concentration (ug/L): 195.0

Replicate 2 Time: 10:44
Peak Area (A-s): 0.366 Peak Height (A): 0.176
Background Pk Area (A-s): 0.133 Background Pk Height (A): 0.054
Blank Corrected Pk Area (A-s): 0.348
Concentration (ug/L): 204.6

Mean Conc (ug/L): 199.8 SD: 6.78 RSD(%): 3.39

Standard number 4 applied. [200.0]
Correlation coefficient: 0.99972 Slope: 0.0017
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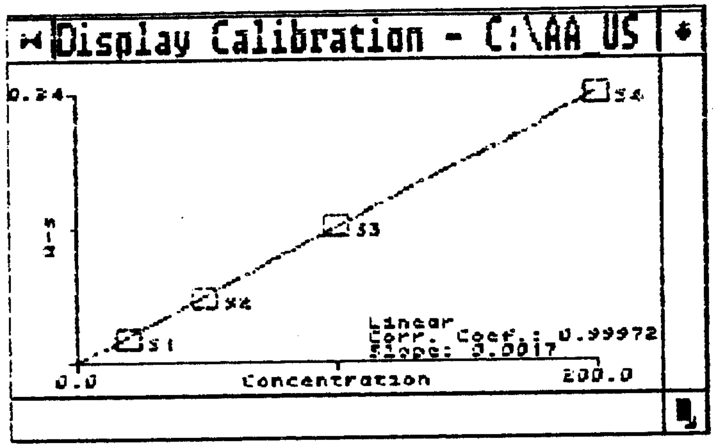

~~~~~~

Ni ID: ICV Seq. No.: 00007 A/S Pos.: 5 Date: 10/19/9

Replicate 1 Time: 10:51
Concentration (ug/L): 106.1

Replicate 2 Time: 10:54
Concentration (ug/L): 109.8

Mean Conc (ug/L): 108.0 SD: 2.62 RSD(%): 2.42

QC sample is within range 79.5 - 120.49

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Ni ID: ICB Seq. No.: 00008 A/S Pos.: 0 Date: 10/19/9

Replicate 1 Time: 10:58
Concentration (ug/L): 3.6

Replicate 2 Time: 11:01
Concentration (ug/L): 2.6

Mean Conc (ug/L): 3.1 SD: 0.69 RSD(%): 22.15

QC sample is within range -15.49 - 15.49

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Ni ID: 81003.RB-AP Seq. No.: 00009 A/S Pos.: 14 Date: 10/19/9

Replicate 1 Time: 11:04
Concentration (ug/L): -0.8

Replicate 2 Time: 11:07
Concentration (ug/L): -6.1

Mean Conc (ug/L): -3.5 SD: 3.71 RSD(%): 107.4

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Ni ID: 81003.RB-F Seq. No.: 00010 A/S Pos.: 15 Date: 10/19/9

Replicate 1 Time: 11:10
Concentration (ug/L): -0.5

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i ID: 81003.I2 Seq. No.: 00031 A/S Pos.: 26 Date: 10/19/98

eplicate 1 Time: 13:41
oncentration (ug/L): 178.5

eplicate 2 Time: 13:44
oncentration (ug/L): 167.4

ean Conc (ug/L): 172.9 SD: 7.88 RSD(%): 4.56

~~~~~~

Ni ID: 81003.I3 Seq. No.: 00032 A/S Pos.: 27 Date: 10/19/9

eplicate 1 Time: 13:47
oncentration (ug/L): 122.9

eplicate 2 Time: 13:50
oncentration (ug/L): 122.4

lean Conc (ug/L): 122.7 SD: 0.36 RSD(%): 0.30

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Ni ID: CCV Seq. No.: 00033 A/S Pos.: 3 Date: 10/19/

Replicate 1 Time: 13:53
Concentration (ug/L): 89.2

Replicate 2 Time: 13:57
Concentration (ug/L): 90.1

Mean Conc (ug/L): 89.7 SD: 0.70 RSD(%): 0.78

QC sample is within range 79.5 - 120.49

~~~~~~

Ni ID: CCB Seq. No.: 00034 A/S Pos.: 0 Date: 10/19/

Replicate 1 Time: 14:00
Concentration (ug/L): -2.8

Replicate 2 Time: 14:03
Concentration (ug/L): -3.8

Mean Conc (ug/L): -3.3 SD: 0.74 RSD(%): 22.59

QC sample is within range -15.49 - 15.49

~~~~~~

Ni ID: 81006.1 Seq. No.: 00035 A/S Pos.: 28 Date: 10/19/9

Sample abs. is greater than that of the largest standard.
Replicate 1 Time: 14:06
Concentration (ug/L): 377.4

Sample abs. is greater than that of the largest standard.
Replicate 2 Time: 14:09
Concentration (ug/L): 391.2
~~~~~~

Sample abs. is greater than that of the largest standard.
Mean Conc (ug/L): 384.3 SD: 9.79 RSD(%): 2.55

~~~~~~

Ni ID: AS Position 000 Seq. No.: 00037 A/S Pos.: 0 Date: 10/19/90

Replicate 1 Time: 14:13
Concentration (ug/L): 5.6

Replicate 2 Time: 14:16
Concentration (ug/L): -2.9

Mean Conc (ug/L): 1.4 SD: 6.01 RSD(%): 439.97

~~~~~~

Ni ID: 81006.1x5 Seq. No.: 00038 A/S Pos.: 28 Date: 10/19/9

Replicate 1 Time: 14:20
Concentration (ug/L): 85.5 Corrected Conc (ug/L): 427.

Replicate 2 Time: 14:23
Concentration (ug/L): 79.0 Corrected Conc (ug/L): 395.

Mean Conc (ug/L): 82.2 SD: 4.61 RSD(%): 5.61
Corrected Conc (ug/L): 411.

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Ni ID: 81006.1x5 Seq. No.: 00039 A/S Pos.: 28 Date: 10/19/9

Replicate 1 Time: 14:26
Concentration (ug/L): 165.4 Corrected Conc (ug/L): 827.

Replicate 2 Time: 14:29
Concentration (ug/L): 166.8 Corrected Conc (ug/L): 834.

Mean Conc (ug/L): 166.1 SD: 0.96 RSD(%): 0.58
Corrected Conc (ug/L): 830.

Recovery is 83.9%

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Ni ID: 81006.2x5 Seq. No.: 00040 A/S Pos.: 29 Date: 10/19/9

Replicate 1 Time: 14:32
Concentration (ug/L): 58.6 Corrected Conc (ug/L): 293.

Replicate 2 Time: 14:36
Concentration (ug/L): 53.5 Corrected Conc (ug/L): 267.

Mean Conc (ug/L): 56.0 SD: 3.61 RSD(%): 6.45
Corrected Conc (ug/L): 280.

~~~~~~

Ni ID: 81006.3x5 Seq. No.: 00041 A/S Pos.: 30 Date: 10/19/9

Replicate 1 Time: 14:39
Concentration (ug/L): 56.9 Corrected Conc (ug/L): 284.

Replicate 2 Time: 14:42
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Concentration (ug/L): 59.5 Corrected Conc (ug/L): 297.

Mean Conc (ug/L): 58.2 SD: 1.85 RSD(%): 3.18
Corrected Conc (ug/L): 291.

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Ni ID: CCV Seq. No.: 00042 A/S Pos.: 3 Date: 10/19/

Replicate 1 Time: 14:45
Concentration (ug/L): 88.6

Replicate 2 Time: 14:48
Concentration (ug/L): 88.2

Mean Conc (ug/L): 88.4 SD: 0.29 RSD(%): 0.32

QC sample is within range 79.5 - 120.49

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Ni ID: CCB Seq. No.: 00043 A/S Pos.: 0 Date: 10/19/

Replicate 1 Time: 14:52
Concentration (ug/L): -4.3

Replicate 2 Time: 14:55
Concentration (ug/L): -4.2

Mean Conc (ug/L): -4.2 SD: 0.06 RSD(%): 1.35

QC sample is within range -15.49 - 15.49

1A 400 Analysis Ver. 4.10 Thu 10/22/98 - 13:23:27

od File Name: P Replicates:3 Read Delay: 65
rks: Data File:

t file is 10236

ANDARD #1			REPLICATE #1					1327	10/22/98
	P214	EM	368			peak-noisy			
ANDARD #1			REPLICATE #2						
	P214	EM	369			peak-noisy			
ANDARD #1			REPLICATE #3						
	P214	EM	370			peak-noisy			
	P214	AV	369.0	SD	1.0	CV	0.3	CONC	0.2000
ANDARD #2			REPLICATE #1					1329	10/22/98
	P214	EM	550						
ANDARD #2			REPLICATE #2						
	P214	EM	563						
ANDARD #2			REPLICATE #3						
	P214	EM	562						
	P214	AV	558.3	SD	7.2	CV	1.3	CONC	1.0000
ANDARD #3			REPLICATE #1					1331	10/22/98
	P214	EM	798						
ANDARD #3			REPLICATE #2						
	P214	EM	816						
ANDARD #3			REPLICATE #3						
	P214	EM	838						
	P214	AV	817.3	SD	20.0	CV	2.5	CONC	2.0000
ANDARD #4			REPLICATE #1					1333	10/22/98
	P214	EM	1550						
ANDARD #4			REPLICATE #2						
	P214	EM	1570						
ANDARD #4			REPLICATE #3						
	P214	EM	1581						
	P214	AV	1567.0	SD	15.7	CV	1.0	CONC	5.0000
ANK			REPLICATE #1					1335	10/22/98
	P214	EM	323						
ANK			REPLICATE #2						
	P214	EM	312						

4NR REPLICATE #3
P214 EM 312

P214 AV 315.7 SD 6.4 CV 2.0 CONC 0.0000

P214 CC 1.0000 SLOPE 250.2997 INT 314.9751

✓ REPLICATE #1 1337 10/22/98
P214 EM 787 1.8858 mg/L

✓ REPLICATE #2
P214 EM 851 2.1415 mg/L

✓ REPLICATE #3
P214 EM 816 2.0017 mg/L

P214 AV 818.0 EM SD 32.0 CV 3.9

P214 AV 2.0097 mg/L SD 0.1280 CV 6.37

B REPLICATE #1 1339 10/22/98
P214 EM 318 0.0121 mg/L peak-noisy

B REPLICATE #2
P214 EM 316 0.0041 mg/L peak-noisy

B REPLICATE #3
P214 EM 327 0.0480 mg/L peak-noisy

P214 AV 320.3 EM SD 5.9 CV 1.8

P214 AV 0.0214 mg/L SD 0.0234 CV 109.35

002.B-1 REPLICATE #1 1341 10/22/98
P214 EM 478 0.6513 mg/L

002.B-1 REPLICATE #2
P214 EM 498 0.7312 mg/L

002.B-1 REPLICATE #3
P214 EM 494 0.7152 mg/L

P214 AV 490.0 EM SD 10.6 CV 2.2

P214 AV 0.6993 mg/L SD 0.0423 CV 6.05

1 REPLICATE #1 1343 10/22/98
P214 EM 5019 18.7936 mg/L

1 REPLICATE #2
P214 EM 5017 18.7856 mg/L

1 REPLICATE #3
P214 EM 5349 20.1120 mg/L

P214 AV 5128.3 EM SD 191.1 CV 3.7

P214 AV 19.2304 mg/L SD 0.7635 CV 3.97

1 REPLICATE #1 1345 10/22/98
P214 EM 4266 15.7852 mg/L

1 REPLICATE #2
P214 EM 4548 16.9118 mg/L

REPLICATE #3

REPLICATE #3

P214 EM 332 0.0680 mg/L peak-noisy

P214 AV 332.3 EM SD 1.5 CV 0.5

P214 AV 0.0693 mg/L SD 0.0061 CV 8.80

REPLICATE #1 1437 10/22/98

P214 EM 438 0.4915 mg/L peak-noisy

L REPLICATE #2

P214 EM 404 0.3557 mg/L

L REPLICATE #3

P214 EM 401 0.3437 mg/L peak-noisy

P214 AV 414.3 EM SD 20.6 CV 5.0

P214 AV 0.3970 mg/L SD 0.0821 CV 20.68

2 REPLICATE #1 1439 10/22/98

P214 EM 432 0.4675 mg/L

2 REPLICATE #2

P214 EM 435 0.4795 mg/L

2 REPLICATE #3

P214 EM 413 0.3916 mg/L

P214 AV 426.7 EM SD 11.9 CV 2.8

P214 AV 0.4462 mg/L SD 0.0477 CV 10.68

3 REPLICATE #1 1441 10/22/98

P214 EM 423 0.4316 mg/L

3 REPLICATE #2

P214 EM 433 0.4715 mg/L

3 REPLICATE #3

P214 EM 409 0.3756 mg/L

P214 AV 421.7 EM SD 12.1 CV 2.9

P214 AV 0.4263 mg/L SD 0.0482 CV 11.30

>V REPLICATE #1 1443 10/22/98

P214 EM 834 2.0736 mg/L

>V REPLICATE #2

P214 EM 824 2.0337 mg/L

>V REPLICATE #3

P214 EM 818 2.0097 mg/L

P214 AV 825.3 EM SD 8.1 CV 1.0

P214 AV 2.0390 mg/L SD 0.0323 CV 1.58

>B REPLICATE #1 1445 10/22/98

P214 EM 296 -0.0758 mg/L window-edge

>B REPLICATE #2

P214 EM 297 -0.0718 mg/L peak-noisy

P214 EM 310 -0.0199 mg/L peak-noisy

P214 AV 301.0 EM SD 7.8 CV 2.6

P214 AV -0.0558 mg/L SD 0.0312 CV 55.89

006.1 REPLICATE #1 1447 10/22/98
P214 EM 521 0.8231 mg/L

006.1 REPLICATE #2
P214 EM 518 0.8111 mg/L

006.1 REPLICATE #3
P214 EM 518 0.8111 mg/L

P214 AV 519.0 EM SD 1.7 CV 0.3

P214 AV 0.8151 mg/L SD 0.0069 CV 0.85

REPLICATE #1 1449 10/22/98
P214 EM 543 0.9110 mg/L peak-noisy

REPLICATE #2
P214 EM 528 0.8511 mg/L

REPLICATE #3
P214 EM 519 0.8151 mg/L

P214 AV 530.0 EM SD 12.1 CV 2.3

P214 AV 0.8591 mg/L SD 0.0484 CV 5.64

› REPLICATE #1 1451 10/22/98
P214 EM 514 0.7951 mg/L

› REPLICATE #2
P214 EM 526 0.8431 mg/L

› REPLICATE #3
P214 EM 578 1.0508 mg/L

P214 AV 539.3 EM SD 34.0 CV 6.3

P214 AV 0.8964 mg/L SD 0.1359 CV 15.16

REPLICATE #1 1453 10/22/98
P214 EM 499 0.7352 mg/L

REPLICATE #2
P214 EM 506 0.7632 mg/L

REPLICATE #3
P214 EM 525 0.8391 mg/L

P214 AV 510.0 EM SD 13.5 CV 2.6

P214 AV 0.7792 mg/L SD 0.0538 CV 6.90

3 REPLICATE #1 1455 10/22/98
P214 EM 914 2.3932 mg/L

3 REPLICATE #2
P214 EM 918 2.4092 mg/L

3 REPLICATE #3

P214 AV 914.3 EM SD 3.5 CV 0.4

P214 AV 2.3946 mg/L SD 0.0140 CV 0.59

:V REPLICATE #1 1457 10/22/98
P214 EM 821 2.0217 mg/L

:V REPLICATE #2
P214 EM 791 1.9018 mg/L

:V REPLICATE #3
P214 EM 805 1.9578 mg/L

P214 AV 805.7 EM SD 15.0 CV 1.9

P214 AV 1.9604 mg/L SD 0.0600 CV 3.06

:B REPLICATE #1 1459 10/22/98
P214 EM 301 -0.0558 mg/L window-edge

:B REPLICATE #2
P214 EM 293 -0.0878 mg/L peak-noisy

:B REPLICATE #3
P214 EM 319 0.0161 mg/L peak-noisy

P214 AV 304.3 EM SD 13.3 CV 4.4

P214 AV -0.0425 mg/L SD 0.0532 CV 125.14

AMPLE #~~43~~ RS-AP REPLICATE #1 1501 10/22/98
P214 EM 288 -0.1078 mg/L window-edge

AMPLE #~~43~~ REPLICATE #2
P214 EM 302 -0.0518 mg/L

AMPLE #~~43~~ REPLICATE #3
P214 EM 297 -0.0718 mg/L peak-noisy

P214 AV 295.7 EM SD 7.1 CV 2.4

P214 AV -0.0771 mg/L SD 0.0283 CV 36.74

AMPLE #44 REPLICATE #1 1503 10/22/98
P214 EM 313 -0.0079 mg/L peak-noisy

AMPLE #44 REPLICATE #2
P214 EM 312 -0.0119 mg/L

AMPLE #44 REPLICATE #3
P214 EM 319 0.0161 mg/L peak-noisy

P214 AV 314.7 EM SD 3.8 CV 1.2

P214 AV -0.0012 mg/L SD 0.0151 CV 1227.44

AMPLE #45 REPLICATE #1 1505 10/22/98
P214 EM 314 -0.0039 mg/L peak-noisy

AMPLE #45 REPLICATE #2
P214 EM 309 -0.0239 mg/L peak-noisy

AMPLE #45 REPLICATE #3
P214 EM 308 -0.0279 mg/L peak-noisy

Element File: SE.GEL   Element: Se   Wavelength: 196.0
Date: 10/16/98   Time: 12:42   Slit: 2.00 L
Data File: ID/Wt File: 81002.IDW   Lamp Current: 0
Technique: HGA   Calib. Type: Linear   Energy: 38

Se   ID: 0 PPB   Seq. No.: 00237   A/S Pos.: 0   Date: 10/16/9

Replicate 1   Time: 12:42
Peak Area (A-s): 0.006   Peak Height (A): 0.037
Background Pk Area (A-s): 0.183   Background Pk Height (A): 0.084
Blank Corrected Pk Area (A-s): 0.010
Concentration (ug/L): 5.34

Replicate 2   Time: 12:45
Peak Area (A-s): 0.011   Peak Height (A): 0.028
Background Pk Area (A-s): 0.192   Background Pk Height (A): 0.082
Blank Corrected Pk Area (A-s): 0.015
Concentration (ug/L): 8.28

Mean Conc (ug/L): 6.81   SD: 2.081   RSD(%): 30.56

Auto-zero performed.

Se   ID: 10 PPB   Seq. No.: 00238   A/S Pos.: 1   Date: 10/16/

Replicate 1   Time: 12:49
Peak Area (A-s): 0.024   Peak Height (A): 0.046
Background Pk Area (A-s): 0.184   Background Pk Height (A): 0.072
Blank Corrected Pk Area (A-s): 0.015
Concentration (ug/L): 8.27

Replicate 2   Time: 12:52
Peak Area (A-s): 0.028   Peak Height (A): 0.050
Background Pk Area (A-s): 0.181   Background Pk Height (A): 0.072
Blank Corrected Pk Area (A-s): 0.019
Concentration (ug/L): 10.35

Mean Conc (ug/L): 9.31   SD: 1.469   RSD(%): 15.77

Standard number 1 applied. [10.00]
Correlation coefficient: 1.00000   Slope: 0.0017

Se   ID: 25 PPB   Seq. No.: 00239   A/S Pos.: 2   Date: 10/16/

Replicate 1   Time: 12:55
Peak Area (A-s): 0.059   Peak Height (A): 0.087
Background Pk Area (A-s): 0.183   Background Pk Height (A): 0.087
Blank Corrected Pk Area (A-s): 0.050
Concentration (ug/L): 29.03

Replicate 2   Time: 12:59
Peak Area (A-s): 0.056   Peak Height (A): 0.099
Background Pk Area (A-s): 0.173   Background Pk Height (A): 0.080
Blank Corrected Pk Area (A-s): 0.048
Concentration (ug/L): 27.69

Mean Conc (ug/L): 28.36 SD: 0.950 RSD(%): 3.35

Standard number 2 applied. [25.00]
Correlation coefficient: 0.99443 Slope: 0.0019

~~~~~~

Se ID: 50 PPB Seq. No.: 00240 A/S Pos.: 3 Date: 10/16/9

Replicate 1 Time: 13:02
Peak Area (A-s): 0.106 Peak Height (A): 0.169
Background Pk Area (A-s): 0.174 Background Pk Height (A): 0.091
Blank Corrected Pk Area (A-s): 0.097
Concentration (ug/L): 50.42

Replicate 2 Time: 13:05
Peak Area (A-s): 0.105 Peak Height (A): 0.152
Background Pk Area (A-s): 0.178 Background Pk Height (A): 0.101
Blank Corrected Pk Area (A-s): 0.096
Concentration (ug/L): 49.81

Mean Conc (ug/L): 50.12 SD: 0.432 RSD(%): 0.86

Standard number 3 applied. [50.00]
Correlation coefficient: 0.99923 Slope: 0.0019

~~~~~~

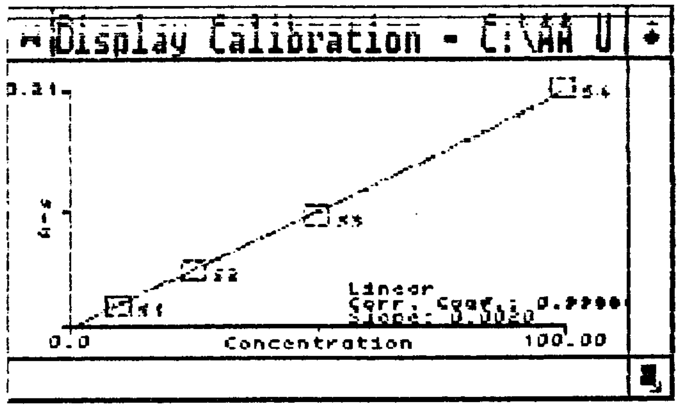
Se ID: 100 PPB Seq. No.: 00241 A/S Pos.: 4 Date: 10/16/9

Replicate 1 Time: 13:09
Peak Area (A-s): 0.212 Peak Height (A): 0.297
Background Pk Area (A-s): 0.193 Background Pk Height (A): 0.109
Blank Corrected Pk Area (A-s): 0.204
Concentration (ug/L): 105.48

Replicate 2 Time: 13:12
Peak Area (A-s): 0.216 Peak Height (A): 0.341
Background Pk Area (A-s): 0.191 Background Pk Height (A): 0.119
Blank Corrected Pk Area (A-s): 0.208
Concentration (ug/L): 107.39

Mean Conc (ug/L): 106.43 SD: 1.354 RSD(%): 1.27

Standard number 4 applied. [100.00]
Correlation coefficient: 0.99888 Slope: 0.0020



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Se ID: ICV Seq. No.: 00242 A/S Pos.: 5 Date: 10/16/9

Replicate 1 Time: 13:23
Concentration (ug/L): 49.40

Replicate 2 Time: 13:26
Concentration (ug/L): 51.48

Mean Conc (ug/L): 50.44 SD: 1.466 RSD(%): 2.91

QC sample is within range

~~~~~~

Se ID: ICB Seq. No.: 00243 A/S Pos.: 0 Date: 10/16/9

Replicate 1 Time: 13:29
Concentration (ug/L): -5.35

Replicate 2 Time: 13:33
Concentration (ug/L): -3.31

Mean Conc (ug/L): -4.33 SD: 1.438 RSD(%): 33.22

QC sample is within range

Auto-zero performed.

~~~~~~

Se ID: 81002.B-1 Seq. No.: 00244 A/S Pos.: 6 Date: 10/16/

Replicate 1 Time: 13:37
Concentration (ug/L): -1.13

Replicate 2 Time: 13:41
Concentration (ug/L): 1.78

Mean Conc (ug/L): 0.32 SD: 2.058 RSD(%): 633.8

~~~~~~

Se ID: 81002.B-1 Seq. No.: 00245 A/S Pos.: 7 Date: 10/16/9

ample abs. is greater than that of the largest standard.
ean Conc (ug/L): 125.74 SD: 5.114 RSD(%): 4.07

~~~~~~

e ID: 81003.I2 Seq. No.: 00271 A/S Pos.: 26 Date: 10/16/98

ample abs. is greater than that of the largest standard.
eplicate 1 Time: 16:38
oncentration (ug/L): 195.59

ample abs. is greater than that of the largest standard.
eplicate 2 Time: 16:42
oncentration (ug/L): 193.25

ample abs. is greater than that of the largest standard.
ean Conc (ug/L): 194.42 SD: 1.650 RSD(%): 0.85

~~~~~~

e ID: 81003.I3 Seq. No.: 00272 A/S Pos.: 27 Date: 10/16/98

ample abs. is greater than that of the largest standard.
eplicate 1 Time: 16:45
oncentration (ug/L): 175.49

ample abs. is greater than that of the largest standard.
eplicate 2 Time: 16:48
oncentration (ug/L): 182.48

ample abs. is greater than that of the largest standard.
lean Conc (ug/L): 178.99 SD: 4.945 RSD(%): 2.76

~~~~~~

e ID: CCV Seq. No.: 00273 A/S Pos.: 3 Date: 10/16/98

eplicate 1 Time: 16:52
oncentration (ug/L): 54.81

eplicate 2 Time: 16:55
oncentration (ug/L): 53.45

lean Conc (ug/L): 54.13 SD: 0.965 RSD(%): 1.78

QC sample is within range

~~~~~~

e ID: CCB Seq. No.: 00274 A/S Pos.: 0 Date: 10/16/98

eplicate 1 Time: 16:59
oncentration (ug/L): 7.29

eplicate 2 Time: 17:02
oncentration (ug/L): 5.46

lean Conc (ug/L): 6.37 SD: 1.293 RSD(%): 20.30

QC sample is within range

~~~~~~

Se ID: 81006.1 Seq. No.: 00275 A/S Pos.: 28 Date: 10/16/9

Replicate 1 Time: 17:05
Concentration (ug/L): 79.56

Replicate 2 Time: 17:08
Concentration (ug/L): 80.96

Mean Conc (ug/L): 80.26 SD: 0.988 RSD(%): 1.23

~~~~~~

Se ID: 81006.1 Seq. No.: 00276 A/S Pos.: 28 Date: 10/16/

Sample abs. is greater than that of the largest standard.
Replicate 1 Time: 17:12
Concentration (ug/L): 122.48

Sample abs. is greater than that of the largest standard.
Replicate 2 Time: 17:15
Concentration (ug/L): 126.54

Sample abs. is greater than that of the largest standard.
Mean Conc (ug/L): 124.51 SD: 2.871 RSD(%): 2.31

Recovery is 88.5%

~~~~~~

Se ID: 81006.2 Seq. No.: 00277 A/S Pos.: 29 Date: 10/16/9

Replicate 1 Time: 17:19
Concentration (ug/L): 68.55

Replicate 2 Time: 17:22
Concentration (ug/L): 65.96

Mean Conc (ug/L): 67.25 SD: 1.828 RSD(%): 2.72

~~~~~~

Se ID: 81006.3 Seq. No.: 00278 A/S Pos.: 30 Date: 10/16/

Replicate 1 Time: 17:25
Concentration (ug/L): 81.60

Replicate 2 Time: 17:29
Concentration (ug/L): 78.09

Mean Conc (ug/L): 79.85 SD: 2.487 RSD(%): 3.11

~~~~~~

Se ID: CCV Seq. No.: 00279 A/S Pos.: 3 Date: 10/16/

Replicate 1 Time: 17:32
Concentration (ug/L): 54.22

Replicate 2 Time: 17:35
Concentration (ug/L): 50.46

Mean Conc (ug/L): 52.34 SD: 2.664 RSD(%): 5.09
~~~~~~

QC sample is within range

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Se ID: CCB Seq. No.: 00280 A/S Pos.: 0 Date: 10/16/9

Replicate 1 Time: 17:39
Concentration (ug/L): 4.44

Replicate 2 Time: 17:42
Concentration (ug/L): -1.54

Mean Conc (ug/L): 1.45 SD: 4.227 RSD(%): 291.52

QC sample is within range
~~~~~~

lement File: AG.GEL
ate: 10/15/98
ata File:
echnique: HGA

Element: Ag
Time: 16:02
ID/Wt File: 81002.IDW
Calib. Type: Linear

Wavelength: 328.1
Slit: 0.7 L
Lamp Current: 10
Energy: 55

---

g ID: BLANK Seq. No.: 00195 A/S Pos.: 0 Date: 10/15/9

eplicate 1
eak Area (A-s): 0.102
ackground Pk Area (A-s): 0.150
lank Corrected Pk Area (A-s): 0.007
oncentration (ug/L): 0.10

Time: 16:02
Peak Height (A): 0.158
Background Pk Height (A): 0.062

eplicate 2
eak Area (A-s): 0.088
ackground Pk Area (A-s): 0.133
lank Corrected Pk Area (A-s): -0.007
oncentration (ug/L): -0.71

Time: 16:05
Peak Height (A): 0.139
Background Pk Height (A): 0.061

ean Conc (ug/L): -0.30 SD: 0.568 RSD(%): 186.82

uto-zero performed.

---

g ID: 5 PPB AG Seq. No.: 00196 A/S Pos.: 1 Date: 10/15/9

eplicate 1
eak Area (A-s): 0.194
ackground Pk Area (A-s): 0.136
lank Corrected Pk Area (A-s): 0.099
oncentration (ug/L): 5.37

Time: 16:08
Peak Height (A): 0.290
Background Pk Height (A): 0.060

eplicate 2
eak Area (A-s): 0.187
ackground Pk Area (A-s): 0.129
lank Corrected Pk Area (A-s): 0.092
oncentration (ug/L): 5.01

Time: 16:12
Peak Height (A): 0.283
Background Pk Height (A): 0.057

ean Conc (ug/L): 5.19 SD: 0.254 RSD(%): 4.90

tandard number 1 applied. [5.00]
orrelation coefficient: 1.00000 Slope: 0.0191 Int: 0.000

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g ID: 10 PPB AG Seq. No.: 00197 A/S Pos.: 2 Date: 10/15/9

eplicate 1
eak Area (A-s): 0.282
ackground Pk Area (A-s): 0.143
lank Corrected Pk Area (A-s): 0.187
oncentration (ug/L): 9.79

Time: 16:15
Peak Height (A): 0.428
Background Pk Height (A): 0.062

eplicate 2
eak Area (A-s): 0.288
ackground Pk Area (A-s): 0.148
lank Corrected Pk Area (A-s): 0.194
oncentration (ug/L): 10.13

Time: 16:18
Peak Height (A): 0.435
Background Pk Height (A): 0.065

ean Conc (ug/L): 9.96 SD: 0.244 RSD(%): 2.45

tandard number 2 applied. [10.00]
orrelation coefficient: 1.00000 Slope: 0.0190 Int: 0.000

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o ID: 20 PPB AG Seq. No.: 00198 A/S Pos.: 3 Date: 10/15/98

eplicate 1 Time: 16:21
eak Area (A-s): 0.482 Peak Height (A): 0.724
ackground Pk Area (A-s): 0.152 Background Pk Height (A): 0.068
lank Corrected Pk Area (A-s): 0.387
oncentration (ug/L): 20.33

eplicate 2 Time: 16:24
eak Area (A-s): 0.471 Peak Height (A): 0.721
ackground Pk Area (A-s): 0.159 Background Pk Height (A): 0.067
lank Corrected Pk Area (A-s): 0.376
oncentration (ug/L): 19.76

lean Conc (ug/L): 20.04 SD: 0.402 RSD(%): 2.01

tandard number 3 applied. [20.00]
orrelation coefficient: 1.00000 Slope: 0.0191 Int: -0.000

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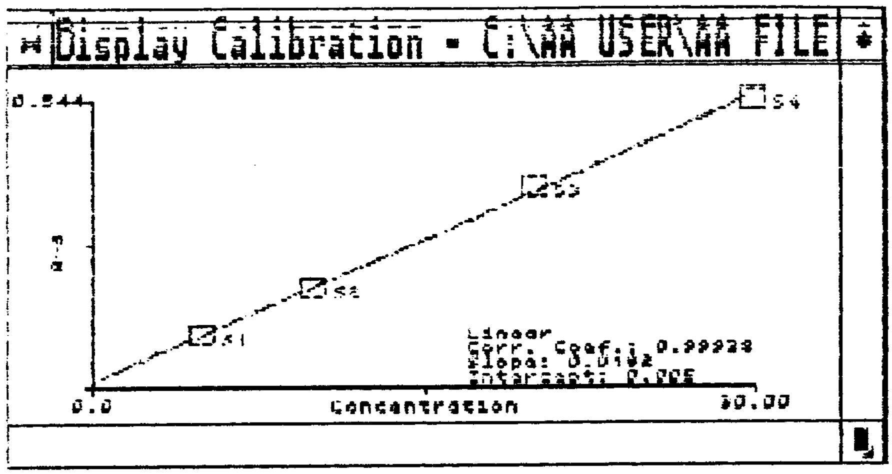
o ID: 30 PPB AG Seq. No.: 00199 A/S Pos.: 4 Date: 10/15/98

eplicate 1 Time: 16:28
eak Area (A-s): 0.641 Peak Height (A): 0.955
ackground Pk Area (A-s): 0.168 Background Pk Height (A): 0.085
lank Corrected Pk Area (A-s): 0.546
oncentration (ug/L): 28.65

eplicate 2 Time: 16:31
eak Area (A-s): 0.636 Peak Height (A): 0.947
ackground Pk Area (A-s): 0.162 Background Pk Height (A): 0.086
lank Corrected Pk Area (A-s): 0.541
oncentration (ug/L): 28.39

lean Conc (ug/L): 28.52 SD: 0.184 RSD(%): 0.64

tandard number 4 applied. [30.00]
orrelation coefficient: 0.99938 Slope: 0.0182 Int: 0.005



Ag ID: ICV Seq. No.: 00200 A/S Pos.: 5 Date: 10/15/9

Replicate 1 Time: 16:35
Concentration (ug/L): 20.25

Replicate 2 Time: 16:39
Concentration (ug/L): 20.13

Mean Conc (ug/L): 20.19 SD: 0.083 RSD(%): 0.41

QC sample is within range 15.5 - 24.49

Ag ID: ICB Seq. No.: 00201 A/S Pos.: 0 Date: 10/15/9

Replicate 1 Time: 16:45
Concentration (ug/L): -0.95

Replicate 2 Time: 16:48
Concentration (ug/L): -1.04

Mean Conc (ug/L): -1.00 SD: 0.061 RSD(%): 6.11

QC sample is within range -5.49 - 5.49

Ag ID: 81002.B-1 Seq. No.: 00202 A/S Pos.: 6 Date: 10/15/9

Replicate 1 Time: 16:51
Concentration (ug/L): -0.19

Replicate 2 Time: 16:55
Concentration (ug/L): -0.21

Mean Conc (ug/L): -0.20 SD: 0.020 RSD(%): 10.04

Ag ID: 81002.8-1 Seq. No.: 00203 A/S Pos.: 7 Date: 10/15/9

Replicate 1 Time: 16:58

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Ag    ID: CCV              Seq. No.: 00224   A/S Pos.: 3    Date: 10/15/9

Replicate  1                          Time: 19:12
Concentration (ug/L  ): 19.12

Replicate  2                          Time: 19:15
Concentration (ug/L  ): 18.08

Mean Conc  (ug/L  ):      18.60       SD: 0.738               RSD(%): 3.97

QC sample is within range 15.5 - 24.49

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Ag    ID: CCB              Seq. No.: 00225   A/S Pos.: 0    Date: 10/15/9

Replicate  1                          Time: 19:18
Concentration (ug/L  ): -1.13

Replicate  2                          Time: 19:21
Concentration (ug/L  ): -1.06

Mean Conc  (ug/L  ):      -1.10       SD: 0.046               RSD(%): 4.23

QC sample is within range -5.49 - 5.49

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Ag    ID: 81003.U2         Seq. No.: 00226   A/S Pos.: 23   Date: 10/15/9

Replicate  1                          Time: 19:24
Concentration (ug/L  ): -1.63

Replicate  2                          Time: 19:28
Concentration (ug/L  ): -1.54

Mean Conc  (ug/L  ):      -1.59       SD: 0.064               RSD(%): 4.04
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Ag    ID: 81003.U3         Seq. No.: 00227   A/S Pos.: 24   Date: 10/15/9

Replicate  1                          Time: 19:31
Concentration (ug/L  ): -1.53

Replicate  2                          Time: 19:34
Concentration (ug/L  ): -1.38

Mean Conc  (ug/L  ):      -1.46       SD: 0.100               RSD(%): 6.88
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Ag    ID: 81003.I1         Seq. No.: 00228   A/S Pos.: 25   Date: 10/15/9

Replicate  1                          Time: 19:38
Concentration (ug/L  ): 3.11

Replicate  2                          Time: 19:41
Concentration (ug/L  ): 3.04

Mean Conc  (ug/L  ):       3.08       SD: 0.049               RSD(%): 1.59
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Ag ID: 81003.I2 Seq. No.: 00229 A/S Pos.: 26 Date: 10/15/9

Replicate 1 Time: 19:44
Concentration (ug/L): 6.09

Replicate 2 Time: 19:47
Concentration (ug/L): 5.76

Mean Conc (ug/L): 5.93 SD: 0.238 RSD(%): 4.01

~~~~~~

Ag ID: 81003.I3 Seq. No.: 00230 A/S Pos.: 27 Date: 10/15/

Replicate 1 Time: 19:51
Concentration (ug/L): 4.31

Replicate 2 Time: 19:54
Concentration (ug/L): 3.77

Mean Conc (ug/L): 4.04 SD: 0.379 RSD(%): 9.38

~~~~~~

Ag ID: 81006.1 Seq. No.: 00231 A/S Pos.: 28 Date: 10/15/

Replicate 1 Time: 19:57
Concentration (ug/L): -0.42

Replicate 2 Time: 20:00
Concentration (ug/L): -0.46

Mean Conc (ug/L): -0.44 SD: 0.030 RSD(%): 6.76

~~~~~~

Ag ID: 81006.1 Seq. No.: 00232 A/S Pos.: 28 Date: 10/15/

Replicate 1 Time: 20:04
Concentration (ug/L): 6.19

Replicate 2 Time: 20:07
Concentration (ug/L): 6.29

Mean Conc (ug/L): 6.24 SD: 0.071 RSD(%): 1.14

Recovery is 66.8%

~~~~~~

Ag ID: 81006.2 Seq. No.: 00233 A/S Pos.: 29 Date: 10/15/

Replicate 1 Time: 20:10
Concentration (ug/L): -1.06

Replicate 2 Time: 20:13
Concentration (ug/L): -1.06

Mean Conc (ug/L): -1.06 SD: 0.001 RSD(%): 0.06
~~~~~~

~~~~~~

Ag ID: 81006.3 Seq. No.: 00234 A/S Pos.: 30 Date: 10/15/9

Replicate 1 Time: 20:17
Concentration (ug/L): -0.72

Replicate 2 Time: 20:20
Concentration (ug/L): -0.62

Mean Conc (ug/L): -0.67 SD: 0.068 RSD(%): 10.16

~~~~~~

Ag ID: CCV Seq. No.: 00235 A/S Pos.: 3 Date: 10/15/9

Replicate 1 Time: 20:23
Concentration (ug/L): 18.13

Replicate 2 Time: 20:26
Concentration (ug/L): 19.10

Mean Conc (ug/L): 18.62 SD: 0.691 RSD(%): 3.71

QC sample is within range 15.5 - 24.49

~~~~~~

Ag ID: CCB Seq. No.: 00236 A/S Pos.: 0 Date: 10/15/9

Replicate 1 Time: 20:29
Concentration (ug/L): -1.28

Replicate 2 Time: 20:32
Concentration (ug/L): -1.31

Mean Conc (ug/L): -1.30 SD: 0.024 RSD(%): 1.86

QC sample is within range -5.49 - 5.49
~~~~~~

Element File: TL.GEL Element: Tl Wavelength: 276.8
Date: 10/19/98 Time: 18:11 Slit: 2.00 H
Data File: ID/Wt File: 81002.IDW Lamp Current: 7
Technique: HGA Calib. Type: Nonlinear Energy: 45

Tl ID: BLANK Seq. No.: 00061 A/S Pos.: 0 Date: 10/19/9

Replicate 1 Time: 18:11
Peak Area (A-s): 0.003 Peak Height (A): 0.015
Background Pk Area (A-s): 0.013 Background Pk Height (A): 0.012
Blank Corrected Pk Area (A-s): 0.003

Replicate 2 Time: 18:14
Peak Area (A-s): -0.000 Peak Height (A): 0.016
Background Pk Area (A-s): 0.022 Background Pk Height (A): 0.015
Blank Corrected Pk Area (A-s): -0.000

Mean Pk Area (A-s): 0.002 SD: 0.0022 RSD(%): 142.9

Auto-zero performed.

Tl ID: 10 PPB TL Seq. No.: 00062 A/S Pos.: 1 Date: 10/19/9

Replicate 1 Time: 18:17
Peak Area (A-s): 0.016 Peak Height (A): 0.026
Background Pk Area (A-s): 0.039 Background Pk Height (A): 0.021
Blank Corrected Pk Area (A-s): 0.015

Characteristic Mass = 29.8 pg/0.0044 A-s

Replicate 2 Time: 18:21
Peak Area (A-s): 0.021 Peak Height (A): 0.027
Background Pk Area (A-s): 0.037 Background Pk Height (A): 0.023
Blank Corrected Pk Area (A-s): 0.019

Mean Pk Area (A-s): 0.017 SD: 0.0033 RSD(%): 19.47

Standard number 1 applied. [10.00]
Correlation coefficient: 1.00000 Slope: 0.0017

Characteristic Mass = 22.6 pg/0.0044 A-s

Tl ID: 20 PPB TL Seq. No.: 00063 A/S Pos.: 2 Date: 10/19/9

Replicate 1 Time: 18:24
Peak Area (A-s): 0.033 Peak Height (A): 0.034
Background Pk Area (A-s): 0.055 Background Pk Height (A): 0.031
Blank Corrected Pk Area (A-s): 0.031
Concentration (ug/L): 18.34

Replicate 2 Time: 18:27
Peak Area (A-s): 0.030 Peak Height (A): 0.040
Background Pk Area (A-s): 0.059 Background Pk Height (A): 0.032

Blank Corrected Pk Area (A-s): 0.028
Concentration (ug/L): 16.61

Mean Conc (ug/L): 17.47 SD: 1.226 RSD(%): 7.02

Standard number 2 applied. [20.00]
Correlation coefficient: 1.00000 Slope: 0.0020

~~~~~~

F1 ID: 50 PPB TL Seq. No.: 00064 A/S Pos.: 3 Date: 10/19/98

Replicate 1 Time: 18:30
Peak Area (A-s): 0.080 Peak Height (A): 0.080
Background Pk Area (A-s): 0.093 Background Pk Height (A): 0.056
Blank Corrected Pk Area (A-s): 0.078
Concentration (ug/L): 115.22

Replicate 2 Time: 18:34
Peak Area (A-s): 0.082 Peak Height (A): 0.081
Background Pk Area (A-s): 0.093 Background Pk Height (A): 0.061
Blank Corrected Pk Area (A-s): 0.080
Concentration (ug/L): 123.13

Mean Conc (ug/L): 119.09 SD: 5.597 RSD(%): 4.70

S-shaped calibration curve detected. 2-coef. equation used.
Standard number 3 applied. [50.00]
Correlation coefficient: 0.99809 Slope: 0.0017

~~~~~~

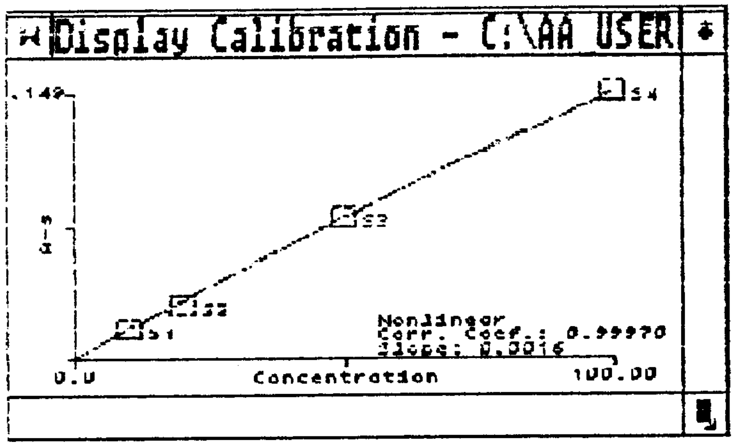
F1 ID: 100 PPB TL Seq. No.: 00065 A/S Pos.: 4 Date: 10/19/98

Replicate 1 Time: 18:37
Peak Area (A-s): 0.153 Peak Height (A): 0.147
Background Pk Area (A-s): 0.146 Background Pk Height (A): 0.114
Blank Corrected Pk Area (A-s): 0.151
Concentration (ug/L): 103.58

Replicate 2 Time: 18:40
Peak Area (A-s): 0.148 Peak Height (A): 0.131
Background Pk Area (A-s): 0.147 Background Pk Height (A): 0.104
Blank Corrected Pk Area (A-s): 0.146
Concentration (ug/L): 99.58

Mean Conc (ug/L): 101.57 SD: 2.829 RSD(%): 2.79

S-shaped calibration curve detected. 2-coef. equation used.
Standard number 4 applied. [100.00]
Correlation coefficient: 0.99970 Slope: 0.0016



F1 ID: ICV Seq. No.: 00066 A/S Pos.: 5 Date: 10/19/

Replicate 1 Time: 18:44
Concentration (ug/L): 51.09

Replicate 2 Time: 18:47
Concentration (ug/L): 46.76

Mean Conc (ug/L): 48.92 SD: 3.058 RSD(%): 6.25

QC sample is within range

F1 ID: ICB Seq. No.: 00067 A/S Pos.: 0 Date: 10/19/

Replicate 1 Time: 18:51
Concentration (ug/L): -2.91

Replicate 2 Time: 18:54
Concentration (ug/L): -2.21

Mean Conc (ug/L): -2.56 SD: 0.495 RSD(%): 19.35

QC sample is within range

F1 ID: 81003.RB-AP Seq. No.: 00068 A/S Pos.: 14 Date: 10/19/9

Replicate 1 Time: 18:57
Concentration (ug/L): 0.19

Replicate 2 Time: 19:00
Concentration (ug/L): -1.09

Mean Conc (ug/L): -0.45 SD: 0.911 RSD(%): 202.6

F1 ID: 81003.RB-F Seq. No.: 00069 A/S Pos.: 15 Date: 10/19/

Replicate 1 Time: 19:03
Concentration (ug/L): -2.47

~~~~~~

1 ID: CCV Seq. No.: 00085 A/S Pos.: 3 Date: 10/19/98

eplicate 1 Time: 20:45
oncentration (ug/L): 44.91

eplicate 2 Time: 20:48
oncentration (ug/L): 46.38

lean Conc (ug/L): 45.64 SD: 1.038 RSD(%): 2.27

IC sample is within range

~~~~~~

1 ID: CCB Seq. No.: 00086 A/S Pos.: 0 Date: 10/19/98

eplicate 1 Time: 20:51
oncentration (ug/L): 1.10

eplicate 2 Time: 20:55
oncentration (ug/L): -0.06

lean Conc (ug/L): 0.52 SD: 0.821 RSD(%): 156.75

IC sample is within range

~~~~~~

1 ID: 81006.1x5 Seq. No.: 00087 A/S Pos.: 28 Date: 10/19/98

eplicate 1 Time: 20:58
oncentration (ug/L): 0.53 Corrected Conc (ug/L): 2.6

eplicate 2 Time: 21:01
oncentration (ug/L): 3.14 Corrected Conc (ug/L): 15.7

lean Conc (ug/L): 1.83 SD: 1.848 RSD(%): 100.73
orrected Conc (ug/L): 9.2

~~~~~~

1 ID: 81006.1x5 Seq. No.: 00088 A/S Pos.: 28 Date: 10/19/98

eplicate 1 Time: 21:04
oncentration (ug/L): 51.97 Corrected Conc (ug/L): 259.84

eplicate 2 Time: 21:08
oncentration (ug/L): 48.19 Corrected Conc (ug/L): 241.0

lean Conc (ug/L): 50.08 SD: 2.671 RSD(%): 5.33
orrected Conc (ug/L): 250.4

Recovery is 96.5%

~~~~~~

1 ID: 81006.2x5 Seq. No.: 00089 A/S Pos.: 29 Date: 10/19/98

eplicate 1 Time: 21:11
oncentration (ug/L): 3.17 Corrected Conc (ug/L): 15.9

eplicate 2 Time: 21:14
~~~~~~

Concentration (ug/L): 3.90 Corrected Conc (ug/L): 19.5

Mean Conc (ug/L): 3.54 SD: 0.513 RSD(%): 14.51
Corrected Conc (ug/L): 17.7

~~~~~~

T1 ID: 81006.3x5 Seq. No.: 00090 A/S Pos.: 30 Date: 10/19/

Replicate 1 Time: 21:17
Concentration (ug/L): 5.05 Corrected Conc (ug/L): 25.2

Replicate 2 Time: 21:20
Concentration (ug/L): 4.46 Corrected Conc (ug/L): 22.3

Mean Conc (ug/L): 4.75 SD: 0.412 RSD(%): 8.66
Corrected Conc (ug/L): 23.8

~~~~~~

T1 ID: CCV Seq. No.: 00091 A/S Pos.: 3 Date: 10/19/9

Replicate 1 Time: 21:23
Concentration (ug/L): 49.51

Replicate 2 Time: 21:27
Concentration (ug/L): 49.92

Mean Conc (ug/L): 49.71 SD: 0.287 RSD(%): 0.58

QC sample is within range

~~~~~~

T1 ID: CCB Seq. No.: 00092 A/S Pos.: 0 Date: 10/19/9

Replicate 1 Time: 21:30
Concentration (ug/L): -2.06

Replicate 2 Time: 21:33
Concentration (ug/L): 0.99

Mean Conc (ug/L): -0.54 SD: 2.163 RSD(%): 404.6

QC sample is within range

~~~~~~

T1 ID: CCV Seq. No.: 00093 A/S Pos.: 3 Date: 10/20/9

Replicate 1 Time: 08:01
Concentration (ug/L): 48.50

Replicate 2 Time: 08:04
Concentration (ug/L): 45.22

Mean Conc (ug/L): 46.85 SD: 2.318 RSD(%): 4.95

QC sample is within range

F1 ID: CCB Seq. No.: 00094 A/S Pos.: 0 Date: 10/20/98

Replicate 1 Time: 08:07
Concentration (ug/L): -0.00

Replicate 2 Time: 08:10
Concentration (ug/L): -0.49

Mean Conc (ug/L): -0.25 SD: 0.344 RSD(%): 139.10

QC sample is within range

F1 ID: B1003.I1 Seq. No.: 00095 A/S Pos.: 25 Date: 10/20/98

Replicate 1 Time: 08:14
Concentration (ug/L): 35.62

Replicate 2 Time: 08:17
Concentration (ug/L): 37.38

Mean Conc (ug/L): 36.50 SD: 1.249 RSD(%): 3.42

F1 ID: B1003.I2 Seq. No.: 00096 A/S Pos.: 26 Date: 10/20/98

Replicate 1 Time: 08:20
Concentration (ug/L): 49.66

Replicate 2 Time: 08:24
Concentration (ug/L): 48.86

Mean Conc (ug/L): 49.26 SD: 0.566 RSD(%): 1.15

F1 ID: B1003.I3 Seq. No.: 00097 A/S Pos.: 27 Date: 10/20/98

Replicate 1 Time: 08:27
Concentration (ug/L): 46.14

Replicate 2 Time: 08:30
Concentration (ug/L): 46.23

Mean Conc (ug/L): 46.18 SD: 0.065 RSD(%): 0.14

F1 ID: B1006.1 Seq. No.: 00098 A/S Pos.: 28 Date: 10/20/98

Replicate 1 Time: 08:33
Concentration (ug/L): 16.97

Replicate 2 Time: 08:37
Concentration (ug/L): 18.19

Mean Conc (ug/L): 17.58 SD: 0.861 RSD(%): 4.90

MAIN:	0.003 MG/L	AA HO 0.001	MAIN:	0.002 MG/L	AA HO 0.001

ZN MEAN: 0.002 MG/L SD: 0.001 RSD: 21.8 AUTOZERO 0.000

MAIN:	0.098 MG/L	AA HO 0.039	MAIN:	0.082 MG/L	AA HO 0.032

ZN MEAN: 0.090 MG/L SD: 0.012 RSD: 12.8 1.STANDARD 0.090 MG/L

MAIN:	0.145 MG/L	AA HO 0.057	MAIN:	0.137 MG/L	AA HO 0.054

ZN MEAN: 0.141 MG/L SD: 0.006 RSD: 4.1 2.STANDARD 0.140 MG/L

MAIN:	0.220 MG/L	AA HO 0.088	MAIN:	0.235 MG/L	AA HO 0.093

ZN MEAN: 0.228 MG/L SD: 0.010 RSD: 4.6 3.STANDARD 0.227 MG/L

MAIN:	0.516 MG/L	AA HO 0.206	MAIN:	0.512 MG/L	AA HO 0.204

ZN MEAN: 0.514 MG/L SD: 0.003 RSD: 0.6 4.STANDARD 0.513 MG/L

MAIN:	0.919 MG/L	AA HO 0.368	MAIN:	0.910 MG/L	AA HO 0.365

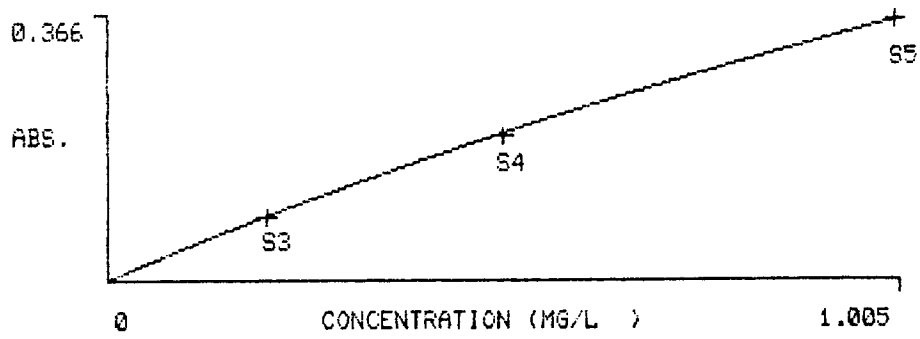
ZN MEAN: 0.915 MG/L SD: 0.006 RSD: 0.7 5.STANDARD 0.959 MG/L

FLAME DISPLAY CALIBRATION MODE
ELEMENT: ZN

PRINTER: ON
BG CORR: OFF
UNITS : MG/L

0.959

REPL. 0 OF 2



READ
ABS. READING
AA : 0.365

STATISTICS
MEAN: 0.915
SD: 0.006
RSD(%): 0.7

C2H2: 2.5 L/MIN OXIDANT: 8.0 L/MIN FLAME: C2H2-AIR

MAIN:	0.001 MG/L	AA HO 0.001	MAIN:	-0.001 MG/L	AA HO-0.000

ZN MEAN: 0.000 MG/L SD: 0.001 RSD: 99.9 AUTOZERO 0.000

~~~~~~

T1 ID: 81006.1 Seq. No.: 00099 A/S Pos.: 28 Date: 10/20/98

Replicate 1 Time: 08:40
Concentration (ug/L): 56.27

Replicate 2 . Time: 08:43
Concentration (ug/L): 56.46

Mean Conc (ug/L): 56.37 SD: 0.139 RSD(%): 0.25

Recovery is 77.6%

~~~~~~

T1 ID: 81006.2 Seq. No.: 00100 A/S Pos.: 29 Date: 10/20/98

Replicate 1 Time: 08:46
Concentration (ug/L): 13.37

Replicate 2 Time: 08:50
Concentration (ug/L): 16.79

Mean Conc (ug/L): 15.08 SD: 2.419 RSD(%): 16.04

~~~~~~

T1 ID: 81006.3 Seq. No.: 00101 A/S Pos.: 30 Date: 10/20/98

Replicate 1 Time: 08:53
Concentration (ug/L): 15.00

Replicate 2 Time: 08:56
Concentration (ug/L): 11.38

Mean Conc (ug/L): 13.18 SD: 2.561 RSD(%): 19.42

~~~~~~

T1 ID: CCV Seq. No.: 00102 A/S Pos.: 3 Date: 10/20/98

Replicate 1 Time: 08:59
Concentration (ug/L): 54.96

Replicate 2 Time: 09:02
Concentration (ug/L): 53.69

Mean Conc (ug/L): 54.32 SD: 0.899 RSD(%): 1.65

QC sample is within range

~~~~~~

T1 ID: CCB Seq. No.: 00103 A/S Pos.: 0 Date: 10/20/98

Replicate 1 Time: 09:06
Concentration (ug/L): -3.09

Replicate 2 Time: 09:09
Concentration (ug/L): -0.94

Mean Conc (ug/L): -2.02 SD: 1.525 RSD(%): 75.70
~~~~~~

		AA				AA	
MAIN:	0.500 MG/L	HO 0.207		MAIN:	0.475 MG/L	HO 0.198	
ZN ICV	MEAN: 0.488 MG/L	SD: 0.018 RSD: 3.6					
		AA				AA	
MAIN:	0.005 MG/L	HO 0.002		MAIN:	0.001 MG/L	HO 0.001	
ZN ICB	MEAN: 0.003 MG/L	SD: 0.002 RSD: 86.6					
		AA				AA	
MAIN:	0.380 MG/L	HO 0.163		MAIN:	0.400 MG/L	HO 0.170	
002 ZN B-1	MEAN: 0.390 MG/L	SD: 0.014 RSD: 3.6					
		AA				AA	
MAIN:	0.272 MG/L	HO 0.120		MAIN:	0.263 MG/L	HO 0.116	
ZN 8-1	MEAN: 0.267 MG/L	SD: 0.006 RSD: 2.4					
		AA				AA	
MAIN:	0.654 MG/L	HO 0.260		MAIN:	0.679 MG/L	HO 0.268	
ZN 8-15	MEAN: 0.666 MG/L	SD: 0.018 RSD: 2.7					
		AA				AA	
MAIN:	0.358 MG/L	HO 0.154		MAIN:	0.384 MG/L	HO 0.164	
ZN 9-1	MEAN: 0.371 MG/L	SD: 0.018 RSD: 4.9					
		AA				AA	
MAIN:	0.360 MG/L	HO 0.155		MAIN:	0.353 MG/L	HO 0.152	
ZN 9-1D	MEAN: 0.356 MG/L	SD: 0.006 RSD: 1.6					
		AA				AA	
MAIN:	0.426 MG/L	HO 0.180		MAIN:	0.439 MG/L	HO 0.135	
ZN 10-1	MEAN: 0.433 MG/L	SD: 0.009 RSD: 2.7					
		AA				AA	
MAIN:	0.013 MG/L	HO 0.006		MAIN:	0.014 MG/L	HO 0.007	
ZN [illegible]	MEAN: 0.013 MG/L	SD: 0.000 RSD: 2.3	AUTOZERO	0.000			
		AA				AA	
MAIN:	0.115 MG/L	HO 0.053		MAIN:	0.114 MG/L	HO 0.053	
ZN B-2A	MEAN: 0.115 MG/L	SD: 0.001 RSD: 0.6					

	AA		AA
MAIN: 0.104 MG/L	HO 0.048	MAIN: 0.099 MG/L	HO 0.046

ZN 43 MEAN: 0.101 MG/L SD: 0.003 RSD: 3.2

	AA		AA
MAIN: 0.480 MG/L	HO 0.200	MAIN: 0.477 MG/L	HO 0.199

ZN CCV MEAN: 0.479 MG/L SD: 0.002 RSD: 0.5

	AA		AA
MAIN: 0.000 MG/L	HO 0.000	MAIN: -0.001 MG/L	HO-0.000

ZN CCB MEAN: -0.000 MG/L SD: 0.001 RSD: 99.9

	AA		AA
MAIN: 0.357 MG/L	HO 0.154	MAIN: 0.356 MG/L	HO 0.153

ZN I1x5 MEAN: 0.356 MG/L SD: 0.001 RSD: 0.2

	AA		AA
MAIN: 0.774 MG/L	HO 0.299	MAIN: 0.770 MG/L	HO 0.297

ZN I1x5 MEAN: 0.772 MG/L SD: 0.003 RSD: 0.4

	AA		AA
MAIN: 0.490 MG/L	HO 0.204	MAIN: 0.476 MG/L	HO 0.198

ZN I2x5 MEAN: 0.483 MG/L SD: 0.010 RSD: 2.1

	AA		AA
MAIN: 0.455 MG/L	HO 0.191	MAIN: 0.454 MG/L	HO 0.191

ZN I3x5 MEAN: 0.455 MG/L SD: 0.000 RSD: 0.1

	AA		AA
MAIN: 0.209 MG/L	HO 0.094	MAIN: 0.209 MG/L	HO 0.094

8/006 ZN 1x5 MEAN: 0.209 MG/L SD: 0.000 RSD: 0.0

	AA		AA
MAIN: 0.593 MG/L	HO 0.240	MAIN: 0.607 MG/L	HO 0.244

ZN 15x5 MEAN: 0.600 MG/L SD: 0.010 RSD: 1.7

	AA		AA
MAIN: 0.139 MG/L	HO 0.064	MAIN: 0.138 MG/L	HO 0.063

ZN 2x5 MEAN: 0.138 MG/L SD: 0.001 RSD: 0.6

MAIN:	0.139 MG/L	AA HO 0.064	MAIN:	0.136 MG/L	AA HO 0.062

ZN 2x5D MEAN: 0.137 MG/L SD: 0.002 RSD: 1.5

MAIN:	0.153 MG/L	AA HO 0.070	MAIN:	0.146 MG/L	AA HO 0.067

ZN 3x5 MEAN: 0.149 MG/L SD: 0.005 RSD: 3.1

MAIN:	0.507 MG/L	AA HO 0.210	MAIN:	0.515 MG/L	AA HO 0.212

ZN CCV MEAN: 0.511 MG/L SD: 0.005 RSD: 1.0

MAIN:	-0.004 MG/L	AA HO-0.002	MAIN:	-0.003 MG/L	AA HO-0.002

ZN CCB MEAN:-0.003 MG/L SD: 0.000 RSD: 7.9

TECHNICAL REPORT DATA

Please read instructions on the reverse before completing

1. REPORT NO. EPA-454/R-99-002a	2.	3. RECIPIENT'S ACCESSION NO.
4. TITLE AND SUBTITLE Final Report - Emissions Testing of Combustion Stack and Pushing Operations at Coke Battery No. 5/6 at ABC Coke in Birmingham, Alabama Volume I of III		5. REPORT DATE February 1999 6. PERFORMING ORGANIZATION CODE
7. AUTHOR(S) Franklin Meadows Daniel F. Scheffel		8. PERFORMING ORGANIZATION REPORT NO.
9. PERFORMING ORGANIZATION NAME AND ADDRESS Pacific Environmental Services, Inc. Post Office Box 12077 Research Triangle Park, North Carolina 27709-2077		10. PROGRAM ELEMENT NO. 11. CONTRACT/GRANT NO. 68-D-98-004
12. SPONSORING AGENCY NAME AND ADDRESS U.S. Environmental Protection Agency Office of Air Quality Planning and Standards Emissions, Monitoring and Analysis Division Research Triangle Park, North Carolina 27711		13. TYPE OF REPORT AND PERIOD COVERED Final 14. SPONSORING AGENCY CODE
15. SUPPLEMENTARY NOTES		

16. ABSTRACT

The United States Environmental Protection Agency (EPA) is investigating the coke making industry to characterize hazardous air pollutants (HAPs) emitted from coke pushing operations and combustion (underfire) stacks. This test report addresses pushing emissions from a coke oven, and emissions from the combustion (underfire) stack that serves Coke Battery No. 5/6 at ABC Coke in Birmingham, Alabama. The purpose of this test program was to quantify emissions from the inlet and outlet of the baghouse controlling emissions from the coke pushing operation and to quantify emissions from the combustion outlet stack. The data may be used by the EPA in the future to support a residual risk assessment for coke oven facilities.

The testing was performed to quantify uncontrolled and controlled air emissions of filterable particulate matter (PM), methylene chloride extractable matter (MCEM) and 19 polycyclic aromatic hydrocarbons (PAHs) including acenaphthene, acenaphthylene, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(e)pyrene, benzo(k)fluoranthene, benzo(ghi)perylene, chrysene, dibenzo(a,h)anthracene, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, 2-methylnapthalene, napthalene, perylene, phenanthrene, and pyrene. In addition, following the PM and MCEM analyses, the samples were analyzed to screen for the presence of 17 trace metals. Baghouse dust samples were also collected and analyzed for 16 trace metals. Simultaneous testing was performed at the inlet and outlet of the baghouse controlling emissions from the coke pushing operation. Sampling was also performed on the combustion outlet stack. In addition to pollutant testing, oxygen (O_2) and carbon dioxide (CO_2) were measured at each location. During the sampling program, Research Triangle Institute (RTI), another EPA contractor, monitored and recorded process and emission control system operating parameters.

This volume (Volume I) is comprised of 542 pages and consists of the report text, and Appendices: A (Process Data), B (Raw field Data), and C (Analytical Data except CARB 429).

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTIONS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COASTI Field/Group
Baghouse Coke Ovens Emission Measurements Hazardous Air Pollutants Metals Methylene Chloride Extractable Matter Particulate Matter Polycyclic Aromatic Hydrocarbons		

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Agency

Office of Air Quality
Planning and Standards
Research Triangle Park, NC 27711

EPA-454/R-99-002b
February 1999

AIR

EPA

Final Report - Volume II of III

Emissions Testing of Combustion Stack and Pushing Operations at Coke Battery No. 5/6 at ABC Coke in Birmingham, Alabama

Office of Air Quality
Clean Air
OAQPS
Planning and Standards

FINAL REPORT
EMISSIONS TESTING OF COMBUSTION STACK AND COKE PUSHING OPERATIONS AT COKE BATTERY NO. 5/6 AT ABC COKE IN BIRMINGHAM, ALABAMA

Volume II
Appendix D

EPA Contract No. 68-D-98-004
Work Assignment No. 2-02

Prepared for:

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February 1999
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APPENDIX D

ANALYTICAL DATA
(CARB 429)

[redacted]

Invoice

Quanterra

Quanterra, Incorporated
880 Riverside Parkway
West Sacramento, CA 95605
Tel (916)373-5600
Fax (916)372-1059

REMIT TO: Quanterra, Incorporated
P.O. Box 2473
Carol Stream, IL 601322473

Number: 0032027606
Date: 11 NOV 98
Quanterra Project Number: CALLAB-301802
Customer Number: 00104971
Terms: NET 30 DAYS
Customer Contact:

Bill To: Payable
Pacific Environmental Services, Inc.
560 Herndon Parkway
Suite 200
Herndon, VA 201705240

Ron Kolde
Pacific Environmental Services
4700 Duke Drive
Suite 150
Mason, OH 45040

Line No.	Qty.	Matrix Code	Analysis Description	Unit Price	Extended Price
			ANALYTICAL SERVICES		
1	14	AIRTRAIN	PAH in air matricies by HRGC/HRMS	1000.00	14000.0
			Analytical Services Subtotal	14000.00	
			ADDITIONAL SERVICES		
2	14		Data Validation Package ($25.00/Sample)	25.00	350.0
3	20		XAD Trap-Prep and QC	75.00	1500.0
			Additional Services Subtotal	1850.00	

O Schiffel
11-12-98
$512.000

EXACT COPY OF THE ORIGINAL

Customer Purchase Order Number: 104-99-0078 and 103-99-350
Customer Project Manager: Robert Weidenfeld
Salesperson: Todd Vilen

Sub Total	15850.0
Tax	
Total	15850.0

Federal Tax I.D. # 84-

QUA-4027 (0597)

PACIFIC ENVIRONMENTAL SERVICES, INC.

PURCHASE ORDER NO. 103-~~98~~ 99 - 350

DATE: 9/14/98

VENDOR: Quantera Laboratories
880 Riverside Parkway
West Sacramento, California
95605

CONTACT: Robert Weisenfeld

PHONE: 916-374-4411

INVOICE TO: Pacific Environmental Services, Inc.
560 Herndon Parkway, Suite 200
Herndon, Virginia 22070
(703) 471-8383

SHIP TO: Pacific Environmental Services, Inc.
~~1700 Duke Drive, Suite 150~~
~~Mason, Ohio 45040~~
~~(513) 398-2556~~

PACIFIC ENVIRONMENTAL SERVICES
ENTERED

CHARGE TO	ACCOUNT NO	BUYER	TERMS	SHIP VIA	SPECIAL INSTRUCTIONS
5505.000		R Kofeld		Fed Ex	

Item #	Description	Req. Date	Qty.	Unit Cost	Total Cost
	XAD resin trap preparation / spiking for CARB 429 sampling	9/14/98	20	$75	$1500

RECEIVED

NOTES:
1. Please reference P.O. Number on all invoices.
2. Invoices submitted more than 45 days after services/goods are delivered will not be honored.
3. Terms are 45 days after receipt of invoice.

Total $1500.00

Requisitioned By

GOODS/SERVICES PURCHASE REQUISITION NO. 103-98-350

Requested by: Ron Kolde Date: 9/14/98

Office No. 103 Charge to: 5505.000

Preferred Vendor: Quanterra Laboratories

Address: 880 Riverside Parkway

West Sacramento, California 95605

Phone: 916-374-4411 Contact: Patrick Rainey / Robert Weidenfeld

Fax: Account No.:

Special Instructions:

(Please list alternate vendors on reverse)

Description (Detailed as possible)	Quantity	Cost/Unit	Cost
XAD Resin trap preparation for CARB Method 429 sampling.	20	$75 each	$1500

☐ COMPLETE JUSTIFICATION MEMO ON REVERSE TOTAL COST: $1500

Total Cost $500 or Less	When required by Purchase Authority Matrix
Approved: D. Schuff	Approved: T.A. Li Puma, President
Date: 10-1-98	Date:

GOODS/SERVICES PURCHASE REQUISITION NO. 103-98-350

Requested by: Ron Kolde Date: 9/14/98

Office No. 103 Charge to: 5505.000

Preferred Vendor: Quantera Laboratories

Address: 880 Riverside Parkway

West Sacramento, California 95605

Phone: 916-374-4411 Contact: Patrick Rainey / Robert Whitehead

Fax: Account No.:

Special Instructions:

(Please list alternate vendors on reverse)

Description (Detailed as possible)	Quantity	Cost/Unit	Cost
XAD Resin trap preparation for CARB Method 429 Sampling.	20	$75 each	$1500

☐ COMPLETE JUSTIFICATION MEMO ON REVERSE

TOTAL COST: $1500

Total Cost $500 or Less

Approved: D. Schaffer 9-26

Date: 10-1-98 10-7-98

When required by Purchase Authority Matrix

Approved: T.A. Li Puma, President

Date: 10/12/98

Quanterra Incorporated
880 Riverside Parkway
West Sacramento, California 95605

916 373-5600 Telephone
916 372-1059 Fax

November 6, 1998
QUANTERRA INCORPORATED PROJECT NUMBER: **301802**
PO/CONTRACT: **CLC-950302**

Ron Kolde
Pacific Environmental Services
4700 Duke Drive
Suite 150
Mason, OH 45040

Dear Mr. Kolde:

This report contains the analytical results for the fourteen samples which were received under chain of custody by Quanterra Incorporated on 29 September 1998.

The case narrative is an integral part of this report.

If you have any questions, please feel free to call.

Sincerely,

Robert Weidenfeld
Project Manager
Advanced Technology

RW/tw

Quanterra

TABLE OF CONTENTS

QUANTERRA INCORPORATED PROJECT NUMBER 301802

Case Narrative

Quanterra's Quality Assurance Program

Sample Description Information

Chain of Custody Documentation

Polynuclear Aromatic Hydrocarbons - Method HRGC/HRMS
Includes Sample(s): 1 through 14
Method Blank Sheets
Sample Data Sheets
Laboratory Control Sample

Quanterra

CASE NARRATIVE

QUANTERRA INCORPORATED PROJECT NUMBER 301802

Sample trains were prepared and analyzed by a modified CARB 429 procedure. All fractions of each train were combined for a single extract which was analyzed by HRGC/HRMS.

Results above the reporting limits for Naphthalene, 2-Methylnaphthalene, and Phenanthrene were detected in the laboratory method blank associated with your samples. These analyte levels are common artifacts of XAD-2 resin and should be reviewed for significance. Positive concentrations detected for these analytes in your samples are qualified with a "B" footnote on the data sheets.

All reported results for your samples are from analysis of extracts diluted 10X, except where qualified with a "D" footnote. D flagged results are from analysis of extracts diluted 100X due to high analyte levels and/or matrix interferences.

Some internal standard recoveries are lower than the method recommended goal of 50%. Generally, data quality is not considered affected if internal standard signal-to-noise is greater than 10:1, which is achieved for all internal standards in all samples except as noted below. For samples "A-U-429-1", "A-U-429-2", "A-U-429-3", and "A-U-429-4", there are very low recoveries for Acenaphthylene-d8, Perylene-d12, and Benzo(a)pyrene-d12 due to severe chemical interferences. These internal standard recoveries and the corresponding native concentration have been determined as best as possible and should be considered estimated. The affected analytes are qualified with an "F" footnote on the appropriate data sheets.

The Laboratory Control Sample (LCS) associated with your samples was reinjected for Flourene on 03 NOV 98 due to poor response for this analyte in the original analysis.

QUANTERRA INCORPORATED QUALITY CONTROL PROGRAM

Quanterra has implemented an extensive Quality Control (QC) program to ensure the production of scientifically sound, legally defensible data of known documentable quality. This QC program is based upon requirements in "Test Methods for Evaluating Solid Waste", USEPA SW-846, Third Edition. It applies whenever SW-846 analytical methods are used. It also applies in whole or in part whenever project requirements fail to specify some aspect of QC practices described here. It does not apply when other well defined QC programs (e.g. CLP or CLP-like) are specified. This is Quanterra's base QC program for environmental analysis.

Definitions:

Quality Control Batch. The quality control (QC) batch is a set of up to 20 field samples plus associated laboratory QC samples that are similar in composition (matrix) and that are processed within the same time period with the same reagent and standard lots.

Surrogate. A surrogate (or internal standard) is an organic compound similar in chemical behavior to the target analyte, but not normally found in environmental samples. Surrogates (or IS) are added to all samples in a batch to monitor the effects of both the matrix and the analytical process on accuracy.

Method Blank. A method blank (MB) is a control sample prepared using the same reagents used for the samples. As part of the QC batch, it accompanies the samples through all steps of the sample extraction and cleanup procedure. The method blank is used to monitor the level of contamination introduced to a batch of samples as a result of processing in the laboratory.

Laboratory Control Sample. A laboratory control sample (LCS) is prepared using a well characterized matrix (e.g., reagent water or Ottawa sand) that is spiked with known amounts of representative analytes. Alternate matrices (e.g., glass beads) may be used for soil analyses when Ottawa sand is not appropriate. As part of a QC batch, it accompanies the samples through all steps of the sample extraction and cleanup process. The LCS is used to monitor the accuracy of the analytical process independent of possible interference effects due to sample matrix.

Duplicate Control Sample. A duplicate laboratory control sample (DCS) consists of a pair of LCSs analyzed within the same QC batch to monitor precision and accuracy independent of sample matrix effects.

Quanterra

SAMPLE DESCRIPTION INFORMATION
for
Pacific Environmental Services

Lab ID	Client ID	Matrix	Sampled Date	Sampled Time	Received Date
301802-0001-MB	Method Blank	AIRTRAIN			29 SEP 98
301802-0001-SA	A-I-429-1	AIRTRAIN	21 SEP 98		29 SEP 98
301802-0002-SA	A-I-429-2	AIRTRAIN	22 SEP 98		29 SEP 98
301802-0003-SA	A-I-429-3	AIRTRAIN	23 SEP 98		29 SEP 98
301802-0004-SA	A-O-429-1	AIRTRAIN	21 SEP 98		29 SEP 98
301802-0005-SA	A-O-429-2	AIRTRAIN	22 SEP 98		29 SEP 98
301802-0006-SA	A-O-429-3	AIRTRAIN	23 SEP 98		29 SEP 98
301802-0007-SA	A-U-429-1	AIRTRAIN	24 SEP 98		29 SEP 98
301802-0008-SA	A-U-429-2	AIRTRAIN	24 SEP 98		29 SEP 98
301802-0009-SA	A-U-429-3	AIRTRAIN	25 SEP 98		29 SEP 98
301802-0010-SA	A-U-429-4	AIRTRAIN	25 SEP 98		29 SEP 98
301802-0011-SA	A-I-429-FB	AIRTRAIN	24 SEP 98		29 SEP 98
301802-0012-SA	A-O-429-FB	AIRTRAIN	24 SEP 98		29 SEP 98
301802-0013-SA	A-U-429-FB	AIRTRAIN	25 SEP 98		29 SEP 98
301802-0014-SA	A-429-LB	AIRTRAIN	21 SEP 98		29 SEP 98

PACIFIC ENVIRONMENTAL SERVICES, INC.

7209 East Kemper Rd.
Cincinnati, Ohio
45249-1030
ph: 513-489-6611
Fax: 513-489-6619

~~4700 Duke Drive, Suite 150~~
~~Mason, OH 45040~~
~~(513) 398-2556~~
~~FAX: (513) 398-3342~~

Chain of Custody Record

Project Number: SS05.000

Project Name: ABC Coke Tarrant, Ala.

Samplers: T. Abernathy, G. Long, S. Blaine, P. Seigel, A. Richards, D. Holschuh

Purchase Order No.:

Analysis Requested: CARB Method 429 for Poly Aromatic Hydrocarbons (PAH's)

PES Field Sample ID	Date	Time	Sample Description	Number of Containers	CARB Method 429 for Poly Aromatic Hydrocarbons (PAH's)				Comments
A-I-429-1	9/21/98		Baghouse Inlet Run 1	7	X				Report results to Dan Schuffel PES, Inc
A-I-M429-2	9/22/98		Baghouse Inlet Run 2	7	X				
A-I-M429-3	9/23/98		Baghouse Inlet Run 3	7	X				
A-I-M429-FB	9/24/98		Baghouse Inlet Field Blank	7	X				
A-O-M429-1	9/21/98		Baghouse Outlet Run 1	7	X				
A-O-M429-2	9/22/98		Baghouse Outlet Run 2	7	X				
A-O-M429-3	9/23/98		Baghouse Outlet Run 3	7	X				
A-O-M429-FB	9/24/98		Baghouse Outlet Field Blank	7	X				
A-U-M429-1	9/24/98		Underfire Stack Run 1	7	X				
A-U-M429-2	9/24/98		Underfire Stack Run 2	8	X				
A-U-M429-3	9/25/98		Underfire Stack Run 3	7	X				
A-U-M429-4	9/25/98		Underfire Stack Run 4	7	X				
A-U-M429-FB	9/25/98		Underfire Stack Field Blank	7	X				
A-M429-LB	9/21/98		Method 429 Reagent Blanks	6	X				

(*) Obtained the XAD from those returned file.

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Ronald J. Kolb	9/25/98	Steve Terrell			

Relinquished by: (Signature)	Date/Time	Received for lab by: (Signature)	REMARKS
Steve Terrell	9/29/98 20	Mary A. C. Dr	

Page: ___ of ___

U.S. EPA - ABC Coke - Birmingham, Alabama - S505.000
Master Sample Log

Sample Run No.	Date/Time	Sample Description	Liquid Level Marked/ Sealed	Being Stored Below 4°C
A-I-429-1	9-21-98/1128	Filter - Teflon		✓
		Front ½ Acetone, Hexane MeCl2 Rinse	✓	✓
		Back ½ Filter Contents Acetone, Hexane MeCl2	✓	✓
		XAD Trap	✓	Yes
		Knockout - Acetone, Hex, MeCl2	✓	✓
		Impinger Contents	✓	✓
		Impinger Rinse Ace, Hex, MeCl2	✓	✓
A-I-429-2	9-22-98/1010	Filter - Teflon	✓	✓
		Front ½ Acetone, Hex, MeCl2	✓	✓
		Back ½ Filter Contents, Ace, Hex, MeCl2	✓	✓
		XAD Trap	✓	Yes
		Knockout Ace, Hex MeCl2	✓	✓
		Impinger Contents	✓	✓
		Impinger Rinse Ace Hex MeCl2	✓	✓
~~A-I-429-3~~ AR				
A-I-429-3	9-23-98/1019	Filter - Teflon	✓	✓
		Front ½ Ace, Hex, MeCl2	✓	✓
		Back ½ Filter Contents, Ace, Hex, MeCl2	✓	✓
		XAD Trap	✓	Yes
		Knockout Ace Hex MeCl2	✓	✓
		Impinger Rinse Ace Hex MeCl2	✓	✓

U.S. EPA - ABC Coke - Birmingham, Alabama - S505.000
Master Sample Log

Sample Run No.	Date/Time	Sample Description	Liquid Level Marked/ Sealed	Being Stored Below 4°C
A-I-429-3 cont	9-23-98	Impinger Rinse Ace Hex MeCl2	✓	✓
A-I-315-1	9/21-98/1125	Filter ~~080898-07~~ 080798-20 (AE)	✓	
		Front Y2 Acetone	✓	
		Front Y2 MeCl2	✓	
		Impinger Contents + H2O Rinse	✓	
		Back Y2 Acetone Rinse	✓	
		Back Y2 MeCl2 Rinse	✓	
A-I-315-2	9/22/98/1015	Filter 080898-07	✓	
		Front Y2 Acetone	✓	
		Front Y2 MeCl2	✓	
		Impinger Conts + H2O Rinse	✓	
		Back Y2 Acetone Rinse	✓	
		Back Y2 MeCl2 Rinse	✓	
A-I-315-3	9/23-98/1010	Filter 080898-16	✓	
		Front Y2 Acetone	✓	
		Front Y2 MeCl2	✓	
		Impinger Cont's + H2O Rinse	✓	
		Back Y2 Acetone Rinse	✓	
		Back Y2 MeCl2 Rinse	✓	

U.S. EPA - ABC Coke - Birmingham, Alabama - S505.000
Master Sample Log

Sample Run No.	Date/Time	Sample Description	Liquid Level Marked/ Sealed	Being Stored Below 4°C
A-I-5506-1	9-21-98/1147	Tube A		Yes
		Tube B		Yes
		Tube C		Yes
A-I-5506-2	9-22-98/1022	Tube A		Yes
		Tube B		Yes
		Tube C		Yes
A-I-5506-3	9-23-98/1022	Tube A		Yes
		Tube B		Yes
		Tube C		Yes
A-O-429-1	9-21-98/1128	Filter: Teflon	✓	✓
		Front ½ Ace Hex MeCl2 Rinse	✓	✓
		Back ½ Filter Cont Ace Hex MeCl2	✓	✓
		XAD Trap	✓	Yes
		Knockout Ace, Hex, MeCl2 Rinse	✓	✓
		Impinger Cont's	✓	✓
		Impinger Rinse Ace Hex MeCl2	✓	✓

U.S. EPA - ABC Coke - Birmingham, Alabama - S505.000
Master Sample Log

Sample Run No.	Date/Time	Sample Description	Liquid Level Marked/ Sealed	Being Stored Below 4°C
A-O-429-2	9-22-98/1018	Filter Teflon.	≠	✓
		Front ½ Ace Hex $MeCl_2$ Rinse	✓	✓
		Back ½ Filter Cont Ace Hex $MeCl_2$	✓	✓
		XAD Trap	✓	Yes
		Knockout Ace Hex $MeCl_2$ Rinse	✓	✓
		Impinger Contents	✓	✓
		Impinger Rinse Ace Hex $MeCl_2$	✓	✓
A-O-429-3	9-23-98/1019	Filter Teflon		✓
		Front ½ Ace Hex $MeCl_2$ Rinse	✓	✓
		Back ½ Filter Cont Ace Hex $MeCl_2$	✓	✓
		XAD Trap	✓	Yes
		Knockout Ace Hex $MeCl_2$ Rinse	✓	✓
		Impinger Contents	✓	✓
		Impinger Rinse Ace Hex $MeCl_2$	✓	✓
A-O-315-1	9-21-98/1223	Filter 080798-02		
		Front ½ Acetone	✓	
		Front ½ $MeCl_2$	✓	
		Impinger Contents & H_2O Rinse	✓	
		Back ½ Acetone Rinse	✓	
		Back ½ $MeCl_2$ Rinse	✓	

U.S. EPA - ABC Coke - Birmingham, Alabama - S505.000
Master Sample Log

Sample Run No.	Date/Time	Sample Description	Liquid Level Marked/ Sealed	Being Stored Below 4°C
A0-315-2	9-22-98/1015	Filter 080898-20		
		Front Yz Acetone	✓	
		Front Yz MeCl2	✓	
		Impinger Contents + H2O Rinse	✓	
		Back Yz Acetone Rinse	✓	
		Back Yz MeCl2 Rinse	✓	
A-0-315-3	9-23-98/1019	Filter 080898-24		
		Front Yz Acetone	✓	
		Front Yz MeCl2	✓	
		Impinger Contents + H2O Rinse	✓	
		Back Yz Acetone Rinse	✓	
		Back Yz MeCl2 Rinse	✓	
A-0-5506-1	9-21-98/1138	Tube A		Yes
		Tube B		Yes
		Tube C		Yes
A-0-5506-2	9-22-98/1031	Tube A		Yes
		Tube B		Yes
		Tube C		Yes

U.S. EPA - ABC Coke - Birmingham, Alabama - S505.000

Master Sample Log

Sample Run No.	Date/Time	Sample Description	Liquid Level Marked/ Sealed	Being Stored Below 4°C
A-0-5506-3	9-23-98/1022	Tube A		Yes
		Tube ~~A~~ B		Yes
		Tube C		Yes
A-U-429-1	9-24-98/1025	Filter - Teflon	✓	✓
		Front ½ Ace, Hex MeCl2 Rinse	✓	✓
		Back ½ Filter Contents Ace Hex MeCl2	✓	✓
		XAD Trap	✓	✓
		Knockout - Ace Hex MeCl2 Rinse	✓	✓
		Impinger Contents	✓	✓
		Impinger Rinses Ace Hex MeCl2	✓	✓
A-U-429-2	9-24-98/1453	Filter - Teflon	✓	✓
		Filter - Teflon	✓ ~~✓~~ (AC)	✓
		Back ½ Filter Contents Ace Hex MeCl2	✓	✓
		XAD Trap	✓	✓
		Knockout - Ace, Hex, MeCl2 Rinse	✓	✓
		Impinger Contents	✓	✓
		Impinger Rinses Ace Hex MeCl2	✓	✓

U.S. EPA - ABC Coke - Birmingham, Alabama - S505.000
Master Sample Log

Sample Run No.	Date/Time	Sample Description	Liquid Level Marked/ Sealed	Being Stored Below 4°C
A-U-M429-3	9/25/98	Filter - Teflon	✓	✓
		Front ½ Ace, Hex, $MeCl_2$	✓	✓
		Back ½ Filter, Cond. Ace, Hex, $MeCl_2$	✓	✓
		XAD trap	✓	✓
		Knockout Ace, Hex, $MeCl_2$	✓	✓
		Impinger Contents	✓	✓
		Imp. Rinse Ace, Hex, $MeCl_2$	✓	✓
A-U-M429-4	9/25/98	Filter - Teflon	✓	✓
		Front ½ Ace, Hex, $MeCl_2$	✓	✓
		Back ½ Filter/Cond. Ace, Hex, $MeCl_2$	✓	✓
		XAD trap	✓	✓
		Knockout Ace, Hex, $MeCl_2$	✓	✓
		Imp. Contents	✓	✓
		Imp. Rinse Ace, Hex, $MeCl_2$	✓	✓
A-U-M315-3	9/25/98	Filter 080898-17	✓	✓
		Front ½ Acetone	✓	✓
		Front ½ $MeCl_2$	✓	✓
		Imp. Contents/DI Rinse	✓	✓
		Back ½ Acetone	✓	✓
		Back ½ $MeCl_2$	✓	✓

U.S. EPA - ABC Coke - Birmingham, Alabama - S505.000
Master Sample Log

Sample Run No.	Date/Time	Sample Description	Liquid Level Marked/ Sealed	Being Stored Below 4°C
A-U-M315-4	9/25/98	Filter 080898-13	✓	✓
		Front ½ Acetone	✓	✓
		Front ½ $MeCl_2$	✓	✓
		Imp. Cont. /DI Rinse	✓	✓
		Back ½ Acetone	✓	✓
		Back ½ $MeCl_2$	✓	✓
A-U-5506-1	9/25/98	Tube A	✓	✓
		Tube B		✓
		Tube C		✓

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POLYNUCLEAR AROMATIC HYDROCARBONS
HIGH RESOLUTION GC/MS
Method HRGC/HRMS

Client Name: Pacific Environmental Services
Client ID: Method Blank
Lab ID: 301802-0001-MB
Matrix: AIRTRAIN Sampled: NA Received: NA
Authorized: NA Prepared: 03 OCT 98 Analyzed: 05 NOV 98
Dilution Factor: 1.0

Parameter	Result	Units	Reporting Limit	Data Qualifiers
Naphthalene	340	ng/sample	--	
2-Methylnaphthalene	25	ng/sample	--	
Acenaphthylene	ND	ng/sample	10	
Acenaphthene	ND	ng/sample	10	
Fluorene	ND	ng/sample	10	
Phenanthrene	24	ng/sample	--	
Anthracene	ND	ng/sample	10	
Fluoranthene	ND	ng/sample	10	
Pyrene	ND	ng/sample	10	
Benzo(a)anthracene	ND	ng/sample	10	
Chrysene	ND	ng/sample	10	
Benzo(b)fluoranthene	ND	ng/sample	10	
Benzo(k)fluoranthene	ND	ng/sample	10	
Benzo(e)pyrene	ND	ng/sample	10	
Benzo(a)pyrene	ND	ng/sample	10	
Perylene	ND	ng/sample	10	
Indeno(1,2,3-cd)pyrene	ND	ng/sample	10	
Dibenz(a,h)anthracene	ND	ng/sample	10	
Benzo(g,h,i)perylene	ND	ng/sample	10	

NA = Not Applicable
ND = Not Detected

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POLYNUCLEAR AROMATIC HYDROCARBONS
HIGH RESOLUTION GC/MS
Method HRGC/HRMS
(cont.)

Client Name: Pacific Environmental Services
Client ID: Method Blank
Lab ID: 301802-0001-MB
Matrix: AIRTRAIN Sampled: NA Received: NA
Authorized: NA Prepared: 03 OCT 98 Analyzed: 05 NOV 98
Dilution Factor: 1.0

Internal Standards	% Recovery	
Naphthalene-d8	42	m
Acenaphthylene-d8	66	
Acenaphthene-d10	64	
Fluorene-d10	60	
Phenanthrene-d10	80	
Fluoranthene-d10	50	
Pyrene-d10	54	
Benzo(a)anthracene-d12	65	
Perylene-d12	85	
Indeno(123-cd)pyrene-d12	93	
Chrysene-d12	87	
Benzo(b)fluoranthene-d12	75	
Benzo(k)fluoranthene-d12	84	
Benzo(a)pyrene-d12	93	
Dibenz(a,h)anthracene-d14	94	
Benzo(g,h,i)perylene-d12	86	

Field Surrogates	% Recovery
13C-Fluorene	87

m = Internal Standard recovery is outside method recovery goal.
NA = Not Applicable

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POLYNUCLEAR AROMATIC HYDROCARBONS
HIGH RESOLUTION GC/MS
Method HRGC/HRMS

Client Name: Pacific Environmental Services
Client ID: A-I-429-1
Lab ID: 301802-0001-SA
Matrix: AIRTRAIN
Authorized: 29 SEP 98
Dilution Factor: 1.0

Sampled: 21 SEP 98
Prepared: 03 OCT 98

Received: 29 SEP 98
Analyzed: 02 NOV 98

Parameter	Result	Units	Reporting Limit	Data Qualifiers
Naphthalene	360000	ng/sample	--	BD
2-Methylnaphthalene	76000	ng/sample	--	D
Acenaphthylene	88000	ng/sample	--	D
Acenaphthene	15000	ng/sample	--	D
Fluorene	3400	ng/sample	--	D
Phenanthrene	160000	ng/sample	--	BD
Anthracene	16000	ng/sample	--	D
Fluoranthene	50000	ng/sample	--	BD
Pyrene	33000	ng/sample	--	D
Benzo(a)anthracene	15000	ng/sample	--	D
Chrysene	26000	ng/sample	--	D
Benzo(b)fluoranthene	17000	ng/sample	--	
Benzo(k)fluoranthene	9200	ng/sample	--	
Benzo(e)pyrene	6500	ng/sample	--	
Benzo(a)pyrene	6300	ng/sample	--	
Perylene	1100	ng/sample	--	
Indeno(1,2,3-cd)pyrene	11000	ng/sample	--	
Dibenz(a,h)anthracene	2500	ng/sample	--	
Benzo(g,h,i)perylene	11000	ng/sample	--	

B = Compound is also detected in the blank.
D = Compound quantitated using a secondary dilution.

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POLYNUCLEAR AROMATIC HYDROCARBONS
HIGH RESOLUTION GC/MS
Method HRGC/HRMS
(cont.)

Client Name: Pacific Environmental Services
Client ID: A-I-429-1
Lab ID: 301802-0001-SA
Matrix: AIRTRAIN Sampled: 21 SEP 98 Received: 29 SEP 98
Authorized: 29 SEP 98 Prepared: 03 OCT 98 Analyzed: 02 NOV 98
Dilution Factor: 1.0

Internal Standards	% Recovery	
Naphthalene-d8	58	D
Acenaphthylene-d8	50	D
Acenaphthene-d10	45	Dm
Fluorene-d10	53	D
Phenanthrene-d10	81	D
Fluoranthene-d10	48	Dm
Pyrene-d10	51	D
Benzo(a)anthracene-d12	61	D
Perylene-d12	58	
Indeno(123-cd)pyrene-d12	91	
Chrysene-d12	72	D
Benzo(b)fluoranthene-d12	87	
Benzo(k)fluoranthene-d12	86	
Benzo(a)pyrene-d12	78	
Dibenz(a,h)anthracene-d14	83	
Benzo(g,h,i)perylene-d12	64	

Field Surrogates	% Recovery	
13C-Fluorene	82	D

D = Compound quantitated using a secondary dilution.
m = Internal Standard recovery is outside method recovery goal.

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POLYNUCLEAR AROMATIC HYDROCARBONS
HIGH RESOLUTION GC/MS
Method HRGC/HRMS

Client Name: Pacific Environmental Services
Client ID: A-I-429-2
Lab ID: 301802-0002-SA
Matrix: AIRTRAIN Sampled: 22 SEP 98 Received: 29 SEP 98
Authorized: 29 SEP 98 Prepared: 03 OCT 98 Analyzed: 30 OCT 98
Dilution Factor: 1.0

Parameter	Result	Units	Reporting Limit	Data Qualifiers
Naphthalene	120000	ng/sample	--	BD
2-Methylnaphthalene	24000	ng/sample	--	B
Acenaphthylene	36000	ng/sample	--	D
Acenaphthene	4300	ng/sample	--	D
Fluorene	16000	ng/sample	--	
Phenanthrene	53000	ng/sample	--	BD
Anthracene	4300	ng/sample	--	
Fluoranthene	18000	ng/sample	--	D
Pyrene	13000	ng/sample	--	
Benzo(a)anthracene	7000	ng/sample	--	
Chrysene	12000	ng/sample	--	
Benzo(b)fluoranthene	5200	ng/sample	--	
Benzo(k)fluoranthene	3700	ng/sample	--	
Benzo(e)pyrene	2600	ng/sample	--	
Benzo(a)pyrene	1900	ng/sample	--	
Perylene	330	ng/sample	--	
Indeno(1,2,3-cd)pyrene	4300	ng/sample	--	
Dibenz(a,h)anthracene	1100	ng/sample	--	
Benzo(g,h,i)perylene	3800	ng/sample	--	

B = Compound is also detected in the blank.
D = Compound quantitated using a secondary dilution.

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POLYNUCLEAR AROMATIC HYDROCARBONS
HIGH RESOLUTION GC/MS
Method HRGC/HRMS
(cont.)

Client Name: Pacific Environmental Services
Client ID: A-I-429-2
Lab ID: 301802-0002-SA
Matrix: AIRTRAIN Sampled: 22 SEP 98 Received: 29 SEP 98
Authorized: 29 SEP 98 Prepared: 03 OCT 98 Analyzed: 30 OCT 98
Dilution Factor: 1.0

Internal Standards	% Recovery	
Naphthalene-d8	75	D
Acenaphthylene-d8	58	D
Acenaphthene-d10	64	D
Fluorene-d10	43	m
Phenanthrene-d10	98	D
Fluoranthene-d10	62	D
Pyrene-d10	73	
Benzo(a)anthracene-d12	64	
Perylene-d12	53	
Indeno(123-cd)pyrene-d12	95	
Chrysene-d12	66	
Benzo(b)fluoranthene-d12	103	
Benzo(k)fluoranthene-d12	70	
Benzo(a)pyrene-d12	75	
Dibenz(a,h)anthracene-d14	91	
Benzo(g,h,i)perylene-d12	80	

Field Surrogates	% Recovery
13C-Fluorene	103

D = Compound quantitated using a secondary dilution.
m = Internal Standard recovery is outside method recovery goal.

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POLYNUCLEAR AROMATIC HYDROCARBONS
HIGH RESOLUTION GC/MS
Method HRGC/HRMS

Client Name: Pacific Environmental Services
Client ID: A-I-429-3
Lab ID: 301802-0003-SA
Matrix: AIRTRAIN Sampled: 23 SEP 98 Received: 29 SEP 98
Authorized: 29 SEP 98 Prepared: 03 OCT 98 Analyzed: 30 OCT 98
Dilution Factor: 1.0

Parameter	Result	Units	Reporting Limit	Data Qualifiers
Naphthalene	160000	ng/sample	--	BD
2-Methylnaphthalene	41000	ng/sample	--	BD
Acenaphthylene	33000	ng/sample	--	D
Acenaphthene	6300	ng/sample	--	D
Fluorene	18000	ng/sample	--	
Phenanthrene	66000	ng/sample	--	BD
Anthracene	9100	ng/sample	--	
Fluoranthene	25000	ng/sample	--	D
Pyrene	18000	ng/sample	--	
Benzo(a)anthracene	11000	ng/sample	--	
Chrysene	18000	ng/sample	--	
Benzo(b)fluoranthene	6100	ng/sample	--	
Benzo(k)fluoranthene	3600	ng/sample	--	
Benzo(e)pyrene	3300	ng/sample	--	
Benzo(a)pyrene	1800	ng/sample	--	
Perylene	280	ng/sample	--	
Indeno(1,2,3-cd)pyrene	3900	ng/sample	--	
Dibenz(a,h)anthracene	980	ng/sample	--	
Benzo(g,h,i)perylene	4000	ng/sample	--	

B = Compound is also detected in the blank.
D = Compound quantitated using a secondary dilution.

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POLYNUCLEAR AROMATIC HYDROCARBONS
HIGH RESOLUTION GC/MS
Method HRGC/HRMS
(cont.)

Client Name: Pacific Environmental Services
Client ID: A-I-429-3
Lab ID: 301802-0003-SA
Matrix: AIRTRAIN Sampled: 23 SEP 98 Received: 29 SEP 98
Authorized: 29 SEP 98 Prepared: 03 OCT 98 Analyzed: 30 OCT 98
Dilution Factor: 1.0

Internal Standards	% Recovery	
Naphthalene-d8	77	D
Acenaphthylene-d8	58	D
Acenaphthene-d10	70	D
Fluorene-d10	50	
Phenanthrene-d10	99	D
Fluoranthene-d10	49	Dm
Pyrene-d10	80	
Benzo(a)anthracene-d12	75	
Perylene-d12	54	
Indeno(123-cd)pyrene-d12	90	
Chrysene-d12	68	
Benzo(b)fluoranthene-d12	99	
Benzo(k)fluoranthene-d12	73	
Benzo(a)pyrene-d12	68	
Dibenz(a,h)anthracene-d14	87	
Benzo(g,h,i)perylene-d12	68	

Field Surrogates	% Recovery
13C-Fluorene	94

D = Compound quantitated using a secondary dilution.
m = Internal Standard recovery is outside method recovery goal.

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POLYNUCLEAR AROMATIC HYDROCARBONS
HIGH RESOLUTION GC/MS
Method HRGC/HRMS

Client Name: Pacific Environmental Services
Client ID: A-O-429-1
Lab ID: 301802-0004-SA
Matrix: AIRTRAIN Sampled: 21 SEP 98 Received: 29 SEP 98
Authorized: 29 SEP 98 Prepared: 03 OCT 98 Analyzed: 30 OCT 98
Dilution Factor: 1.0

Parameter	Result	Units	Reporting Limit	Data Qualifiers
Naphthalene	290000	ng/sample	--	BD
2-Methylnaphthalene	55000	ng/sample	--	B
Acenaphthylene	50000	ng/sample	--	
Acenaphthene	7000	ng/sample	--	
Fluorene	21000	ng/sample	--	
Phenanthrene	66000	ng/sample	--	BD
Anthracene	20000	ng/sample	--	
Fluoranthene	32000	ng/sample	--	
Pyrene	16000	ng/sample	--	
Benzo(a)anthracene	290	ng/sample	--	
Chrysene	740	ng/sample	--	
Benzo(b)fluoranthene	200	ng/sample	--	
Benzo(k)fluoranthene	200	ng/sample	--	
Benzo(e)pyrene	130	ng/sample	--	
Benzo(a)pyrene	ND	ng/sample	100	
Perylene	ND	ng/sample	100	
Indeno(1,2,3-cd)pyrene	ND	ng/sample	100	
Dibenz(a,h)anthracene	ND	ng/sample	100	
Benzo(g,h,i)perylene	ND	ng/sample	100	

B = Compound is also detected in the blank.
D = Compound quantitated using a secondary dilution.
ND = Not Detected

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POLYNUCLEAR AROMATIC HYDROCARBONS
HIGH RESOLUTION GC/MS
Method HRGC/HRMS
(cont.)

Client Name: Pacific Environmental Services
Client ID: A-0-429-1
Lab ID: 301802-0004-SA
Matrix: AIRTRAIN Sampled: 21 SEP 98 Received: 29 SEP 98
Authorized: 29 SEP 98 Prepared: 03 OCT 98 Analyzed: 30 OCT 98
Dilution Factor: 1.0

Internal Standards	% Recovery	
Naphthalene-d8	92	D
Acenaphthylene-d8	90	
Acenaphthene-d10	74	
Fluorene-d10	69	
Phenanthrene-d10	99	D
Fluoranthene-d10	69	
Pyrene-d10	70	
Benzo(a)anthracene-d12	81	
Perylene-d12	60	
Indeno(123-cd)pyrene-d12	81	
Chrysene-d12	79	
Benzo(b)fluoranthene-d12	88	
Benzo(k)fluoranthene-d12	87	
Benzo(a)pyrene-d12	77	
Dibenz(a,h)anthracene-d14	77	
Benzo(g,h,i)perylene-d12	69	

Field Surrogates	% Recovery
13C-Fluorene	124

D = Compound quantitated using a secondary dilution.

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POLYNUCLEAR AROMATIC HYDROCARBONS
HIGH RESOLUTION GC/MS
Method HRGC/HRMS

Client Name: Pacific Environmental Services
Client ID: A-O-429-2
Lab ID: 301802-0005-SA
Matrix: AIRTRAIN Sampled: 22 SEP 98 Received: 29 SEP 98
Authorized: 29 SEP 98 Prepared: 03 OCT 98 Analyzed: 30 OCT 98
Dilution Factor: 1.0

Parameter	Result	Units	Reporting Limit	Data Qualifiers
Naphthalene	95000	ng/sample	--	B
2-Methylnaphthalene	24000	ng/sample	--	B
Acenaphthylene	22000	ng/sample	--	
Acenaphthene	2500	ng/sample	--	
Fluorene	7500	ng/sample	--	
Phenanthrene	45000	ng/sample	--	B
Anthracene	3300	ng/sample	--	
Fluoranthene	14000	ng/sample	--	
Pyrene	8100	ng/sample	--	
Benzo(a)anthracene	240	ng/sample	--	
Chrysene	640	ng/sample	--	
Benzo(b)fluoranthene	180	ng/sample	--	
Benzo(k)fluoranthene	160	ng/sample	--	
Benzo(e)pyrene	ND	ng/sample	100	
Benzo(a)pyrene	ND	ng/sample	100	
Perylene	ND	ng/sample	100	
Indeno(1,2,3-cd)pyrene	ND	ng/sample	100	
Dibenz(a,h)anthracene	ND	ng/sample	100	
Benzo(g,h,i)perylene	ND	ng/sample	100	

B = Compound is also detected in the blank.
ND = Not Detected

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POLYNUCLEAR AROMATIC HYDROCARBONS
HIGH RESOLUTION GC/MS
Method HRGC/HRMS
(cont.)

Client Name: Pacific Environmental Services
Client ID: A-0-429-2
Lab ID: 301802-0005-SA
Matrix: AIRTRAIN Sampled: 22 SEP 98 Received: 29 SEP 98
Authorized: 29 SEP 98 Prepared: 03 OCT 98 Analyzed: 30 OCT 98
Dilution Factor: 1.0

Internal Standards	% Recovery	
Naphthalene-d8	46	m
Acenaphthylene-d8	75	
Acenaphthene-d10	72	
Fluorene-d10	75	
Phenanthrene-d10	88	
Fluoranthene-d10	58	
Pyrene-d10	56	
Benzo(a)anthracene-d12	75	
Perylene-d12	58	
Indeno(123-cd)pyrene-d12	73	
Chrysene-d12	80	
Benzo(b)fluoranthene-d12	94	
Benzo(k)fluoranthene-d12	88	
Benzo(a)pyrene-d12	76	
Dibenz(a,h)anthracene-d14	64	
Benzo(g,h,i)perylene-d12	76	

Field Surrogates	% Recovery
13C-Fluorene	112

m = Internal Standard recovery is outside method recovery goal.

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POLYNUCLEAR AROMATIC HYDROCARBONS
HIGH RESOLUTION GC/MS
Method HRGC/HRMS

Client Name: Pacific Environmental Services
Client ID: A-O-429-3
Lab ID: 301802-0006-SA
Matrix: AIRTRAIN Sampled: 23 SEP 98 Received: 29 SEP 98
Authorized: 29 SEP 98 Prepared: 03 OCT 98 Analyzed: 30 OCT 98
Dilution Factor: 1.0

Parameter	Result	Units	Reporting Limit	Data Qualifiers
Naphthalene	110000	ng/sample	--	BD
2-Methylnaphthalene	36000	ng/sample	--	B
Acenaphthylene	17000	ng/sample	--	
Acenaphthene	3500	ng/sample	--	
Fluorene	8800	ng/sample	--	
Phenanthrene	27000	ng/sample	--	BD
Anthracene	5100	ng/sample	--	
Fluoranthene	12000	ng/sample	--	
Pyrene	6400	ng/sample	--	
Benzo(a)anthracene	240	ng/sample	--	
Chrysene	690	ng/sample	--	
Benzo(b)fluoranthene	210	ng/sample	--	
Benzo(k)fluoranthene	140	ng/sample	--	
Benzo(e)pyrene	110	ng/sample	--	
Benzo(a)pyrene	ND	ng/sample	100	
Perylene	ND	ng/sample	100	
Indeno(1,2,3-cd)pyrene	ND	ng/sample	100	
Dibenz(a,h)anthracene	ND	ng/sample	100	
Benzo(g,h,i)perylene	ND	ng/sample	100	

B = Compound is also detected in the blank.
D = Compound quantitated using a secondary dilution.
ND = Not Detected

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POLYNUCLEAR AROMATIC HYDROCARBONS
HIGH RESOLUTION GC/MS
Method HRGC/HRMS
(cont.)

Client Name: Pacific Environmental Services
Client ID: A-0-429-3
Lab ID: 301802-0006-SA
Matrix: AIRTRAIN Sampled: 23 SEP 98 Received: 29 SEP 98
Authorized: 29 SEP 98 Prepared: 03 OCT 98 Analyzed: 30 OCT 98
Dilution Factor: 1.0

Internal Standards	% Recovery	
Naphthalene-d8	65	D
Acenaphthylene-d8	85	
Acenaphthene-d10	82	
Fluorene-d10	75	
Phenanthrene-d10	107	D
Fluoranthene-d10	69	
Pyrene-d10	63	
Benzo(a)anthracene-d12	80	
Perylene-d12	58	
Indeno(123-cd)pyrene-d12	80	
Chrysene-d12	85	
Benzo(b)fluoranthene-d12	88	
Benzo(k)fluoranthene-d12	87	
Benzo(a)pyrene-d12	73	
Dibenz(a,h)anthracene-d14	81	
Benzo(g,h,i)perylene-d12	66	

Field Surrogates	% Recovery
13C-Fluorene	117

D = Compound quantitated using a secondary dilution.

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POLYNUCLEAR AROMATIC HYDROCARBONS
HIGH RESOLUTION GC/MS
Method HRGC/HRMS

Client Name: Pacific Environmental Services
Client ID: A-U-429-1
Lab ID: 301802-0007-SA
Matrix: AIRTRAIN Sampled: 24 SEP 98 Received: 29 SEP 98
Authorized: 29 SEP 98 Prepared: 03 OCT 98 Analyzed: 31 OCT 98
Dilution Factor: 1.0

Parameter	Result	Units	Reporting Limit	Data Qualifiers
Naphthalene	100000	ng/sample	--	B
2-Methylnaphthalene	2900	ng/sample	--	B
Acenaphthylene	16000	ng/sample	--	F
Acenaphthene	280	ng/sample	--	
Fluorene	930	ng/sample	--	
Phenanthrene	11000	ng/sample	--	B
Anthracene	310	ng/sample	--	
Fluoranthene	5400	ng/sample	--	
Pyrene	2700	ng/sample	--	
Benzo(a)anthracene	160	ng/sample	--	
Chrysene	380	ng/sample	--	
Benzo(b)fluoranthene	270	ng/sample	--	
Benzo(k)fluoranthene	ND	ng/sample	100	
Benzo(e)pyrene	290	ng/sample	--	F
Benzo(a)pyrene	230	ng/sample	--	F
Perylene	ND	ng/sample	100	
Indeno(1,2,3-cd)pyrene	ND	ng/sample	100	
Dibenz(a,h)anthracene	ND	ng/sample	100	
Benzo(g,h,i)perylene	ND	ng/sample	100	

B = Compound is also detected in the blank.
F = Reported value estimated due to an interference.
ND = Not Detected

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POLYNUCLEAR AROMATIC HYDROCARBONS
HIGH RESOLUTION GC/MS
Method HRGC/HRMS
(cont.)

Client Name: Pacific Environmental Services
Client ID: A-U-429-1
Lab ID: 301802-0007-SA
Matrix: AIRTRAIN Sampled: 24 SEP 98 Received: 29 SEP 98
Authorized: 29 SEP 98 Prepared: 03 OCT 98 Analyzed: 31 OCT 98
Dilution Factor: 1.0

Internal Standards	% Recovery	
Naphthalene-d8	46	m
Acenaphthylene-d8	5.0	m
Acenaphthene-d10	50	
Fluorene-d10	81	
Phenanthrene-d10	94	
Fluoranthene-d10	70	
Pyrene-d10	57	
Benzo(a)anthracene-d12	52	
Perylene-d12	14	m
Indeno(123-cd)pyrene-d12	70	
Chrysene-d12	80	
Benzo(b)fluoranthene-d12	79	
Benzo(k)fluoranthene-d12	80	
Benzo(a)pyrene-d12	18	m
Dibenz(a,h)anthracene-d14	77	
Benzo(g,h,i)perylene-d12	58	

Field Surrogates	% Recovery
13C-Fluorene	119

m = Internal Standard recovery is outside method recovery goal.

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POLYNUCLEAR AROMATIC HYDROCARBONS
HIGH RESOLUTION GC/MS
Method HRGC/HRMS

Client Name: Pacific Environmental Services
Client ID: A-U-429-2
Lab ID: 301802-0008-SA
Matrix: AIRTRAIN Sampled: 24 SEP 98 Received: 29 SEP 98
Authorized: 29 SEP 98 Prepared: 03 OCT 98 Analyzed: 31 OCT 98
Dilution Factor: 1.0

Parameter	Result	Units	Reporting Limit	Data Qualifiers
Naphthalene	130000	ng/sample	--	B
2-Methylnaphthalene	2300	ng/sample	--	B
Acenaphthylene	68000	ng/sample	--	F
Acenaphthene	240	ng/sample	--	
Fluorene	690	ng/sample	--	
Phenanthrene	20000	ng/sample	--	
Anthracene	460	ng/sample	--	
Fluoranthene	12000	ng/sample	--	
Pyrene	21000	ng/sample	--	
Benzo(a)anthracene	100	ng/sample	--	
Chrysene	460	ng/sample	--	
Benzo(b)fluoranthene	420	ng/sample	--	
Benzo(k)fluoranthene	130	ng/sample	--	
Benzo(e)pyrene	1400	ng/sample	--	F
Benzo(a)pyrene	210	ng/sample	--	F
Perylene	ND	ng/sample	100	
Indeno(1,2,3-cd)pyrene	ND	ng/sample	100	
Dibenz(a,h)anthracene	ND	ng/sample	100	
Benzo(g,h,i)perylene	ND	ng/sample	100	

B = Compound is also detected in the blank.
F = Reported value estimated due to an interference.
ND = Not Detected

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POLYNUCLEAR AROMATIC HYDROCARBONS
HIGH RESOLUTION GC/MS
Method HRGC/HRMS
(cont.)

Client Name: Pacific Environmental Services
Client ID: A-U-429-2
Lab ID: 301802-0008-SA
Matrix: AIRTRAIN Sampled: 24 SEP 98 Received: 29 SEP 98
Authorized: 29 SEP 98 Prepared: 03 OCT 98 Analyzed: 31 OCT 98
Dilution Factor: 1.0

Internal Standards	% Recovery	
Naphthalene-d8	42	
Acenaphthylene-d8	4.0	m
Acenaphthene-d10	49	
Fluorene-d10	78	
Phenanthrene-d10	95	
Fluoranthene-d10	65	
Pyrene-d10	55	
Benzo(a)anthracene-d12	61	
Perylene-d12	12	m
Indeno(123-cd)pyrene-d12	52	
Chrysene-d12	76	
Benzo(b)fluoranthene-d12	74	
Benzo(k)fluoranthene-d12	66	
Benzo(a)pyrene-d12	17	m
Dibenz(a,h)anthracene-d14	56	
Benzo(g,h,i)perylene-d12	40	m

Field Surrogates	% Recovery
13C-Fluorene	99

m = Internal Standard recovery is outside method recovery goal.

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POLYNUCLEAR AROMATIC HYDROCARBONS
HIGH RESOLUTION GC/MS
Method HRGC/HRMS

Client Name: Pacific Environmental Services
Client ID: A-U-429-3
Lab ID: 301802-0009-SA
Matrix: AIRTRAIN Sampled: 25 SEP 98 Received: 29 SEP 98
Authorized: 29 SEP 98 Prepared: 03 OCT 98 Analyzed: 31 OCT 98
Dilution Factor: 1.0

Parameter	Result	Units	Reporting Limit	Data Qualifiers
Naphthalene	76000	ng/sample	--	B
2-Methylnaphthalene	1600	ng/sample	--	B
Acenaphthylene	13000	ng/sample	--	F
Acenaphthene	120	ng/sample	--	
Fluorene	360	ng/sample	--	
Phenanthrene	9900	ng/sample	--	B
Anthracene	220	ng/sample	--	
Fluoranthene	4800	ng/sample	--	
Pyrene	3300	ng/sample	--	
Benzo(a)anthracene	ND	ng/sample	100	
Chrysene	290	ng/sample	--	
Benzo(b)fluoranthene	210	ng/sample	--	
Benzo(k)fluoranthene	ND	ng/sample	100	
Benzo(e)pyrene	350	ng/sample	--	
Benzo(a)pyrene	ND	ng/sample	100	
Perylene	ND	ng/sample	100	
Indeno(1,2,3-cd)pyrene	ND	ng/sample	100	
Dibenz(a,h)anthracene	ND	ng/sample	100	
Benzo(g,h,i)perylene	ND	ng/sample	100	

B = Compound is also detected in the blank.
F = Reported value estimated due to an interference.
ND = Not Detected

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POLYNUCLEAR AROMATIC HYDROCARBONS
HIGH RESOLUTION GC/MS
Method HRGC/HRMS
(cont.)

Client Name: Pacific Environmental Services
Client ID: A-U-429-3
Lab ID: 301802-0009-SA
Matrix: AIRTRAIN Sampled: 25 SEP 98 Received: 29 SEP 98
Authorized: 29 SEP 98 Prepared: 03 OCT 98 Analyzed: 31 OCT 98
Dilution Factor: 1.0

Internal Standards	% Recovery	
Naphthalene-d8	52	
Acenaphthylene-d8	9.0	m
Acenaphthene-d10	59	
Fluorene-d10	73	
Phenanthrene-d10	88	
Fluoranthene-d10	77	
Pyrene-d10	64	
Benzo(a)anthracene-d12	75	
Perylene-d12	20	m
Indeno(123-cd)pyrene-d12	77	
Chrysene-d12	95	
Benzo(b)fluoranthene-d12	93	
Benzo(k)fluoranthene-d12	90	
Benzo(a)pyrene-d12	22	m
Dibenz(a,h)anthracene-d14	79	
Benzo(g,h,i)perylene-d12	57	

Field Surrogates	% Recovery
13C-Fluorene	104

m = Internal Standard recovery is outside method recovery goal.

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POLYNUCLEAR AROMATIC HYDROCARBONS
HIGH RESOLUTION GC/MS
Method HRGC/HRMS

Client Name: Pacific Environmental Services
Client ID: A-U-429-4
Lab ID: 301802-0010-SA
Matrix: AIRTRAIN Sampled: 25 SEP 98 Received: 29 SEP 98
Authorized: 29 SEP 98 Prepared: 03 OCT 98 Analyzed: 31 OCT 98
Dilution Factor: 1.0

Parameter	Result	Units	Reporting Limit	Data Qualifiers
Naphthalene	99000	ng/sample	--	B
2-Methylnaphthalene	4400	ng/sample	--	B
Acenaphthylene	NC	ng/sample	--	
Acenaphthene	240	ng/sample	--	
Fluorene	1300	ng/sample	--	
Phenanthrene	18000	ng/sample	--	B
Anthracene	280	ng/sample	--	
Fluoranthene	7100	ng/sample	--	
Pyrene	4600	ng/sample	--	
Benzo(a)anthracene	150	ng/sample	--	
Chrysene	520	ng/sample	--	
Benzo(b)fluoranthene	260	ng/sample	--	
Benzo(k)fluoranthene	110	ng/sample	--	
Benzo(e)pyrene	300	ng/sample	--	F
Benzo(a)pyrene	160	ng/sample	--	F
Perylene	ND	ng/sample	100	
Indeno(1,2,3-cd)pyrene	ND	ng/sample	100	
Dibenz(a,h)anthracene	ND	ng/sample	100	
Benzo(g,h,i)perylene	ND	ng/sample	100	

B = Compound is also detected in the blank.
F = Reported value estimated due to an interference.
NC = Not Calculated, calculation not applicable.
ND = Not Detected

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POLYNUCLEAR AROMATIC HYDROCARBONS
HIGH RESOLUTION GC/MS
Method HRGC/HRMS
(cont.)

Client Name: Pacific Environmental Services
Client ID: A-U-429-4
Lab ID: 301802-0010-SA
Matrix: AIRTRAIN Sampled: 25 SEP 98 Received: 29 SEP 98
Authorized: 29 SEP 98 Prepared: 03 OCT 98 Analyzed: 31 OCT 98
Dilution Factor: 1.0

Internal Standards	% Recovery	
Naphthalene-d8	43	m
Acenaphthylene-d8	NC	
Acenaphthene-d10	45	
Fluorene-d10	79	
Phenanthrene-d10	87	
Fluoranthene-d10	80	
Pyrene-d10	53	
Benzo(a)anthracene-d12	53	
Perylene-d12	8.0	m
Indeno(123-cd)pyrene-d12	55	
Chrysene-d12	79	
Benzo(b)fluoranthene-d12	94	
Benzo(k)fluoranthene-d12	75	
Benzo(a)pyrene-d12	16	m
Dibenz(a,h)anthracene-d14	61	
Benzo(g,h,i)perylene-d12	41	m

Field Surrogates	% Recovery
13C-Fluorene	122

m = Internal Standard recovery is outside method recovery goal.
NC = Not Calculated, calculation not applicable.

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POLYNUCLEAR AROMATIC HYDROCARBONS
HIGH RESOLUTION GC/MS
Method HRGC/HRMS

Client Name: Pacific Environmental Services
Client ID: A-I-429-FB
Lab ID: 301802-0011-SA
Matrix: AIRTRAIN Sampled: 24 SEP 98 Received: 29 SEP 98
Authorized: 29 SEP 98 Prepared: 03 OCT 98 Analyzed: 31 OCT 98
Dilution Factor: 1.0

Parameter	Result	Units	Reporting Limit	Data Qualifiers
Naphthalene	1600	ng/sample	--	B
2-Methylnaphthalene	200	ng/sample	--	B
Acenaphthylene	ND	ng/sample	100	
Acenaphthene	ND	ng/sample	100	
Fluorene	ND	ng/sample	100	
Phenanthrene	210	ng/sample	--	B
Anthracene	ND	ng/sample	100	
Fluoranthene	ND	ng/sample	100	
Pyrene	ND	ng/sample	100	
Benzo(a)anthracene	ND	ng/sample	100	
Chrysene	ND	ng/sample	100	
Benzo(b)fluoranthene	ND	ng/sample	100	
Benzo(k)fluoranthene	ND	ng/sample	100	
Benzo(e)pyrene	ND	ng/sample	100	
Benzo(a)pyrene	ND	ng/sample	100	
Perylene	ND	ng/sample	100	
Indeno(1,2,3-cd)pyrene	ND	ng/sample	100	
Dibenz(a,h)anthracene	ND	ng/sample	100	
Benzo(g,h,i)perylene	ND	ng/sample	100	

B = Compound is also detected in the blank.
ND = Not Detected

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POLYNUCLEAR AROMATIC HYDROCARBONS
HIGH RESOLUTION GC/MS
Method HRGC/HRMS
(cont.)

Client Name: Pacific Environmental Services
Client ID: A-I-429-FB
Lab ID: 301802-0011-SA
Matrix: AIRTRAIN Sampled: 24 SEP 98 Received: 29 SEP 98
Authorized: 29 SEP 98 Prepared: 03 OCT 98 Analyzed: 31 OCT 98
Dilution Factor: 1.0

Internal Standards	% Recovery	
Naphthalene-d8	45	m
Acenaphthylene-d8	54	
Acenaphthene-d10	62	
Fluorene-d10	57	
Phenanthrene-d10	61	
Fluoranthene-d10	68	
Pyrene-d10	70	
Benzo(a)anthracene-d12	64	
Perylene-d12	65	
Indeno(123-cd)pyrene-d12	81	
Chrysene-d12	89	
Benzo(b)fluoranthene-d12	72	
Benzo(k)fluoranthene-d12	87	
Benzo(a)pyrene-d12	68	
Dibenz(a,h)anthracene-d14	75	
Benzo(g,h,i)perylene-d12	70	

Field Surrogates	% Recovery
13C-Fluorene	103

m = Internal Standard recovery is outside method recovery goal.

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POLYNUCLEAR AROMATIC HYDROCARBONS
HIGH RESOLUTION GC/MS
Method HRGC/HRMS

Client Name: Pacific Environmental Services
Client ID: A-O-429-FB
Lab ID: 301802-0012-SA
Matrix: AIRTRAIN Sampled: 24 SEP 98 Received: 29 SEP 98
Authorized: 29 SEP 98 Prepared: 03 OCT 98 Analyzed: 31 OCT 98
Dilution Factor: 1.0

Parameter	Result	Units	Reporting Limit	Data Qualifiers
Naphthalene	1000	ng/sample	--	B
2-Methylnaphthalene	ND	ng/sample	100	
Acenaphthylene	ND	ng/sample	100	
Acenaphthene	ND	ng/sample	100	
Fluorene	ND	ng/sample	100	
Phenanthrene	270	ng/sample	--	B
Anthracene	ND	ng/sample	100	
Fluoranthene	190	ng/sample	--	
Pyrene	150	ng/sample	--	
Benzo(a)anthracene	ND	ng/sample	100	
Chrysene	ND	ng/sample	100	
Benzo(b)fluoranthene	ND	ng/sample	100	
Benzo(k)fluoranthene	ND	ng/sample	100	
Benzo(e)pyrene	ND	ng/sample	100	
Benzo(a)pyrene	ND	ng/sample	100	
Perylene	ND	ng/sample	100	
Indeno(1,2,3-cd)pyrene	ND	ng/sample	100	
Dibenz(a,h)anthracene	ND	ng/sample	100	
Benzo(g,h,i)perylene	ND	ng/sample	100	

B = Compound is also detected in the blank.
ND = Not Detected

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POLYNUCLEAR AROMATIC HYDROCARBONS
HIGH RESOLUTION GC/MS.
Method HRGC/HRMS
(cont.)

Client Name: Pacific Environmental Services
Client ID: A-O-429-FB
Lab ID: 301802-0012-SA
Matrix: AIRTRAIN Sampled: 24 SEP 98 Received: 29 SEP 98
Authorized: 29 SEP 98 Prepared: 03 OCT 98 Analyzed: 31 OCT 98
Dilution Factor: 1.0

Internal Standards	% Recovery	
Naphthalene-d8	46	m
Acenaphthylene-d8	54	
Acenaphthene-d10	68	
Fluorene-d10	51	
Phenanthrene-d10	65	
Fluoranthene-d10	75	
Pyrene-d10	71	
Benzo(a)anthracene-d12	60	
Perylene-d12	57	
Indeno(123-cd)pyrene-d12	73	
Chrysene-d12	94	
Benzo(b)fluoranthene-d12	80	
Benzo(k)fluoranthene-d12	77	
Benzo(a)pyrene-d12	61	
Dibenz(a,h)anthracene-d14	66	
Benzo(g,h,i)perylene-d12	66	

Field Surrogates	% Recovery
13C-Fluorene	107

m = Internal Standard recovery is outside method recovery goal.

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POLYNUCLEAR AROMATIC HYDROCARBONS
HIGH RESOLUTION GC/MS
Method HRGC/HRMS

Client Name: Pacific Environmental Services
Client ID: A-U-429-FB
Lab ID: 301802-0013-SA
Matrix: AIRTRAIN Sampled: 25 SEP 98 Received: 29 SEP 98
Authorized: 29 SEP 98 Prepared: 03 OCT 98 Analyzed: 31 OCT 98
Dilution Factor: 1.0

Parameter	Result	Units	Reporting Limit	Data Qualifiers
Naphthalene	980	ng/sample	--	B
2-Methylnaphthalene	ND	ng/sample	100	
Acenaphthylene	ND	ng/sample	100	
Acenaphthene	ND	ng/sample	100	
Fluorene	ND	ng/sample	100	
Phenanthrene	120	ng/sample	--	B
Anthracene	ND	ng/sample	100	
Fluoranthene	ND	ng/sample	100	
Pyrene	ND	ng/sample	100	
Benzo(a)anthracene	ND	ng/sample	100	
Chrysene	ND	ng/sample	100	
Benzo(b)fluoranthene	ND	ng/sample	100	
Benzo(k)fluoranthene	ND	ng/sample	100	
Benzo(e)pyrene	ND	ng/sample	100	
Benzo(a)pyrene	ND	ng/sample	100	
Perylene	ND	ng/sample	100	
Indeno(1,2,3-cd)pyrene	ND	ng/sample	100	
Dibenz(a,h)anthracene	ND	ng/sample	100	
Benzo(g,h,i)perylene	ND	ng/sample	100	

B = Compound is also detected in the blank.
ND = Not Detected

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POLYNUCLEAR AROMATIC HYDROCARBONS
HIGH RESOLUTION GC/MS
Method HRGC/HRMS
(cont.)

Client Name: Pacific Environmental Services
Client ID: A-U-429-FB
Lab ID: 301802-0013-SA
Matrix: AIRTRAIN Sampled: 25 SEP 98 Received: 29 SEP 98
Authorized: 29 SEP 98 Prepared: 03 OCT 98 Analyzed: 31 OCT 98
Dilution Factor: 1.0

Internal Standards	% Recovery	
Naphthalene-d8	48	m
Acenaphthylene-d8	63	
Acenaphthene-d10	66	
Fluorene-d10	64	
Phenanthrene-d10	67	
Fluoranthene-d10	83	
Pyrene-d10	80	
Benzo(a)anthracene-d12	61	
Perylene-d12	57	
Indeno(123-cd)pyrene-d12	73	
Chrysene-d12	106	
Benzo(b)fluoranthene-d12	81	
Benzo(k)fluoranthene-d12	89	
Benzo(a)pyrene-d12	65	
Dibenz(a,h)anthracene-d14	77	
Benzo(g,h,i)perylene-d12	73	

Field Surrogates	% Recovery
13C-Fluorene	98

m = Internal Standard recovery is outside method recovery goal.

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POLYNUCLEAR AROMATIC HYDROCARBONS
HIGH RESOLUTION GC/MS
Method HRGC/HRMS

Client Name: Pacific Environmental Services
Client ID: A-429-LB
Lab ID: 301802-0014-SA
Matrix: AIRTRAIN Sampled: 21 SEP 98 Received: 29 SEP 98
Authorized: 29 SEP 98 Prepared: 03 OCT 98 Analyzed: 31 OCT 98
Dilution Factor: 1.0

Parameter	Result	Units	Reporting Limit	Data Qualifiers
Naphthalene	840	ng/sample	--	B
2-Methylnaphthalene	ND	ng/sample	100	
Acenaphthylene	ND	ng/sample	100	
Acenaphthene	ND	ng/sample	100	
Fluorene	ND	ng/sample	100	
Phenanthrene	ND	ng/sample	100	
Anthracene	ND	ng/sample	100	
Fluoranthene	ND	ng/sample	100	
Pyrene	ND	ng/sample	100	
Benzo(a)anthracene	ND	ng/sample	100	
Chrysene	ND	ng/sample	100	
Benzo(b)fluoranthene	ND	ng/sample	100	
Benzo(k)fluoranthene	ND	ng/sample	100	
Benzo(e)pyrene	ND	ng/sample	100	
Benzo(a)pyrene	ND	ng/sample	100	
Perylene	ND	ng/sample	100	
Indeno(1,2,3-cd)pyrene	ND	ng/sample	100	
Dibenz(a,h)anthracene	ND	ng/sample	100	
Benzo(g,h,i)perylene	ND	ng/sample	100	

B = Compound is also detected in the blank.
ND = Not Detected

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POLYNUCLEAR AROMATIC HYDROCARBONS
HIGH RESOLUTION GC/MS
Method HRGC/HRMS
(cont.)

Client Name: Pacific Environmental Services
Client ID: A-429-LB
Lab ID: 301802-0014-SA
Matrix: AIRTRAIN Sampled: 21 SEP 98 Received: 29 SEP 98
Authorized: 29 SEP 98 Prepared: 03 OCT 98 Analyzed: 31 OCT 98
Dilution Factor: 1.0

Internal Standards	% Recovery
Naphthalene-d8	52
Acenaphthylene-d8	51
Acenaphthene-d10	57
Fluorene-d10	69
Phenanthrene-d10	77
Fluoranthene-d10	84
Pyrene-d10	82
Benzo(a)anthracene-d12	56
Perylene-d12	61
Indeno(123-cd)pyrene-d12	64
Chrysene-d12	106
Benzo(b)fluoranthene-d12	76
Benzo(k)fluoranthene-d12	87
Benzo(a)pyrene-d12	65
Dibenz(a,h)anthracene-d14	60
Benzo(g,h,i)perylene-d12	64

Field Surrogates	% Recovery
13C-Fluorene	101

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LABORATORY CONTROL SAMPLE REPORT
Advanced Technology Group - High Resolution
Project: 301802

Category: PAH-HR-AIR PAH by HRGC/HRMS
Test: PAH-HR-AIR
Matrix: AIR
QC Lot: 03 OCT 98-A QC Run: 02 NOV 98-A
Concentration Units: ng/sample

Analyte	Concentration Spiked	Concentration Measured	Accuracy(%) LCS	Accuracy(%) Limits	
Naphthalene	100	90	90	50-150	B
2-Methylnaphthalene	100	100	103	50-150	B
Acenaphthylene	100	100	102	50-150	
Acenaphthene	100	92	92	50-150	
Fluorene	100	77	77	50-150	a
Phenanthrene	100	81	81	50-150	B
Anthracene	100	78	78	50-150	
Fluoranthene	100	80	80	50-150	
Pyrene	100	64	64	50-150	
Benzo(a)anthracene	100	87	87	50-150	
Chrysene	100	77	77	50-150	
Benzo(b)fluoranthene	100	76	76	50-150	
Benzo(k)fluoranthene	100	66	66	50-150	
Benzo(e)pyrene	100	73	73	50-150	
Benzo(a)pyrene	100	68	68	50-150	
Perylene	100	79	79	50-150	
Indeno(1,2,3-cd)pyrene	100	90	90	50-150	
Dibenz(a,h)anthracene	100	76	76	50-150	
Benzo(g,h,i)perylene	100	88	88	50-150	
Naphthalene-d8	50	27	53	50-150	
Acenaphthylene-d8	50	31	63	50-150	
Acenaphthene-d10	50	31	61	50-150	
Fluorene-d10	50	28	55	50-150	
Phenanthrene-d10	50	38	75	50-150	
Fluoranthene-d10	50	24	48	50-150	#
Pyrene-d10	50	26	52	50-150	
Benzo(a)anthracene-d12	50	31	62	50-150	
Chrysene-d12	50	43	85	50-150	
Benzo(b)fluoranthene-d12	50	36	71	50-150	
Benzo(k)fluoranthene-d12	50	44	88	50-150	
Benzo(a)pyrene-d12	50	45	91	50-150	
Perylene-d12	50	32	65	50-150	
Indeno(123-cd)pyrene-d12	50	59	117	50-150	
Dibenz(a,h)anthracene-d14	50	56	112	50-150	
Benzo(g,h,i)perylene-d12	50	54	109	50-150	

# = Outside of control limits.
a = See narrative.
B = Compound is also detected in the blank.

Calculations are performed before rounding to avoid round-off errors in calculated results.

Method Blank

POLYNUCLEAR AROMATIC HYDROCARBONS
HIGH RESOLUTION GC/MS
Method HRGC/HRMS

Client Name: Pacific Environmental Services
Client ID: Method Blank
Lab ID: 301802-0001-MB
Matrix: AIRTRAIN
Authorized: NA
Dilution Factor: 1.0

Sampled: NA
Prepared: 03 OCT 98

Received: NA
Analyzed: 05 NOV 98

Parameter	Result	Units	Reporting Limit	Data Qualifiers
Naphthalene	340	ng/sample	--	
2-Methylnaphthalene	25	ng/sample	--	
Acenaphthylene	ND	ng/sample	10	
Acenaphthene	ND	ng/sample	10	
Fluorene	ND	ng/sample	10	
Phenanthrene	24	ng/sample	--	
Anthracene	ND	ng/sample	10	
Fluoranthene	ND	ng/sample	10	
Pyrene	ND	ng/sample	10	
Benzo(a)anthracene	ND	ng/sample	10	
Chrysene	ND	ng/sample	10	
Benzo(b)fluoranthene	ND	ng/sample	10	
Benzo(k)fluoranthene	ND	ng/sample	10	
Benzo(e)pyrene	ND	ng/sample	10	
Benzo(a)pyrene	ND	ng/sample	10	
Perylene	ND	ng/sample	10	
Indeno(1,2,3-cd)pyrene	ND	ng/sample	10	
Dibenz(a,h)anthracene	ND	ng/sample	10	
Benzo(g,h,i)perylene	ND	ng/sample	10	

NA = Not Applicable
ND = Not Detected

Reported By: Clark Pickell

Approved By: Eric Redman

The cover letter is an integral part of this report.
Rev 230787

POLYNUCLEAR AROMATIC HYDROCARBONS
HIGH RESOLUTION GC/MS
Method HRGC/HRMS
(cont.)

Client Name: Pacific Environmental Services
Client ID: Method Blank
Lab ID: 301802-0001-MB
Matrix: AIRTRAIN
Authorized: NA
Dilution Factor: 1.0

Sampled: NA
Prepared: 03 OCT 98

Received: NA
Analyzed: 05 NOV 98

Internal Standards	% Recovery	
Naphthalene-d8	42	m
Acenaphthylene-d8	66	
Acenaphthene-d10	64	
Fluorene-d10	60	
Phenanthrene-d10	80	
Fluoranthene-d10	50	
Pyrene-d10	54	
Benzo(a)anthracene-d12	65	
Perylene-d12	85	
Indeno(123-cd)pyrene-d12	93	
Chrysene-d12	87	
Benzo(b)fluoranthene-d12	75	
Benzo(k)fluoranthene-d12	84	
Benzo(a)pyrene-d12	93	
Dibenz(a,h)anthracene-d14	94	
Benzo(g,h,i)perylene-d12	86	

Field Surrogates	% Recovery
13C-Fluorene	87

m = Internal Standard recovery is outside method recovery goal.
NA = Not Applicable

Reported By: Clark Pickell

Approved By: Eric Redman

The cover letter is an integral part of this report.
Rev 230787

04-NOV-1998 12:40:42 PM Dioxin Furan Unknown RESULTS

Mass Spec : VG-4 Results : 02NO98V4031.RES : PAHAIR.TRG
GC Column : DB-5 Date analyzed : 02-NOV-98
Data file : 02NO98V4 301802-1MB :METHOD BLANK Ex Cal : PAHAIR102998V4.R
Weight : 0.5

Name	Total Response	Isotope Ratio		R. T. mm:ss		RRF	ng/ TRAIN	Rec/ MDL
d10-2-Methylnaphthalene	112227400	1.00	Y	12: 28	Y	1.00	50.00	
d8-Naphthalene	105343000	1.00	Y	10: 12	Y	2.24	20.95	42 m
Naphthalene	444010000	1.00	Y	10: 16	Y	1.23	344.04	
2-Methylnaphthalene	14520000	1.00	Y	12: 34	Y	0.56	24.59	
d8-Acenaphthylene	89410200	1.00	Y	15: 28	Y	1.21	32.82	66
Acenaphthylene	738674	1.00	Y	15: 31	Y	0.94	<RL=10.00	
d10-Acenaphthene	53754000	1.00	Y	16: 2	Y	0.74	32.16	64
Acenaphthene	6026800	1.00	Y	16: 8	Y	1.25	<RL=10.00	
d10-Anthracene	66464600	1.00	Y	20: 55	Y	1.00	50.00	
d10-Fluorene	56334800	1.00	Y	17: 41	Y	1.42	29.83	60
Fluorene	1991522	1.00	Y	17: 47	Y	1.16	<RL=10.00	
d10-Phenanthrene	149506400	1.00	Y	20: 46	Y	2.81	~~40.06~~	80
Phenanthrene	32600000	1.00	Y	20: 50	Y	0.89	24.38	
Anthracene	* No Peak	0.00	N	20: 59	N	0.80	<RL=10.00	
d14-Terphenyl	191478400	1.00	Y	26: 0	Y	1.00	50.00	
d10-Fluoranthene	135260800	1.00	Y	24: 36	Y	1.41	25.04	50
Fluoranthene	11031920	1.00	Y	24: 40	Y	1.11	<RL=10.00	
d10-Pyrene	155985600	1.00	Y	25: 18	Y	1.52	26.83	54
Pyrene	5781280	1.00	Y	25: 21	Y	1.21	<RL=10.00	
d12-Benzo(a)anthracene	112804800	1.00	Y	29: 9	Y	0.90	32.73	65
Benzo(a)anthracene	609918	1.00	Y	29: 13	Y	1.20	<RL=10.00	
d12-Chrysene	212384000	1.00	Y	29: 15	Y	1.28	43.36	87
Chrysene	1683386	1.00	Y	29: 20	Y	1.08	<RL=10.00	
d12-Benzo(e)pyrene	237306000	1.00	Y	33: 21	Y	1.00	50.00	
d12-Benzo(b)fluoranthene	80350200	1.00	Y	32: 29	Y	0.45	37.30	75
Benzo(b)fluoranthene	948200	1.00	Y	32: 35	Y	1.17	<RL=10.00	
d12-Benzo(k)fluoranthene	189536400	1.00	Y	32: 34	Y	0.95	42.12	84
Benzo(k)fluoranthene	948200	1.00	Y	32: 35	Y	1.16	<RL=10.00	
d12-Benzo(a)pyrene	149194200	1.00	Y	33: 32	Y	0.68	46.45	93
Benzo(e)pyrene	481952	1.00	Y	33: 27	Y	1.64	<RL=10.00	
Benzo(a)pyrene	78083	1.00	Y	33: 38	Y	1.07	<RL=10.00	
d12-Perylene	127833600	1.00	Y	33: 50	Y	0.63	42.74	85
Perylene	* No Peak	0.00	N	33: 54	N	1.71	<RL=10.00	
d12-Indeno(123-cd)pyrene	98292400	1.00	Y	38: 1	Y	0.44	46.59	93
Indeno(123-cd)pyrene	59792	1.00	Y	38: 9	Y	0.62	<RL=10.00	
d14-Dibenz(ah)anthracene	55083800	1.00	Y	38: 6	Y	0.25	47.21	94
Dibenz(ah)anthracene	* No Peak	0.00	N	38: 14	N	1.40	<RL=10.00	
d12-Benzo(ghi)perylene	118699600	1.00	Y	39: 12	Y	0.58	43.14	86
Benzo(ghi)perylene	143538	1.00	Y	39: 21	Y	1.02	<RL=10.00	
d10-Fluorene	56334800	1.00	Y	17: 41	Y	1.00	50.00	
13C-Fluorene	39298000	1.00	Y	17: 47	Y	0.80	43.60	87

48 11-4-98 CP

04-NOV-1998 12:40:39 PM Dioxin Furan Unknown RESULTS

	0.5	
98V4.RRF		
Rec/		
MDL		
	56113700	56113700
42	52671500	52671500
	222005000	222005000
	7260000	7260000
66	44705100	44705100
10.00	369337	369337
64	26877000	26877000
10.00	3013400	3013400
	33232300	33232300
60	28167400	28167400
10.00	995761	995761
80	74753200	74753200
	16300000	16300000
10.00	0	0
	95739200	95739200
50	67630400	67630400
10.00	5515960	5515960
54	77992800	77992800
10.00	2890640	2890640
65	56402400	56402400
10.00	304959	304959
87	106192000	106192000
10.00	841693	841693
	118653000	118653000
75	40175100	40175100
10.00	474100	474100
84	94768200	94768200
10.00	474100	474100
93	74597100	74597100
10.00	240976	240976
10.00	39041	39041
85	63916800	63916800
10.00	0	0
93	49146200	49146200
10.00	29896	29896
94	27541900	27541900
10.00	0	0
86	59349800	59349800
10.00	71769	71769

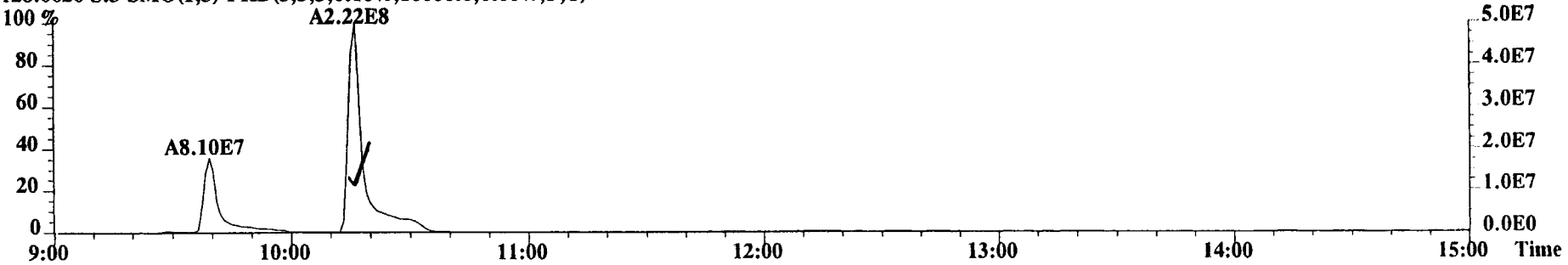
03-NOV-1998 08:08:26 AM 429AIR Unknown RESULTS

Mass Spec : VG-4 Results : 02NO98V4031.RES : PAHAIR.TRG
GC Column : DB-5 Date analyzed : 02-NOV-98
Data file : 02NO98V4 301802-1MB :METHOD BLANK Ex Cal : PAHAIR102998V4.R
Weight : 0.5

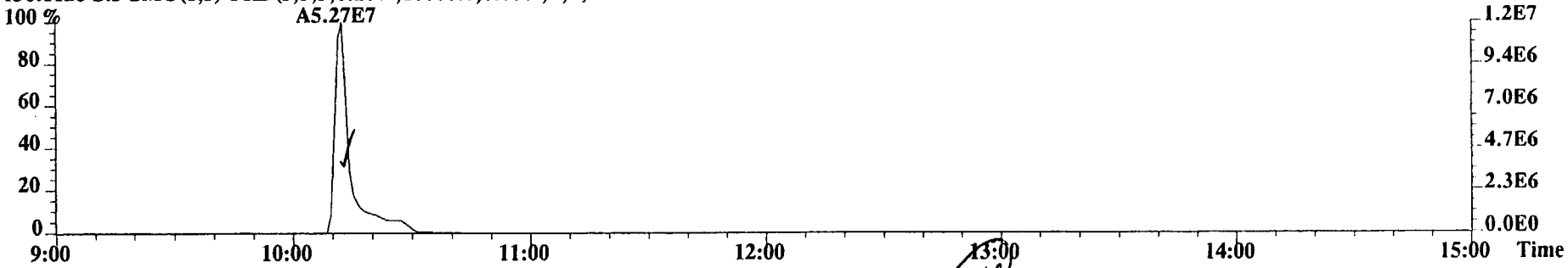
Name	Total Response	Isotope Ratio		R. T. mm:ss		RRF	ng/ TRAIN	Rec/ MDL
d10-2-Methylnaphthalene	112227400	1.00	Y	12: 28	Y	1.00	50.00	
d8-Naphthalene	105343000	1.00	Y	10: 12	Y	2.24	20.95	42
Naphthalene	444010000	1.00	Y	10: 16	Y	1.23	344.04	0.000
2-Methylnaphthalene	15679360	1.00	Y	12: 34	Y	0.56	26.55	0.000
d8-Acenaphthylene	89410200	1.00	Y	15: 28	Y	1.21	32.82	66
Acenaphthylene	738674	1.00	Y	15: 31	Y	0.94	0.88	0.000
d10-Acenaphthene	53754000	1.00	Y	16: 2	Y	0.74	32.16	64
Acenaphthene	6026800	1.00	Y	16: 8	Y	1.25	9.00	0.000
d10-Anthracene	66464600	1.00	Y	20: 55	Y	1.00	50.00	
d10-Fluorene	56334800	1.00	Y	17: 41	Y	1.42	29.83	60
Fluorene	1991522	1.00	Y	17: 47	Y	1.16	3.05	0.000
d10-Phenanthrene	149506400	1.00	Y	20: 46	Y	2.81	40.06	80
Phenanthrene	34755000	1.00	Y	20: 50	Y	0.89	25.99	0.000
Anthracene	* No Peak	0.00	N	20: 59	N	0.80	0.00	0.000
d14-Terphenyl	191478400	1.00	Y	26: 0	Y	1.00	50.00	
d10-Fluoranthene	135260800	1.00	Y	24: 36	Y	1.41	25.04	50
Fluoranthene	11031920	1.00	Y	24: 40	Y	1.11	7.34	0.000
d10-Pyrene	155985600	1.00	Y	25: 18	Y	1.52	26.83	54
Pyrene	5781280	1.00	Y	25: 21	Y	1.21	3.08	0.000
d12-Benzo(a)anthracene	112804800	1.00	Y	29: 9	Y	0.90	32.73	65
Benzo(a)anthracene	609918	1.00	Y	29: 13	Y	1.20	0.45	0.000
d12-Chrysene	212384000	1.00	Y	29: 15	Y	1.28	43.36	87
Chrysene	1683386	1.00	Y	29: 20	Y	1.08	0.73	0.000
d12-Benzo(e)pyrene	237306000	1.00	Y	33: 21	Y	1.00	50.00	
d12-Benzo(b)fluoranthene	80350200	1.00	Y	32: 29	Y	0.45	37.30	75
Benzo(b)fluoranthene	948200	1.00	Y	32: 35	Y	1.17	1.01	0.000
d12-Benzo(k)fluoranthene	189536400	1.00	Y	32: 34	Y	0.95	42.12	84
Benzo(k)fluoranthene	948200	1.00	Y	32: 35	Y	1.16	0.43	0.000
d12-Benzo(a)pyrene	149194200	1.00	Y	33: 32	Y	0.68	46.45	93
Benzo(e)pyrene	481952	1.00	Y	33: 27	Y	1.64	0.20	0.000
Benzo(a)pyrene	78083	1.00	Y	33: 38	Y	1.07	0.05	0.000
d12-Perylene	127833600	1.00	Y	33: 50	Y	0.63	42.74	85
Perylene	* No Peak	0.00	N	33: 54	N	1.71	0.00	0.000
d12-Indeno(123-cd)pyrene	98292400	1.00	Y	38: 1	Y	0.44	46.59	93
Indeno(123-cd)pyrene	59792	1.00	Y	38: 9	Y	0.62	0.10	0.000
d14-Dibenz(ah)anthracene	55083800	1.00	Y	38: 6	Y	0.25	47.21	94
Dibenz(ah)anthracene	* No Peak	0.00	N	38: 14	N	1.40	0.00	0.000
d12-Benzo(ghi)perylene	118699600	1.00	Y	39: 12	Y	0.58	43.14	86
Benzo(ghi)perylene	143538	1.00	Y	39: 21	Y	1.02	0.12	0.000
d10-Fluorene	56334800	1.00	Y	17: 41	Y	1.42	8.35	17
13C-Fluorene	39298000	1.00	Y	17: 47	Y	1.00	69.76	0.000

File:02NO98V4 #1-509 Acq: 2-NOV-1998 14:51:29 GC EI+ Voltage SIR 70SE
Sample#3 Text:301802-1MB :METHOD BLANK Exp:PAHAIR

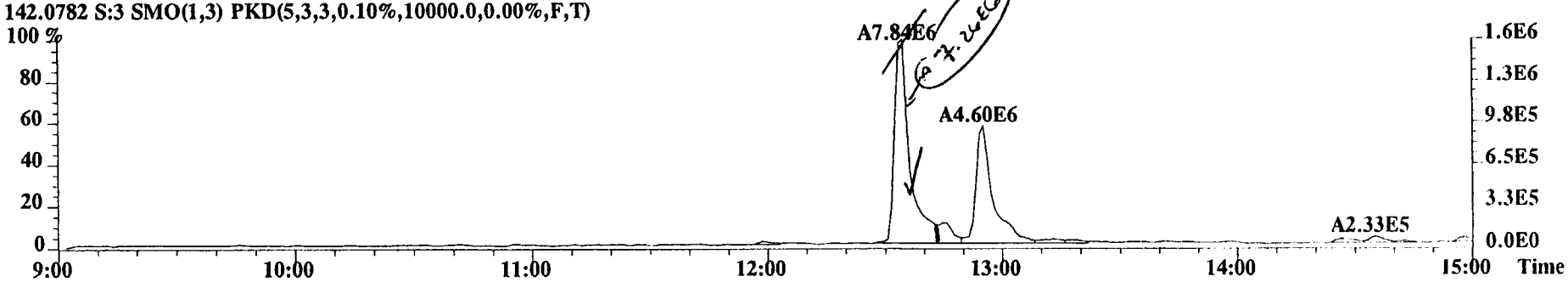
128.0626 S:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



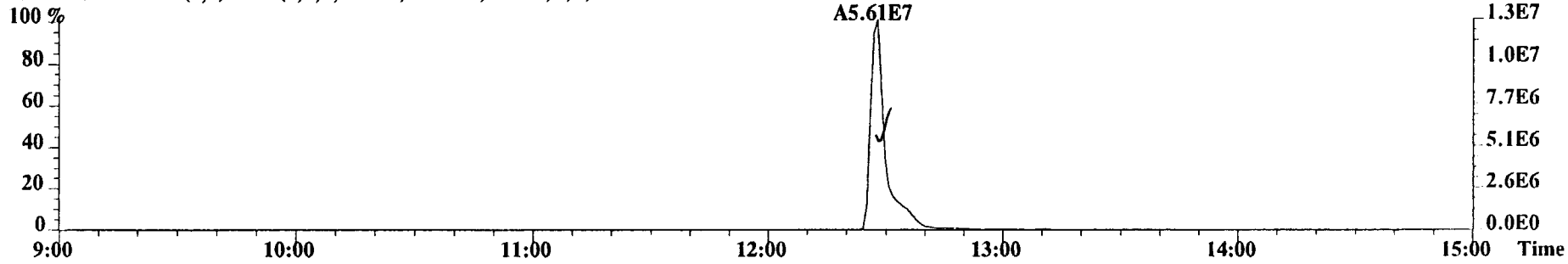
136.1128 S:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



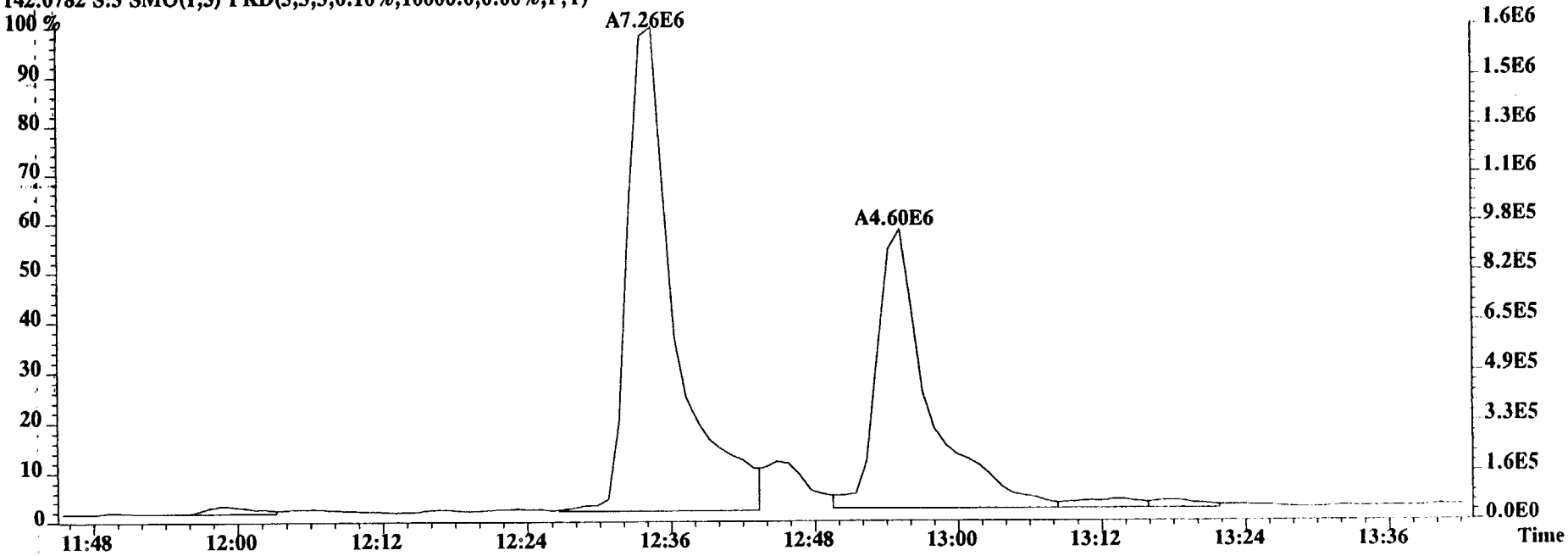
142.0782 S:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



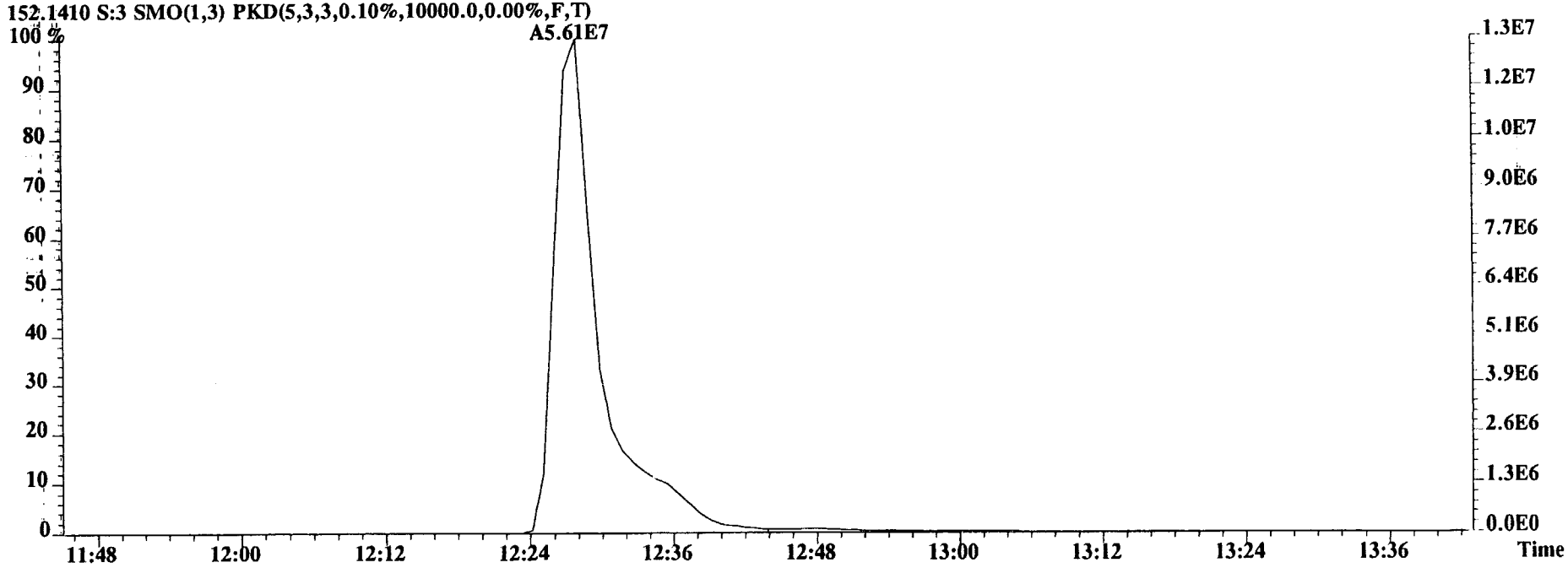
152.1410 S:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



File:02NO98V4 #1-509 Acq: 2-NOV-1998 14:51:29 GC EI+ Voltage SIR 70SE
Sample#3 Text:301802-1MB :METHOD BLANK Exp:PAHAIR
142.0782 S:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

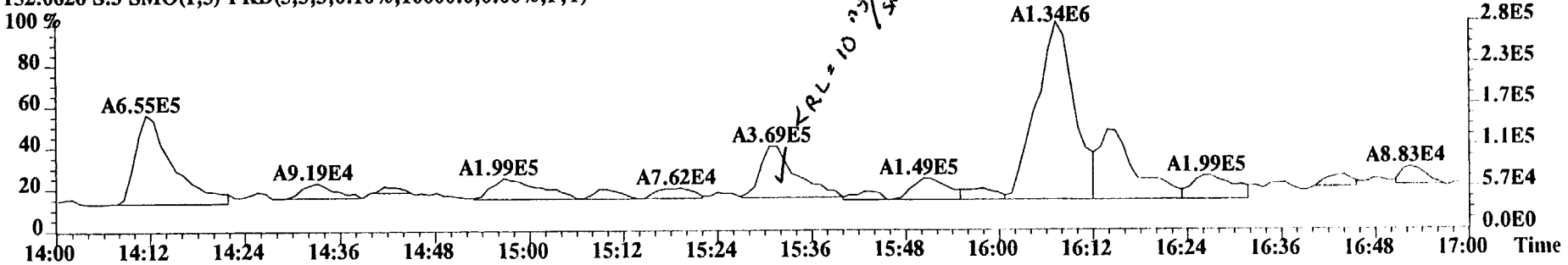


152.1410 S:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

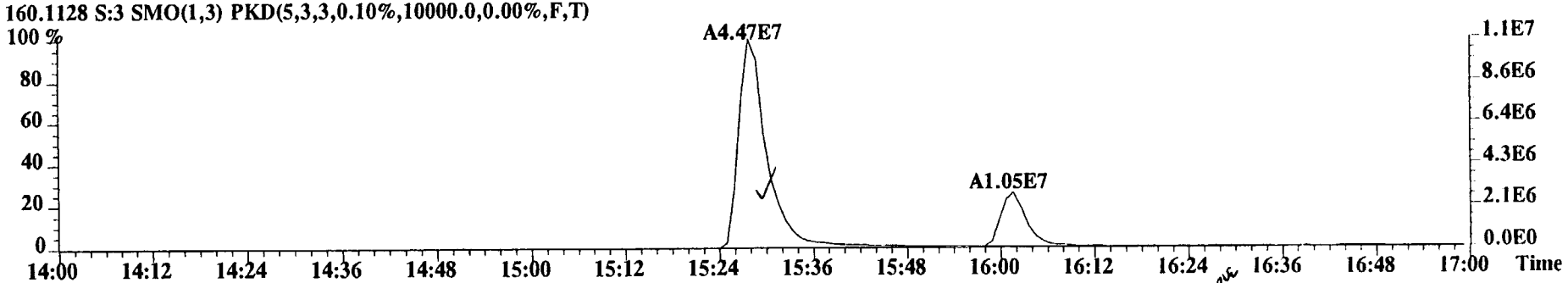


File:02NO98V4 #1-509 Acq: 2-NOV-1998 14:51:29 GC EI+ Voltage SIR 70SE
Sample#3 Text:301802-1MB :METHOD BLANK Exp:PAHAIR

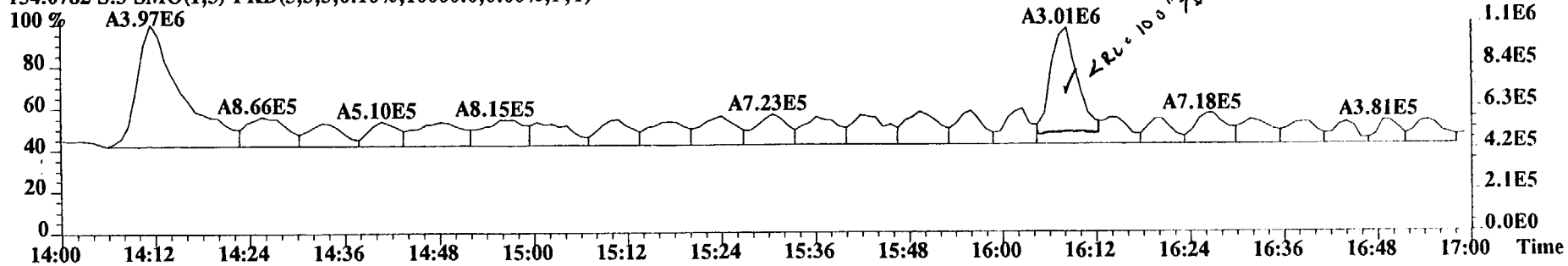
152.0626 S:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



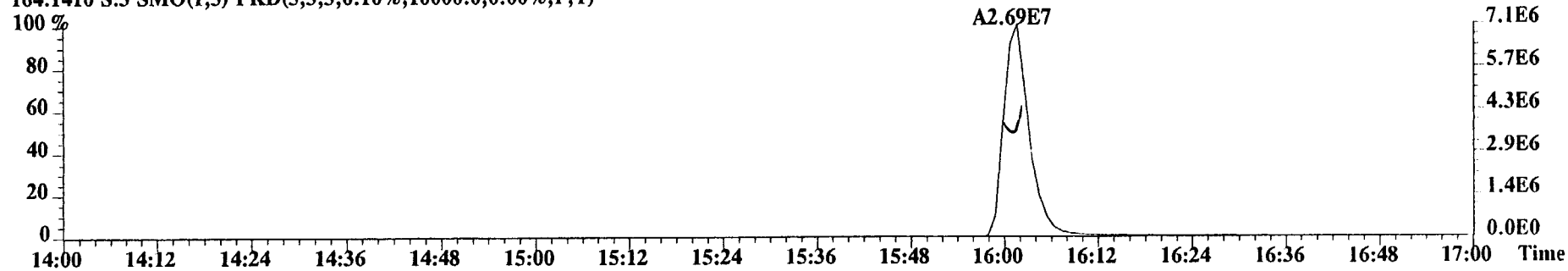
160.1128 S:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



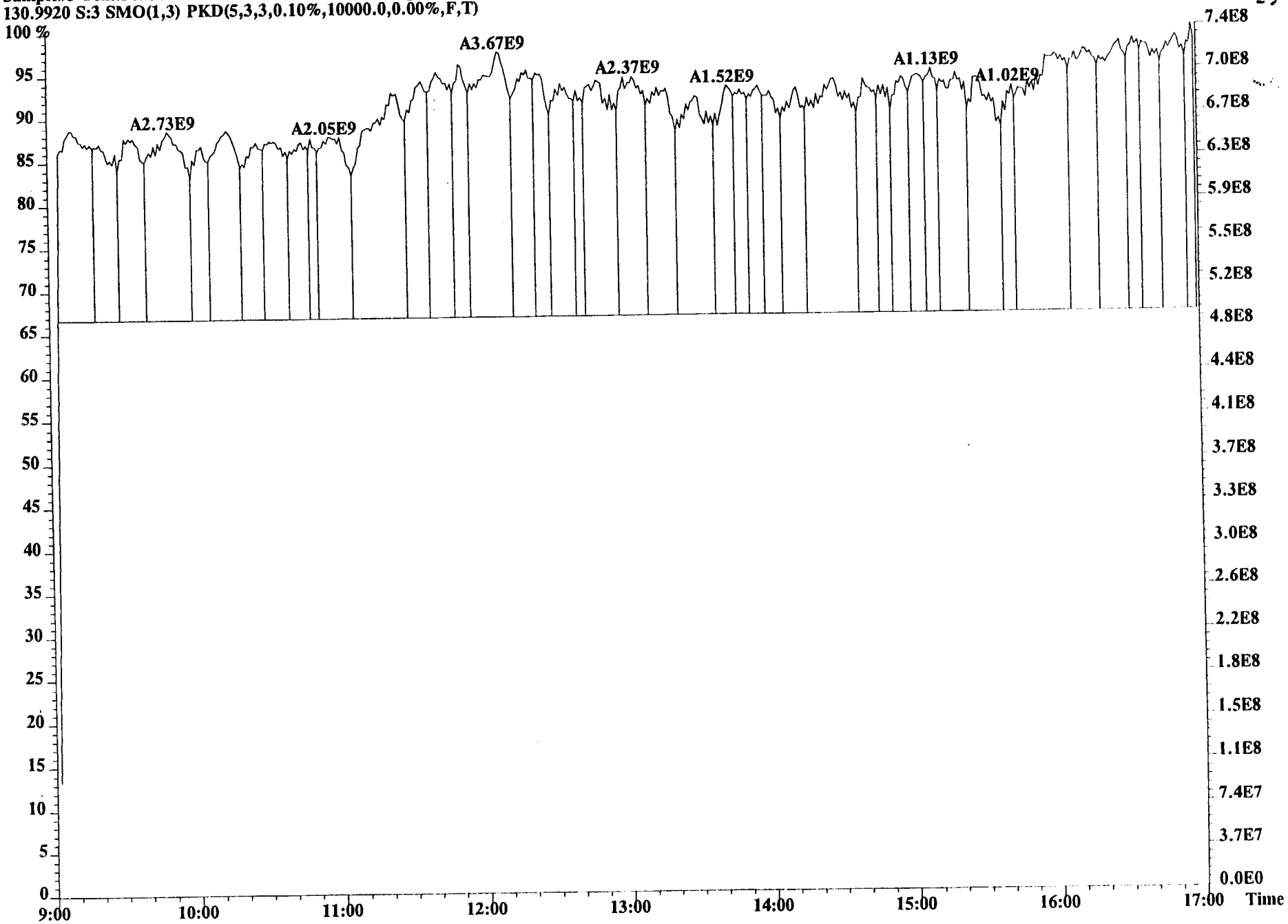
154.0782 S:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



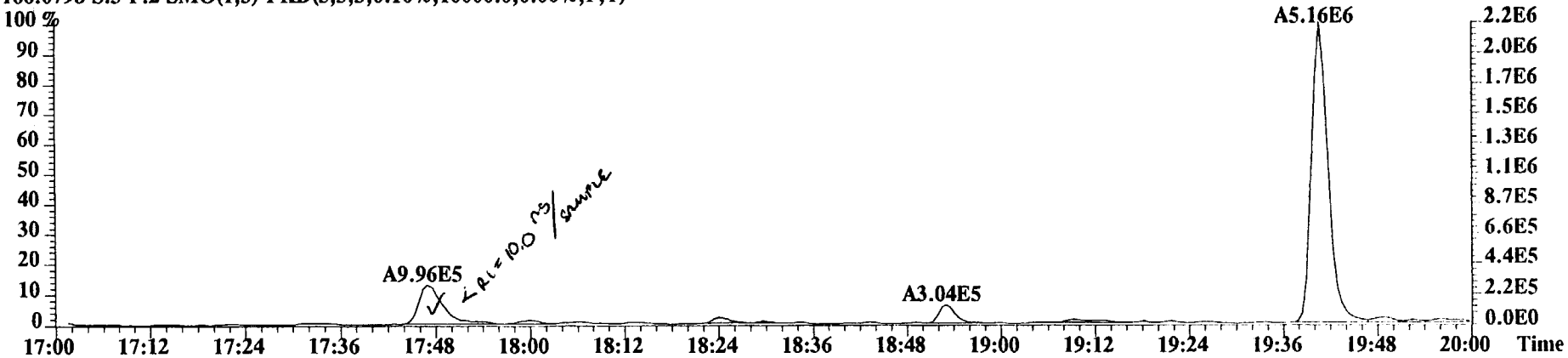
164.1410 S:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



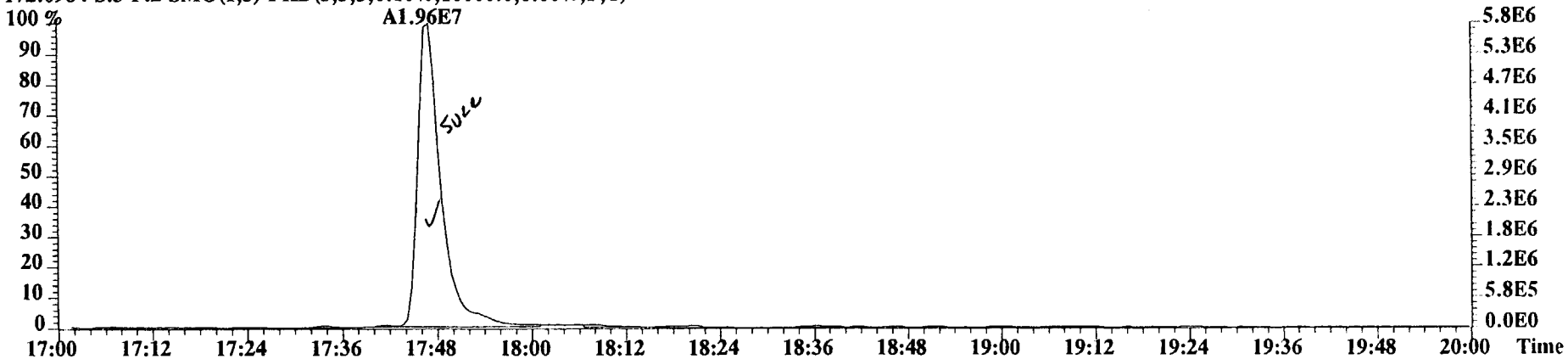
File:02NO98V4 #1-509 Acq: 2-NOV-1998 14:51:29 GC EI+ Voltage SIR 70SE
Sample#3 Text:301802-1MB :METHOD BLANK Exp:PAHAIR
130.9920 S:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



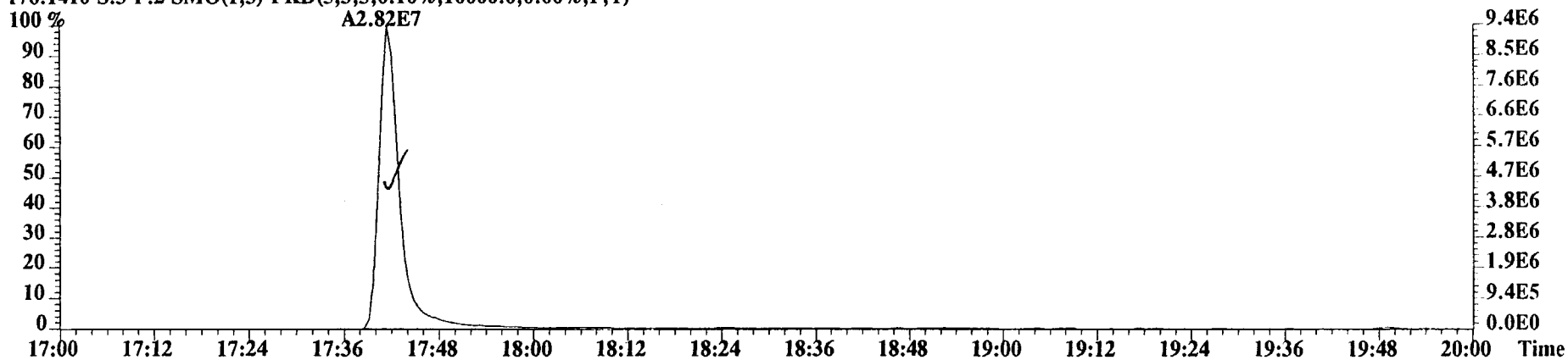
File:02NO98V4 #1-641 Acq: 2-NOV-1998 14:51:29 GC EI+ Voltage SIR 70SE
Sample#3 Text:301802-1MB :METHOD BLANK Exp:PAHAIR
166.0798 S:3 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



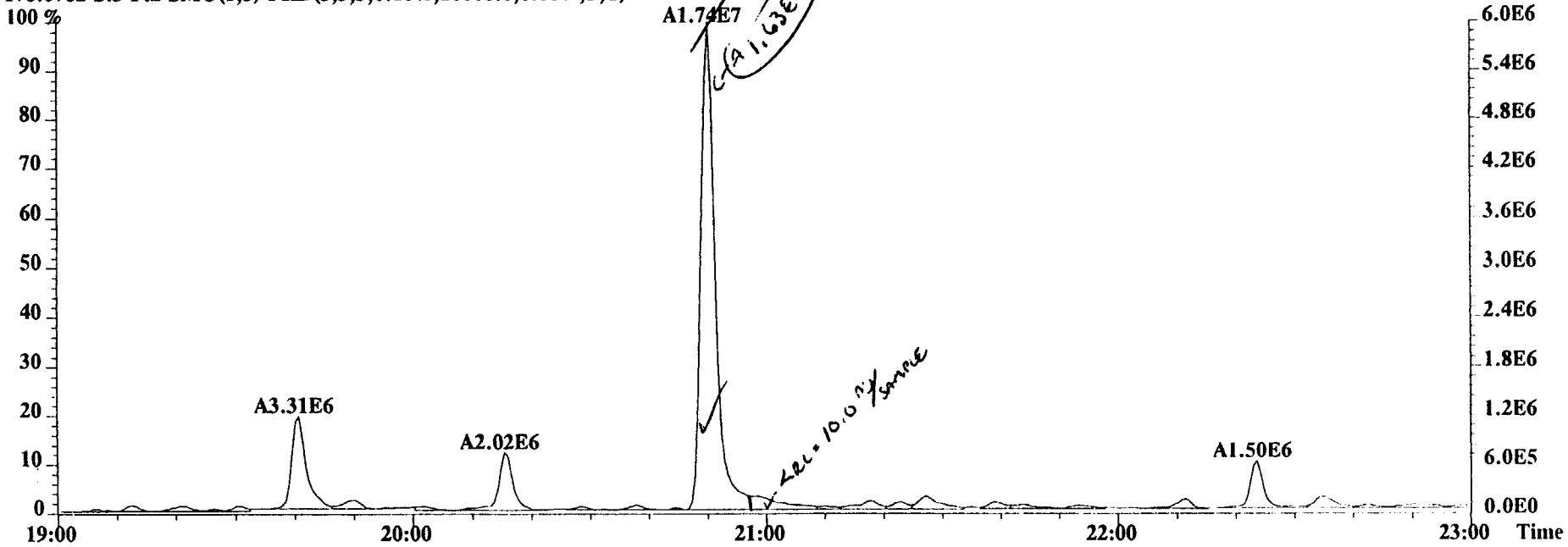
172.0984 S:3 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



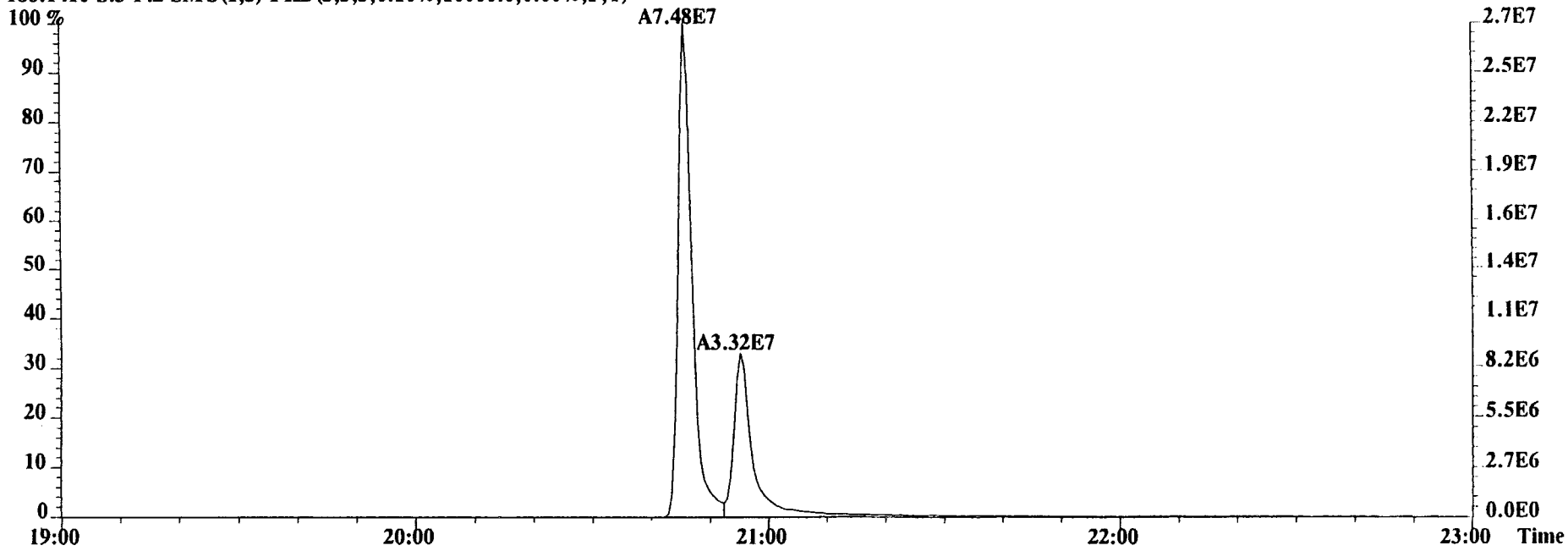
176.1410 S:3 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



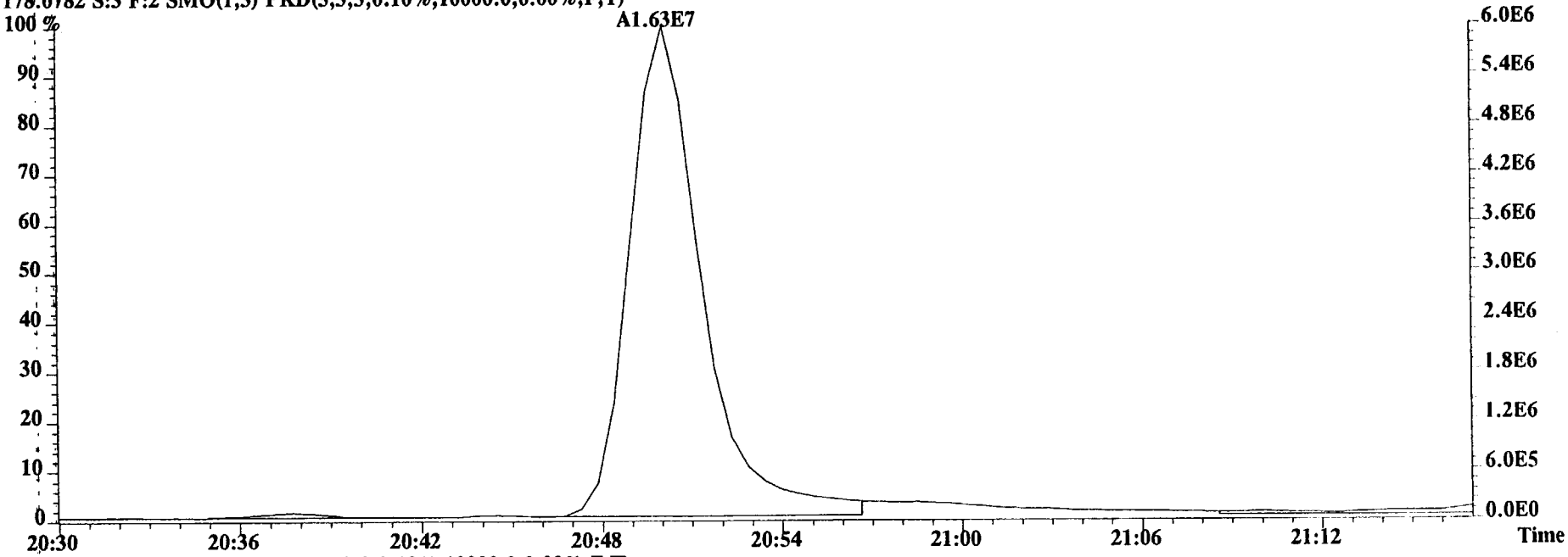
File:02NO98V4 #1-641 Acq: 2-NOV-1998 14:51:29 GC EI+ Voltage SIR 70SE
Sample#3 Text:301802-1MB :METHOD BLANK Exp:PAHAIR
178.0782 S:3 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



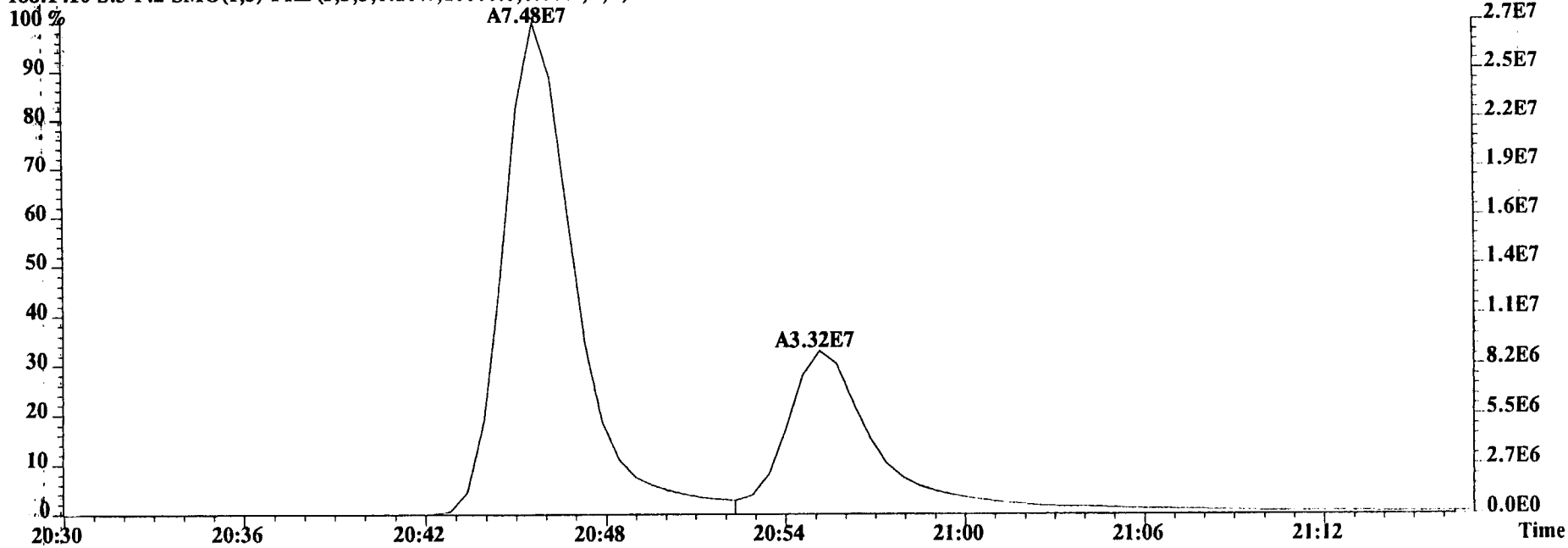
188.1410 S:3 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



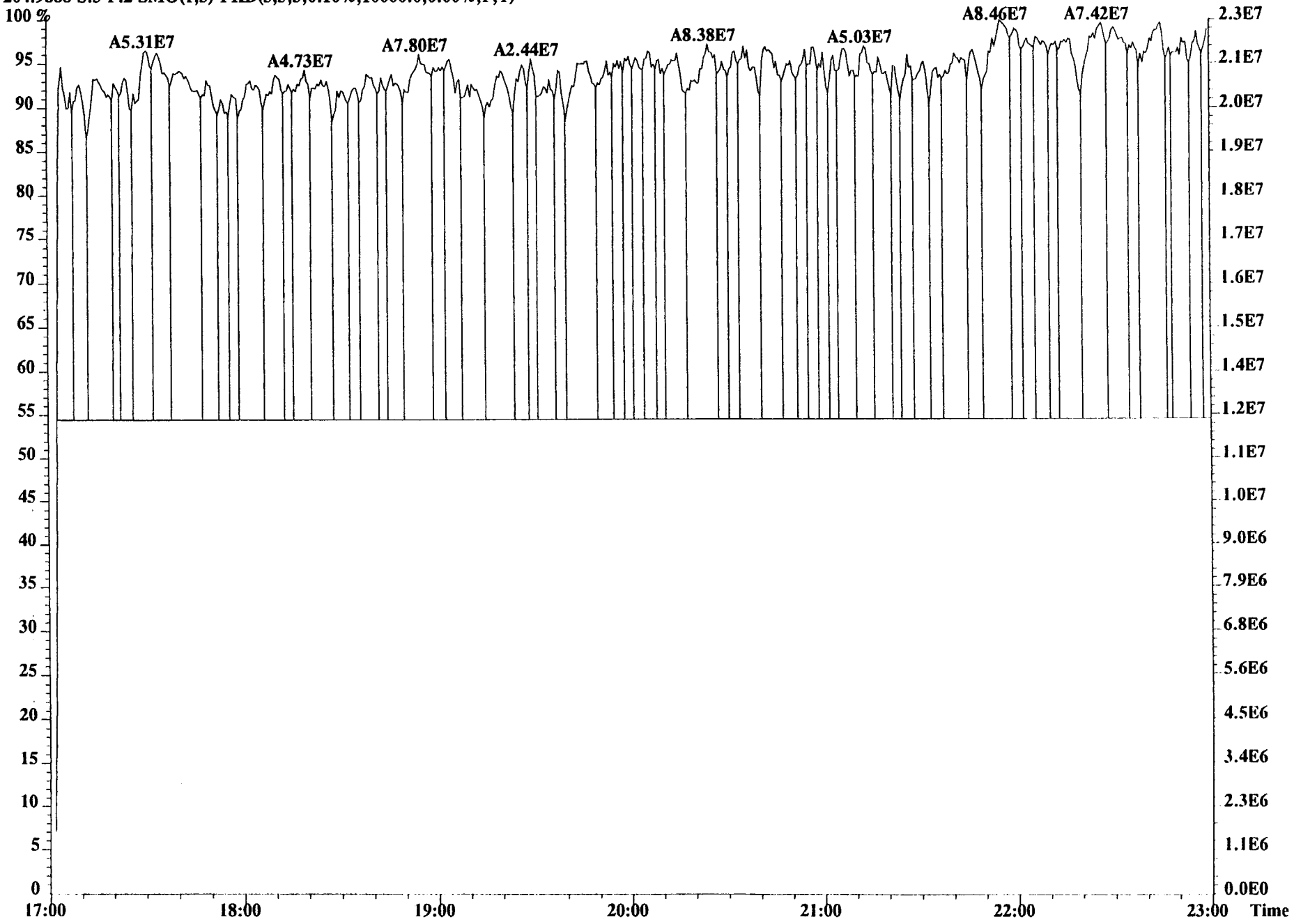
File:02NO98V4 #1-641 Acq: 2-NOV-1998 14:51:29 GC EI+ Voltage SIR 70SE
Sample#3 Text:301802-1MB :METHOD BLANK Exp:PAHAIR
178.0782 S:3 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



188.1410 S:3 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

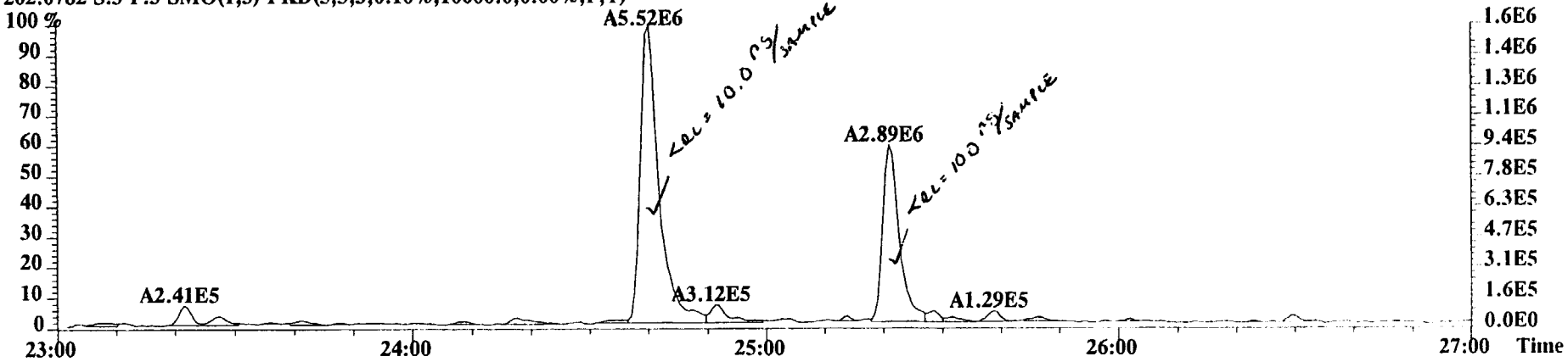


File:02NO98V4 #1-641 Acq: 2-NOV-1998 14:51:29 GC EI+ Voltage SIR 70SE
Sample#3 Text:301802-1MB :METHOD BLANK Exp:PAHAIR
204.9888 S:3 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

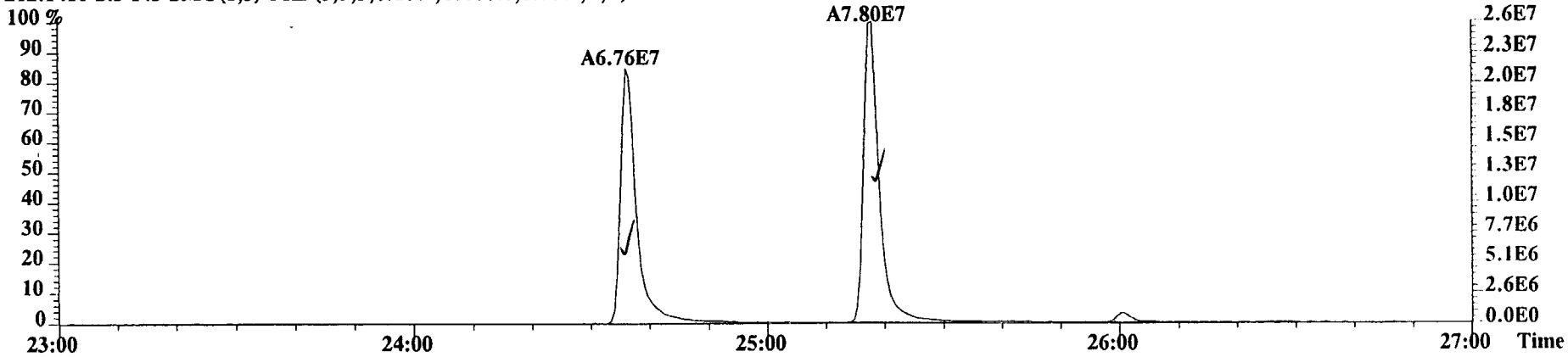


File:02NO98V4 #1-939 Acq: 2-NOV-1998 14:51:29 GC EI+ Voltage SIR 70SE
Sample#3 Text:301802-1MB :METHOD BLANK Exp:PAHAIR

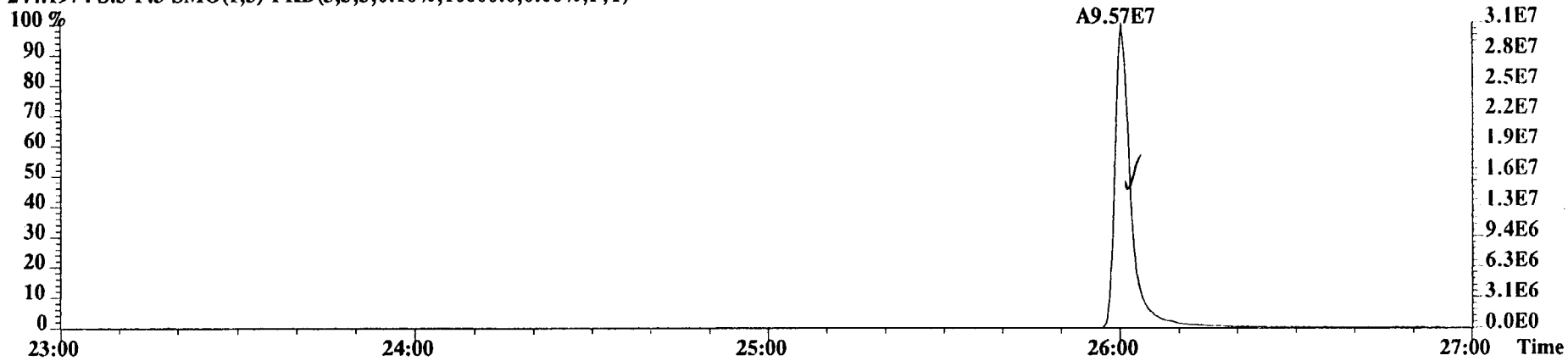
202.0782 S:3 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



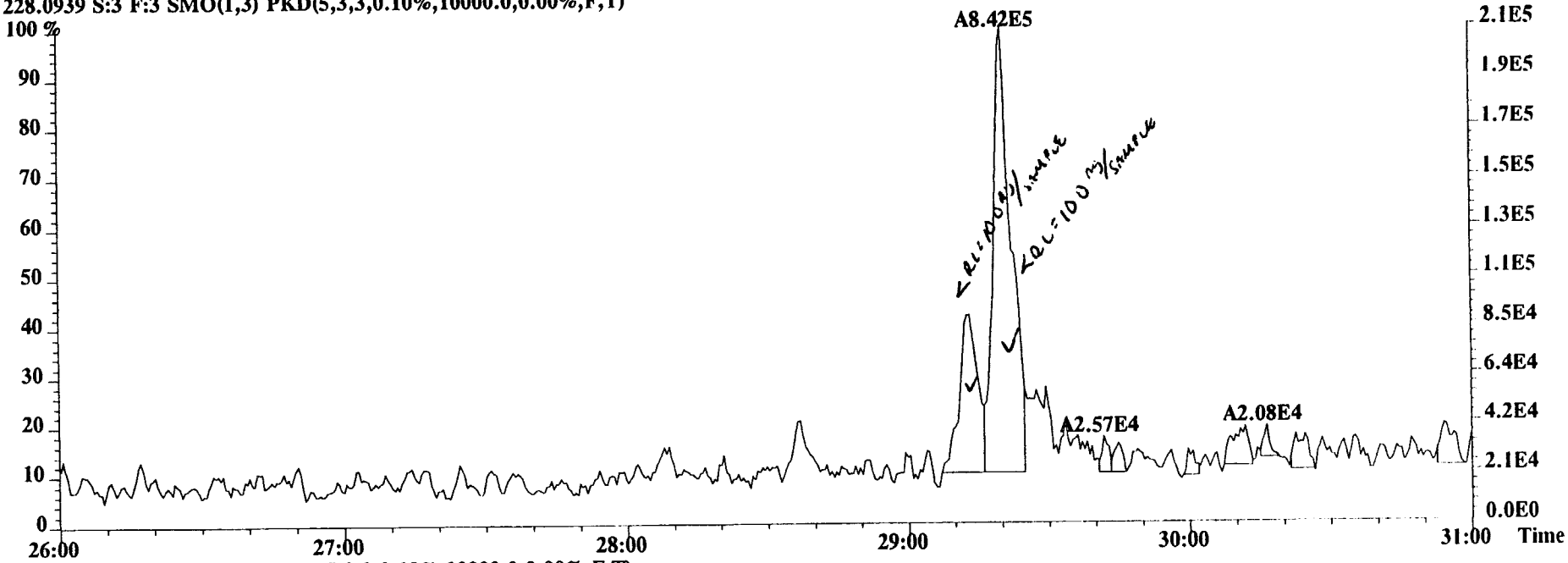
212.1410 S:3 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



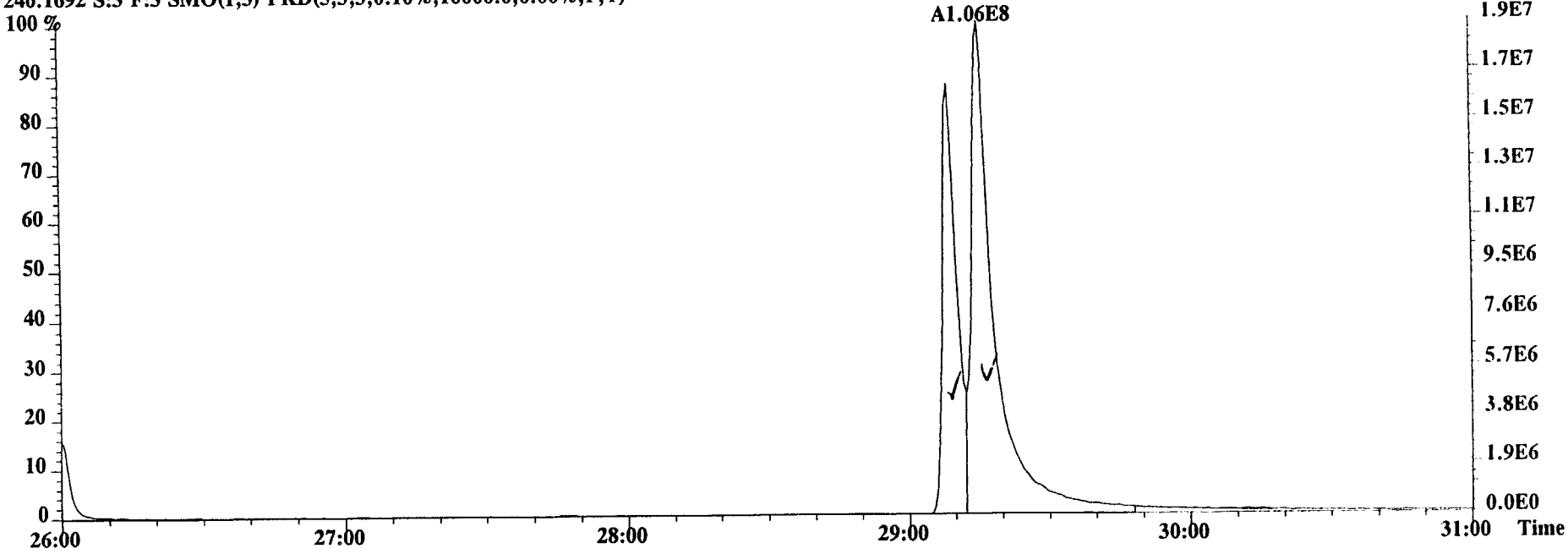
244.1974 S:3 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



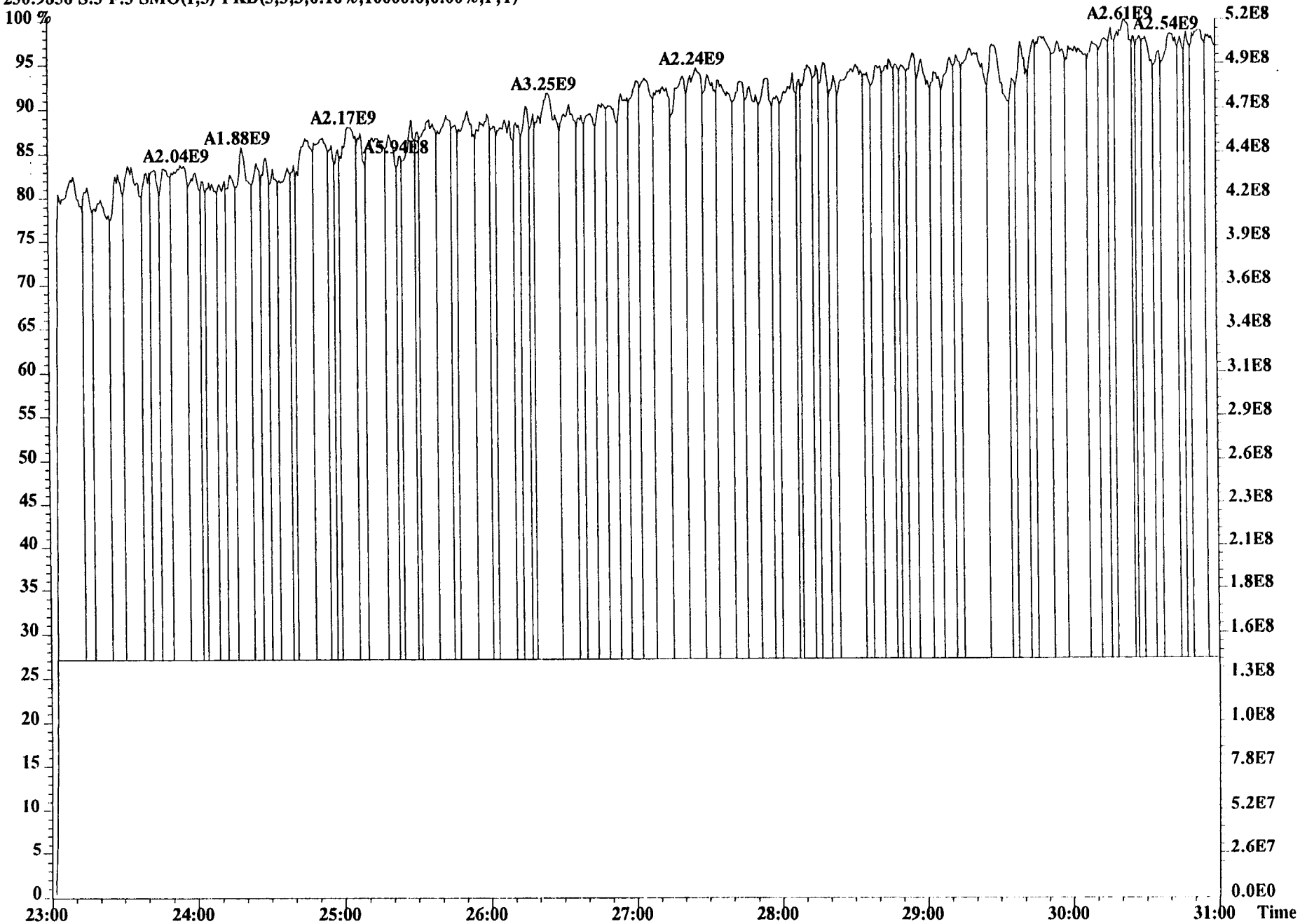
File:02NO98V4 #1-939 Acq: 2-NOV-1998 14:51:29 GC EI+ Voltage SIR 70SE
Sample#3 Text:301802-1MB :METHOD BLANK Exp:PAHAIR
228.0939 S:3 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



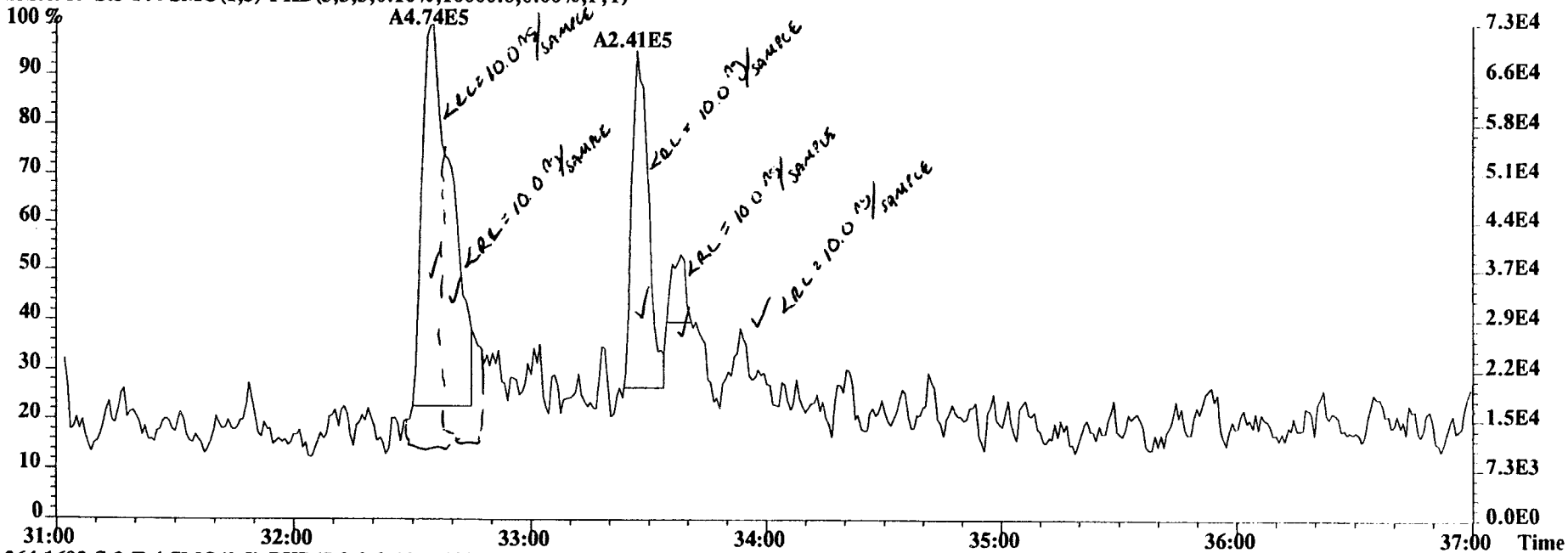
240.1692 S:3 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



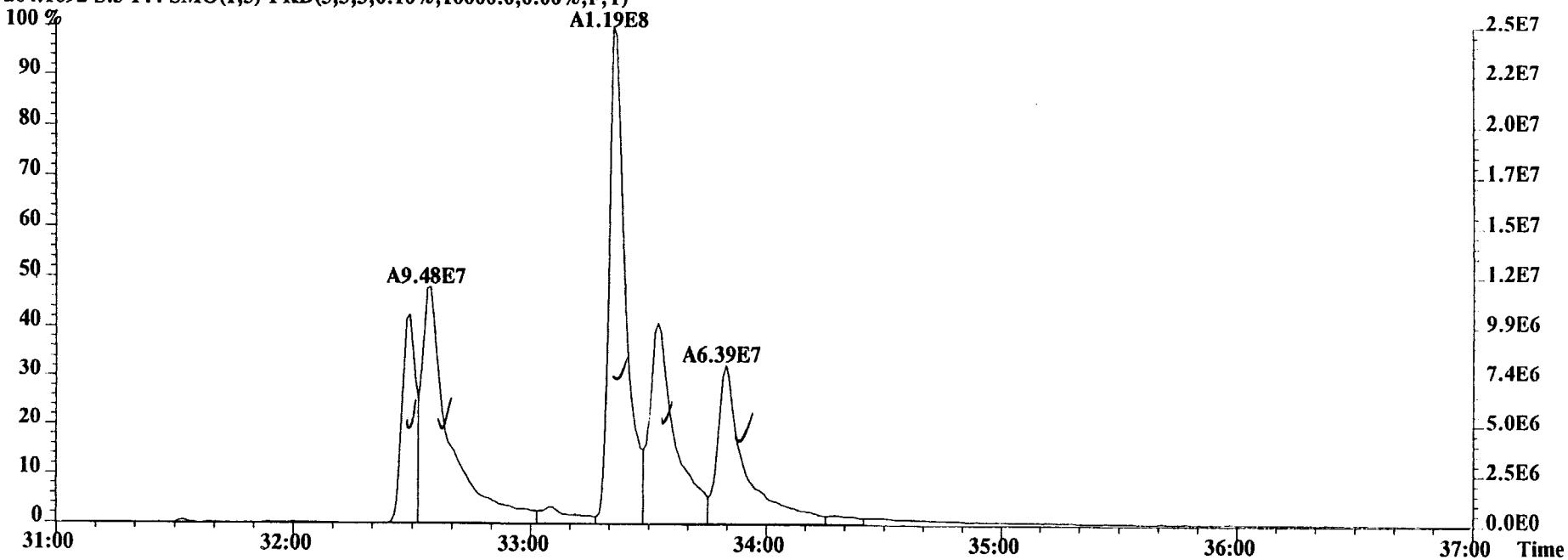
File:02NO98V4 #1-939 Acq: 2-NOV-1998 14:51:29 GC EI+ Voltage SIR 70SE
Sample#3 Text:301802-1MB :METHOD BLANK Exp:PAHAIR
230.9856 S:3 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



File:02NO98V4 #1-878 Acq: 2-NOV-1998 14:51:29 GC EI+ Voltage SIR 70SE
Sample#3 Text:301802-1MB :METHOD BLANK Exp:PAHAIR
252.0939 S:3 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

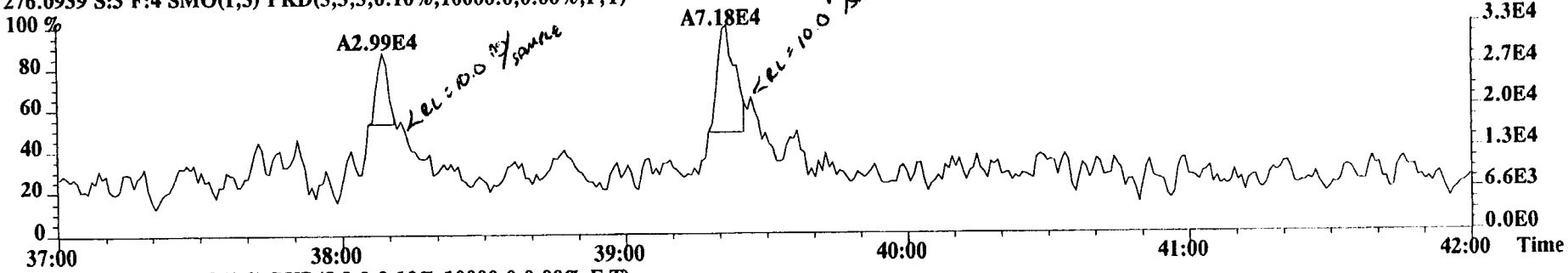


264.1692 S:3 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

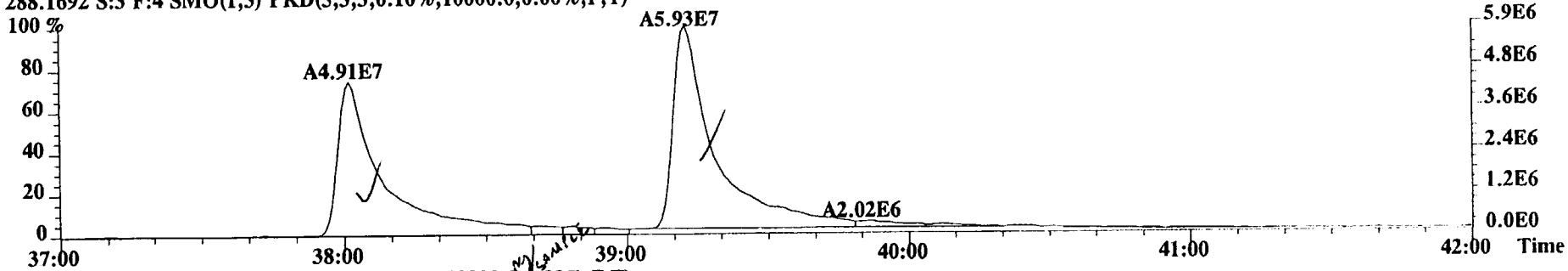


File:02NO98V4 #1-878 Acq: 2-NOV-1998 14:51:29 GC EI+ Voltage SIR 70SE
Sample#3 Text:301802-1MB :METHOD BLANK Exp:PAHAIR

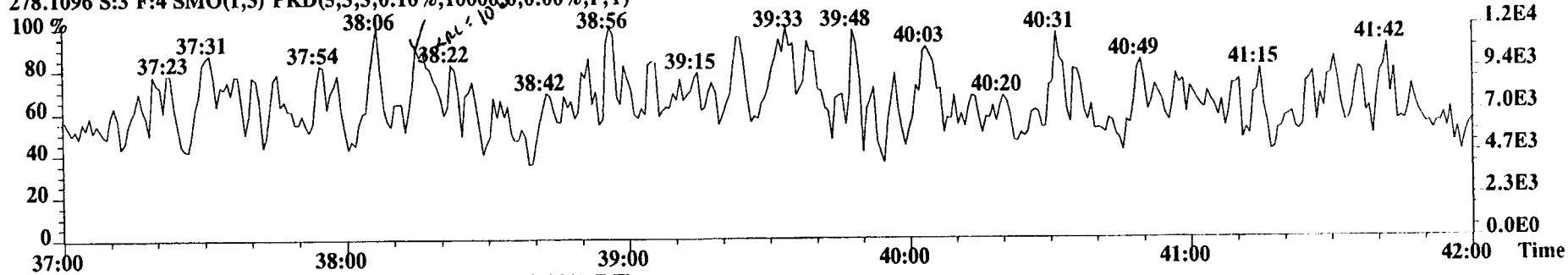
276.0939 S:3 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



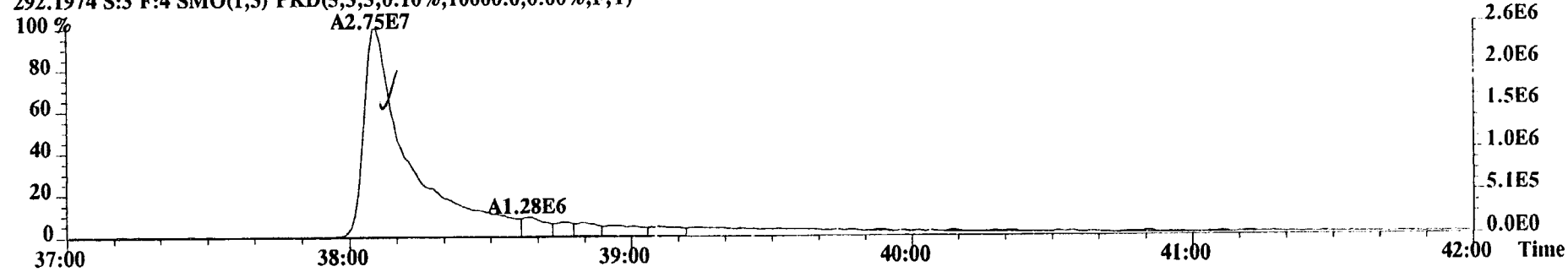
288.1692 S:3 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



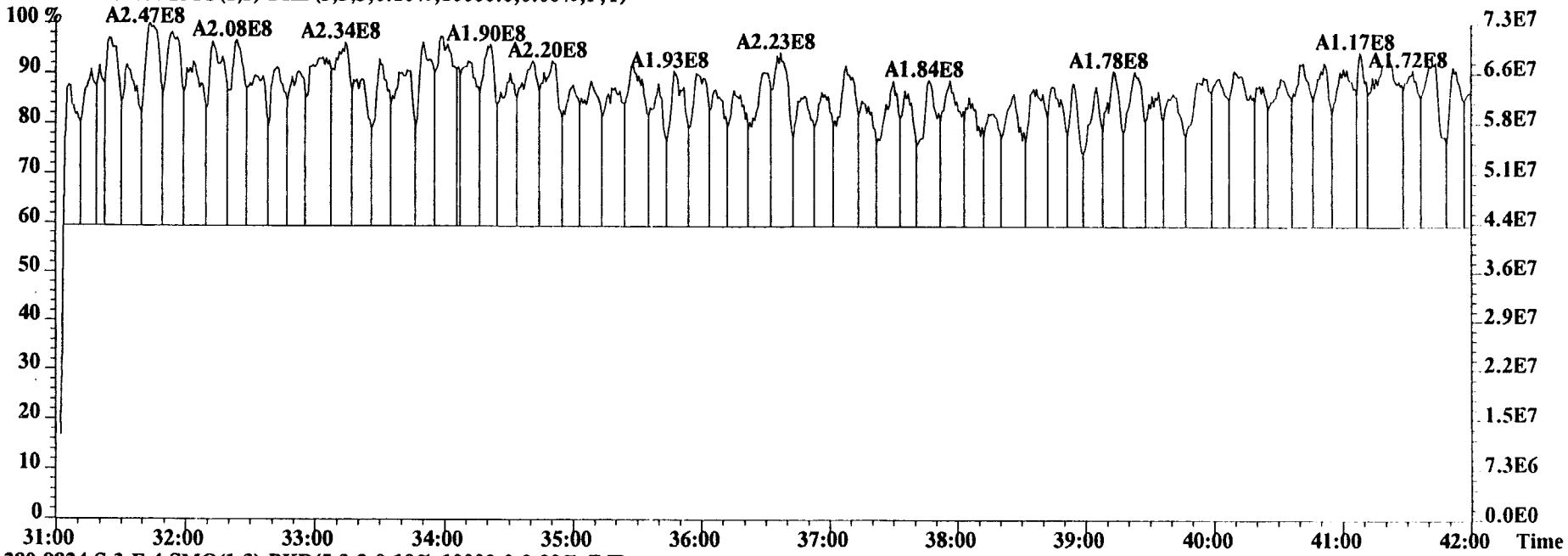
278.1096 S:3 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



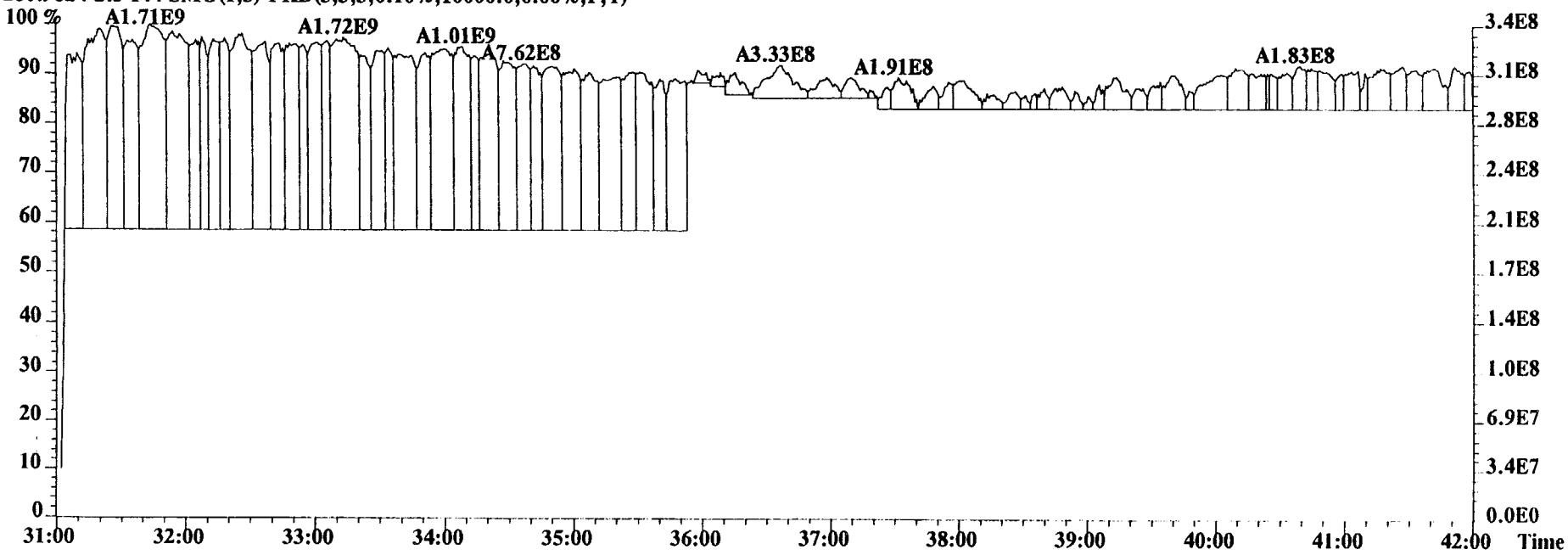
292.1974 S:3 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



File:02NO98V4 #1-878 Acq: 2-NOV-1998 14:51:29 GC EI+ Voltage SIR 70SE
Sample#3 Text:301802-1MB :METHOD BLANK Exp:PAHAIR
268.9824 S:3 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



280.9824 S:3 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



Sample Data

POLYNUCLEAR AROMATIC HYDROCARBONS
HIGH RESOLUTION GC/MS
Method HRGC/HRMS

Client Name: Pacific Environmental Services
Client ID: A-I-429-1
Lab ID: 301802-0001-SA
Matrix: AIRTRAIN Sampled: 21 SEP 98 Received: 29 SEP 98
Authorized: 29 SEP 98 Prepared: 03 OCT 98 Analyzed: 02 NOV 98
Dilution Factor: 1.0

Parameter	Result	Units	Reporting Limit	Data Qualifiers
Naphthalene	360000	ng/sample	--	BD
2-Methylnaphthalene	76000	ng/sample	--	D
Acenaphthylene	88000	ng/sample	--	D
Acenaphthene	15000	ng/sample	--	D
Fluorene	3400	ng/sample	--	D
Phenanthrene	160000	ng/sample	--	BD
Anthracene	16000	ng/sample	--	D
Fluoranthene	50000	ng/sample	--	BD
Pyrene	33000	ng/sample	--	D
Benzo(a)anthracene	15000	ng/sample	--	D
Chrysene	26000	ng/sample	--	D
Benzo(b)fluoranthene	17000	ng/sample	--	
Benzo(k)fluoranthene	9200	ng/sample	--	
Benzo(e)pyrene	6500	ng/sample	--	
Benzo(a)pyrene	6300	ng/sample	--	
Perylene	1100	ng/sample	--	
Indeno(1,2,3-cd)pyrene	11000	ng/sample	--	
Dibenz(a,h)anthracene	2500	ng/sample	--	
Benzo(g,h,i)perylene	11000	ng/sample	--	

B = Compound is also detected in the blank.
D = Compound quantitated using a secondary dilution.

Reported By: Clark Pickell Approved By: Eric Redman

The cover letter is an integral part of this report.
Rev 230787

POLYNUCLEAR AROMATIC HYDROCARBONS
HIGH RESOLUTION GC/MS
Method HRGC/HRMS
(cont.)

Client Name: Pacific Environmental Services
Client ID: A-I-429-1
Lab ID: 301802-0001-SA
Matrix: AIRTRAIN
Authorized: 29 SEP 98
Dilution Factor: 1.0

Sampled: 21 SEP 98
Prepared: 03 OCT 98

Received: 29 SEP 98
Analyzed: 02 NOV 98

Internal Standards	% Recovery	
Naphthalene-d8	58	D
Acenaphthylene-d8	50	D
Acenaphthene-d10	45	Dm
Fluorene-d10	53	D
Phenanthrene-d10	81	D
Fluoranthene-d10	48	Dm
Pyrene-d10	51	D
Benzo(a)anthracene-d12	61	D
Perylene-d12	58	
Indeno(123-cd)pyrene-d12	91	
Chrysene-d12	72	D
Benzo(b)fluoranthene-d12	87	
Benzo(k)fluoranthene-d12	86	
Benzo(a)pyrene-d12	78	
Dibenz(a,h)anthracene-d14	83	
Benzo(g,h,i)perylene-d12	64	

Field Surrogates	% Recovery	
13C-Fluorene	82	D

D = Compound quantitated using a secondary dilution.
m = Internal Standard recovery is outside method recovery goal.

Reported By: Clark Pickell

Approved By: Eric Redman

The cover letter is an integral part of this report.
Rev 230787

04-NOV-1998 01:07:24 PM Dioxin Furan Unknown RESULTS

Mass Spec : VG-4 Results : 02NO98V4091.RES : PAHAIR.TRG
GC Column : DB-5 Date analyzed : 02-NOV-98
Data file : 02NO98V4 301802-1 :100X DIL: AIR Ex Cal : PAHAIR102998V4.R
Weight : 0.5

Name	Total Response	Isotope Ratio		R. T. mm:ss		RRF	ng/ TRAIN		Rec/ MDL
d10-2-Methylnaphthalene	592000	1.00	Y	12: 28	Y	1.00	50.00		
d8-Naphthalene	772000	1.00	Y	10: 13	Y	2.24	29.10		58
Naphthalene	3448480000	1.00	Y	10: 15	Y	1.23	3.6e+05	B	~~E~~
2-Methylnaphthalene	328228000	1.00	Y	12: 34	Y	0.56	7.6e+04	B	~~E~~
d8-Acenaphthylene	357346	1.00	Y	15: 27	Y	1.21	24.87		50
Acenaphthylene	295804000	1.00	Y	15: 30	Y	0.94	8.8e+04		~~E~~
d10-Acenaphthene	199957	1.00	Y	16: 1	Y	0.74	22.68		45 m
Acenaphthene	37493600	1.00	Y	16: 8	Y	1.25	1.5e+04		
d10-Anthracene	397598	1.00	Y	20: 55	Y	1.00	50.00		
d10-Fluorene	299420	1.00	Y	17: 41	Y	1.42	26.50		53
Fluorene	11855640	1.00	Y	17: 47	Y	1.16	3411.87		
d10-Phenanthrene	905068	1.00	Y	20: 45	Y	2.81	40.54		81
Phenanthrene	1267780000	1.00	Y	20: 49	Y	0.89	1.6e+05	B	~~E~~
Anthracene	118200000	1.00	Y	20: 59	Y	0.80	1.6e+04		
d14-Terphenyl	1215336	1.00	Y	26: 1	Y	1.00	50.00		
d10-Fluoranthene	824000	1.00	Y	24: 35	Y	1.41	24.03		48 m
Fluoranthene	458920000	1.00	Y	24: 39	Y	1.11	5.0e+04		~~E~~
d10-Pyrene	939830	1.00	Y	25: 16	Y	1.52	25.47		51
Pyrene	368212000	1.00	Y	25: 20	Y	1.21	3.3e+04		
d12-Benzo(a)anthracene	669672	1.00	Y	29: 8	Y	0.90	30.61		61
Benzo(a)anthracene	123418000	1.00	Y	29: 12	Y	1.20	1.5e+04		
d12-Chrysene	1116460	1.00	Y	29: 14	Y	1.28	35.91		72
Chrysene	317112000	1.00	Y	29: 19	Y	1.08	2.6e+04		

see 10X
~~100~~X

d10-Fluorene	299420	1.00	Y	17: 41	Y	1.00	50.00		
13C-Fluorene	197600	1.00	Y	17: 46	Y	0.80	41.25		82

11-4-98

04-NOV-1998 01:07:20 PM Dioxin Furan Unknown RESULTS

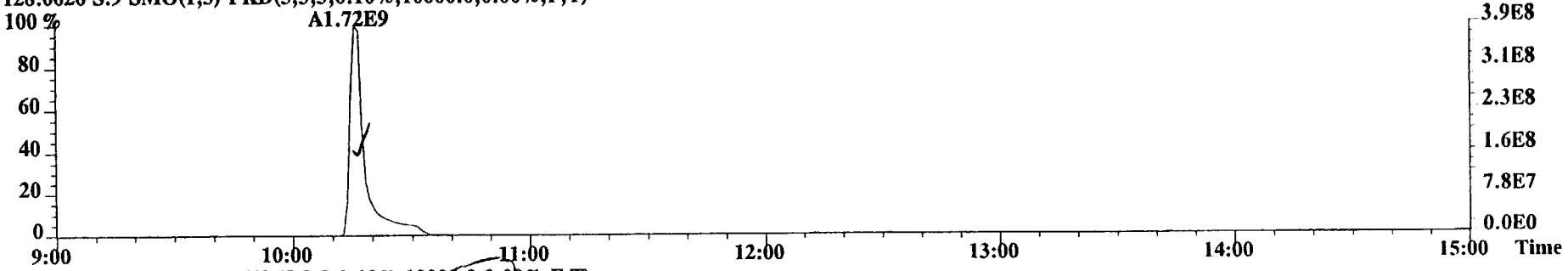
		0.5	
98V4.RRF			
Rec/			
MDL			
		296000	296000
	58	386000	386000
B	E	1724240000	1724240000
B	E	164114000	164114000
	50	178673	178673
	E	147902000	147902000
	45	99979	99979
		18746800	18746800
		198799	198799
	53	149710	149710
		5927820	5927820
	81	452534	452534
B	E	633890000	633890000
		59100000	59100000
		607668	607668
	48	412000	412000
B	E	229460000	229460000
	51	469915	469915
		184106000	184106000
	61	334836	334836
		61709000	61709000
	72	558230	558230
		158556000	158556000

03-NOV-1998 08:29:39 AM 429AIR Unknown RESULTS

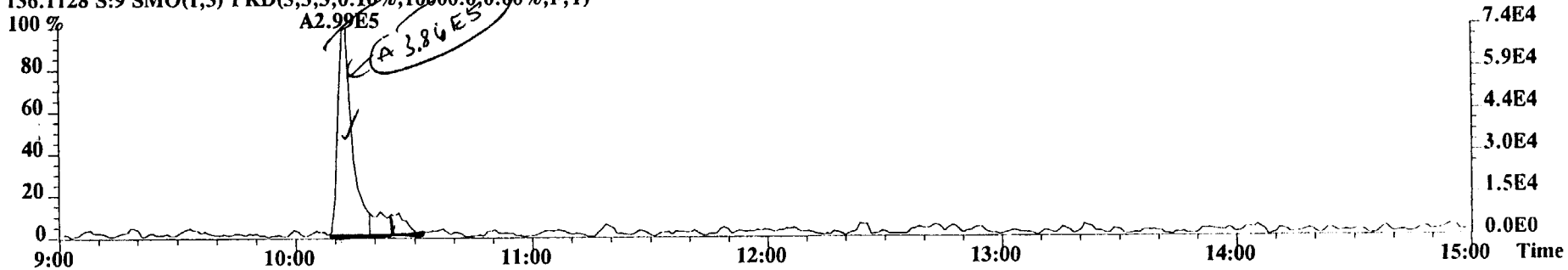
Mass Spec : VG-4 Results : 02NO98V4091.RES : PAHAIR.TRG
GC Column : DB-5 Date analyzed : 02-NOV-98
Data file : 02NO98V4 301802-1 :100X DIL. :AIR Ex Cal : PAHAIR102998V4.R
Weight : 0.5

Name	Total Response	Isotope Ratio		AIR R. T. mm:ss		Cal RRF	ng/ TRAIN	Rec/ MDL
d10-2-Methylnaphthalene	485074	1.00	Y	12: 28	Y	1.00	50.00	
d8-Naphthalene	598348	1.00	Y	10: 13	Y	2.24	27.53	55
Naphthalene	3448480000	1.00	Y	10: 15	Y	1.23	4.7e+05	0.000
2-Methylnaphthalene	328228000	1.00	Y	12: 34	Y	0.56	9.8e+04	0.000
d8-Acenaphthylene	357346	1.00	Y	15: 27	Y	1.21	30.35	61
Acenaphthylene	295804000	1.00	Y	15: 30	Y	0.94	8.8e+04	0.000
d10-Acenaphthene	199957	1.00	Y	16: 1	Y	0.74	27.68	55
Acenaphthene	37493600	1.00	Y	16: 8	Y	1.25	1.5e+04	0.000
d10-Anthracene	397598	1.00	Y	20: 55	Y	1.00	50.00	
d10-Fluorene	299420	1.00	Y	17: 41	Y	1.42	26.50	53
Fluorene	11855640	1.00	Y	17: 47	Y	1.16	3411.87	0.000
d10-Phenanthrene	905068	1.00	Y	20: 45	Y	2.81	40.54	81
Phenanthrene	1267780000	1.00	Y	20: 49	Y	0.89	1.6e+05	0.000
Anthracene	* No Peak	0.00	N	20: 59	N	0.80	0.00	0.000
d14-Terphenyl	1215336	1.00	Y	26: 1	Y	1.00	50.00	
d10-Fluoranthene	743050	1.00	Y	24: 35	Y	1.41	21.67	43
Fluoranthene	458920000	1.00	Y	24: 39	Y	1.11	5.6e+04	0.000
d10-Pyrene	939830	1.00	Y	25: 16	Y	1.52	25.47	51
Pyrene	368212000	1.00	Y	25: 20	Y	1.21	3.3e+04	0.000
d12-Benzo(a)anthracene	669672	1.00	Y	29: 8	Y	0.90	30.61	61
Benzo(a)anthracene	123418000	1.00	Y	29: 12	Y	1.20	1.5e+04	0.000
d12-Chrysene	1116460	1.00	Y	29: 14	Y	1.28	35.91	72
Chrysene	317112000	1.00	Y	29: 19	Y	1.08	2.6e+04	0.000
d12-Benzo(e)pyrene	1340970	1.00	Y	33: 21	Y	1.00	50.00	
d12-Benzo(b)fluoranthene	537714	1.00	Y	32: 28	Y	0.45	44.18	88
Benzo(b)fluoranthene	142542000	1.00	Y	32: 34	Y	1.17	2.3e+04	0.000
d12-Benzo(k)fluoranthene	1040730	1.00	Y	32: 34	Y	0.95	40.93	82
Benzo(k)fluoranthene	142542000	1.00	Y	32: 34	Y	1.16	1.2e+04	0.000
d12-Benzo(a)pyrene	509580	1.00	Y	33: 32	Y	0.68	28.08	56
Benzo(e)pyrene	50739200	1.00	Y	33: 26	Y	1.64	6068.31	0.000
Benzo(a)pyrene	34229000	1.00	Y	33: 38	Y	1.07	6266.07	0.000
d12-Perylene	467150	1.00	Y	33: 50	Y	0.63	27.64	55
Perylene	* No Peak	0.00	N	33: 54	N	1.71	0.00	0.000
d12-Indeno(123-cd)pyrene	311154	1.00	Y	38: 1	Y	0.44	26.10	52
Indeno(123-cd)pyrene	57223000	1.00	Y	38: 7	Y	0.62	3.0e+04	0.000
d14-Dibenz(ah)anthracene	142852	1.00	Y	38: 6	Y	0.25	21.67	43
Dibenz(ah)anthracene	8027680	1.00	Y	38: 15	Y	1.40	4003.87	0.000
d12-Benzo(ghi)perylene	468222	1.00	Y	39: 12	Y	0.58	30.12	60
Benzo(ghi)perylene	62917800	1.00	Y	39: 20	Y	1.02	1.3e+04	0.000
d10-Fluorene	299420	1.00	Y	17: 41	Y	1.42	7.86	16
13C-Fluorene	149561	1.00	Y	17: 46	Y	1.00	49.95	0.000

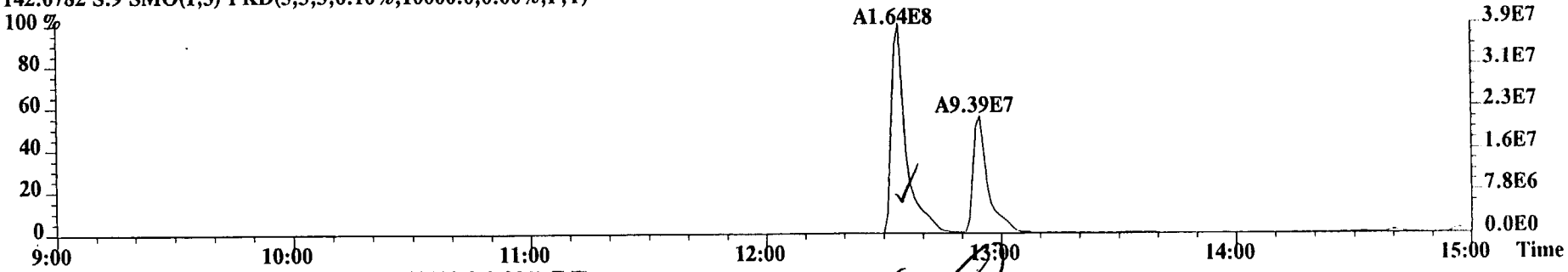
File:02NO98V4 #1-510 Acq: 2-NOV-1998 19:45:31 GC EI+ Voltage SIR 70SE
Sample#9 Text:301802-1 :100X DIL. :AIR Exp:PAHAIR
128.0626 S:9 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



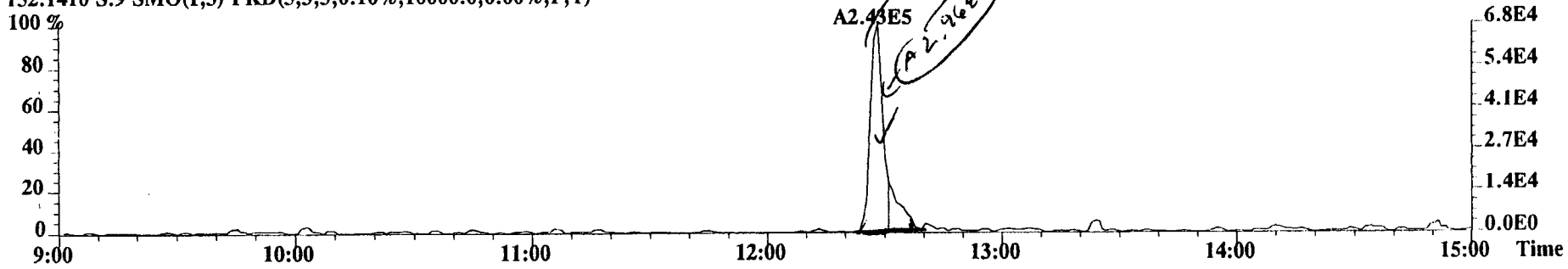
136.1128 S:9 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



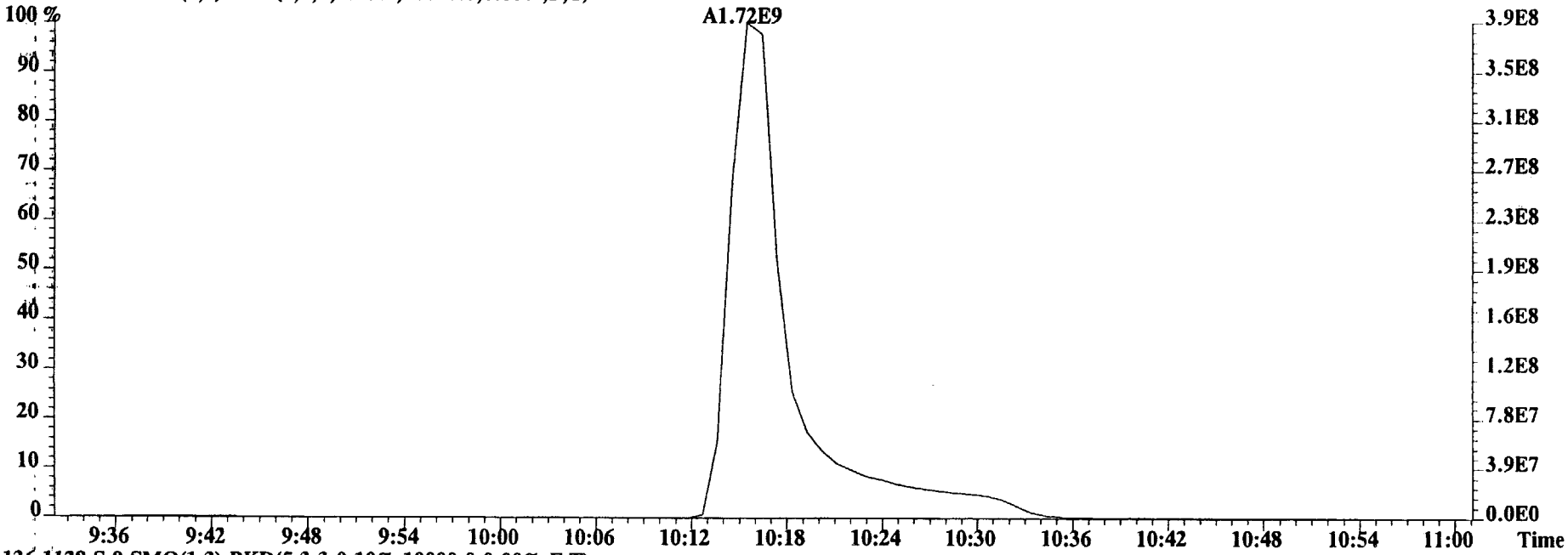
142.0782 S:9 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



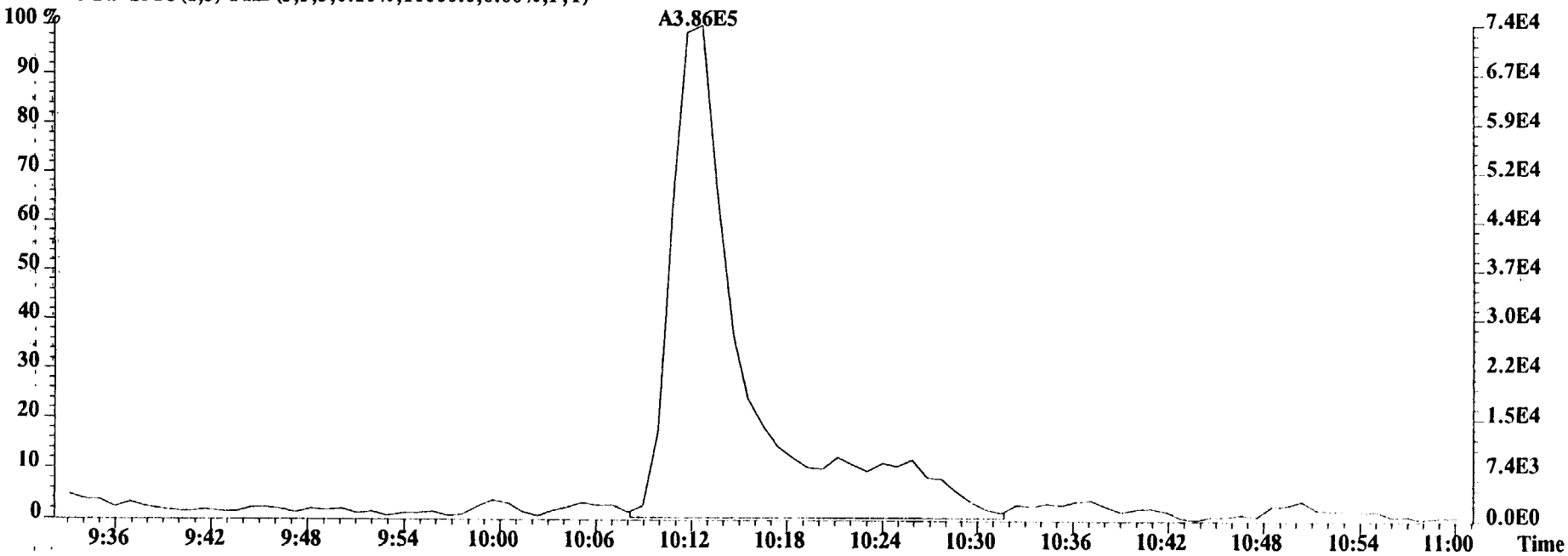
152.1410 S:9 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



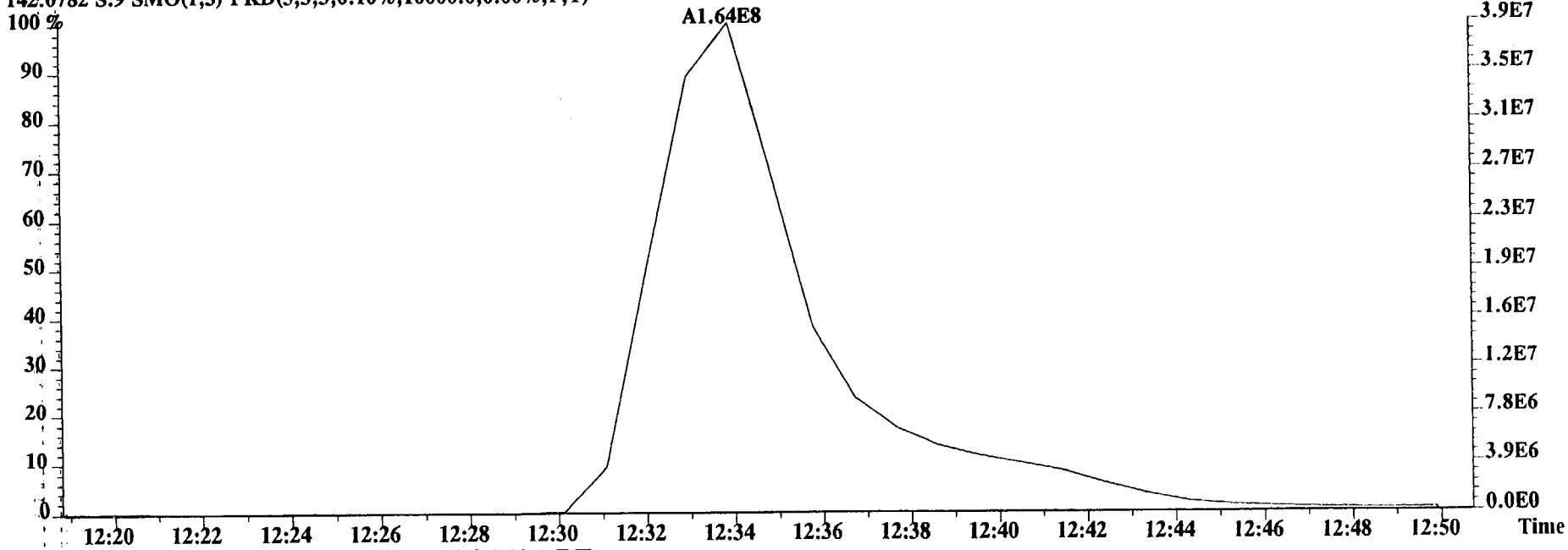
File:02NO98V4 #1-510 Acq: 2-NOV-1998 19:45:31 GC EI+ Voltage SIR 70SE
Sample#9 Text:301802-1 :100X DIL. :AIR Exp:PAHAIR
128.0626 S:9 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



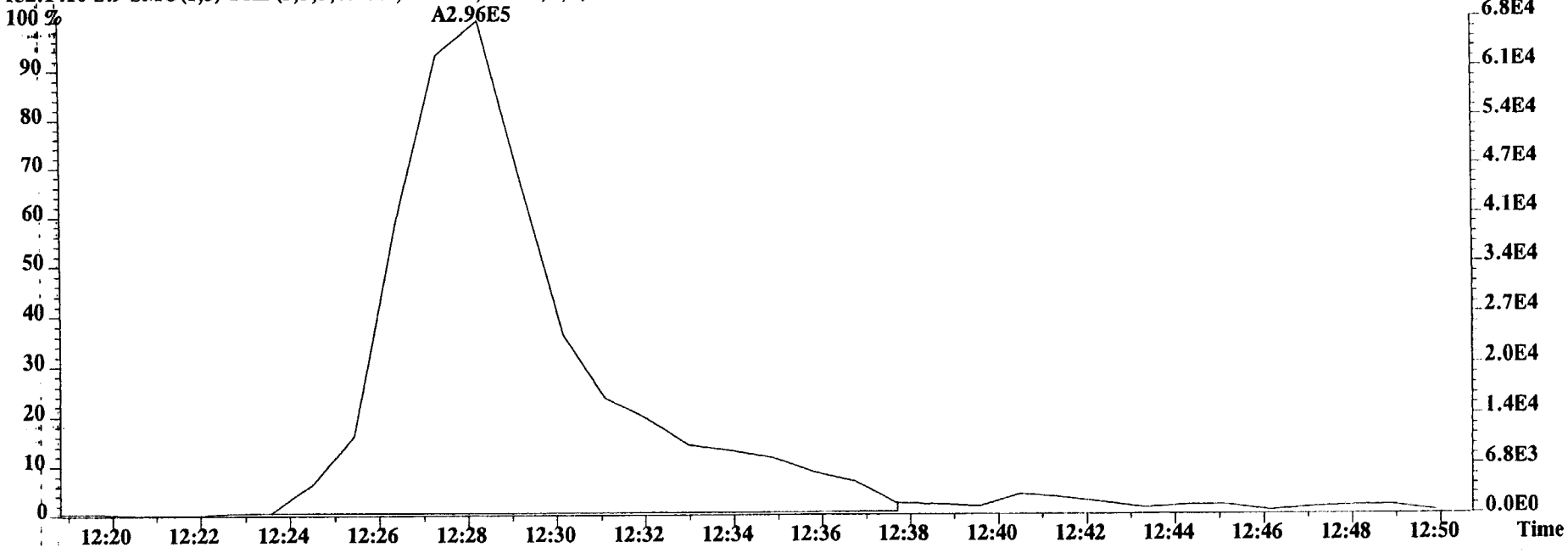
136.1128 S:9 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



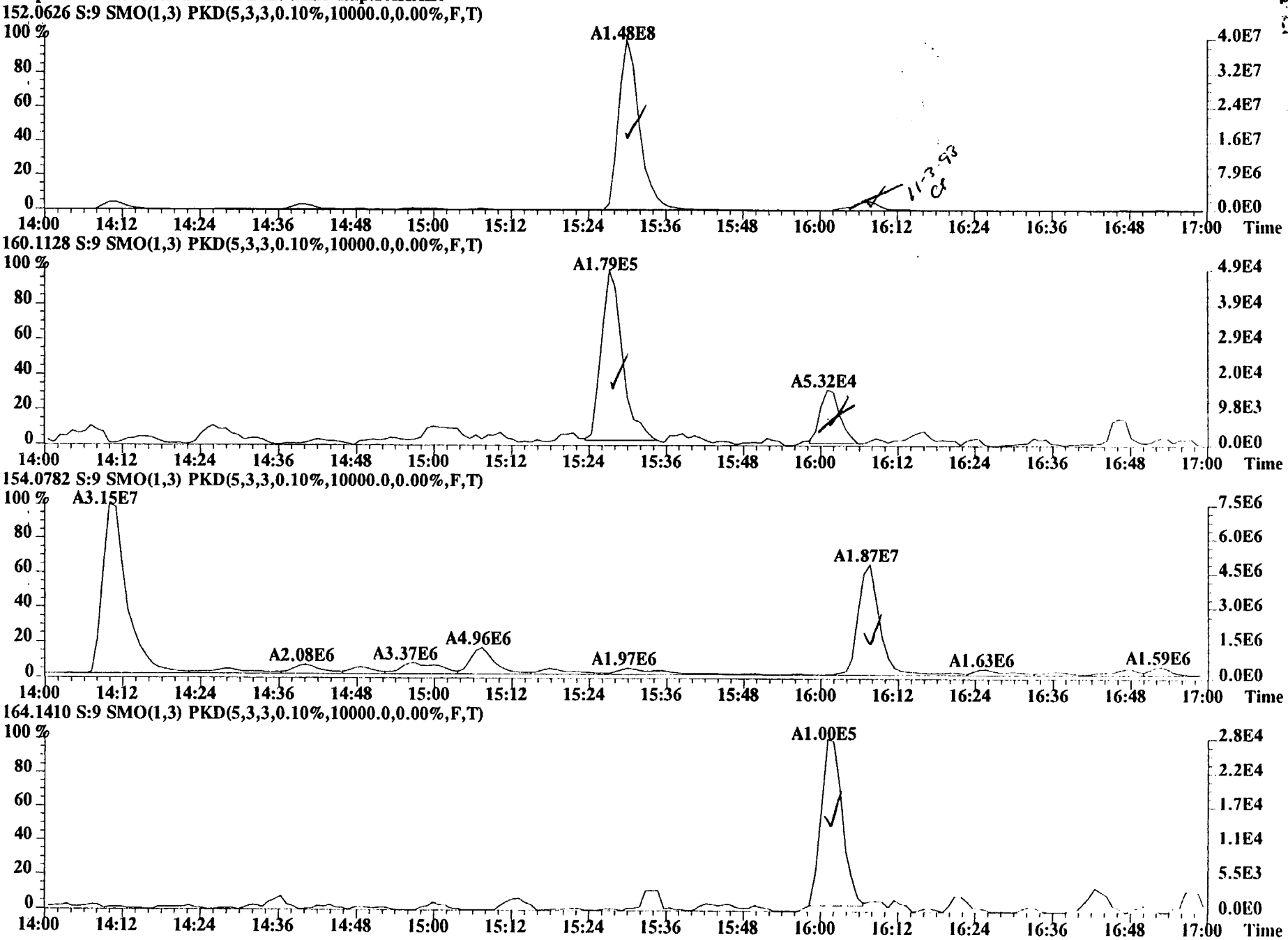
File:02NO98V4 #1-510 Acq: 2-NOV-1998 19:45:31 GC EI+ Voltage SIR 70SE
Sample#9 Text:301802-1 :100X DIL. :AIR Exp:PAHAIR
142.0782 S:9 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



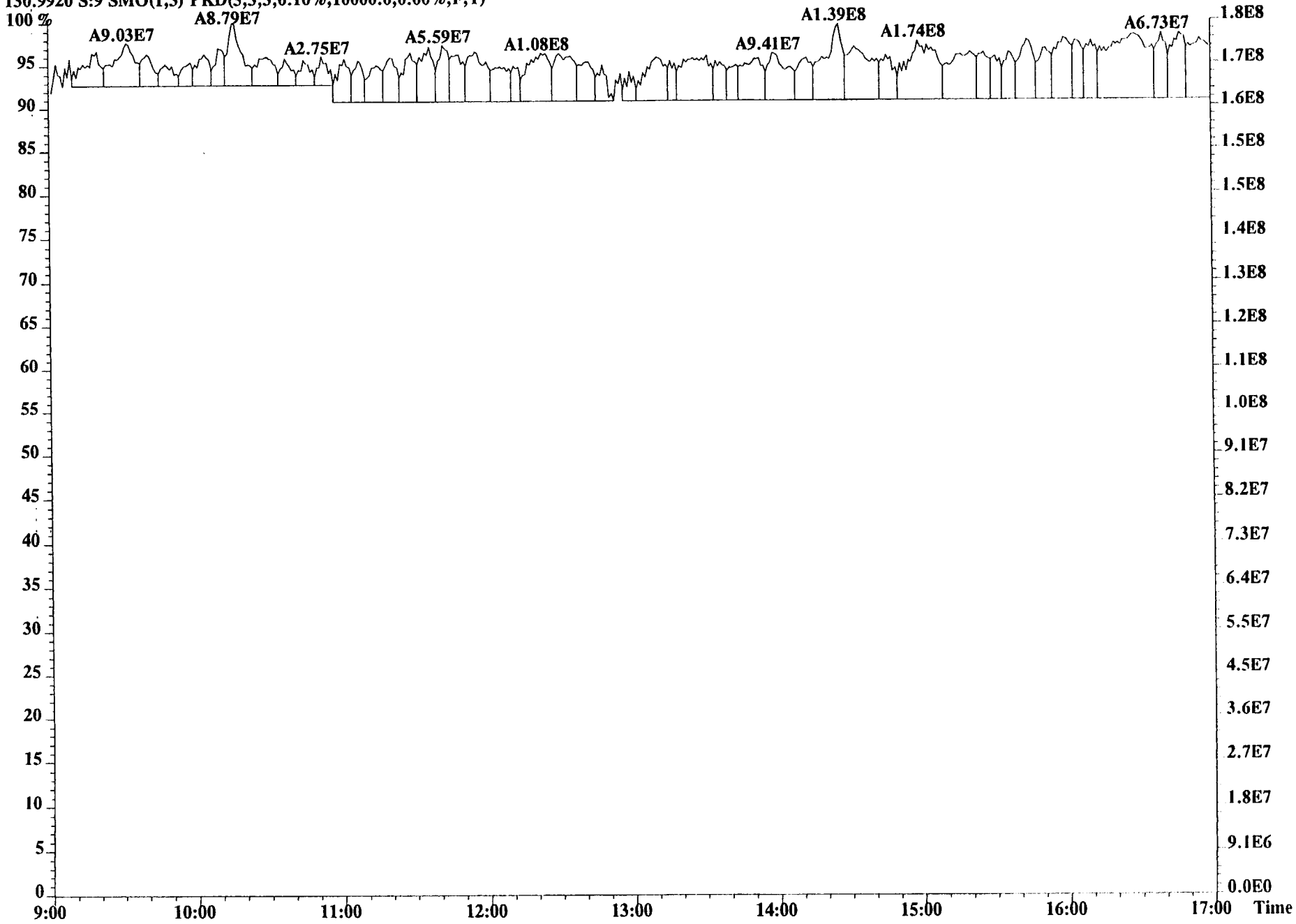
152.1410 S:9 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



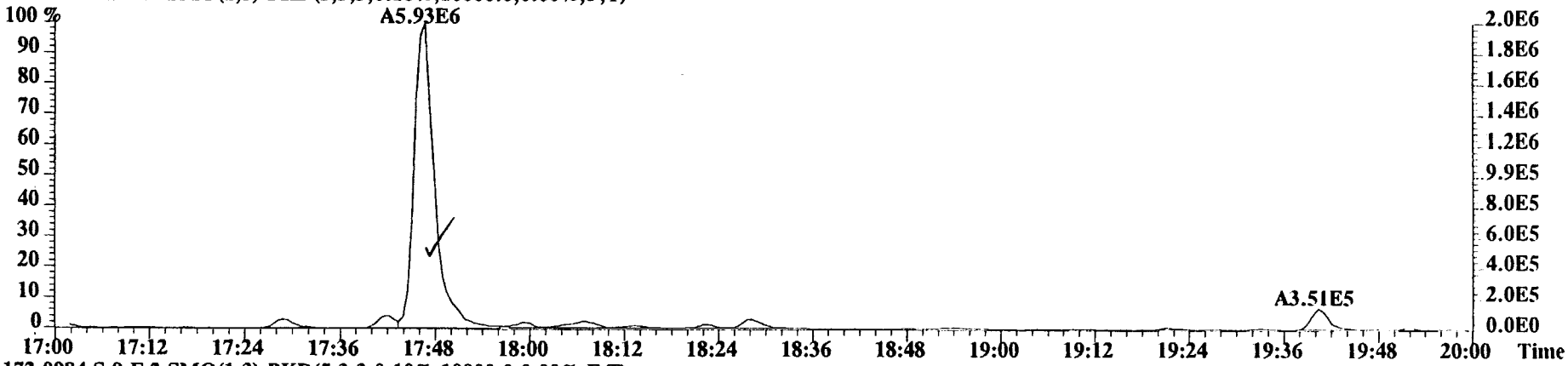
File:02NO98V4 #1-510 Acq: 2-NOV-1998 19:45:31 GC EI+ Voltage SIR 70SE
Sample#9 Text:301802-1 :100X DIL. :AIR Exp:PAHAIR



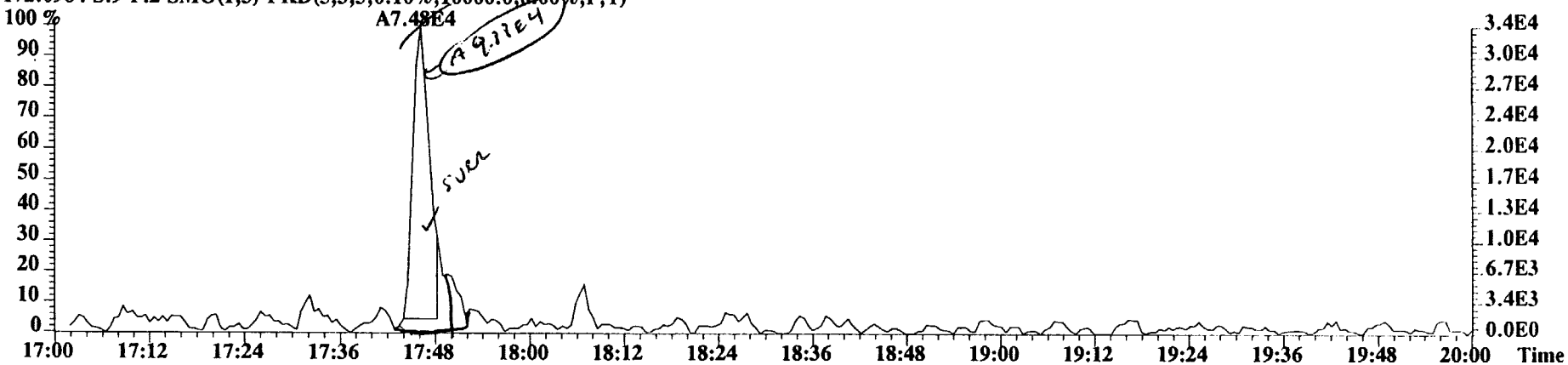
File:02NO98V4 #1-510 Acq: 2-NOV-1998 19:45:31 GC EI+ Voltage SIR 70SE
Sample#9 Text:301802-1 :100X DIL. :AIR Exp:PAHAIR
130.9920 S:9 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



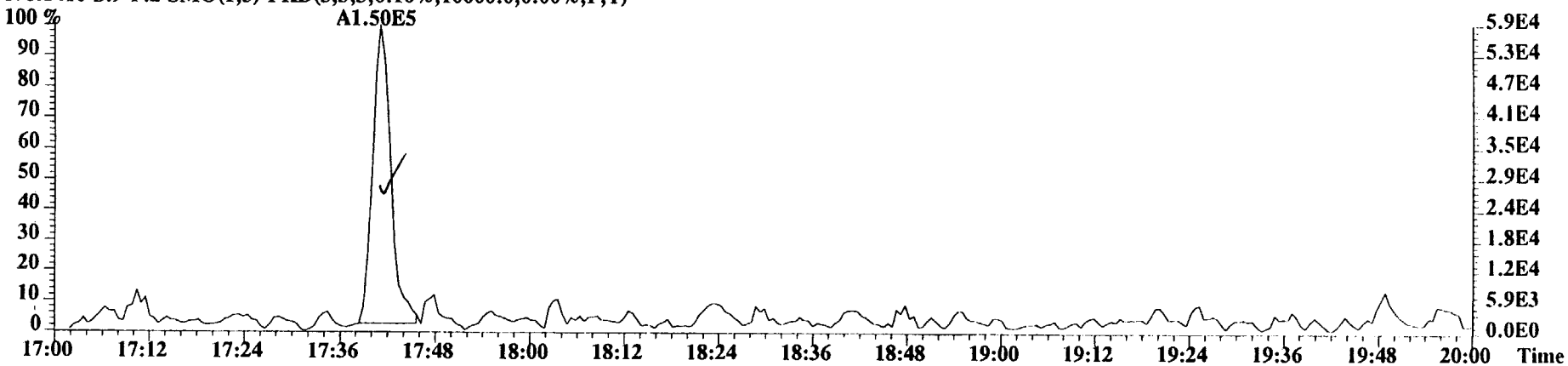
File:02NO98V4 #1-641 Acq: 2-NOV-1998 19:45:31 GC EI+ Voltage SIR 70SE
Sample#9 Text:301802-1 :100X DIL. :AIR Exp:PAHAIR
166.0798 S:9 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



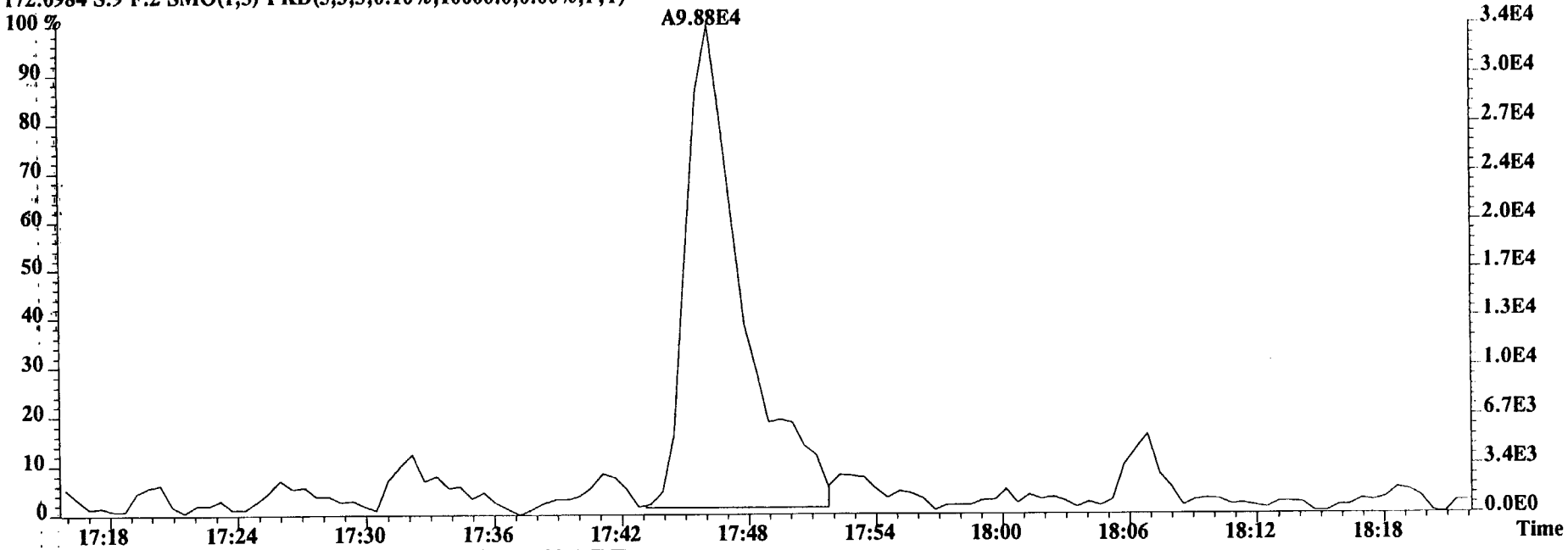
172.0984 S:9 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



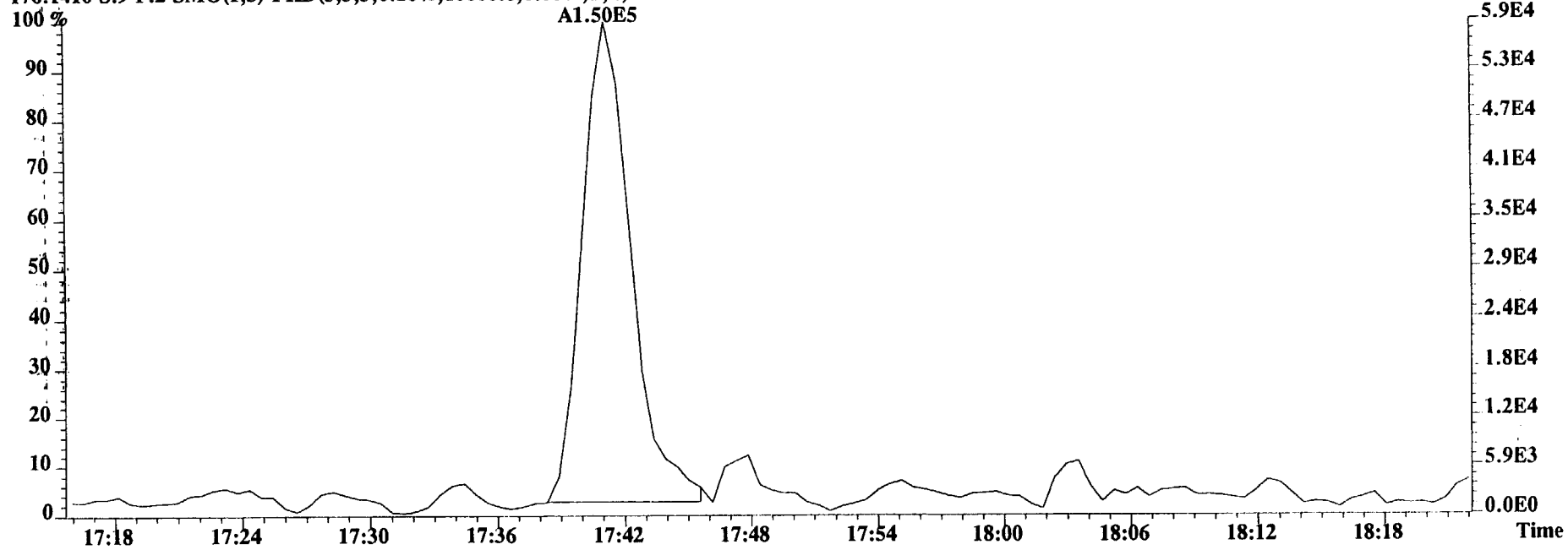
176.1410 S:9 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



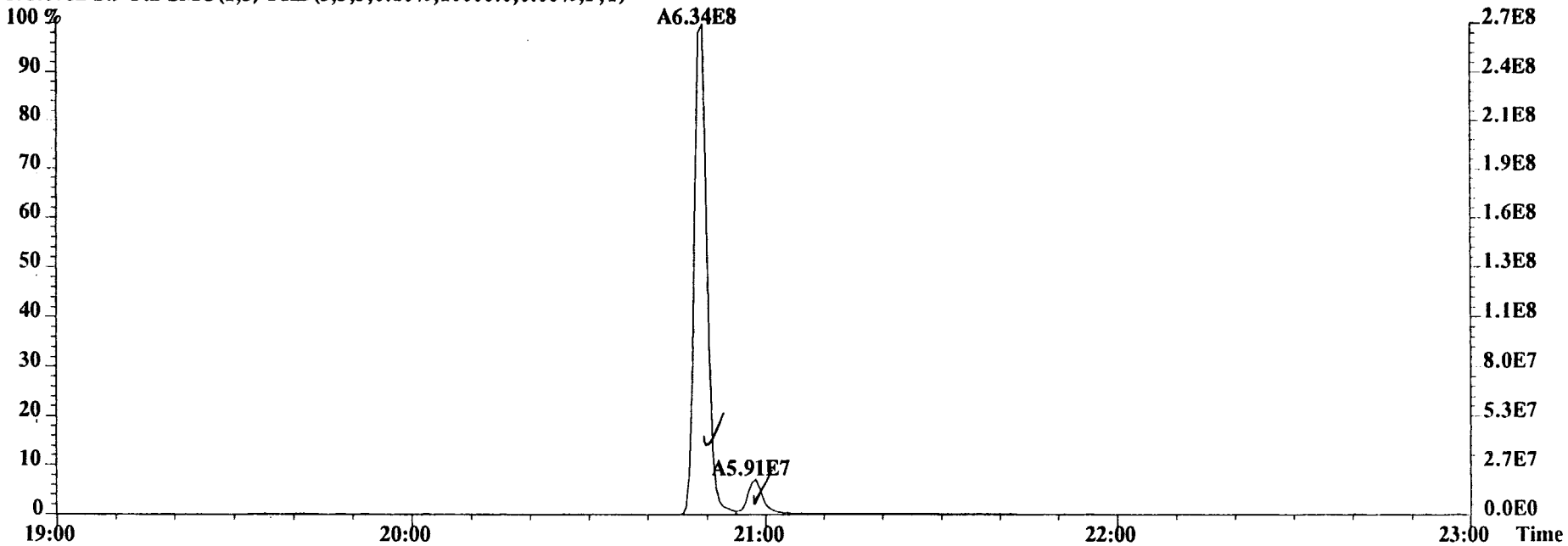
File:02NO98V4 #1-641 Acq: 2-NOV-1998 19:45:31 GC EI+ Voltage SIR 70SE
Sample#9 Text:301802-1 :100X DIL. :AIR Exp:PAHAIR
172.0984 S:9 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



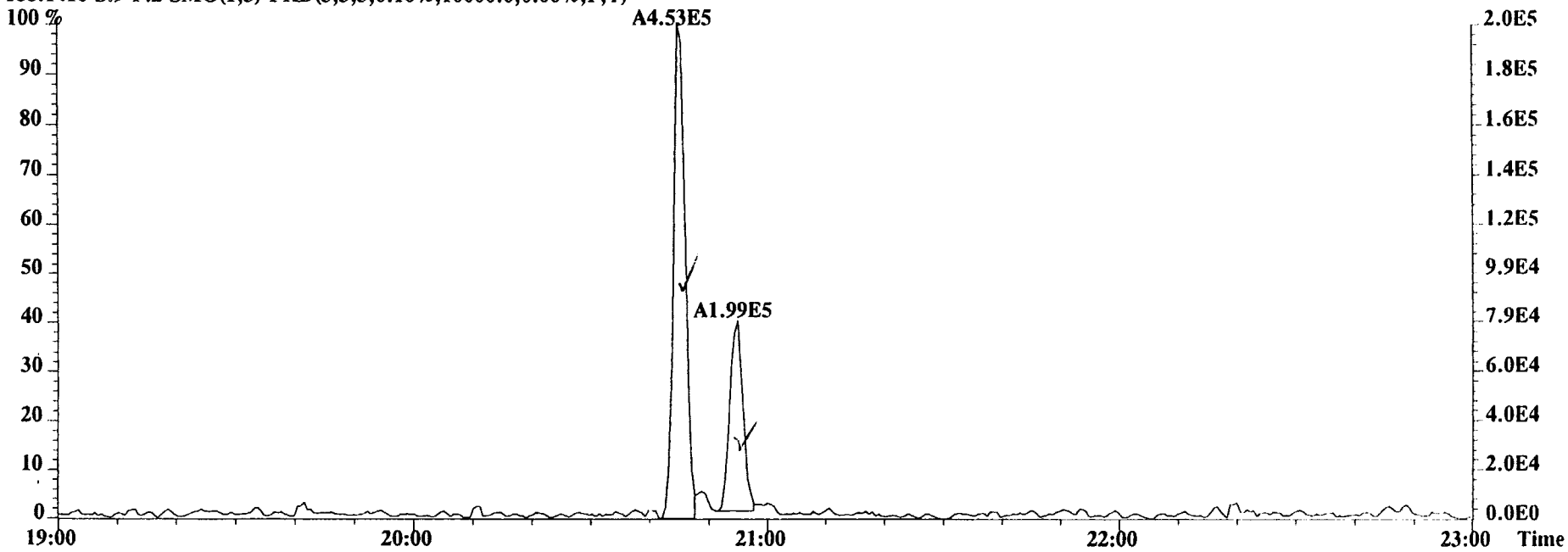
176.1410 S:9 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



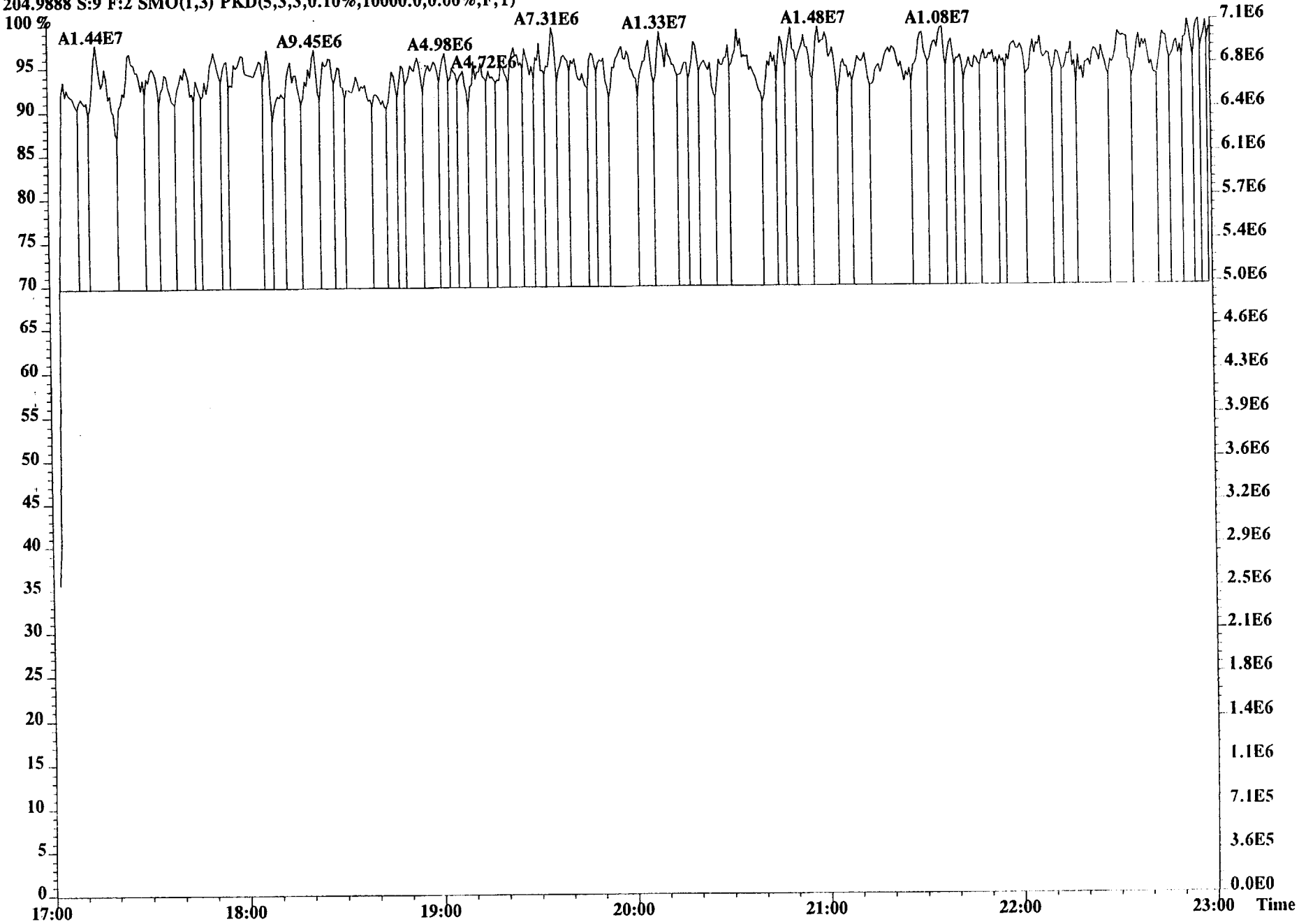
File:02NO98V4 #1-641 Acq: 2-NOV-1998 19:45:31 GC EI+ Voltage SIR 70SE
Sample#9 Text:301802-1 :100X DIL. :AIR Exp:PAHAIR
178.0782 S:9 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



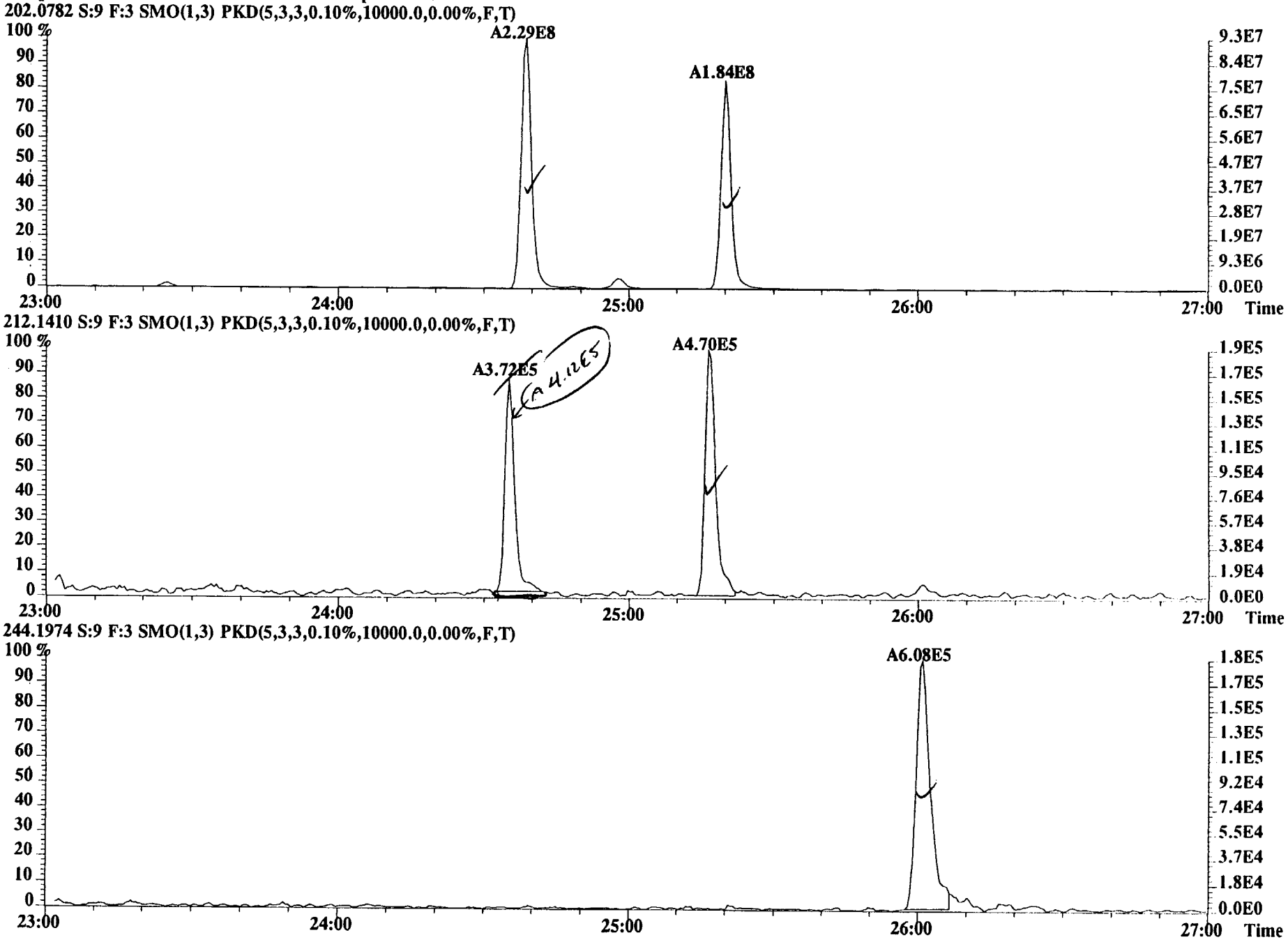
188.1410 S:9 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



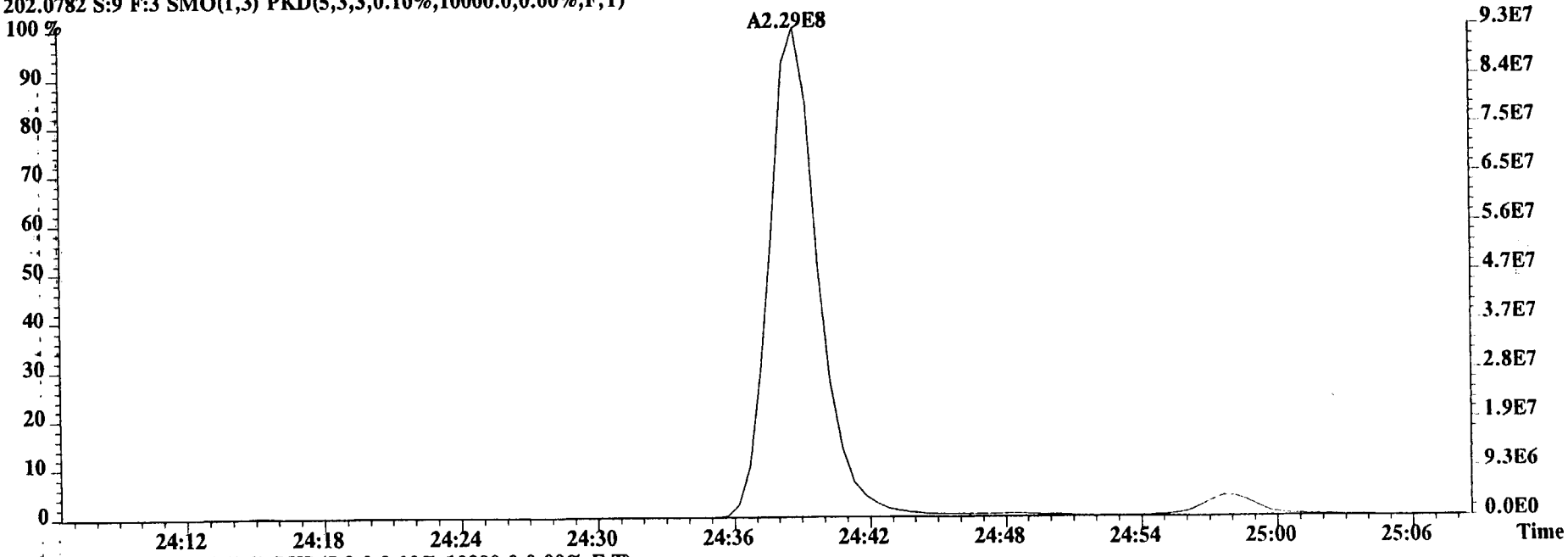
File:02NO98V4 #1-641 Acq: 2-NOV-1998 19:45:31 GC EI+ Voltage SIR 70SE
Sample#9 Text:301802-1 :100X DIL. :AIR Exp:PAHAIR
204.9888 S:9 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



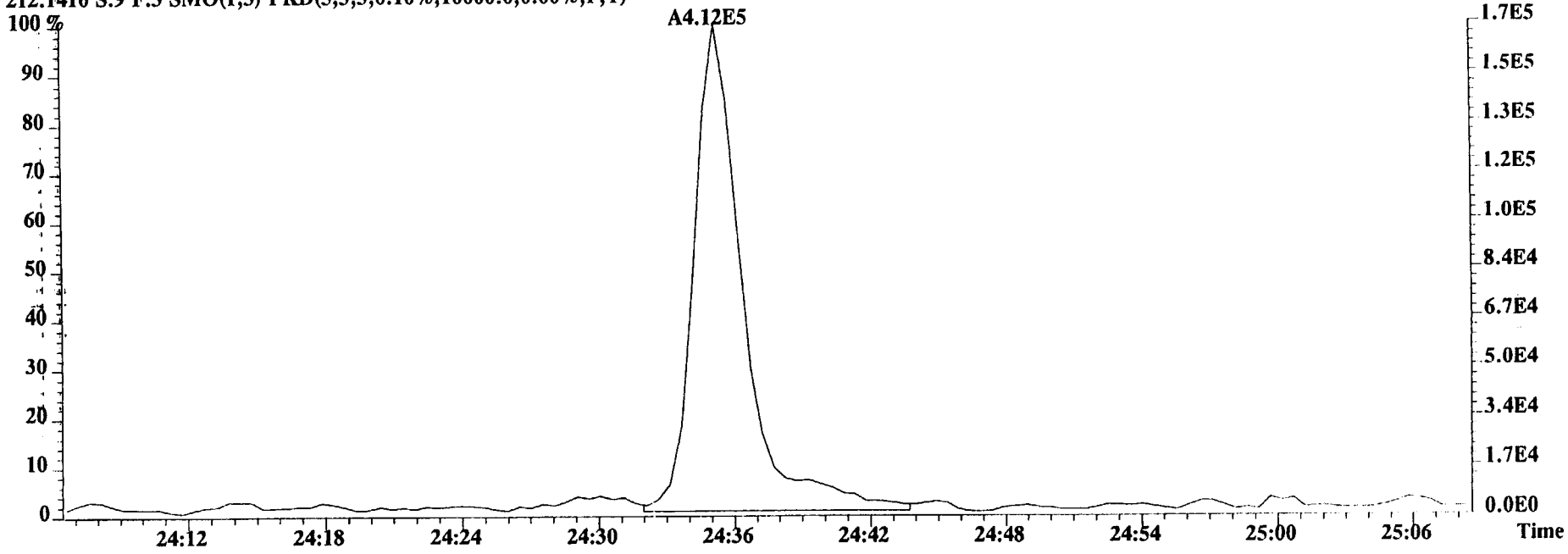
File:02NO98V4 #1-939 Acq: 2-NOV-1998 19:45:31 GC EI+ Voltage SIR 70SE
Sample#9 Text:301802-1 :100X DIL. :AIR Exp:PAHAIR



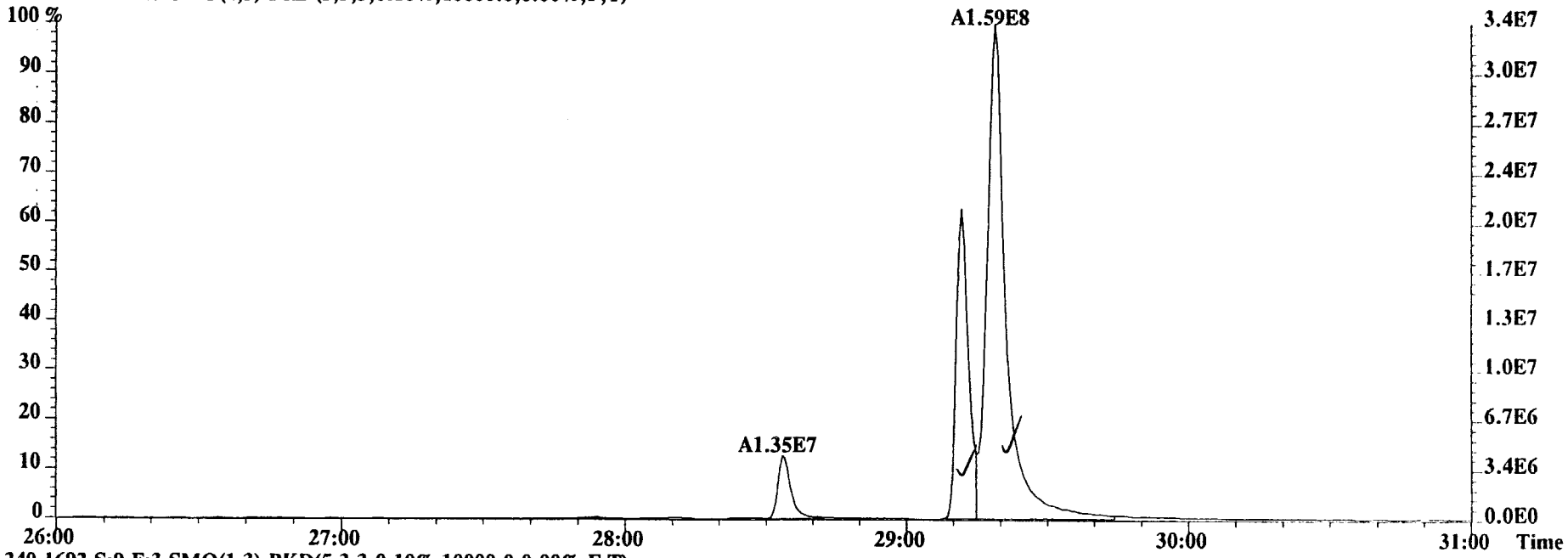
File:02NO98V4 #1-939 Acq: 2-NOV-1998 19:45:31 GC EI+ Voltage SIR 70SE
Sample#9 Text:301802-1 :100X DIL. :AIR Exp:PAHAIR
202.0782 S:9 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



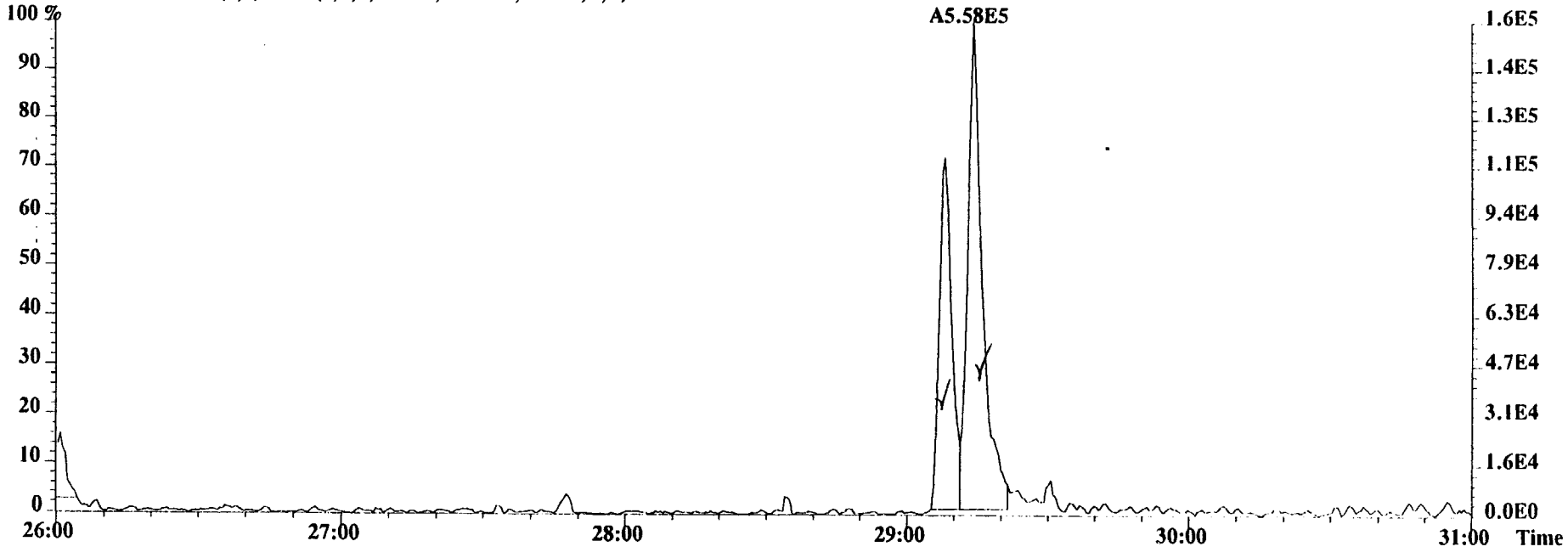
212.1410 S:9 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



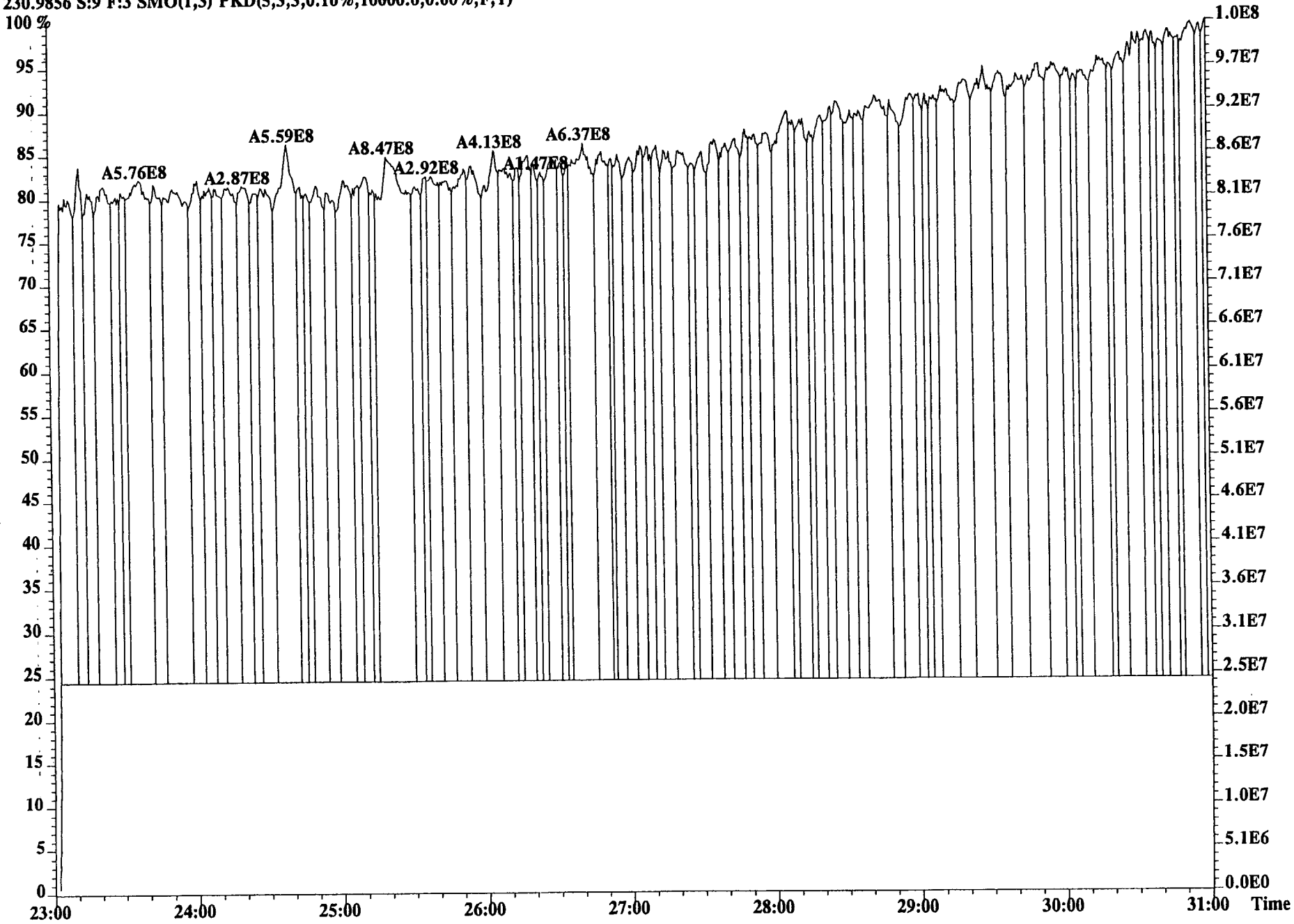
File:02NO98V4 #1-939 Acq: 2-NOV-1998 19:45:31 GC EI+ Voltage SIR 70SE
Sample#9 Text:301802-1 :100X DIL. :AIR Exp:PAHAIR
228.0939 S:9 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



240.1692 S:9 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

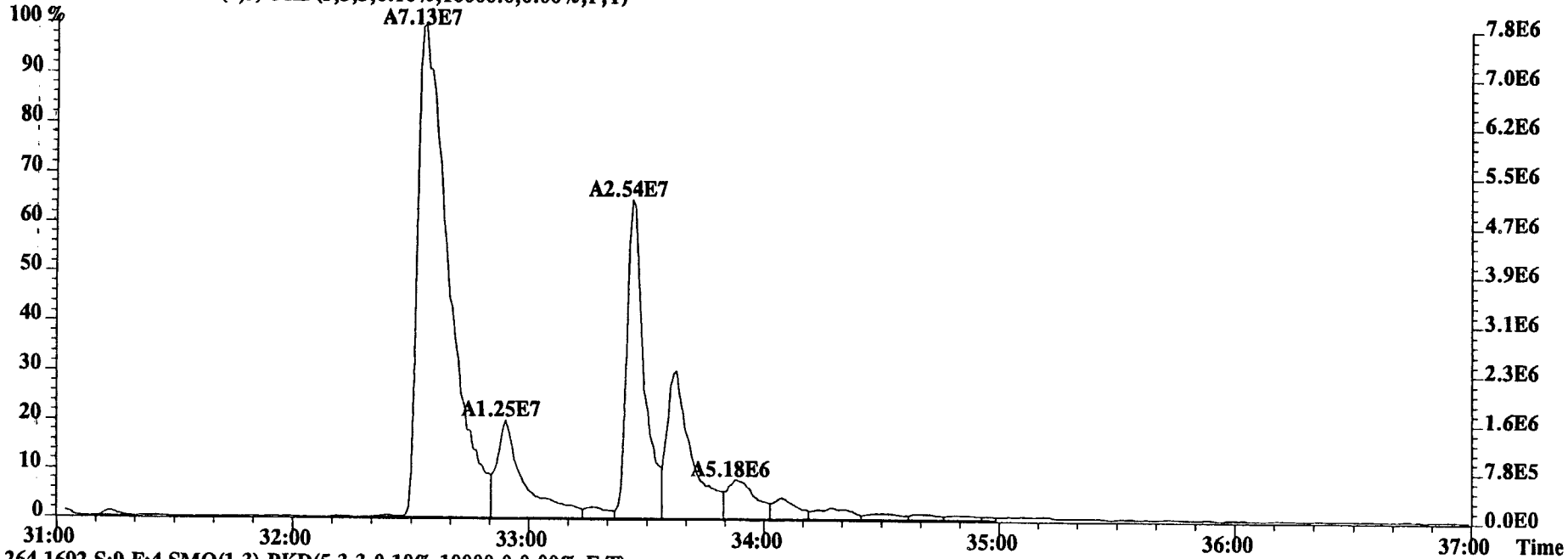


File:02NO98V4 #1-939 Acq: 2-NOV-1998 19:45:31 GC EI+ Voltage SIR 70SE
Sample#9 Text:301802-1 :100X DIL. :AIR Exp:PAHAIR
230.9856 S:9 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

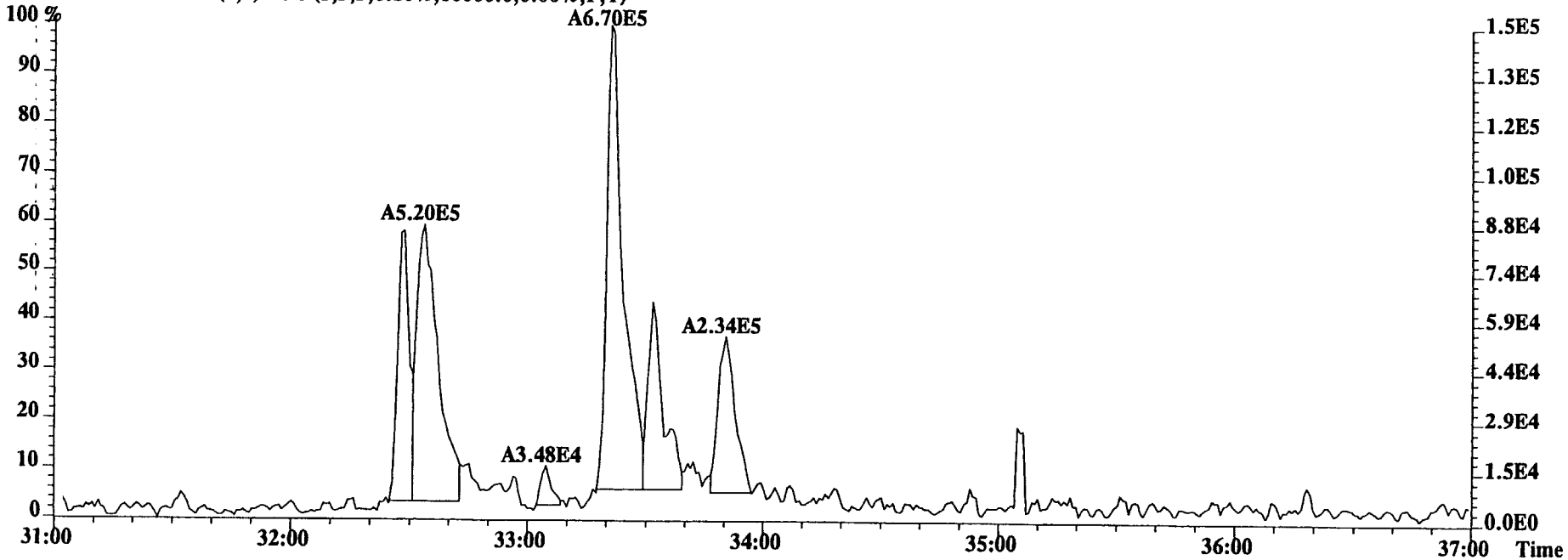


83

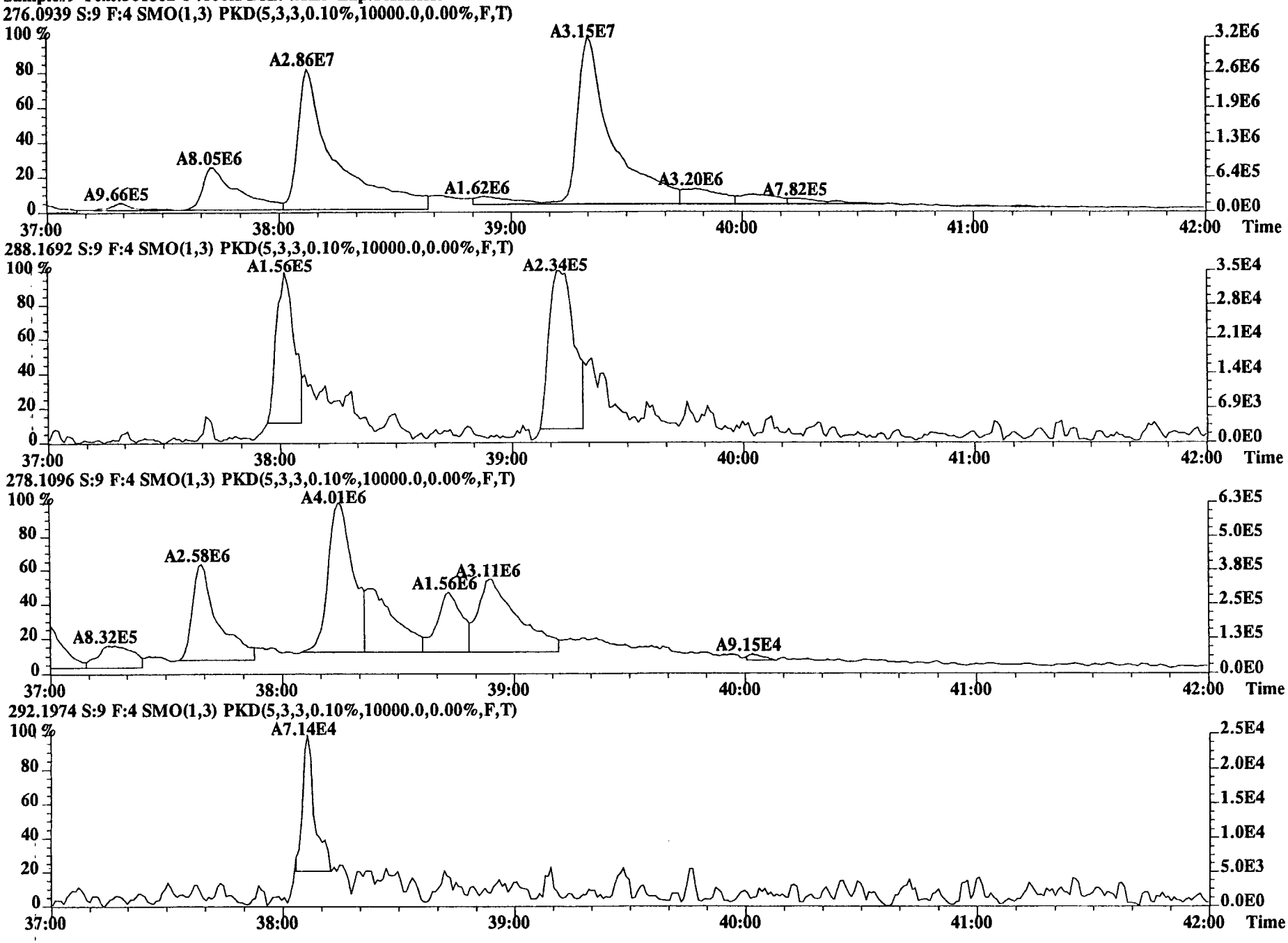
File:02NO98V4 #1-878 Acq: 2-NOV-1998 19:45:31 GC EI+ Voltage SIR 70SE
Sample#9 Text:301802-1 :100X DIL. :AIR Exp:PAHAIR
252.0939 S:9 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



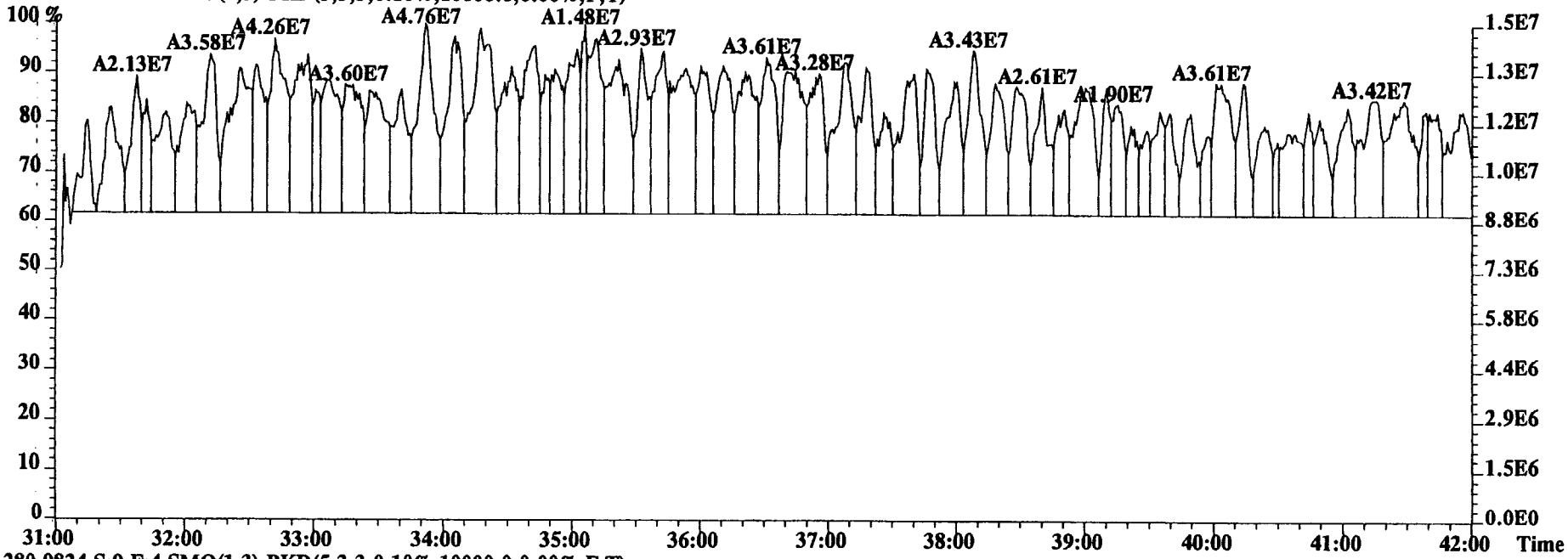
264.1692 S:9 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



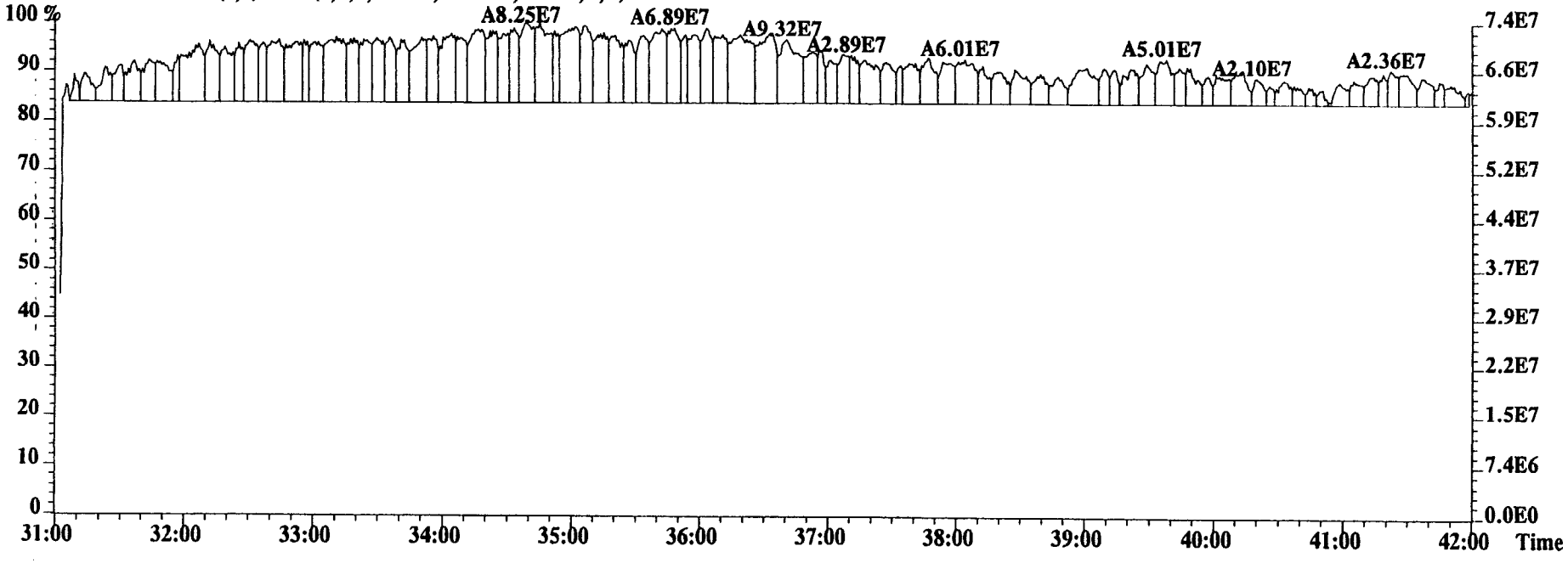
File:02NO98V4 #1-878 Acq: 2-NOV-1998 19:45:31 GC EI+ Voltage SIR 70SE
Sample#9 Text:301802-1 :100X DIL. :AIR Exp:PAHAIR



File:02NO98V4 #1-878 Acq: 2-NOV-1998 19:45:31 GC EI+ Voltage SIR 70SE
Sample#9 Text:301802-1 :100X DIL. :AIR Exp:PAHAIR
268.9824 S:9 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



280.9824 S:9 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



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04-NOV-1998 05:02:00 PM Dioxin Furan Unknown RESULTS

Mass Spec : VG-4 Results : 29OC98V4211.RES : PAHAIR.TRG
GC Column : DB-5 Date analyzed : 29-OCT-98
Data file : [illegible] 10X DIL. AIR [illegible] PAH[illegible]10299[illegible]V4.R
Weight : 0.5

Name	Total Response	Isotope Ratio	R. T. mm:ss	RRF	pg/ SAMPLE	Rec/ MDL
d12-Benzo(e)pyrene	35942800	1.00 Y	33: 21 Y	1.00	50.00	
d12-Benzo(b)fluoranthene	14231180	1.00 Y	32: 28 Y	0.45	43.62	87
Benzo(b)fluoranthene	2860000000	1.00 Y	32: 33 Y	1.17	1.7e+04	
d12-Benzo(k)fluoranthene	29376000	1.00 Y	32: 33 Y	0.95	43.10	86
Benzo(k)fluoranthene	3160000000	1.00 Y	32: 38 Y	1.16	9240.29	
d12-Benzo(a)pyrene	18968780	1.00 Y	33: 32 Y	0.68	39.00	78
Benzo(e)pyrene	2022400000	1.00 Y	33: 27 Y	1.64	6497.77	
Benzo(a)pyrene	1284450000	1.00 Y	33: 36 Y	1.07	6316.71	
d12-Perylene	13184320	1.00 Y	33: 49 Y	0.63	29.10	58
Perylene	256000000	1.00 Y	33: 54 Y	1.71	1133.11	
d12-Indeno(123-cd)pyrene	14531060	1.00 Y	38: 0 Y	0.44	45.47	91
Indeno(123-cd)pyrene	1022000000	1.00 Y	38: 7 Y	0.62	1.1e+04	
d14-Dibenz(ah)anthracene	7305720	1.00 Y	38: 4 Y	0.25	41.34	83
Dibenz(ah)anthracene	258000000	1.00 Y	38: 13 Y	1.40	2516.12	
d12-Benzo(ghi)perylene	13293180	1.00 Y	39: 12 Y	0.58	31.90	64
Benzo(ghi)perylene	1548716000	1.00 Y	39: 20 Y	1.02	1.1e+04	

see 100x

04-NOV-1998 05:01:57 PM Dioxin Furan Unknown RESULTS

0.5
Red/
MDL

	17971400	17971400
87	7115590	7115590
	1430000000	1430000000
86	14688000	14688000
	1580000000	1580000000
78	9484390	9484390
	1011200000	1011200000
	642225000	642225000
58	6592160	6592160
	128000000	128000000
91	7265530	7265530
	511000000	511000000
83	3652860	3652860
	129000000	129000000
64	6646590	6646590
	774358000	774358000

02-NOV-1998 09:41:06 AM Dioxin Furan Unknown RESULTS

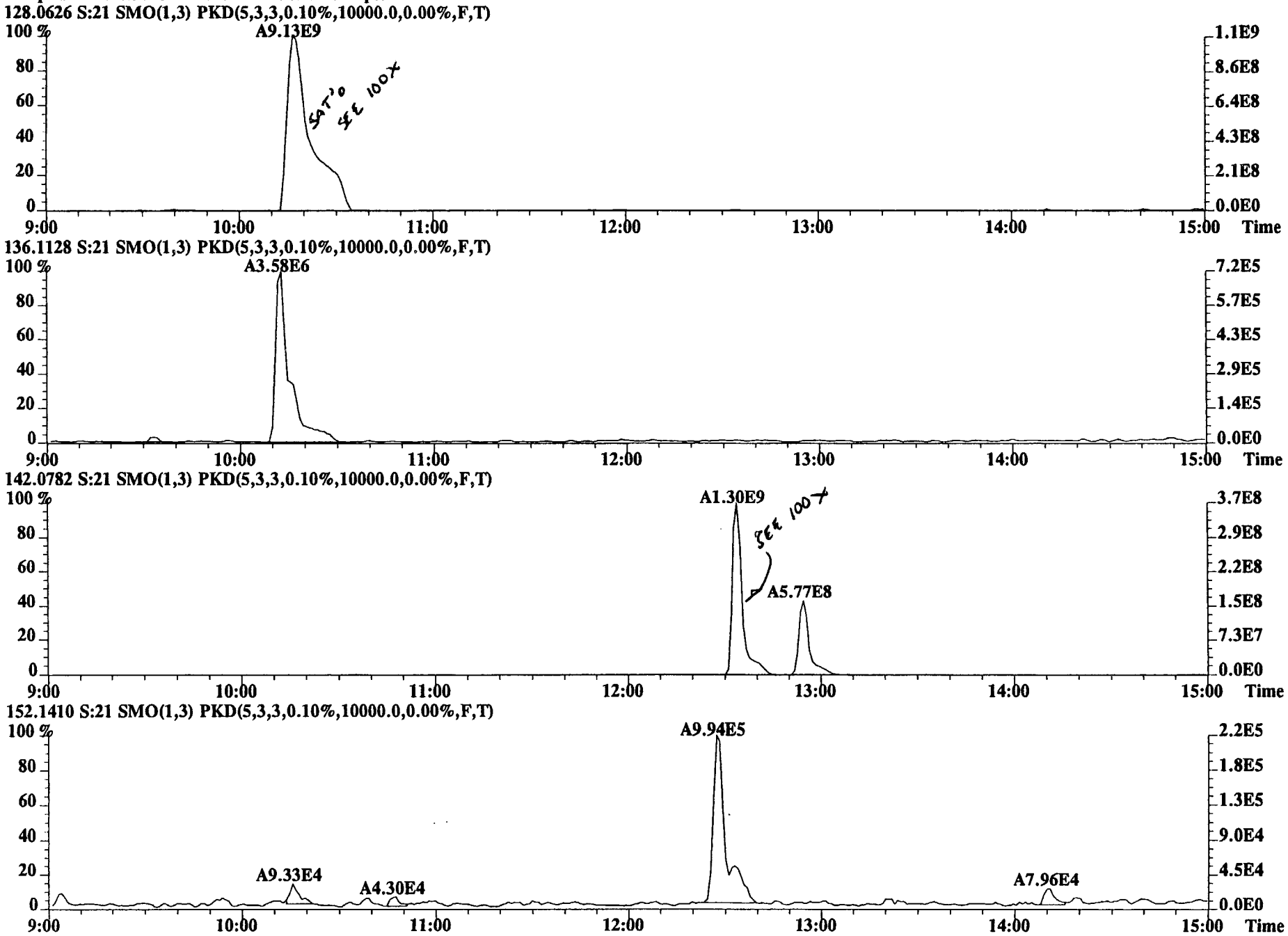
Mass Spec : VG-4
GC Column : DB-5
Data file : 29OC98V4
Weight : 0.5

Results : 29OC98V4211.RES : PAHAIR.TRG
Date analyzed : 29-OCT-98
301802-1 :10X DIL. :AIR : Ex Cal : PAHAIR102998V4.R

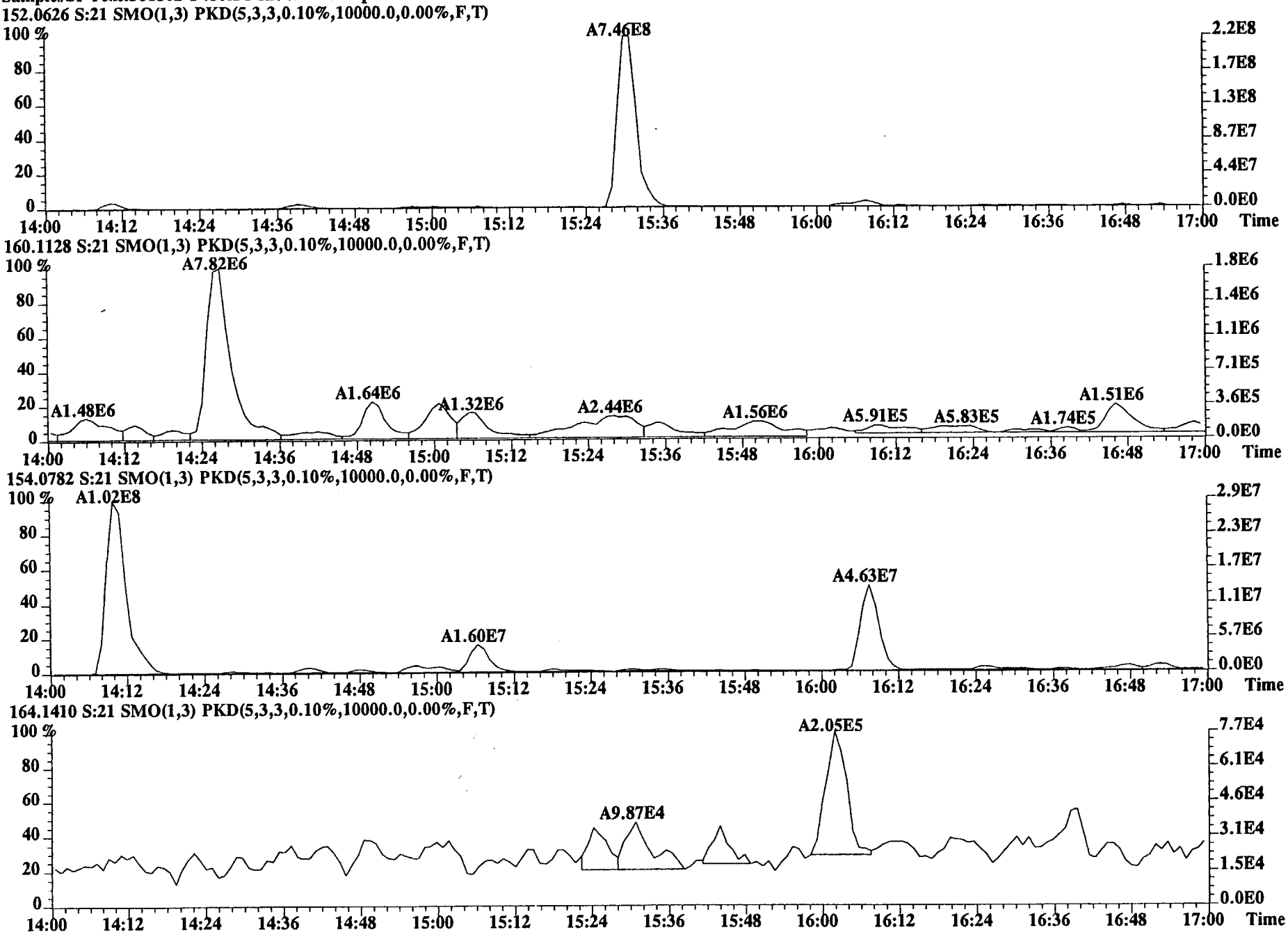
Name	Total Response	Isotope Ratio	R. T. mm:ss	RRF	pg/ SAMPLE	Rec/ MDL
d10-2-Methylnaphthalene	1987508	1.00 Y	12: 27 Y	1.00	50.00	
d8-Naphthalene	7167580	1.00 Y	10: 13 Y	2.24	80.47	161
Naphthalene	18269040000	1.00 Y	10: 16 Y	1.23	2.1e+05	0.000
2-Methylnaphthalene	2594880000	1.00 Y	12: 34 Y	0.56	6.5e+04	0.000
d8-Acenaphthylene	4874760	1.00 Y	15: 28 Y	1.21	101.04	202
Acenaphthylene	1492652000	1.00 Y	15: 30 Y	0.94	3.2e+04	0.000
d10-Acenaphthene	409646	1.00 Y	16: 2 Y	0.74	13.84	28
Acenaphthene	92561800	1.00 Y	16: 7 Y	1.25	1.8e+04	0.000
d10-Anthracene	4533580	1.00 Y	20: 55 Y	1.00	50.00	
d10-Fluorene	3028760	1.00 Y	17: 41 Y	1.42	23.51	47
Fluorene	2024080000	1.00 Y	17: 47 Y	1.16	5.8e+04	0.000
d10-Phenanthrene	8423420	1.00 Y	20: 45 Y	2.81	33.09	66
Phenanthrene	7383740000	1.00 Y	20: 50 Y	0.89	9.8e+04	0.000
Anthracene	1803014000	1.00 Y	20: 58 Y	0.80	2.7e+04	0.000
d14-Terphenyl	12190760	1.00 Y	26: 0 Y	1.00	50.00	
d10-Fluoranthene	16033260	1.00 Y	24: 35 Y	1.41	46.61	93
Fluoranthene	6834220000	1.00 Y	24: 40 Y	1.11	3.8e+04	0.000
d10-Pyrene	13399300	1.00 Y	25: 17 Y	1.52	36.20	72
Pyrene	6081540000	1.00 Y	25: 21 Y	1.21	3.8e+04	0.000
d12-Benzo(a)anthracene	7458460	1.00 Y	29: 8 Y	0.90	33.99	68
Benzo(a)anthracene	2198000000	1.00 Y	29: 12 Y	1.20	2.4e+04	0.000
d12-Chrysene	10119100	1.00 Y	29: 14 Y	1.28	32.45	65
Chrysene	4591820000	1.00 Y	29: 19 Y	1.08	4.2e+04	0.000
d12-Benzo(e)pyrene	35942800	1.00 Y	33: 21 Y	1.00	50.00	
d12-Benzo(b)fluoranthene	14231180	1.00 Y	32: 28 Y	0.45	43.62	87
Benzo(b)fluoranthene	5954800000	1.00 Y	32: 33 Y	1.17	3.6e+04	0.000
d12-Benzo(k)fluoranthene	29376000	1.00 Y	32: 33 Y	0.95	43.10	86
Benzo(k)fluoranthene	5954800000	1.00 Y	32: 33 Y	1.16	1.7e+04	0.000
d12-Benzo(a)pyrene	18968780	1.00 Y	33: 32 Y	0.68	39.00	78
Benzo(e)pyrene	2022400000	1.00 Y	33: 27 Y	1.64	6497.77	0.000
Benzo(a)pyrene	1284450000	1.00 Y	33: 36 Y	1.07	6316.71	0.000
d12-Perylene	13184320	1.00 Y	33: 49 Y	0.63	29.10	58
Perylene	* No Peak	0.00 N	33: 54 N	1.71	0.00	0.000
d12-Indeno(123-cd)pyrene	14531060	1.00 Y	38: 0 Y	0.44	45.47	91
Indeno(123-cd)pyrene	1397488000	1.00 Y	38: 7 Y	0.62	1.5e+04	0.000
d14-Dibenz(ah)anthracene	7305720	1.00 Y	38: 4 Y	0.25	41.34	83
Dibenz(ah)anthracene	272420000	1.00 Y	38: 13 Y	1.40	2656.75	0.000
d12-Benzo(ghi)perylene	13293180	1.00 Y	39: 12 Y	0.58	31.90	64
Benzo(ghi)perylene	1548716000	1.00 Y	39: 20 Y	1.02	1.1e+04	0.000
d10-Fluorene	3028760	1.00 Y	17: 41 Y	1.42	2.97	6
13C-Fluorene	3398420	1.00 Y	17: 47 Y	1.00	112.20	0.000

SEE 100X DILUTION

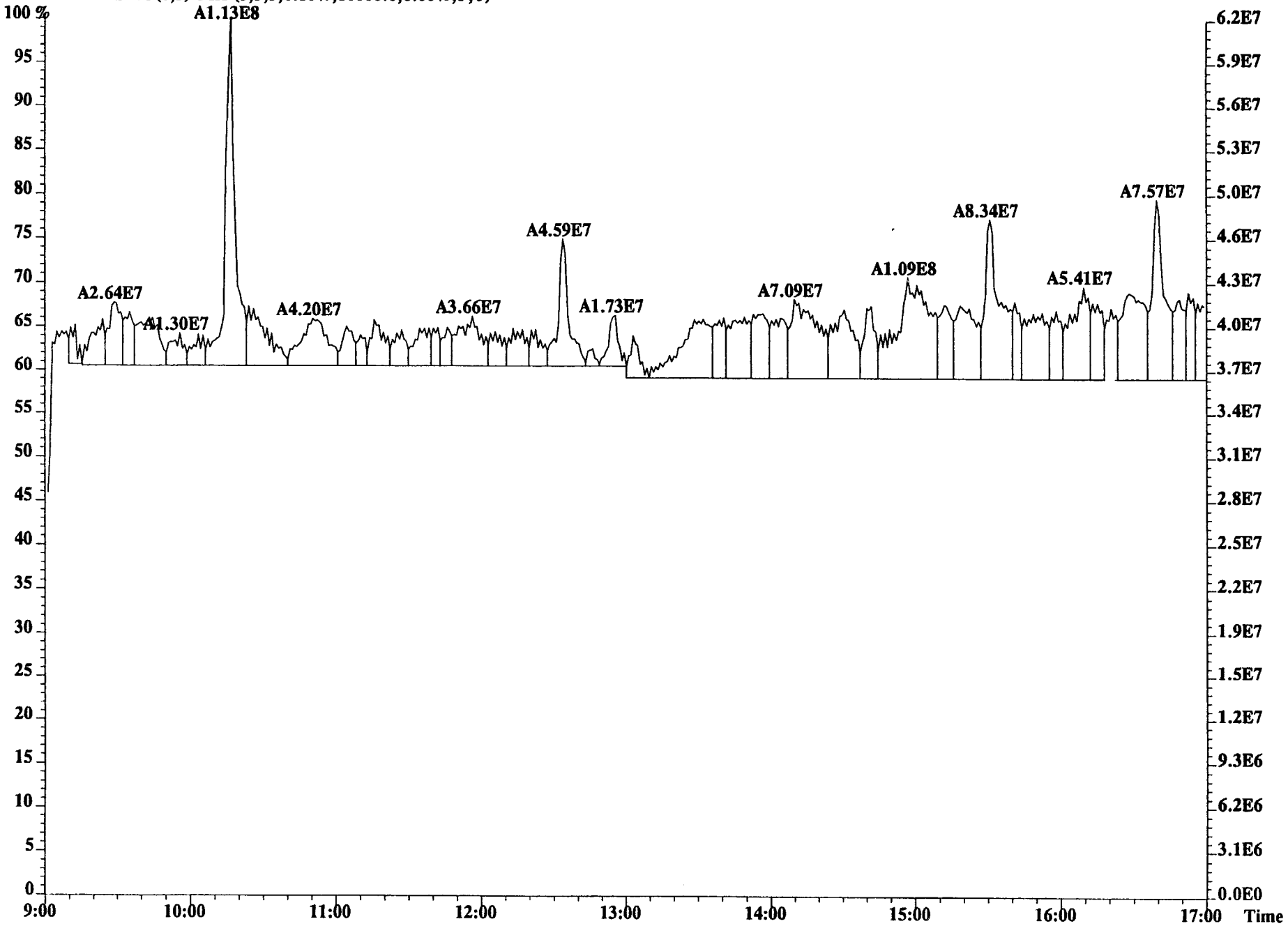
File:29OC98V4 #1-510 Acq:30-OCT-1998 07:48:11 GC EI+ Voltage SIR 70SE
Sample#21 Text:301802-1 :10X DIL. :AIR : Exp:PAHAIR



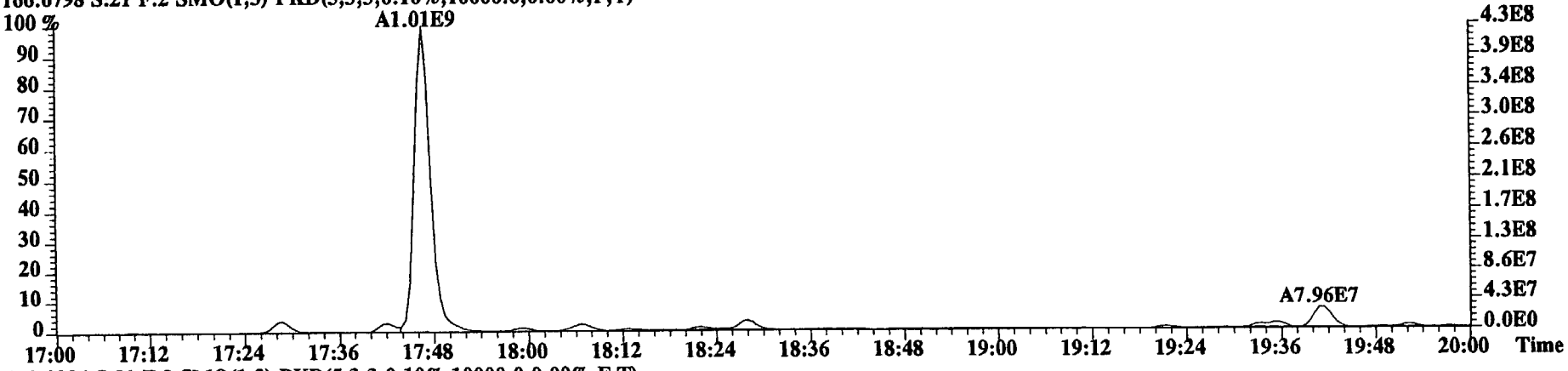
File:29OC98V4 #1-510 Acq:30-OCT-1998 07:48:11 GC EI+ Voltage SIR 70SE
Sample#21 Text:301802-1 :10X DIL. :AIR : Exp:PAHAIR



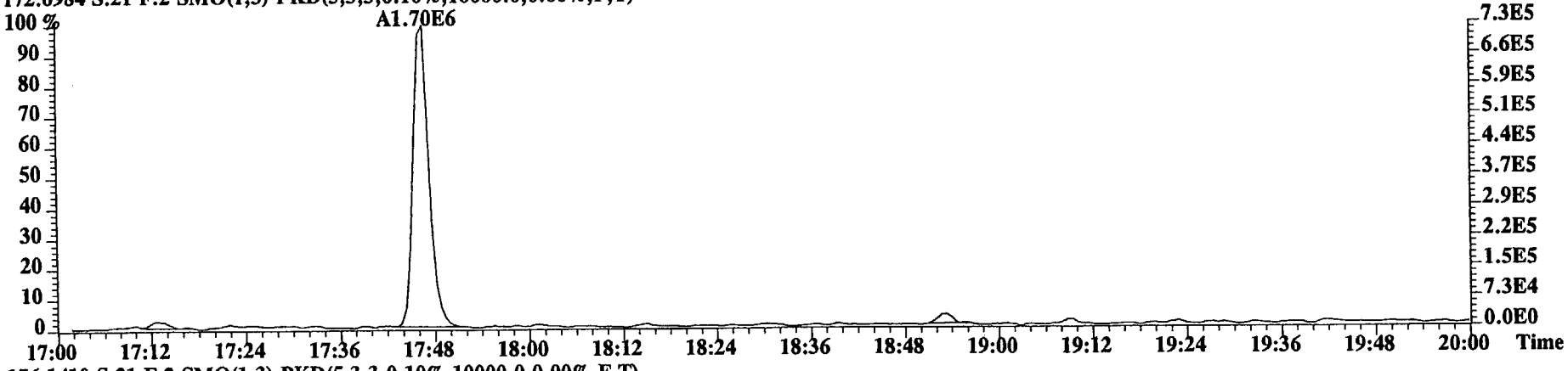
File:29OC98V4 #1-510 Acq:30-OCT-1998 07:48:11 GC EI+ Voltage SIR 70SE
Sample#21 Text:301802-1 :10X DIL. :AIR : Exp:PAHAIR
130.9920 S:21 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



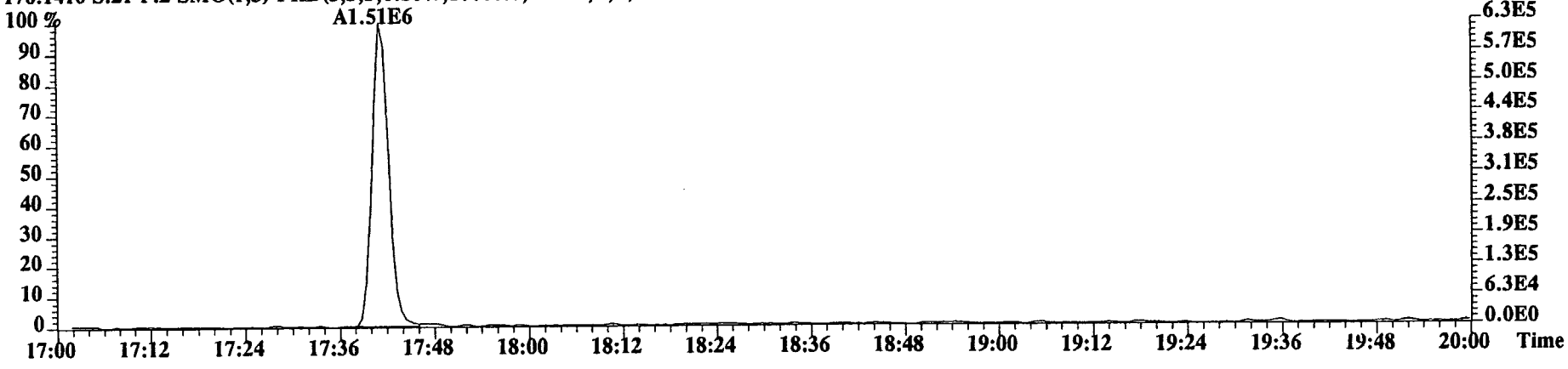
File:29OC98V4 #1-641 Acq:30-OCT-1998 07:48:11 GC EI+ Voltage SIR 70SE
Sample#21 Text:301802-1 :10X DIL. :AIR : Exp:PAHAIR
166.0798 S:21 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



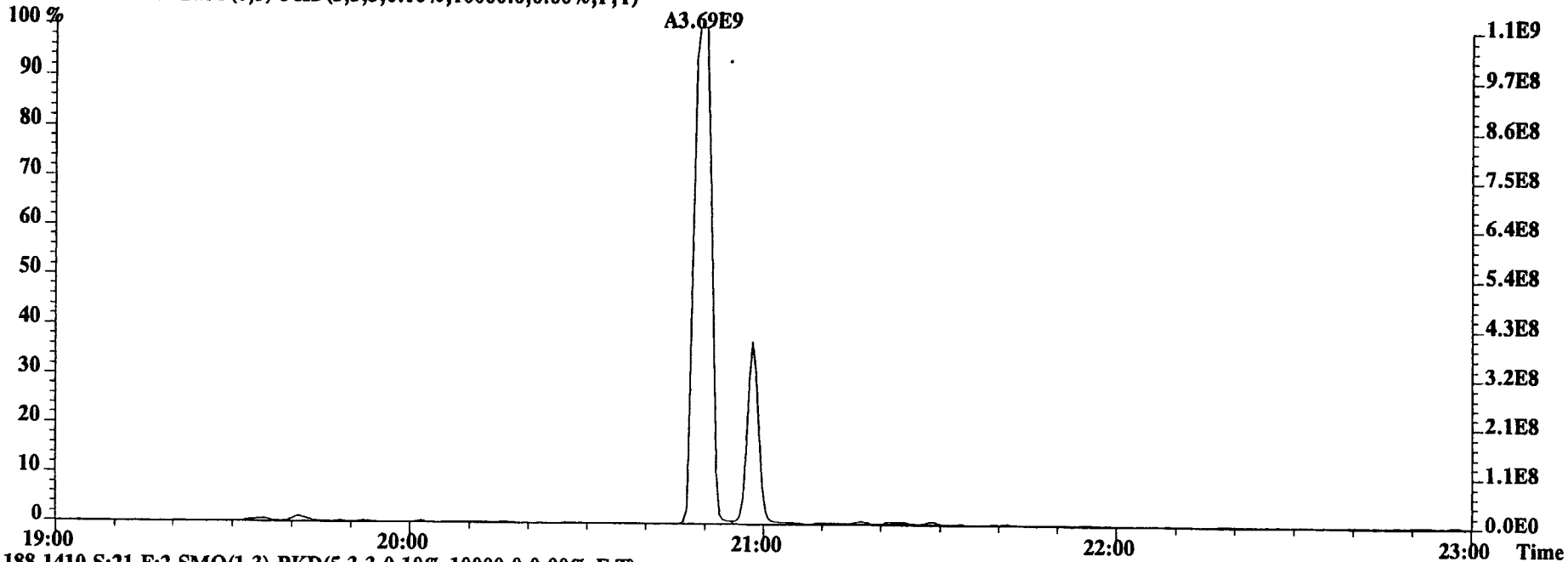
172.0984 S:21 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



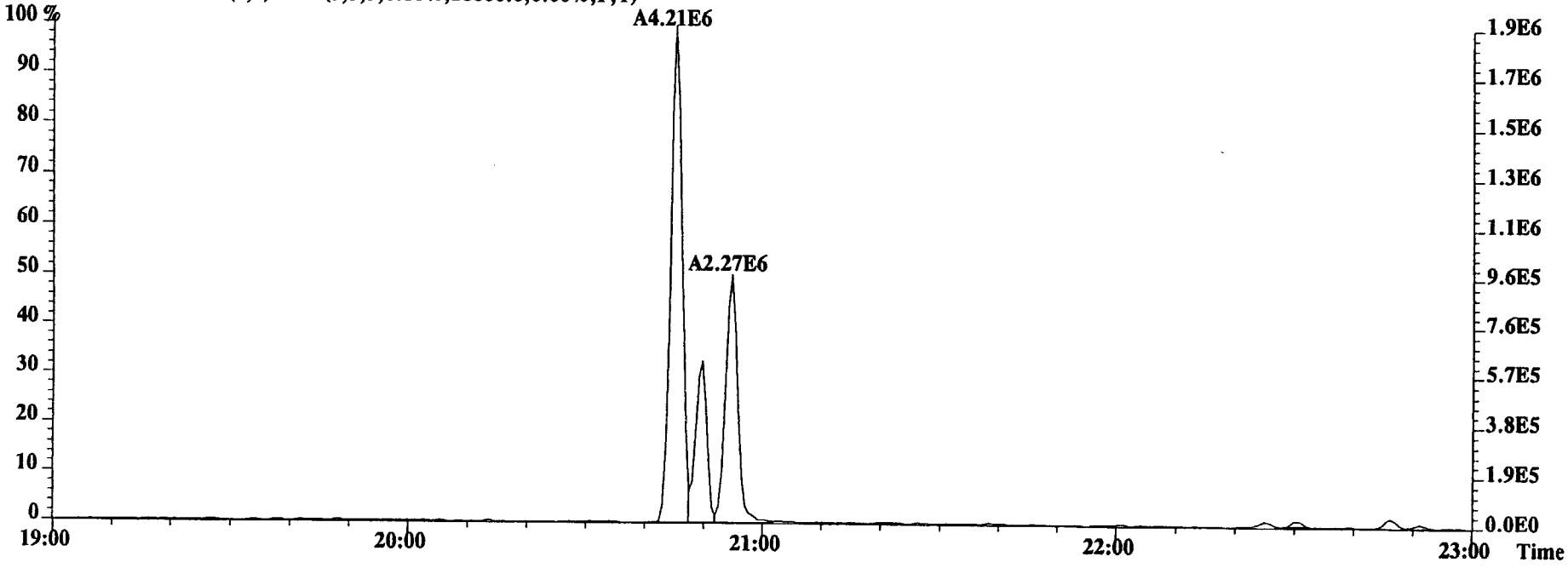
176.1410 S:21 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



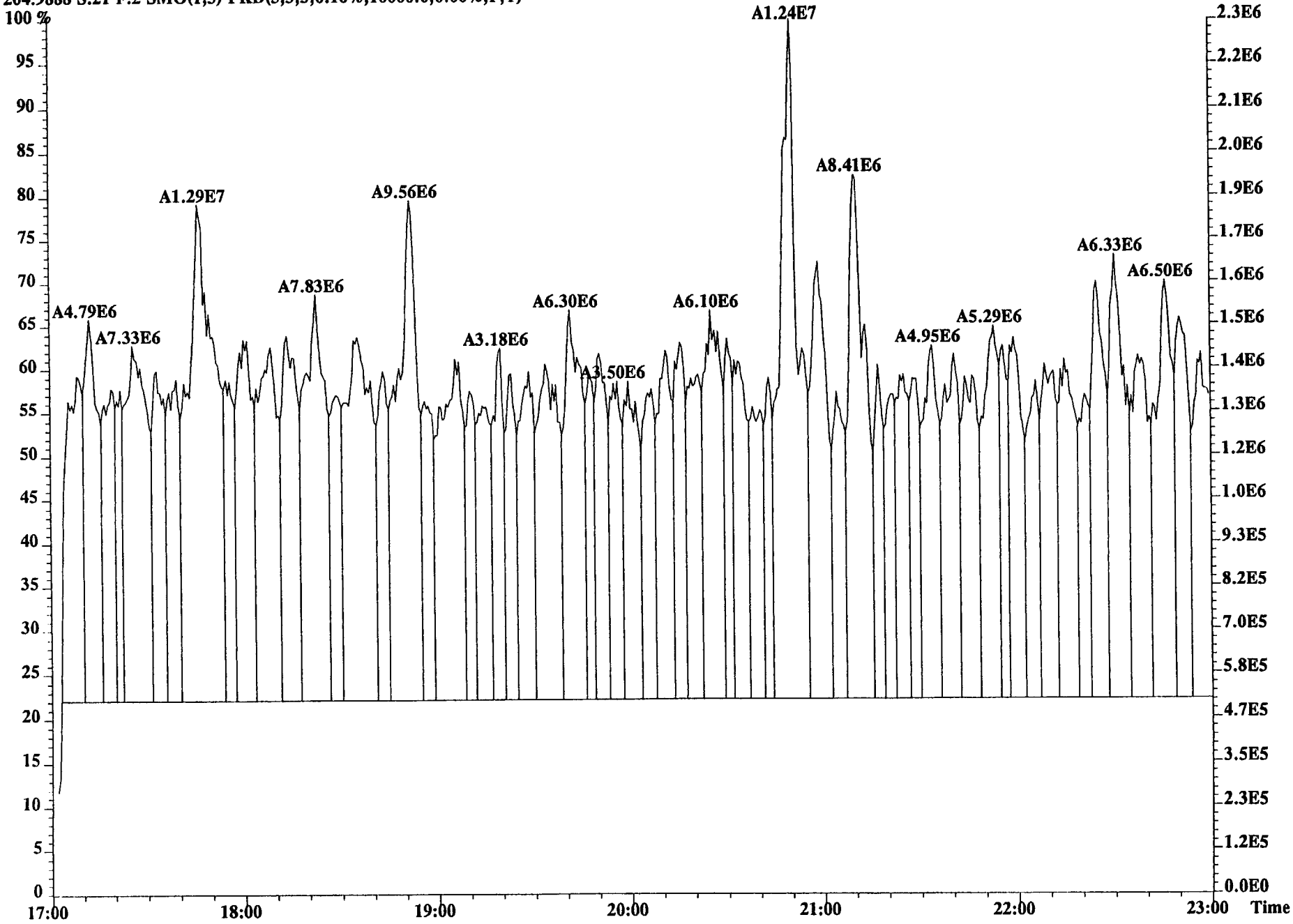
File:29OC98V4 #1-641 Acq:30-OCT-1998 07:48:11 GC EI+ Voltage SIR 70SE
Sample#21 Text:301802-1 :10X DIL. :AIR : Exp:PAHAIR
178.0782 S:21 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



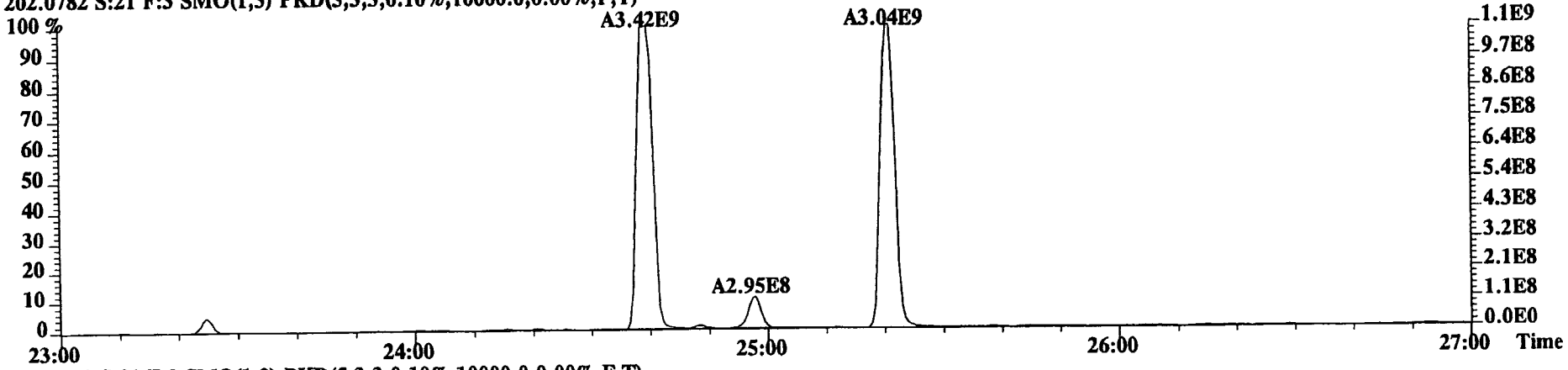
188.1410 S:21 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



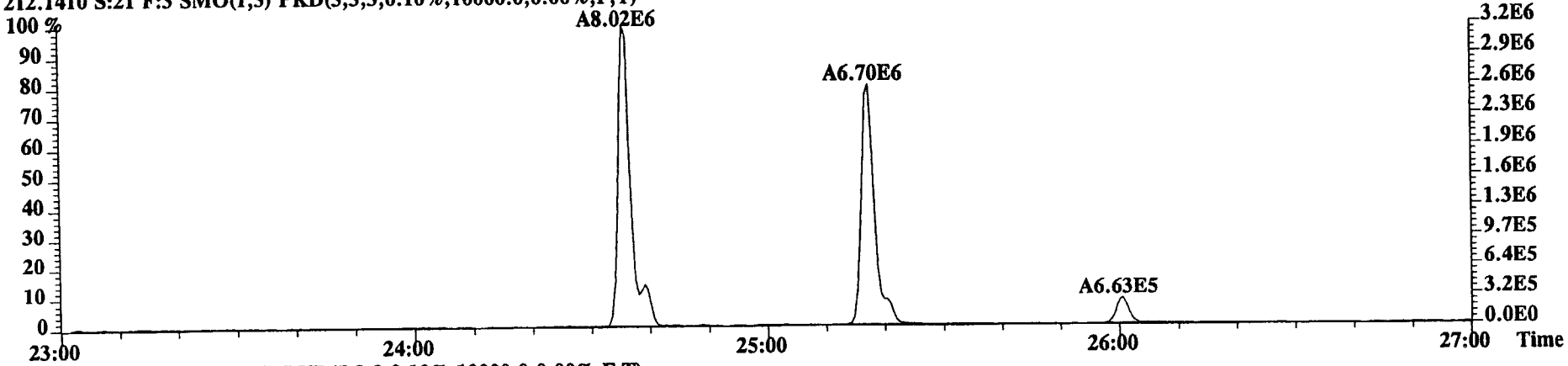
File:29OC98V4 #1-641 Acq:30-OCT-1998 07:48:11 GC EI+ Voltage SIR 70SE
Sample#21 Text:301802-1 :10X DIL. :AIR : Exp:PAHAIR
204.9888 S:21 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



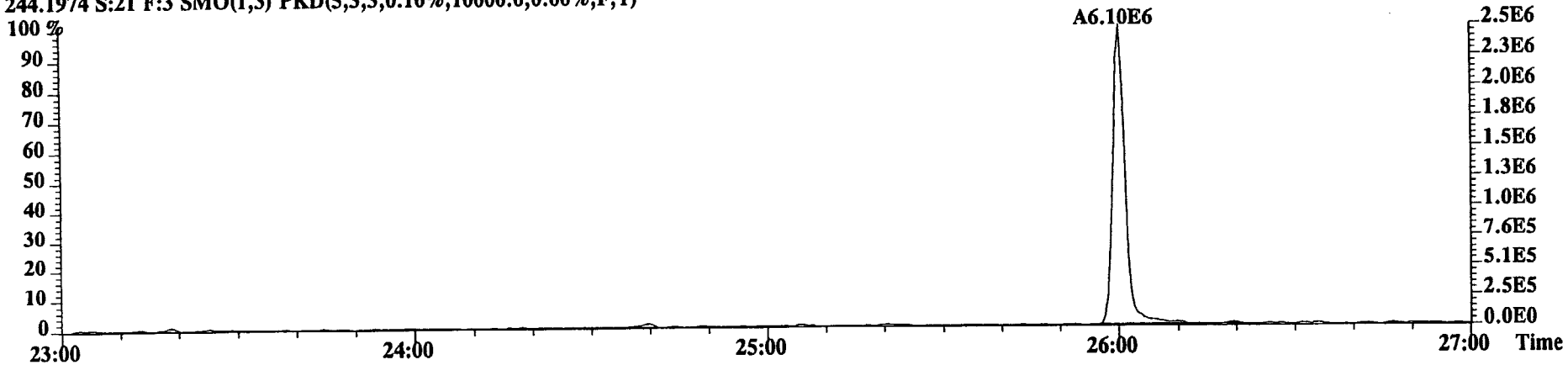
File:29OC98V4 #1-939 Acq:30-OCT-1998 07:48:11 GC EI+ Voltage SIR 70SE
Sample#21 Text:301802-1 :10X DIL. :AIR : Exp:PAHAIR
202.0782 S:21 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



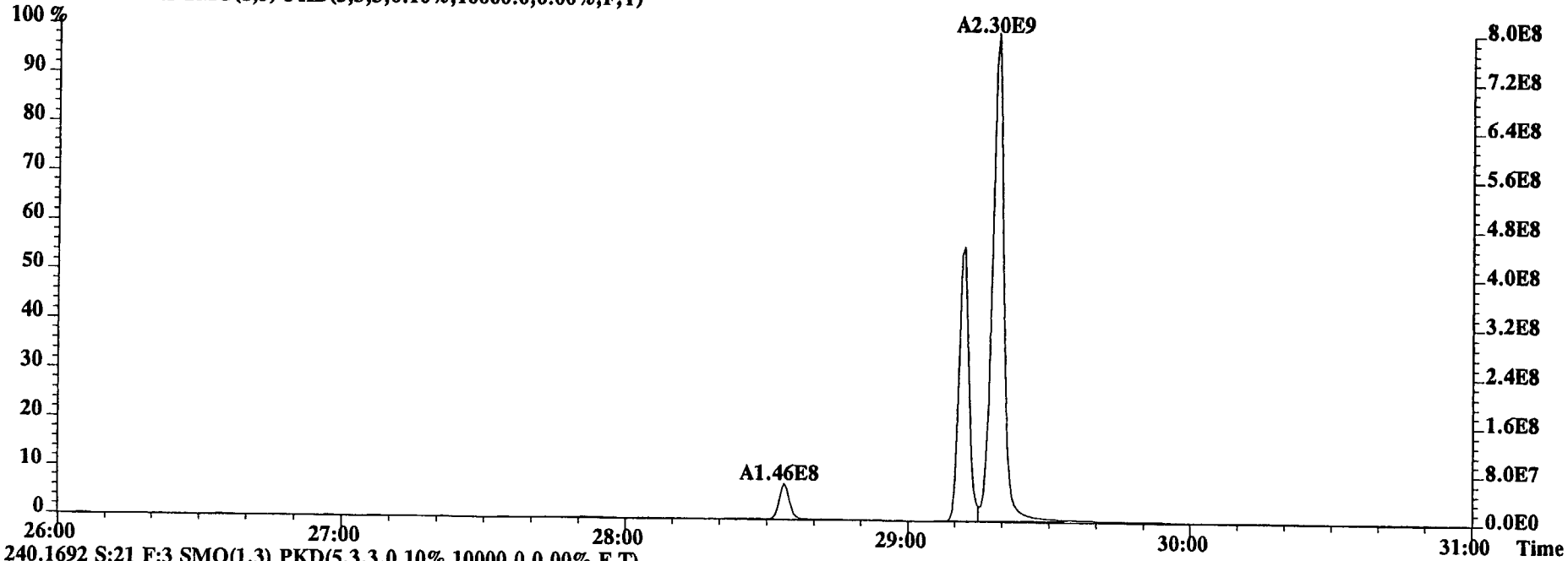
212.1410 S:21 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



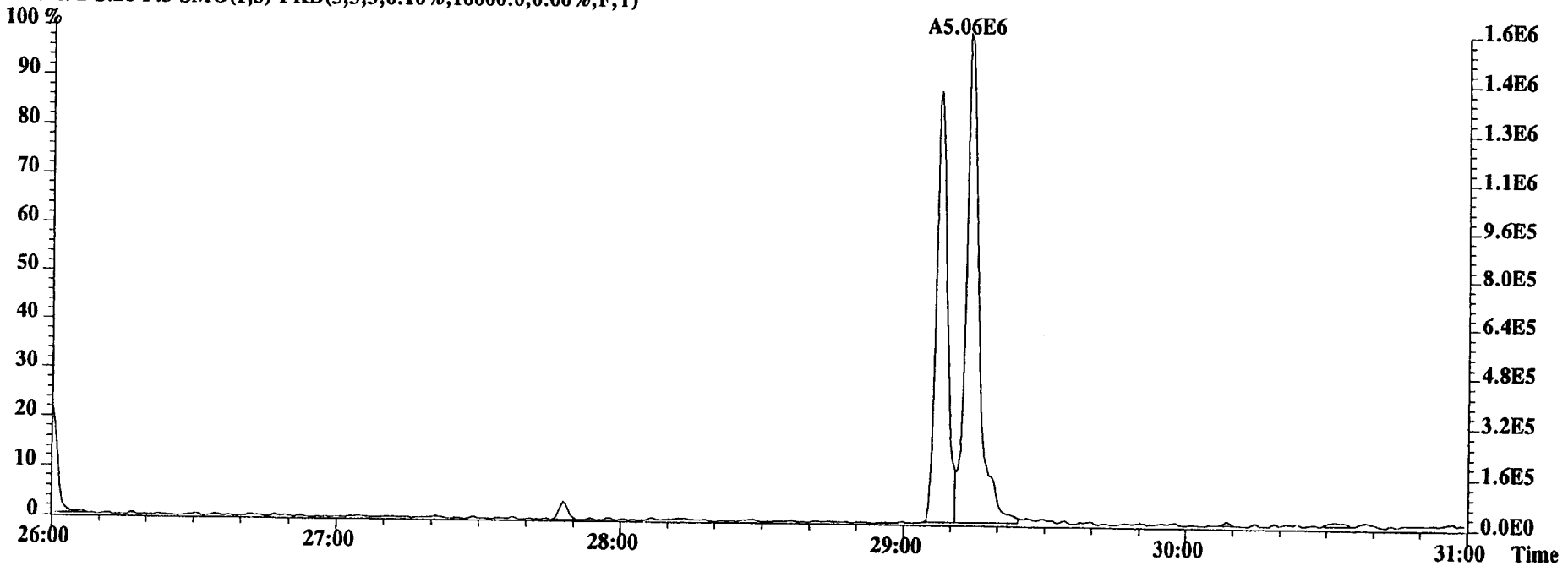
244.1974 S:21 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



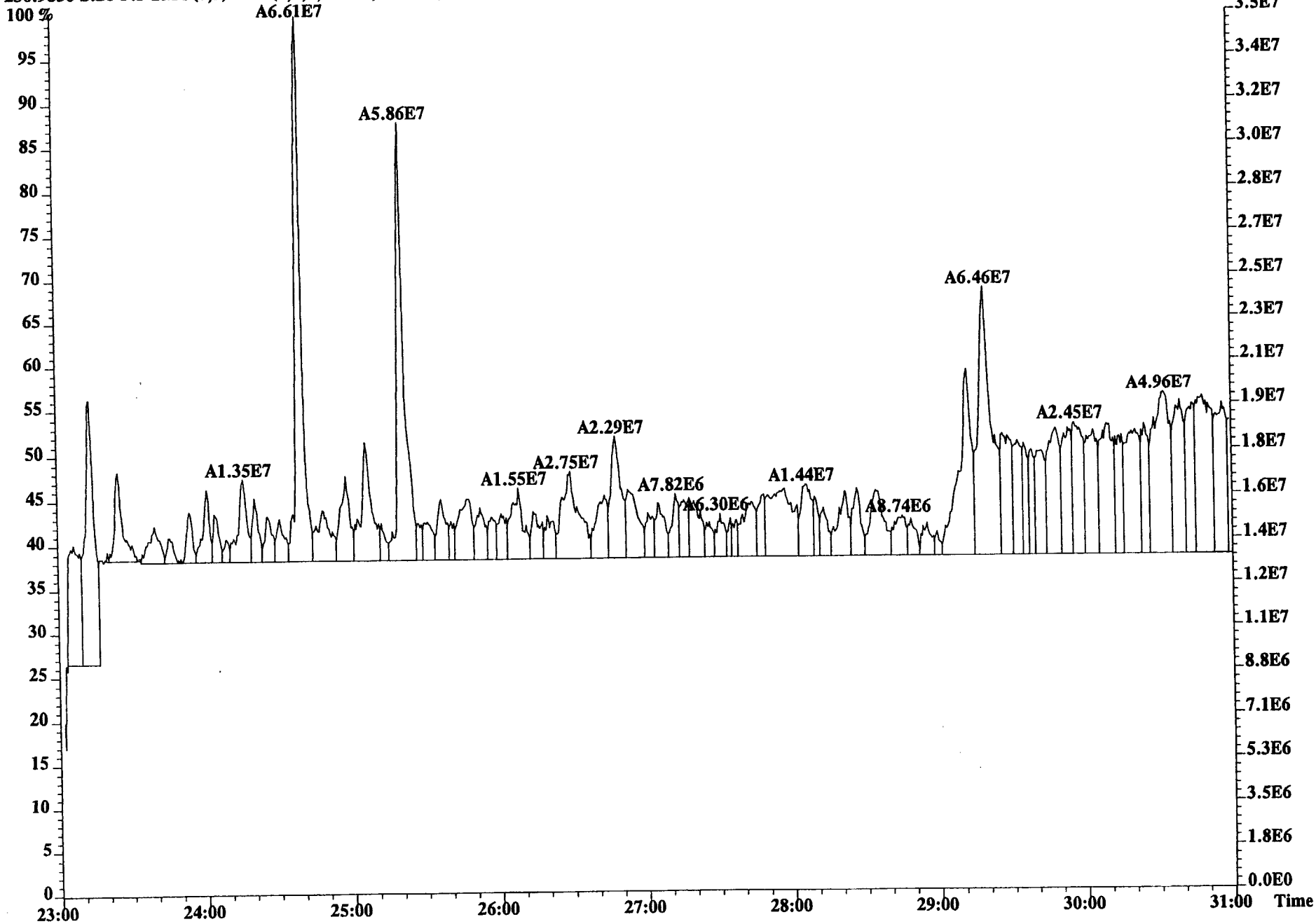
File:29OC98V4 #1-939 Acq:30-OCT-1998 07:48:11 GC EI+ Voltage SIR 70SE
Sample#21 Text:301802-1 :10X DIL. :AIR : Exp:PAHAIR
228.0939 S:21 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



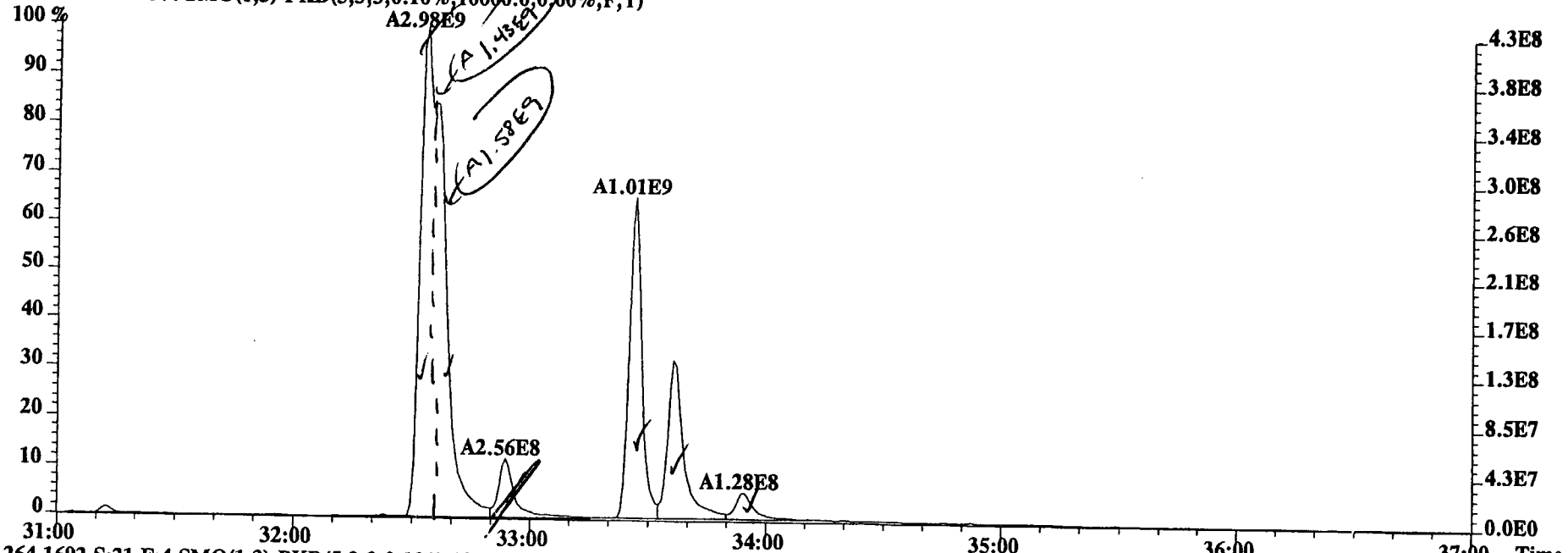
240.1692 S:21 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



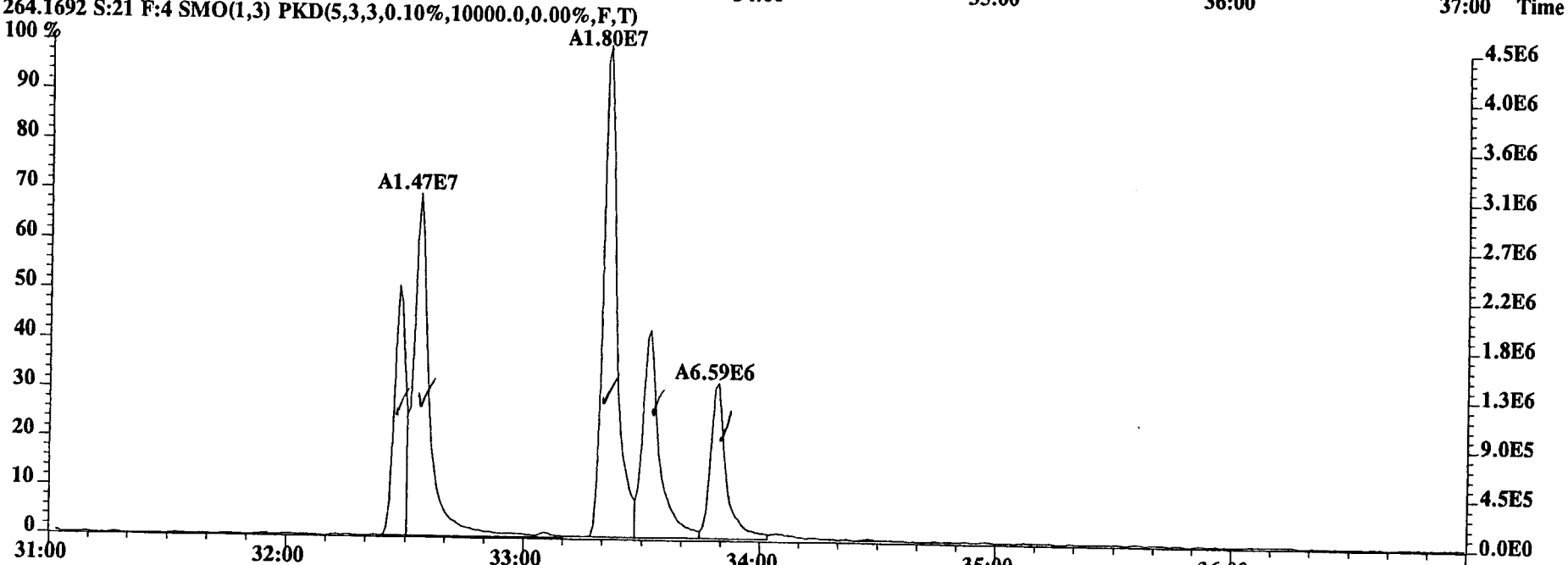
File:29OC98V4 #1-939 Acq:30-OCT-1998 07:48:11 GC EI+ Voltage SIR 70SE
Sample#21 Text:301802-1 :10X DIL. :AIR : Exp:PAHAIR
230.9856 S:21 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



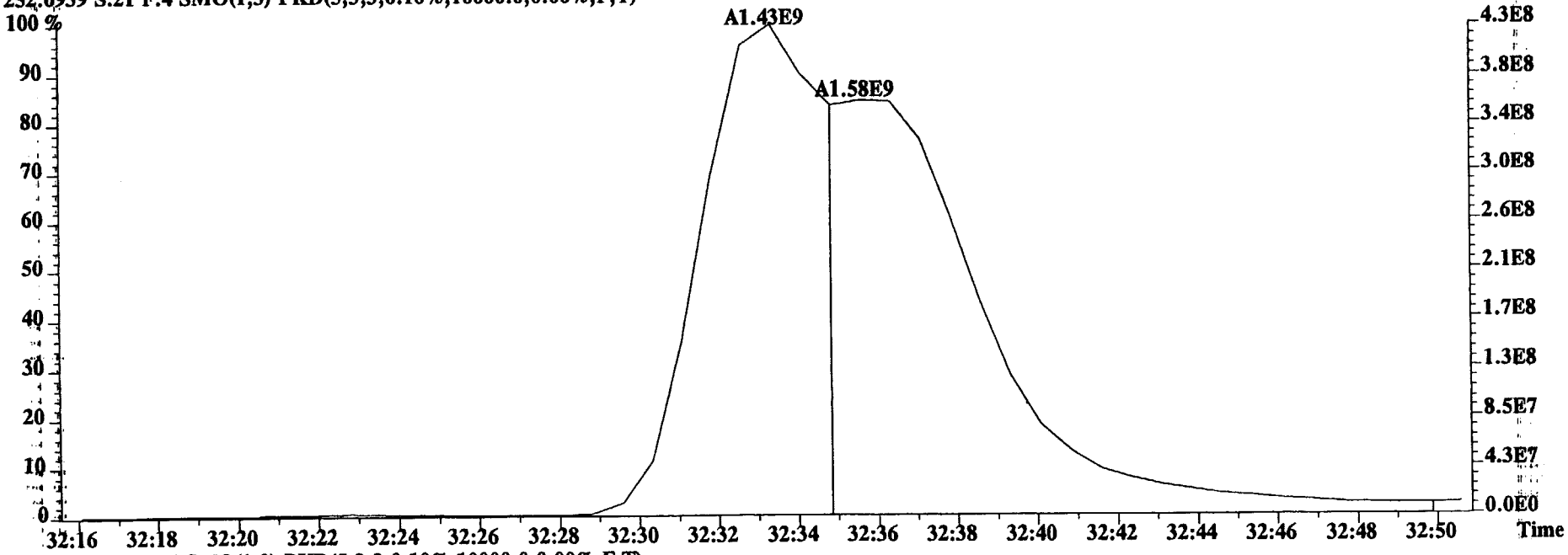
File:29OC98V4 #1-879 Acq:30-OCT-1998 07:48:11 GC EI+ Voltage SIR 70SE
Sample#21 Text:301802-1 :10X DIL. :AIR : Exp:PAHAIR
252.0939 S:21 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



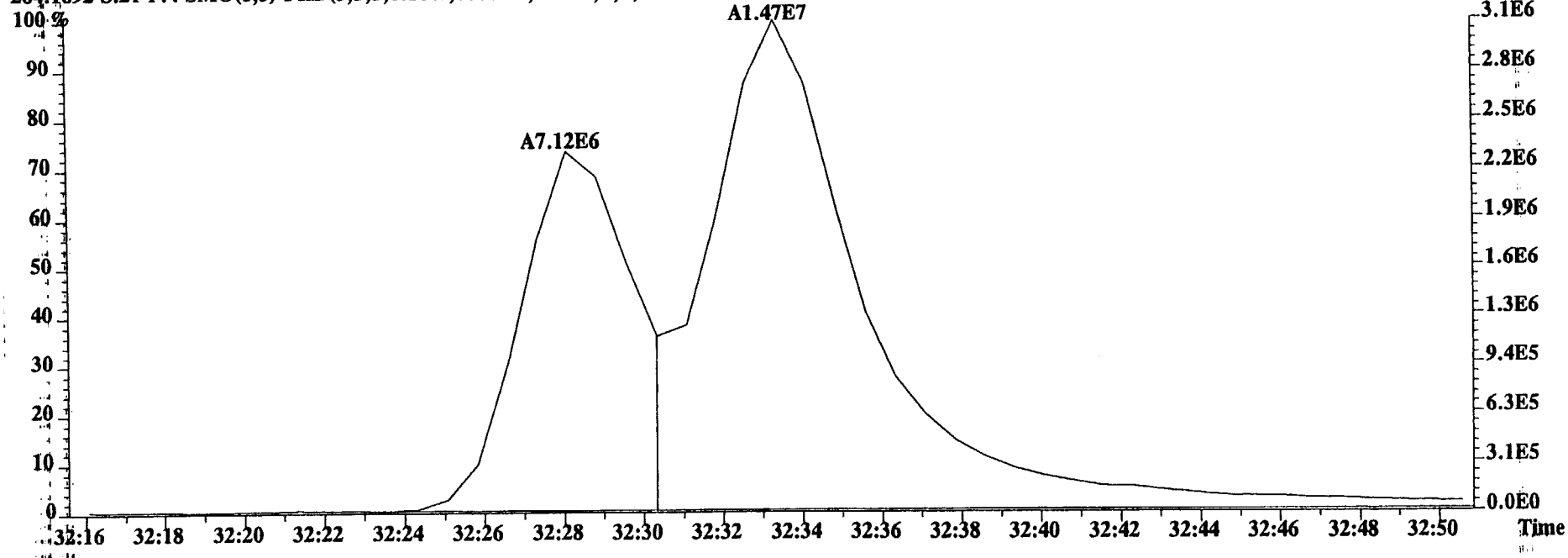
264.1692 S:21 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



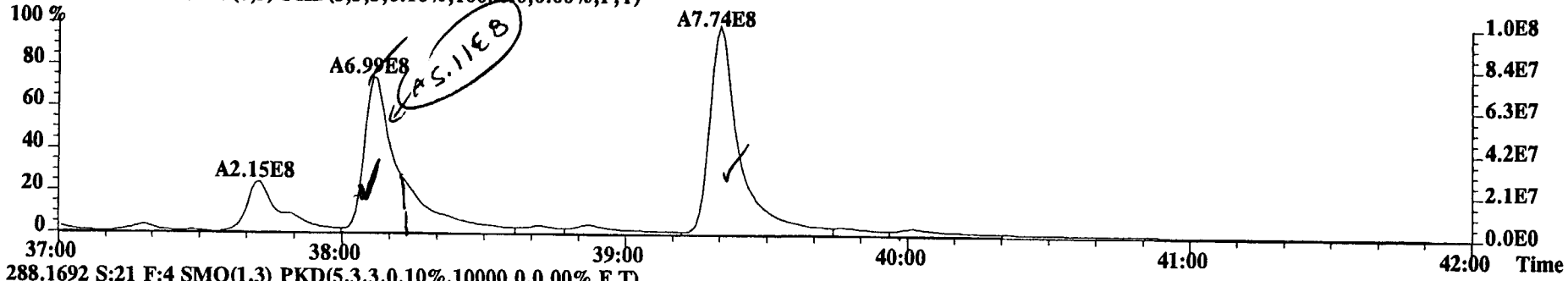
File:29OC98V4 #1-879 Acq:30-OCT-1998 07:48:11 GC EI+ Voltage SIR 70SE
Sample#21 Text:301802-1 :10X DIL. :AIR : Exp:PAHAIR
252.0939 S:21 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



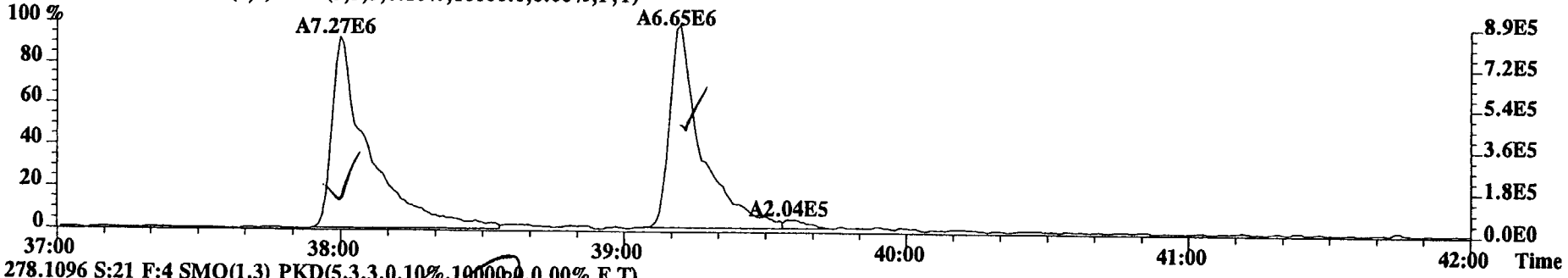
264.1692 S:21 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



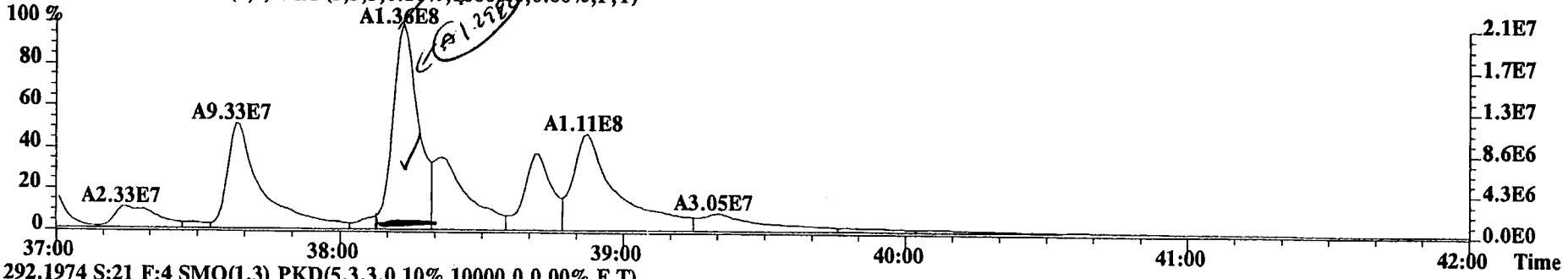
File:29OC98V4 #1-879 Acq:30-OCT-1998 07:48:11 GC EI+ Voltage SIR 70SE
Sample#21 Text:301802-1 :10X DIL. :AIR : Exp:PAHAIR
276.0939 S:21 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



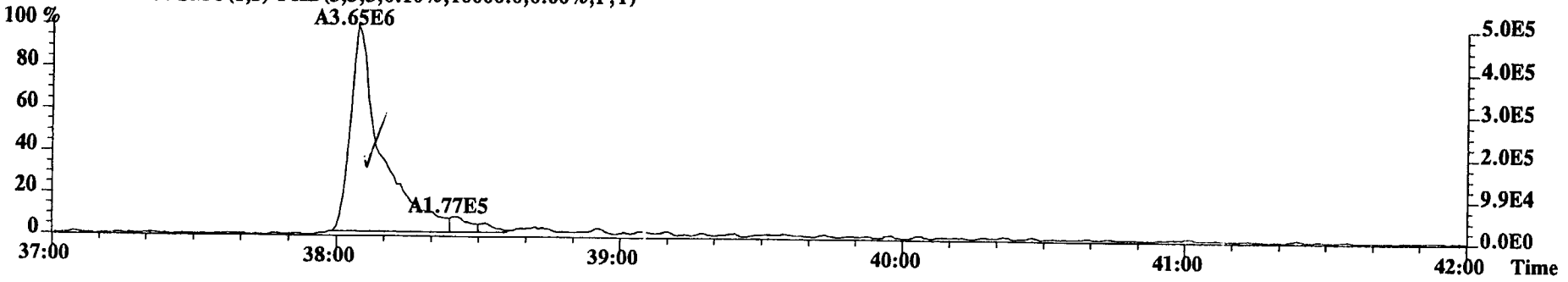
288.1692 S:21 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



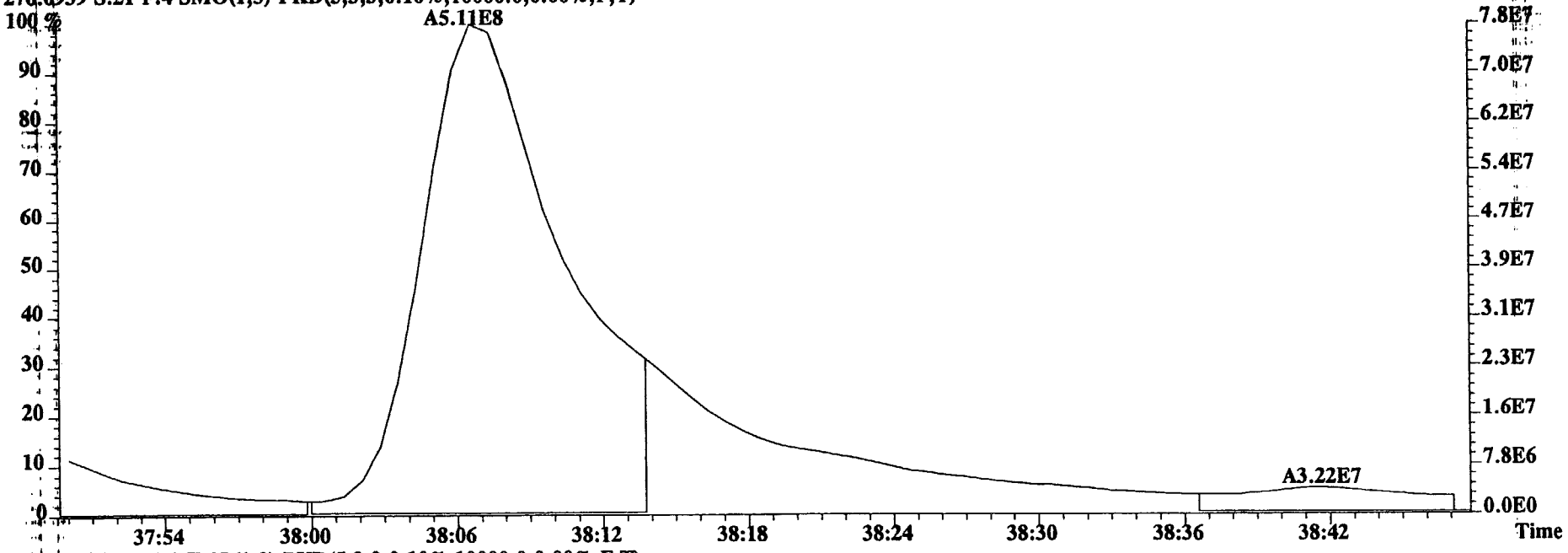
278.1096 S:21 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



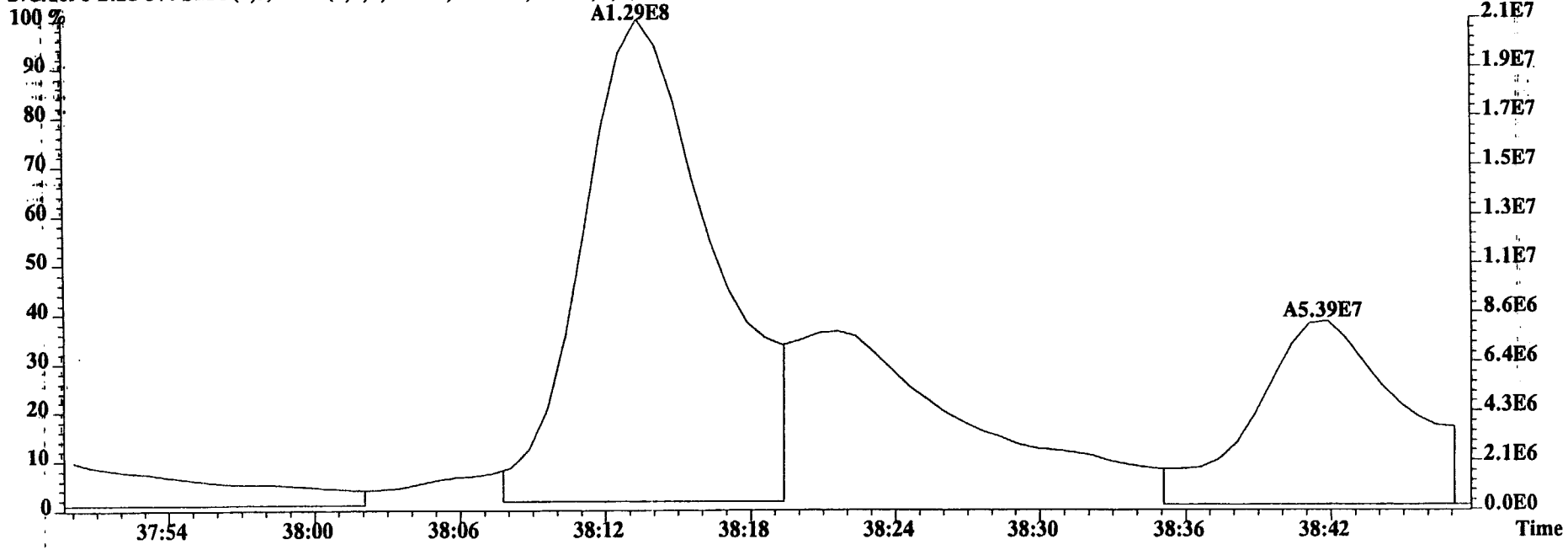
292.1974 S:21 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



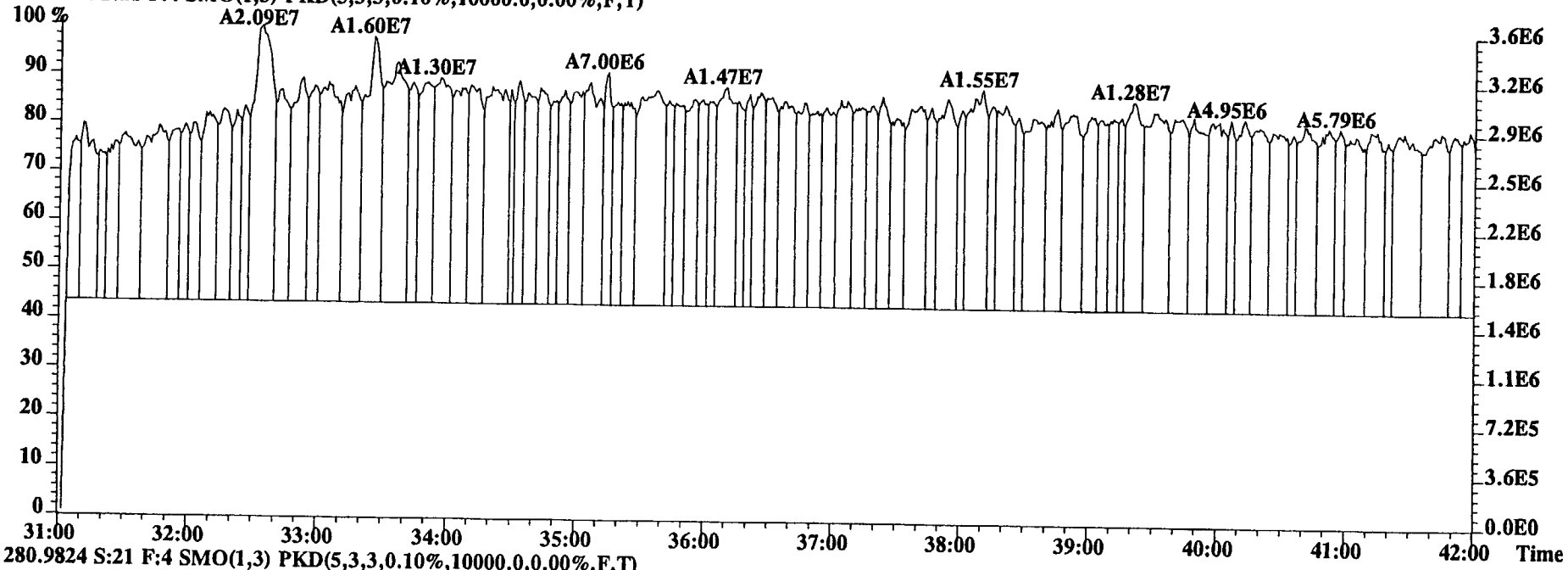
File:29OC98V4 #1-879 Acq:30-OCT-1998 07:48:11 GC EI+ Voltage SIR 70SE
Sample#21 Text:301802-1 :10X DIL. :AIR : Exp:PAHAIR
276.0939 S:21 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



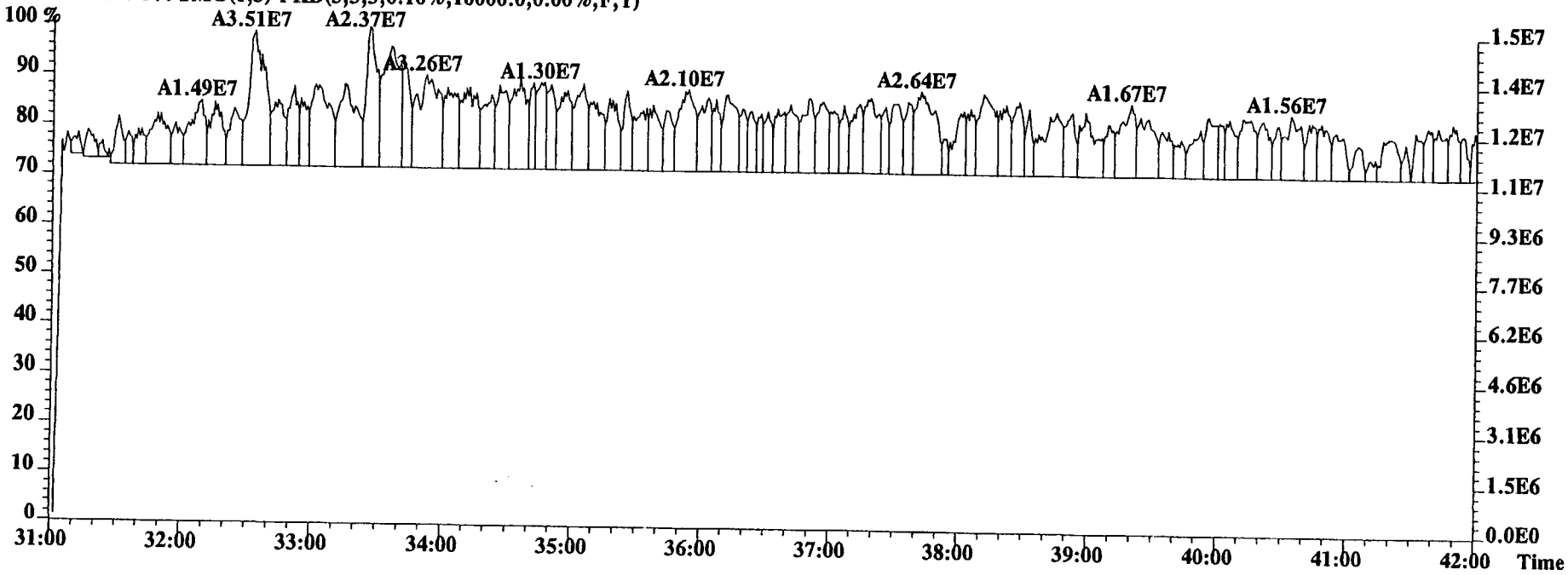
278.1096 S:21 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



File:29OC98V4 #1-879 Acq:30-OCT-1998 07:48:11 GC EI+ Voltage SIR 70SE
Sample#21 Text:301802-1 :10X DIL. :AIR : Exp:PAHAIR
268.9824 S:21 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



280.9824 S:21 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



POLYNUCLEAR AROMATIC HYDROCARBONS
HIGH RESOLUTION GC/MS
Method HRGC/HRMS

Client Name: Pacific Environmental Services
Client ID: A-I-429-2
Lab ID: 301802-0002-SA
Matrix: AIRTRAIN
Authorized: 29 SEP 98
Dilution Factor: 1.0

Sampled: 22 SEP 98
Prepared: 03 OCT 98

Received: 29 SEP 98
Analyzed: 30 OCT 98

Parameter	Result	Units	Reporting Limit	Data Qualifiers
Naphthalene	120000	ng/sample	--	BD
2-Methylnaphthalene	24000	ng/sample	--	B
Acenaphthylene	36000	ng/sample	--	D
Acenaphthene	4300	ng/sample	--	D
Fluorene	16000	ng/sample	--	
Phenanthrene	53000	ng/sample	--	BD
Anthracene	4300	ng/sample	--	
Fluoranthene	18000	ng/sample	--	D
Pyrene	13000	ng/sample	--	
Benzo(a)anthracene	7000	ng/sample	--	
Chrysene	12000	ng/sample	--	
Benzo(b)fluoranthene	5200	ng/sample	--	
Benzo(k)fluoranthene	3700	ng/sample	--	
Benzo(e)pyrene	2600	ng/sample	--	
Benzo(a)pyrene	1900	ng/sample	--	
Perylene	330	ng/sample	--	
Indeno(1,2,3-cd)pyrene	4300	ng/sample	--	
Dibenz(a,h)anthracene	1100	ng/sample	--	
Benzo(g,h,i)perylene	3800	ng/sample	--	

B = Compound is also detected in the blank.
D = Compound quantitated using a secondary dilution.

Reported By: Clark Pickell

Approved By: Eric Redman

The cover letter is an integral part of this report.
Rev 230787

POLYNUCLEAR AROMATIC HYDROCARBONS
HIGH RESOLUTION GC/MS
Method HRGC/HRMS
(cont.)

Client Name: Pacific Environmental Services
Client ID: A-I-429-2
Lab ID: 301802-0002-SA
Matrix: AIRTRAIN Sampled: 22 SEP 98 Received: 29 SEP 98
Authorized: 29 SEP 98 Prepared: 03 OCT 98 Analyzed: 30 OCT 98
Dilution Factor: 1.0

Internal Standards	% Recovery	
Naphthalene-d8	75	D
Acenaphthylene-d8	58	D
Acenaphthene-d10	64	D
Fluorene-d10	43	m
Phenanthrene-d10	98	D
Fluoranthene-d10	62	D
Pyrene-d10	73	
Benzo(a)anthracene-d12	64	
Perylene-d12	53	
Indeno(123-cd)pyrene-d12	95	
Chrysene-d12	66	
Benzo(b)fluoranthene-d12	103	
Benzo(k)fluoranthene-d12	70	
Benzo(a)pyrene-d12	75	
Dibenz(a,h)anthracene-d14	91	
Benzo(g,h,i)perylene-d12	80	

Field Surrogates	% Recovery
13C-Fluorene	103

D = Compound quantitated using a secondary dilution.
m = Internal Standard recovery is outside method recovery goal.

Reported By: Clark Pickell Approved By: Eric Redman

The cover letter is an integral part of this report.
Rev 230787

04-NOV-1998 05:00:22 PM Dioxin Furan Unknown RESULTS

Mass Spec : VG-4 Results : 29OC98V4221.RES : PAHAIR.TRG
GC Column : DB-5 Date analyzed : 29-OCT-98
Data [illegible] 301802-2 10X Dil. Ex [illegible] PAHAIR102998V4 R
Weight : 0.5

Name	Total Response	Isotope Ratio	R. T. mm:ss	RRF	pg/ SAMPLE	Rec/ MDL
d10-2-Methylnaphthalene	3711140	1.00 Y	12: 28 Y	1.00	50.00	
d8-Naphthalene	10509740	1.00 Y	10: 12 Y	2.24	63.19	126
Naphthalene	13241960000	1.00 Y	10: 16 Y	1.23	-	SAT'D
2-Methylnaphthalene	1402202000	1.00 Y	12: 33 Y	0.56	2.4e+04	B E
d8-Acenaphthylene	3715200	1.00 Y	15: 27 Y	1.21	41.24	82
Acenaphthylene	798294000	1.00 Y	15: 30 Y	0.94	-	SEE 100X
d10-Acenaphthene	556866	1.00 Y	16: 1 Y	0.74	10.08	20
Acenaphthene	59635000	1.00 Y	16: 8 Y	1.25	-	SEE 100X
d10-Anthracene	8557100	1.00 Y	20: 55 Y	1.00	50.00	
d10-Fluorene	5255240	1.00 Y	17: 41 Y	1.42	21.61	43
Fluorene	991330000	1.00 Y	17: 46 Y	1.16	1.6e+04	E
d10-Phenanthrene	18520000	1.00 Y	20: 45 Y	2.81	38.54	77
Phenanthrene	6578680000	1.00 Y	20: 49 Y	0.89	-	SAT'D
Anthracene	644164000	1.00 Y	20: 58 Y	0.80	4345.57	
d14-Terphenyl	20776800	1.00 Y	26: 0 Y	1.00	50.00	
d10-Fluoranthene	21887800	1.00 Y	24: 35 Y	1.41	37.34	75
Fluoranthene	5509320000	1.00 Y	24: 39 Y	1.11	-	SAT'D
d10-Pyrene	23113800	1.00 Y	25: 17 Y	1.52	36.64	73
Pyrene	3721240000	1.00 Y	25: 20 Y	1.21	1.3e+04	E
d12-Benzo(a)anthracene	12010700	1.00 Y	29: 7 Y	0.90	32.11	64
Benzo(a)anthracene	1018480000	1.00 Y	29: 12 Y	1.20	7040.05	E
d12-Chrysene	17560360	1.00 Y	29: 14 Y	1.28	33.04	66
Chrysene	2305580000	1.00 Y	29: 19 Y	1.08	1.2e+04	E
d12-Benzo(e)pyrene	45895600	1.00 Y	33: 21 Y	1.00	50.00	
d12-Benzo(b)fluoranthene	21436600	1.00 Y	32: 28 Y	0.45	51.46	103
Benzo(b)fluoranthene	1294000000	1.00 Y	32: 33 Y	1.17	5171.46	E
d12-Benzo(k)fluoranthene	30286400	1.00 Y	32: 33 Y	0.95	34.80	70
Benzo(k)fluoranthene	1290000000	1.00 Y	32: 38 Y	1.16	3658.76	
d12-Benzo(a)pyrene	23346400	1.00 Y	33: 31 Y	0.68	37.59	75
Benzo(e)pyrene	996856000	1.00 Y	33: 26 Y	1.64	2602.25	
Benzo(a)pyrene	485588000	1.00 Y	33: 37 Y	1.07	1940.27	
d12-Perylene	15337980	1.00 Y	33: 49 Y	0.63	26.51	53
Perylene	87000000	1.00 Y	33: 54 Y	1.71	331.01	
d12-Indeno(123-cd)pyrene	19293060	1.00 Y	38: 0 Y	0.44	47.28	95
Indeno(123-cd)pyrene	514000000	1.00 Y	38: 7 Y	0.62	4290.44	
d14-Dibenz(ah)anthracene	10308660	1.00 Y	38: 5 Y	0.25	45.69	91
Dibenz(ah)anthracene	158400000	1.00 Y	38: 14 Y	1.40	1094.78	
d12-Benzo(ghi)perylene	21398400	1.00 Y	39: 12 Y	0.58	40.21	80
Benzo(ghi)perylene	818000000	1.00 Y	39: 20 Y	1.02	3762.46	
d10-Fluorene	5255240	1.00 Y	17: 41 Y	1.00	50.00	
Fluorene	[illegible]	[illegible]	[illegible]	0.81	[illegible]	[illegible]

11-4-98

04-NOV-1998 05:00:18 PM Dioxin Furan Unknown RESULTS

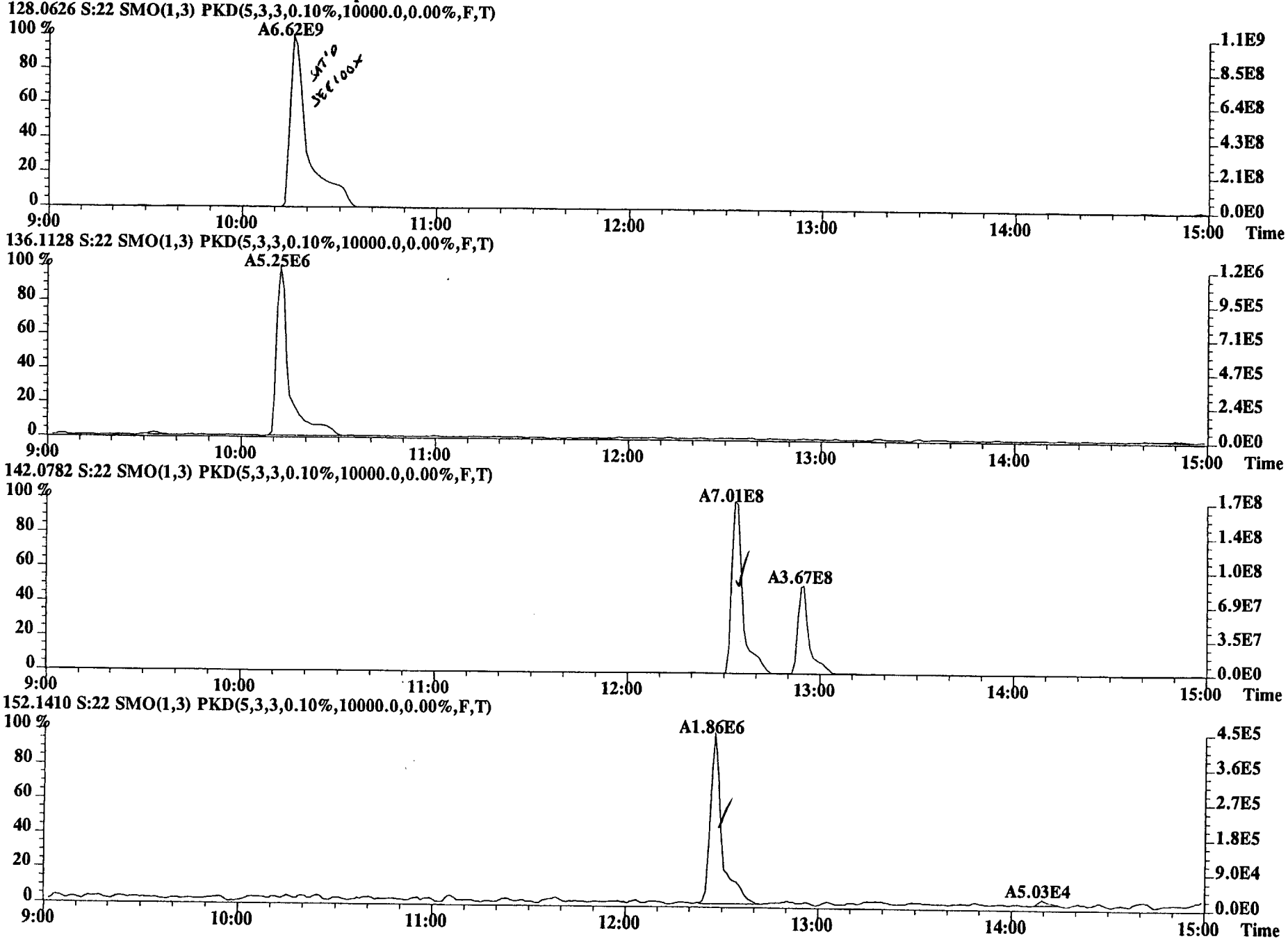
	0.5	
Rec/ MDL		
	1855570	1855570
126	5254870	5254870
SAT'D	6620980000	6620980000
B E	701101000	701101000
82	1857600	1857600
SEE	399147000	399147000
100X		
20	278433	278433
SEE	29817500	29817500
100X		
	4278550	4278550
43	2627620	2627620
E	495665000	495665000
77	9260000	9260000
SAT'D	3289340000	3289340000
	322082000	322082000
	10388400	10388400
75	10943900	10943900
SAT'D	2754660000	2754660000
73	11556900	11556900
E	1860620000	1860620000
64	6005350	6005350
E	509240000	509240000
66	8780180	8780180
E	1152790000	1152790000
	22947800	22947800
103	10718300	10718300
E	647000000	647000000
70	15143200	15143200
	645000000	645000000
75	11673200	11673200
	498428000	498428000
	242794000	242794000
53	7668990	7668990
	43500000	43500000
95	9646530	9646530
	257000000	257000000
91	5154330	5154330
	79200000	79200000
80	10699200	10699200
	409000000	409000000

03-NOV-1998 05:52:29 PM 429AIR Unknown RESULTS

Mass Spec : VG-4 Results : 29OC98V4221.RES : PAHAIR.TRG
GC Column : DB-5 Date analyzed : 29-OCT-98
Data file : 29OC98V4 301802-2 :10X DIL. : : : Ex Cal : PAHAIR102998V4.R
Weight : 0.5

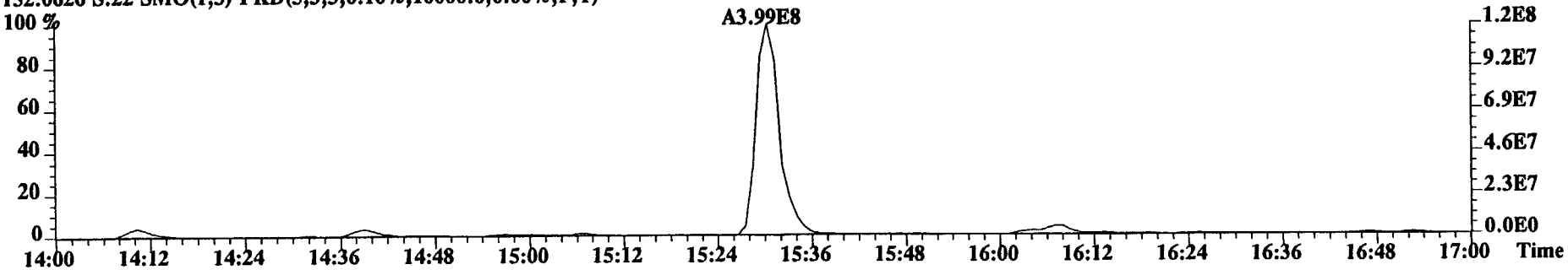
Name	Total Response	Isotope Ratio		R. T. mm:ss		Ex	Cal RRF	pg/ SAMPLE	Rec/ MDL
d10-2-Methylnaphthalene	3711140	1.00	Y	12: 28	Y		1.00	50.00	
d8-Naphthalene	10509740	1.00	Y	10: 12	Y		2.24	63.19	126
Naphthalene	13241960000	1.00	Y	10: 16	Y		1.23	1.0e+05	0.000
2-Methylnaphthalene	1402202000	1.00	Y	12: 33	Y		0.56	2.4e+04	0.000
d8-Acenaphthylene	3715200	1.00	Y	15: 27	Y		1.21	41.24	82
Acenaphthylene	798294000	1.00	Y	15: 30	Y		0.94	2.3e+04	0.000
d10-Acenaphthene	556866	1.00	Y	16: 1	Y		0.74	10.08	20
Acenaphthene	59635000	1.00	Y	16: 8	Y		1.25	8594.10	0.000
d10-Anthracene	8557100	1.00	Y	20: 55	Y		1.00	50.00	
d10-Fluorene	5255240	1.00	Y	17: 41	Y		1.42	21.61	43
Fluorene	991330000	1.00	Y	17: 46	Y		1.16	1.6e+04	0.000
d10-Phenanthrene	19292200	1.00	Y	20: 45	Y		2.81	40.15	80
Phenanthrene	6578680000	1.00	Y	20: 49	Y		0.89	3.8e+04	0.000
Anthracene	644164000	1.00	Y	20: 58	Y		0.80	4171.63	0.000
d14-Terphenyl	20776800	1.00	Y	26: 0	Y		1.00	50.00	
d10-Fluoranthene	21887800	1.00	Y	24: 35	Y		1.41	37.34	75
Fluoranthene	5509320000	1.00	Y	24: 39	Y		1.11	2.3e+04	0.000
d10-Pyrene	23113800	1.00	Y	25: 17	Y		1.52	36.64	73
Pyrene	3721240000	1.00	Y	25: 20	Y		1.21	1.3e+04	0.000
d12-Benzo(a)anthracene	12010700	1.00	Y	29: 7	Y		0.90	32.11	64
Benzo(a)anthracene	1018480000	1.00	Y	29: 12	Y		1.20	7040.05	0.000
d12-Chrysene	17560360	1.00	Y	29: 14	Y		1.28	33.04	66
Chrysene	2305580000	1.00	Y	29: 19	Y		1.08	1.2e+04	0.000
d12-Benzo(e)pyrene	45895600	1.00	Y	33: 21	Y		1.00	50.00	
d12-Benzo(b)fluoranthene	21436600	1.00	Y	32: 28	Y		0.45	51.46	103
Benzo(b)fluoranthene	2568140000	1.00	Y	32: 33	Y		1.17	1.0e+04	0.000
d12-Benzo(k)fluoranthene	30286400	1.00	Y	32: 33	Y		0.95	34.80	70
Benzo(k)fluoranthene	2568140000	1.00	Y	32: 33	Y		1.16	7283.87	0.000
d12-Benzo(a)pyrene	23346400	1.00	Y	33: 31	Y		0.68	37.59	75
Benzo(e)pyrene	996856000	1.00	Y	33: 26	Y		1.64	2602.25	0.000
Benzo(a)pyrene	485588000	1.00	Y	33: 37	Y		1.07	1940.27	0.000
d12-Perylene	15337980	1.00	Y	33: 49	Y		0.63	26.51	53
Perylene	* No Peak	0.00	N	33: 54	N		1.71	0.00	0.000
d12-Indeno(123-cd)pyrene	19293060	1.00	Y	38: 0	Y		0.44	47.28	95
Indeno(123-cd)pyrene	724340000	1.00	Y	38: 7	Y		0.62	6046.18	0.000
d14-Dibenz(ah)anthracene	10308660	1.00	Y	38: 5	Y		0.25	45.69	91
Dibenz(ah)anthracene	166334400	1.00	Y	38: 14	Y		1.40	1149.62	0.000
d12-Benzo(ghi)perylene	21398400	1.00	Y	39: 12	Y		0.58	40.21	80
Benzo(ghi)perylene	861652000	1.00	Y	39: 20	Y		1.02	3963.24	0.000
d10-Fluorene	5255240	1.00	Y	17: 41	Y		1.42	4.03	8
13C-Fluorene	4390980	1.00	Y	17: 46	Y		1.00	83.55	0.000

File:29OC98V4 #1-510 Acq:30-OCT-1998 08:37:13 GC EI+ Voltage SIR 70SE
Sample#22 Text:301802-2 :10X DIL. : : : Exp:PAHAIR

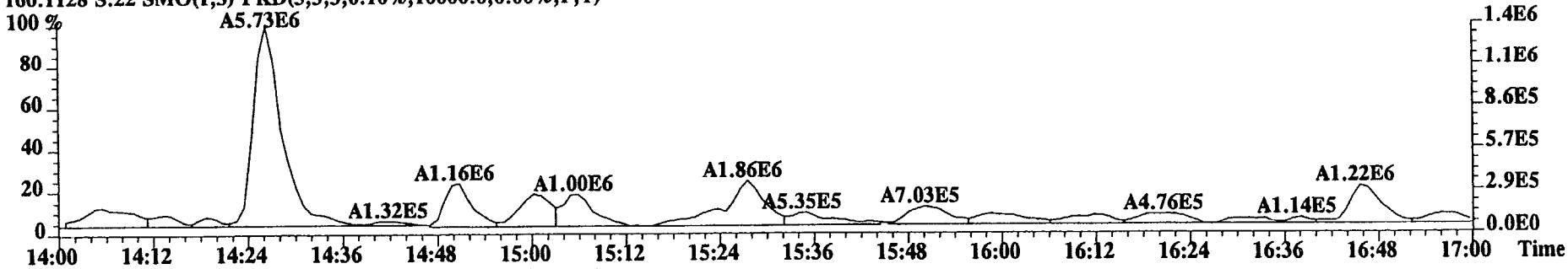


File:29OC98V4 #1-510 Acq:30-OCT-1998 08:37:13 GC EI+ Voltage SIR 70SE
Sample#22 Text:301802-2 :10X DIL. : : : Exp:PAHAIR

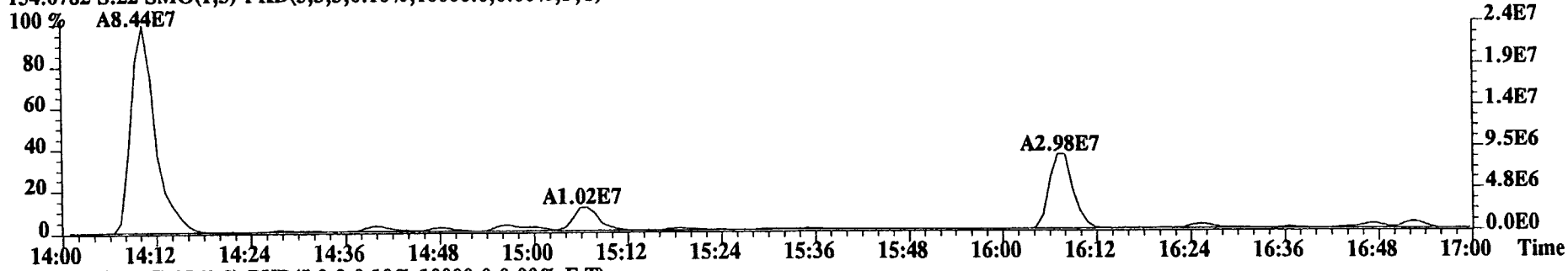
152.0626 S:22 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



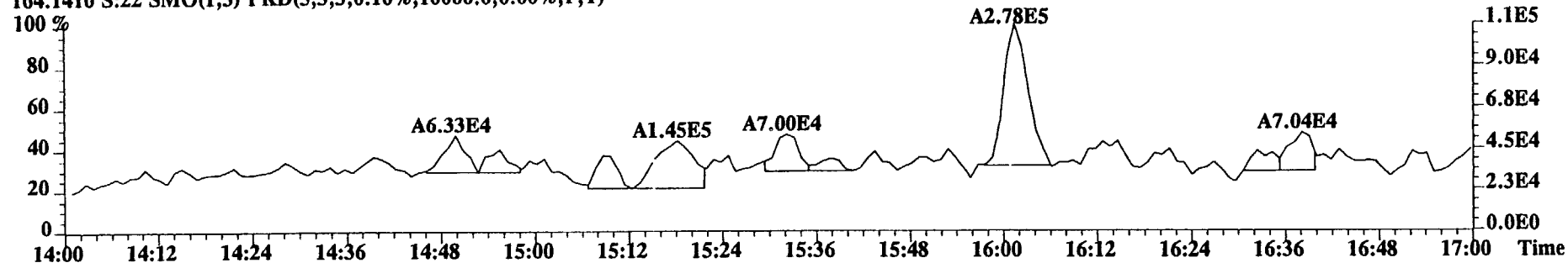
160.1128 S:22 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



154.0782 S:22 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

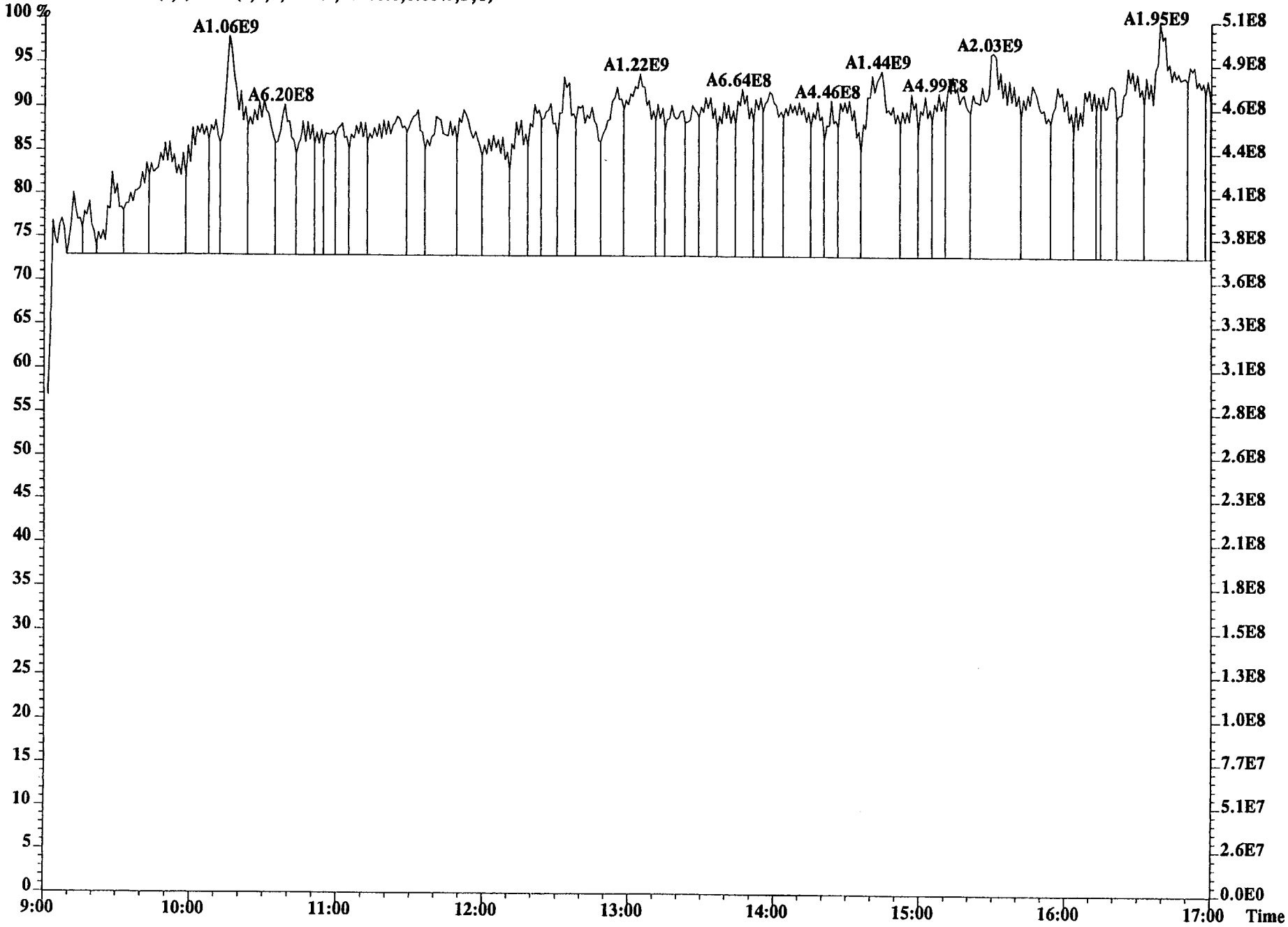


164.1410 S:22 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



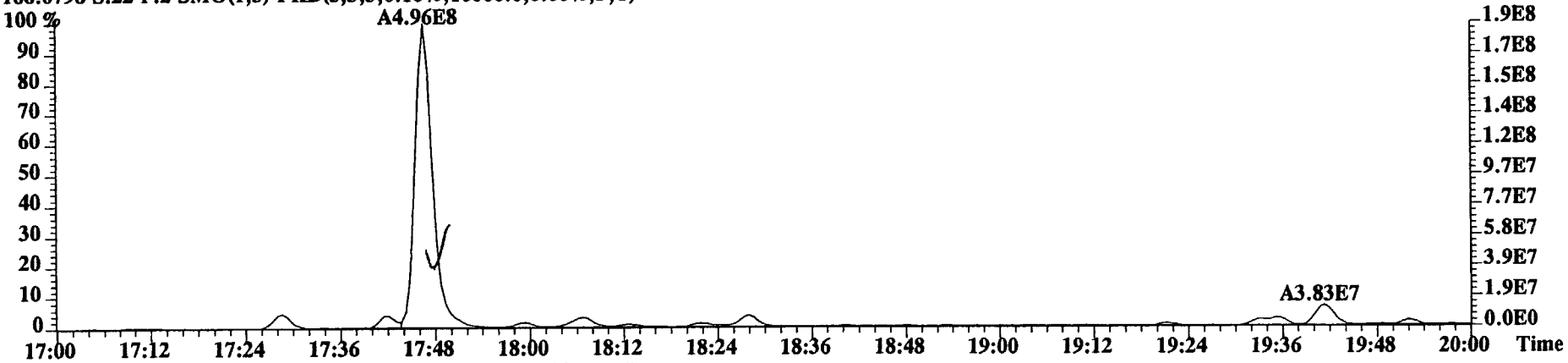
110

File:29OC98V4 #1-510 Acq:30-OCT-1998 08:37:13 GC EI+ Voltage SIR 70SE
Sample#22 Text:301802-2 :10X DIL. : : : Exp:PAHAIR
130.9920 S:22 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

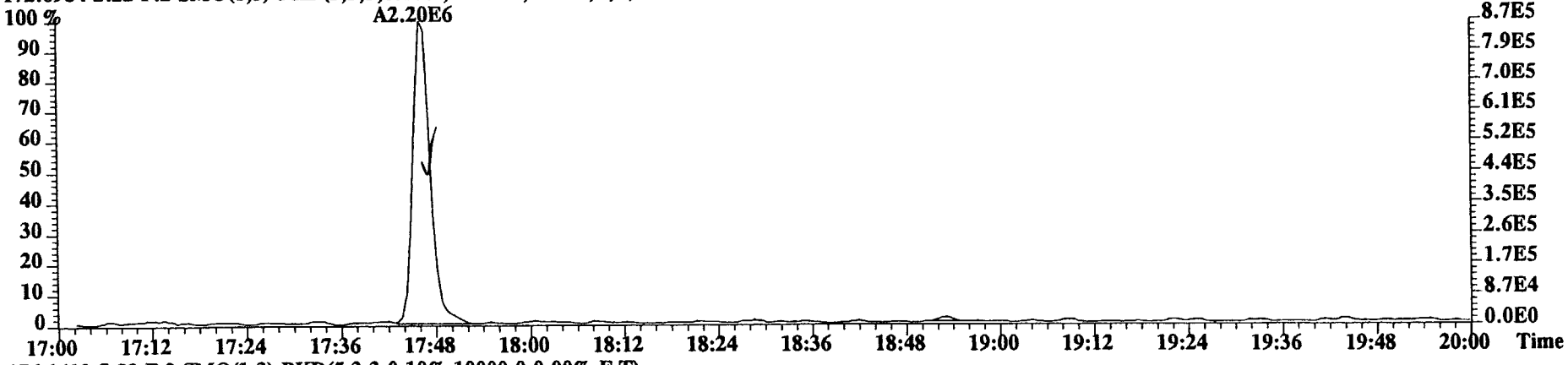


111

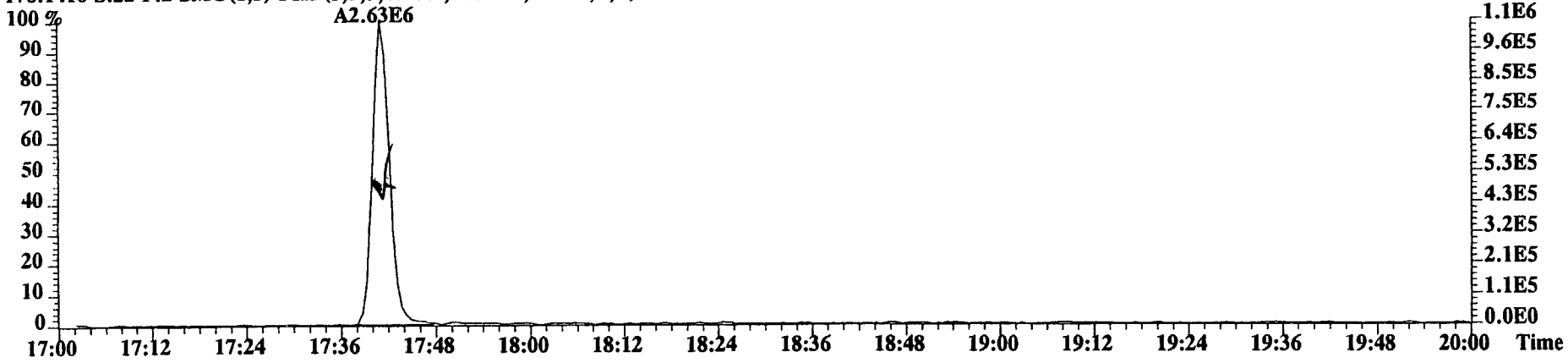
File:29OC98V4 #1-640 Acq:30-OCT-1998 08:37:13 GC EI+ Voltage SIR 70SE
Sample#22 Text:301802-2 :10X DIL. : : : Exp:PAHAIR
166.0798 S:22 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



172.0984 S:22 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

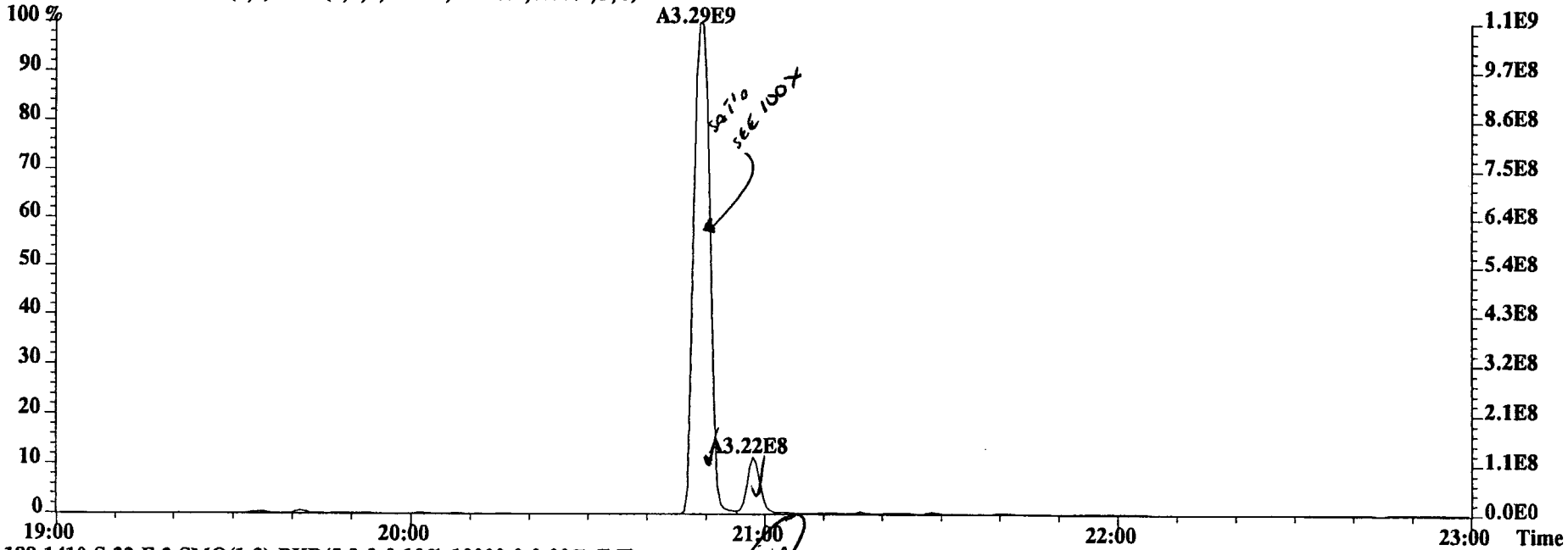


176.1410 S:22 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

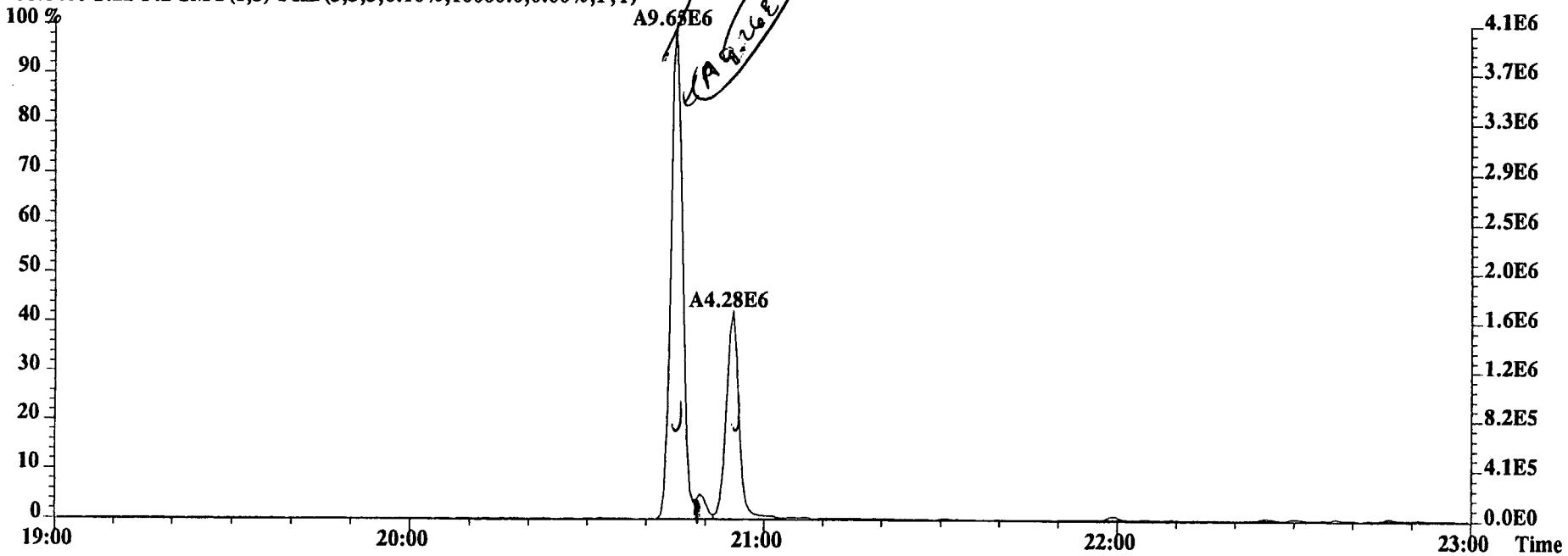


112

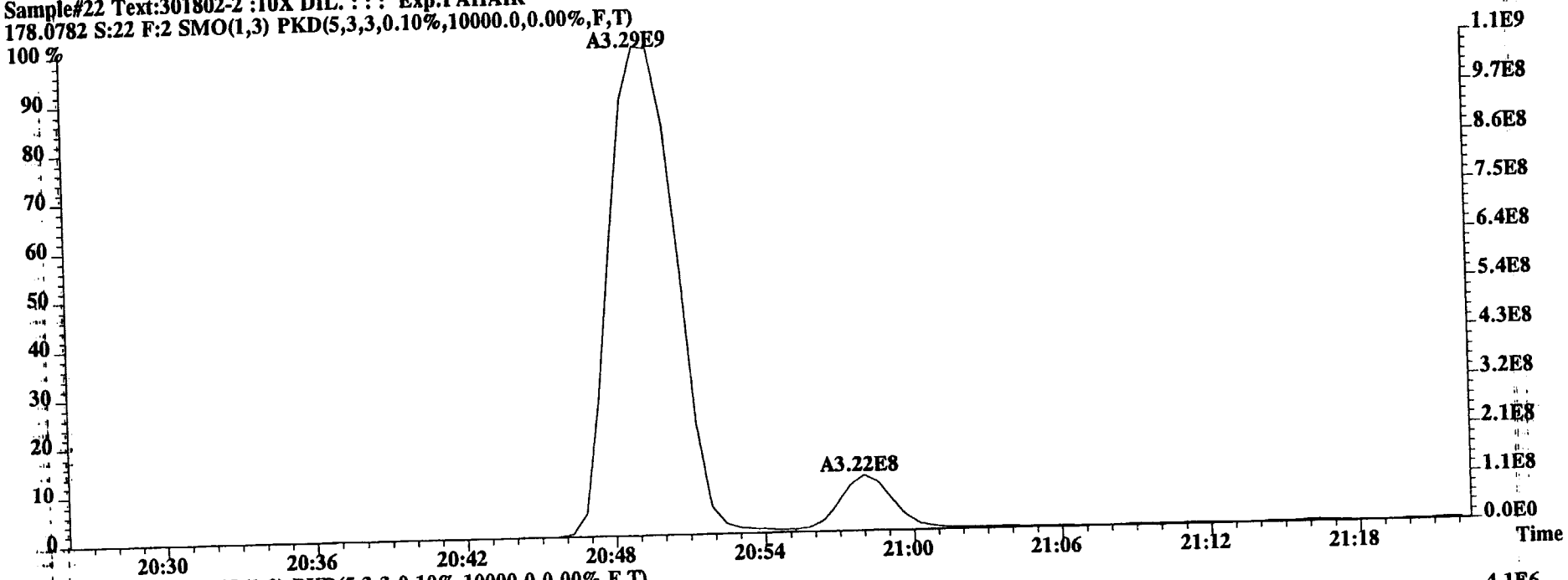
File:29OC98V4 #1-640 Acq:30-OCT-1998 08:37:13 GC EI+ Voltage SIR 70SE
Sample#22 Text:301802-2 :10X DIL. : : : Exp:PAHAIR
178.0782 S:22 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



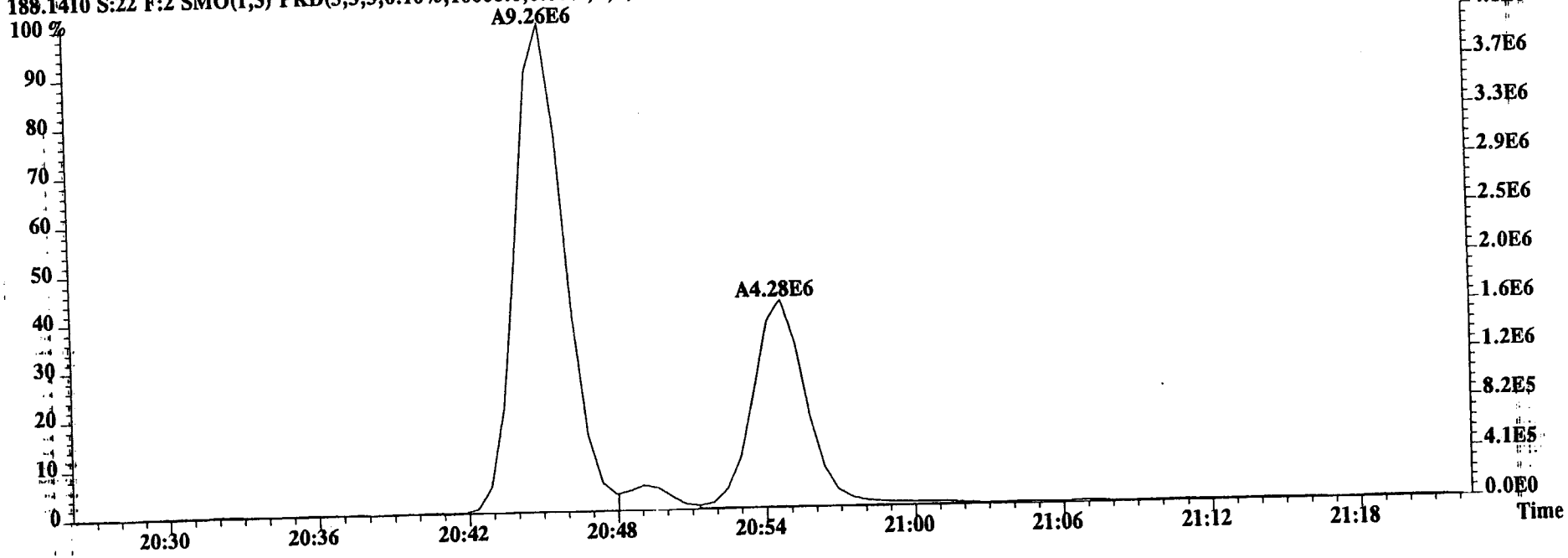
188.1410 S:22 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



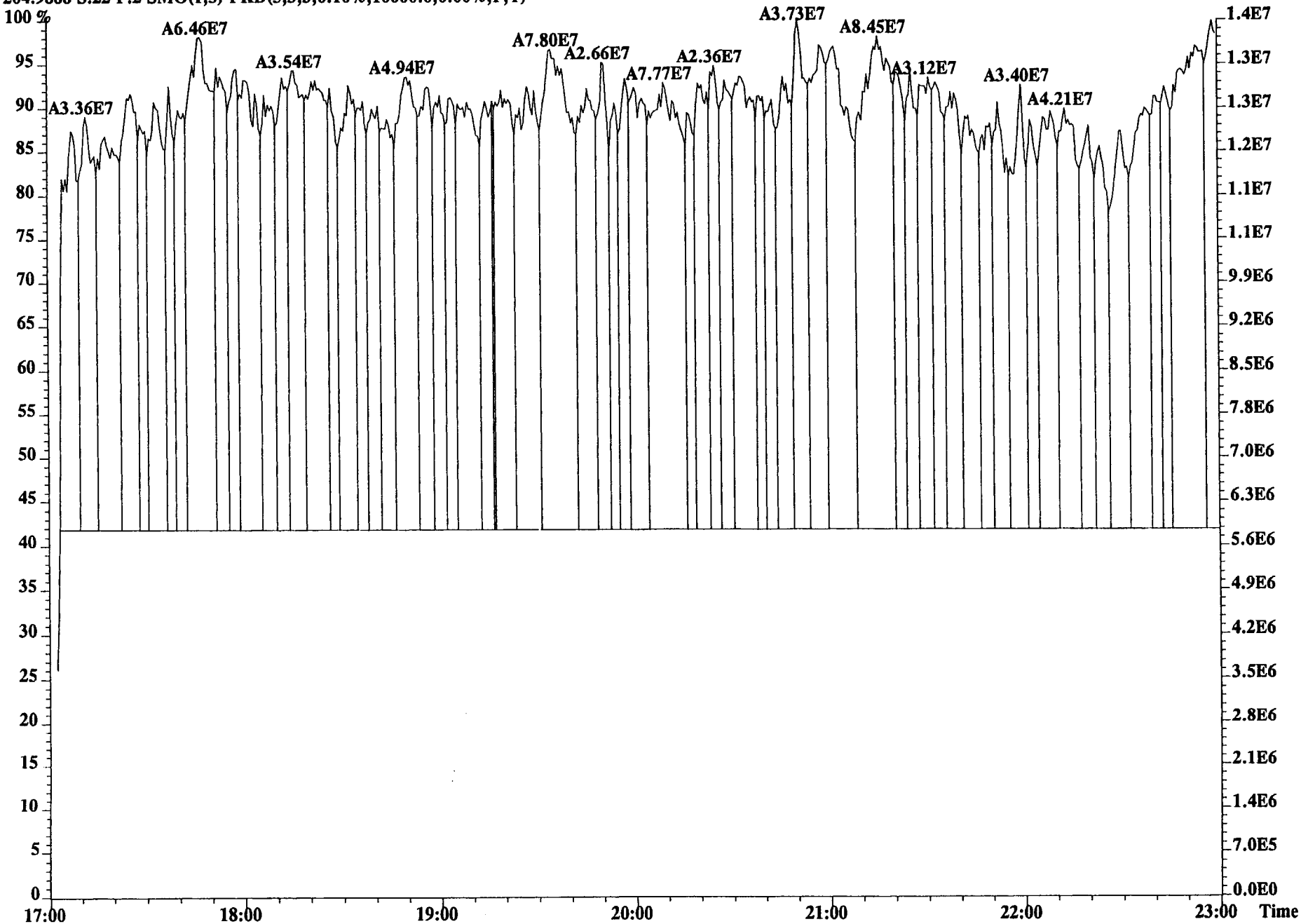
File:29OC98V4 #1-640 Acq:30-OCT-1998 08:37:13 GC EI+ Voltage SIR 70SE
Sample#22 Text:301802-2 :10X DIL. : : : Exp:PAHAIR
178.0782 S:22 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



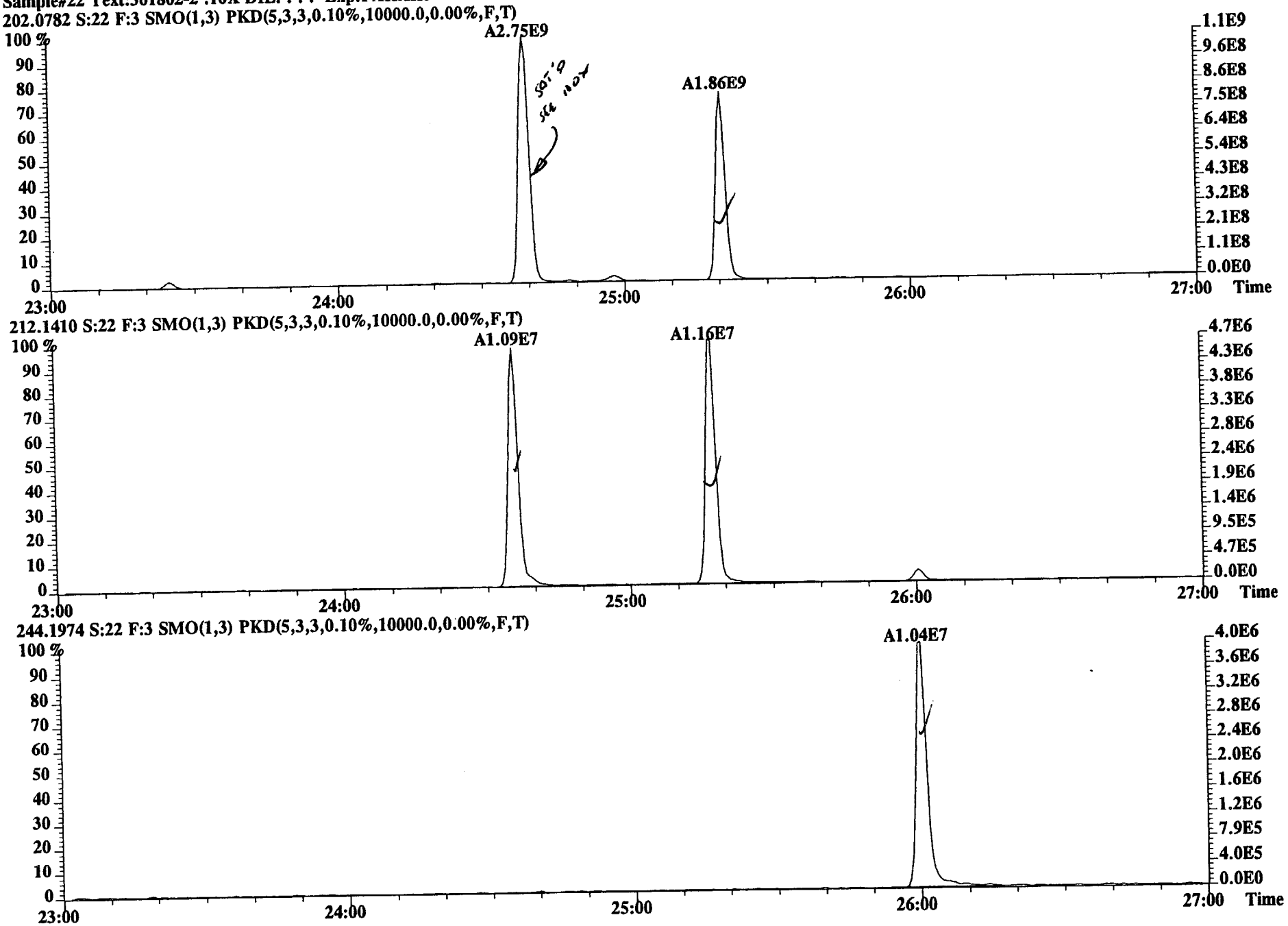
188.1410 S:22 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



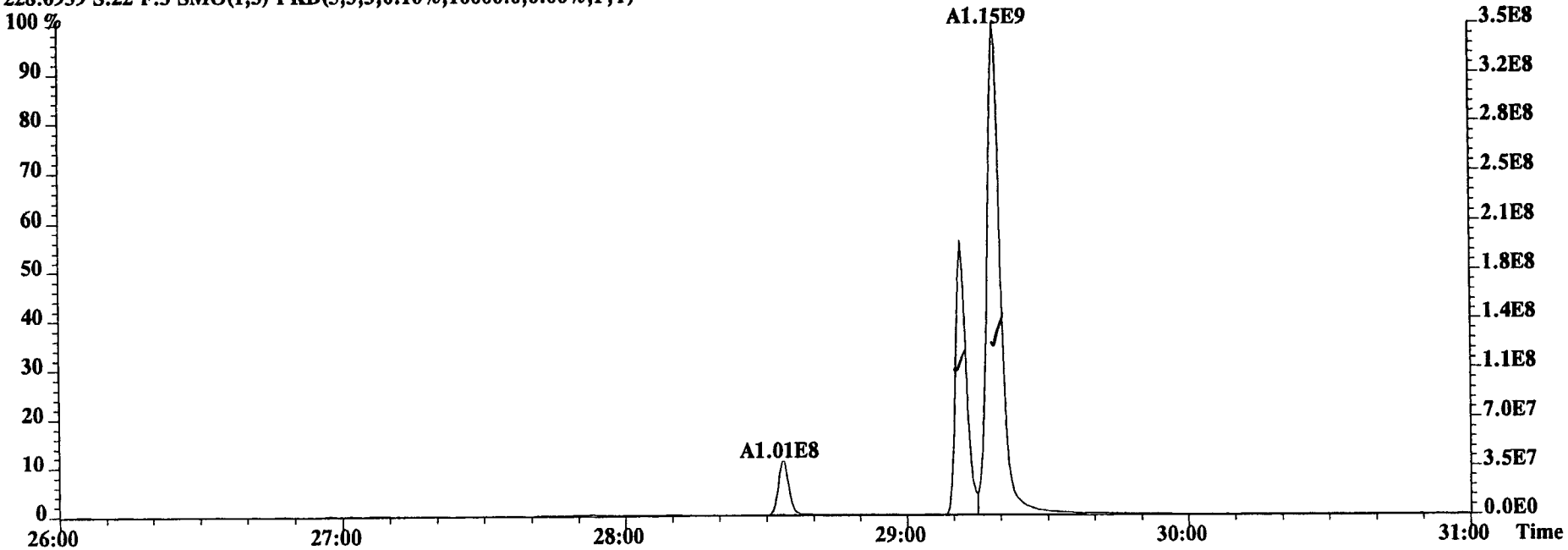
File:29OC98V4 #1-640 Acq:30-OCT-1998 08:37:13 GC EI+ Voltage SIR 70SE
Sample#22 Text:301802-2 :10X DIL. : : : Exp:PAHAIR
204.9888 S:22 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



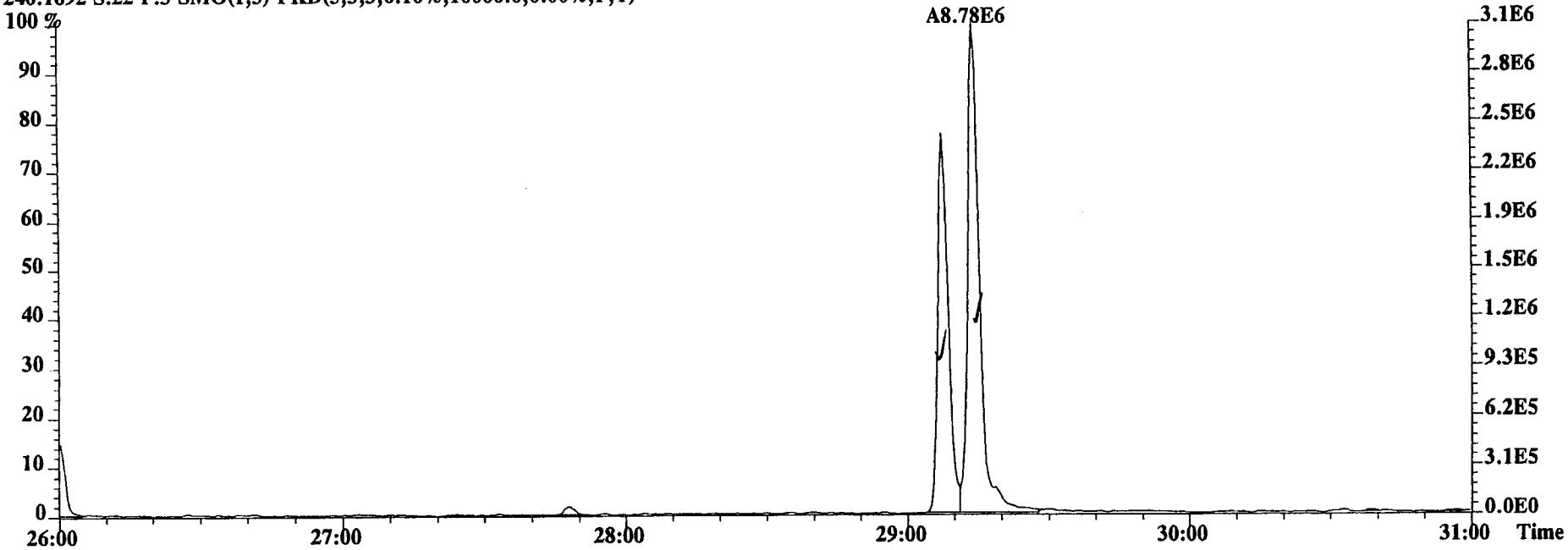
File:29OC98V4 #1-939 Acq:30-OCT-1998 08:37:13 GC EI+ Voltage SIR 70SE
Sample#22 Text:301802-2 :10X DIL. : : : Exp:PAHAIR



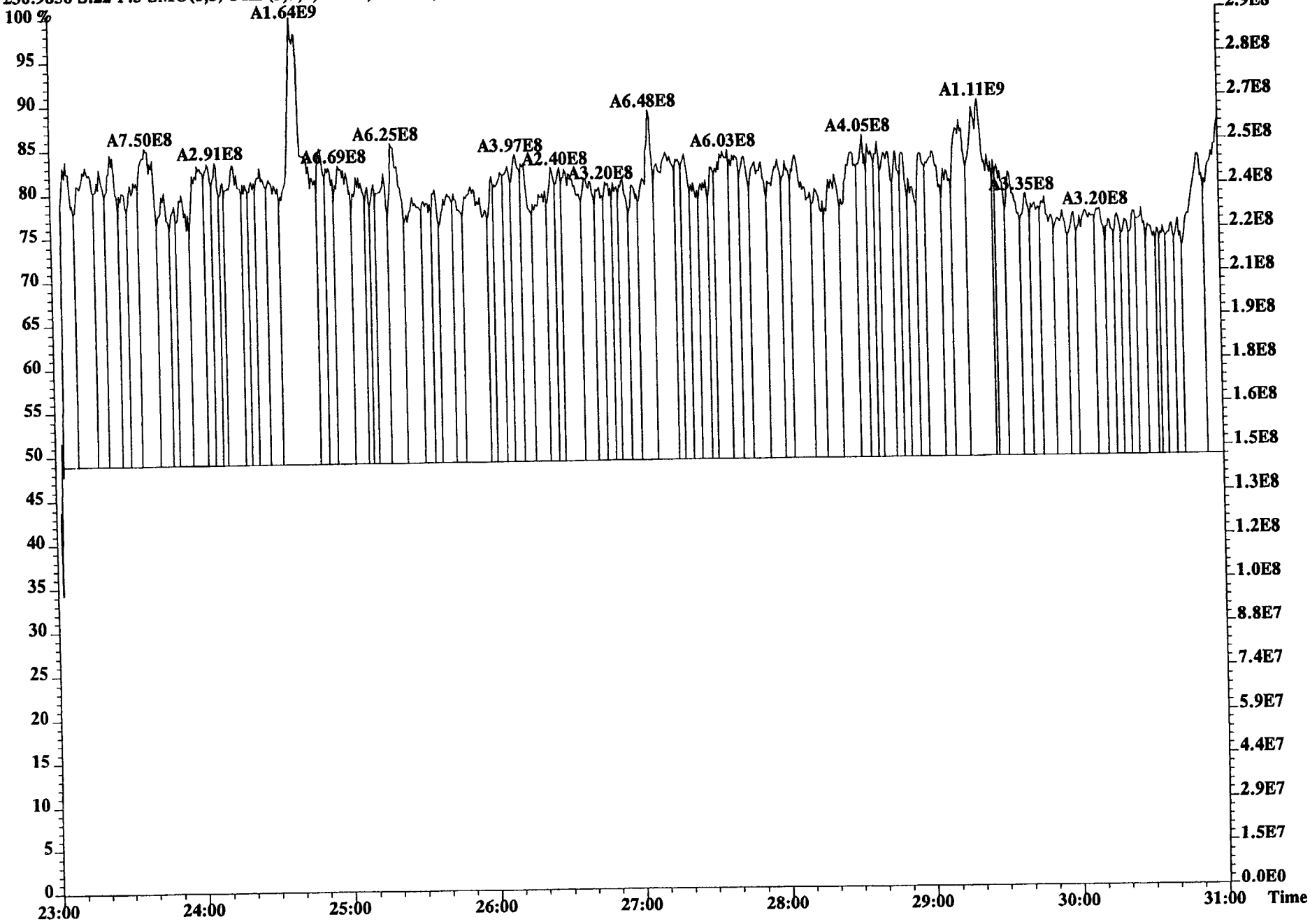
File:29OC98V4 #1-939 Acq:30-OCT-1998 08:37:13 GC EI+ Voltage SIR 70SE
Sample#22 Text:301802-2 :10X DIL. : : : Exp:PAHAIR
228.0939 S:22 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



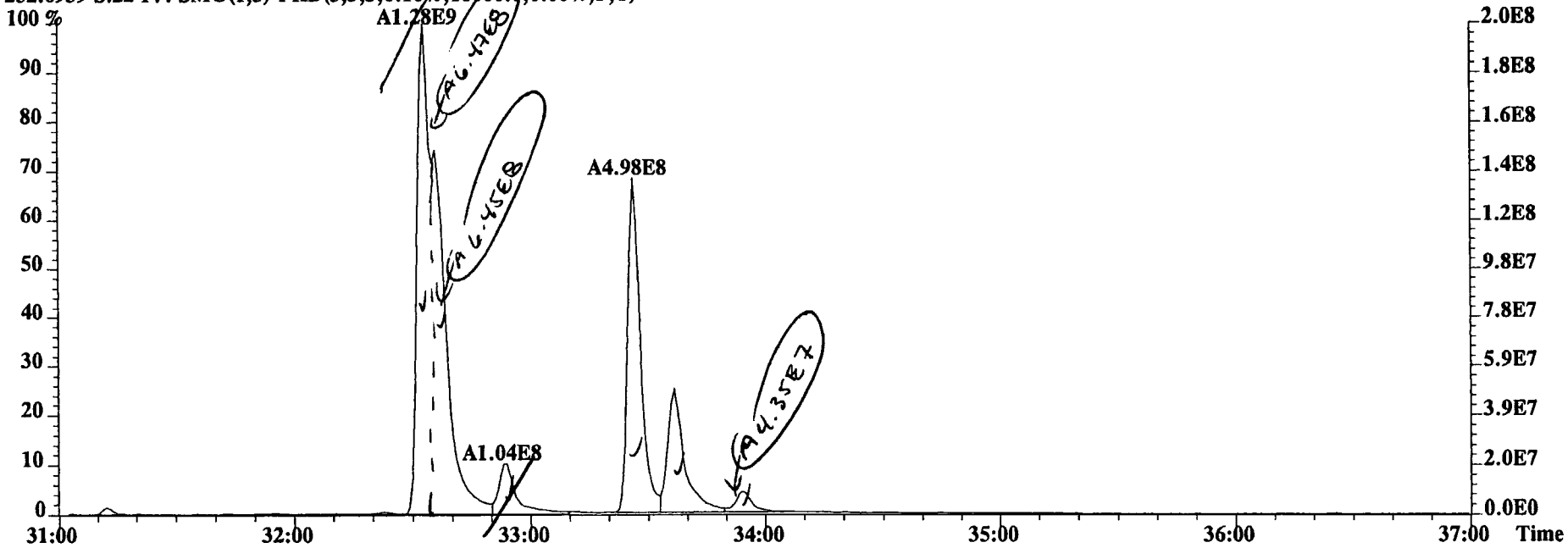
240.1692 S:22 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



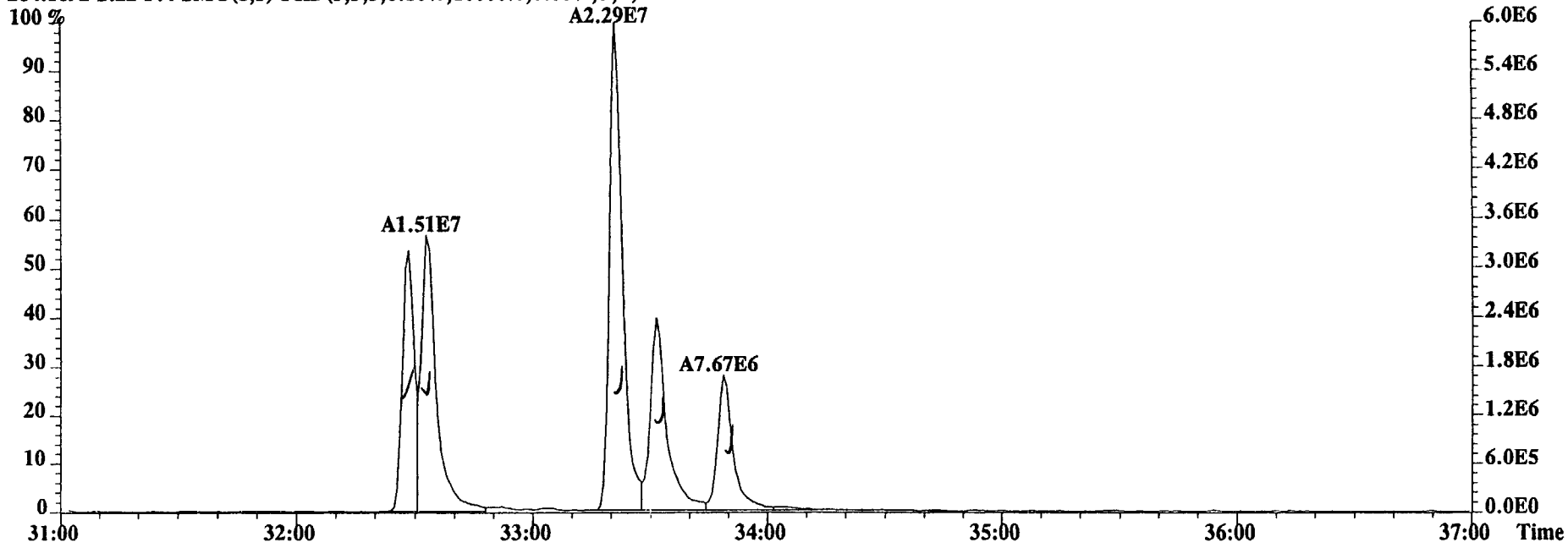
File:29OC98V4 #1-939 Acq:30-OCT-1998 08:37:13 GC EI+ Voltage SIR 70SE
Sample#22 Text:301802-2 :10X DIL. : : : Exp:PAHAIR
230.9856 S:22 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



File:29OC98V4 #1-878 Acq:30-OCT-1998 08:37:13 GC EI+ Voltage SIR 70SE
Sample#22 Text:301802-2 :10X DIL. : : : Exp:PAHAIR
252.0939 S:22 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

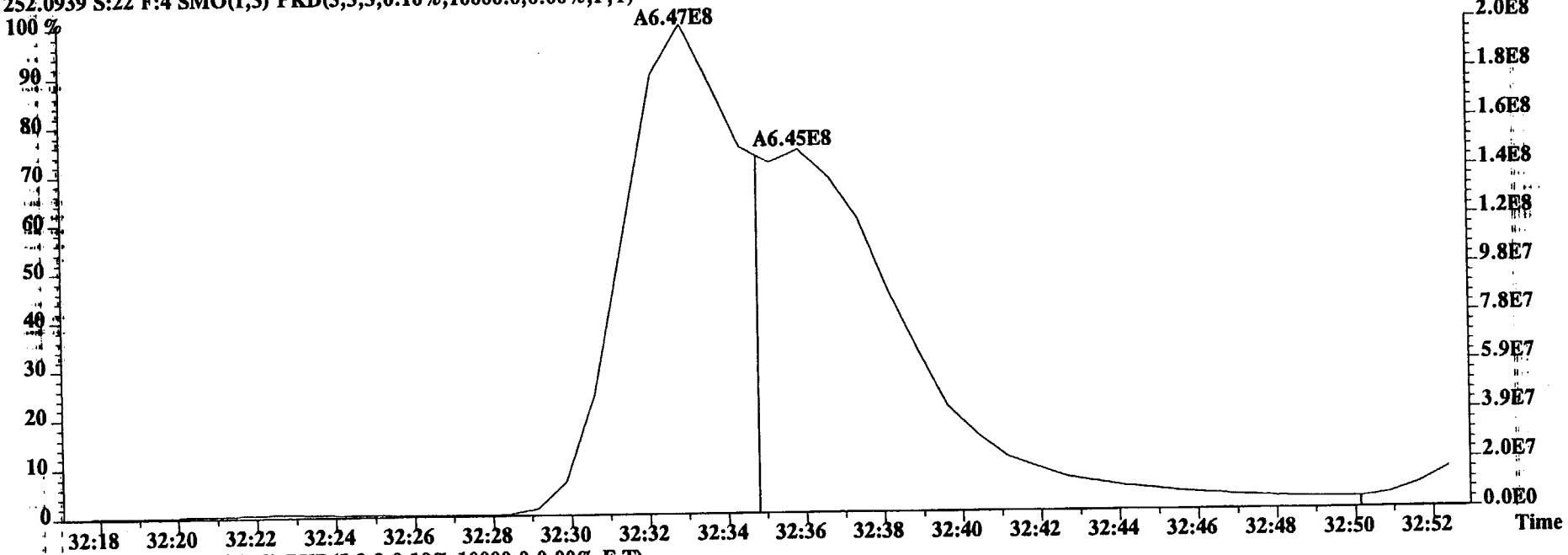


264.1692 S:22 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

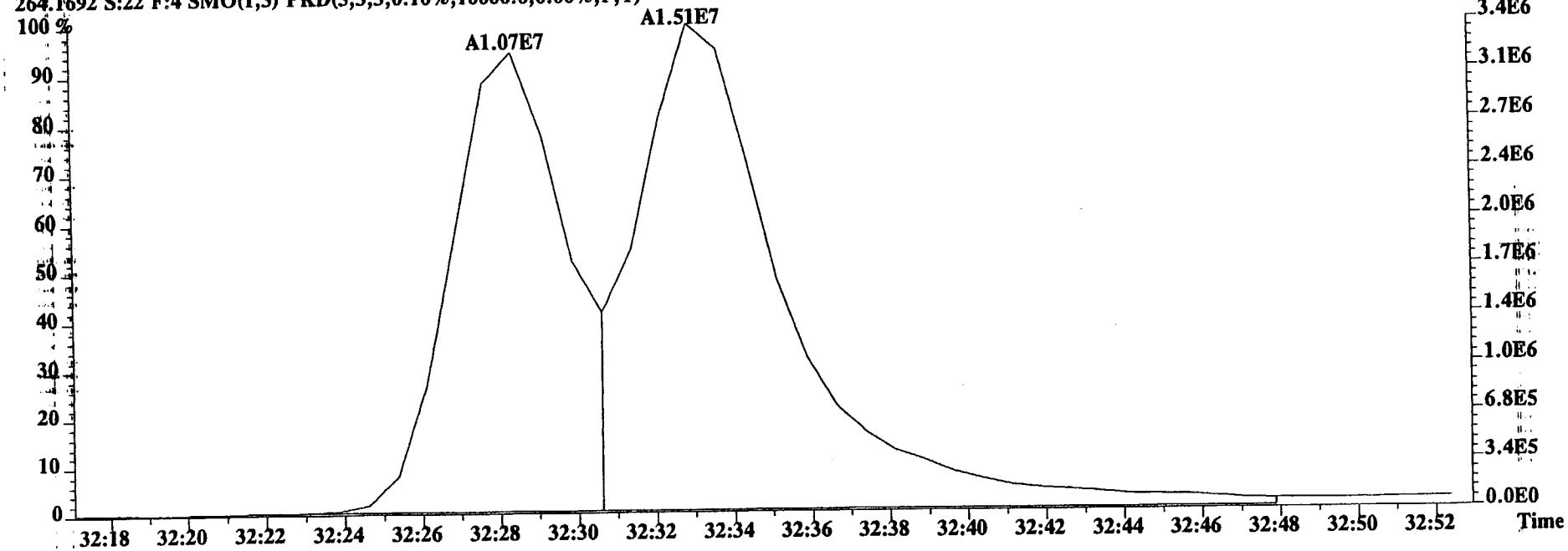


119

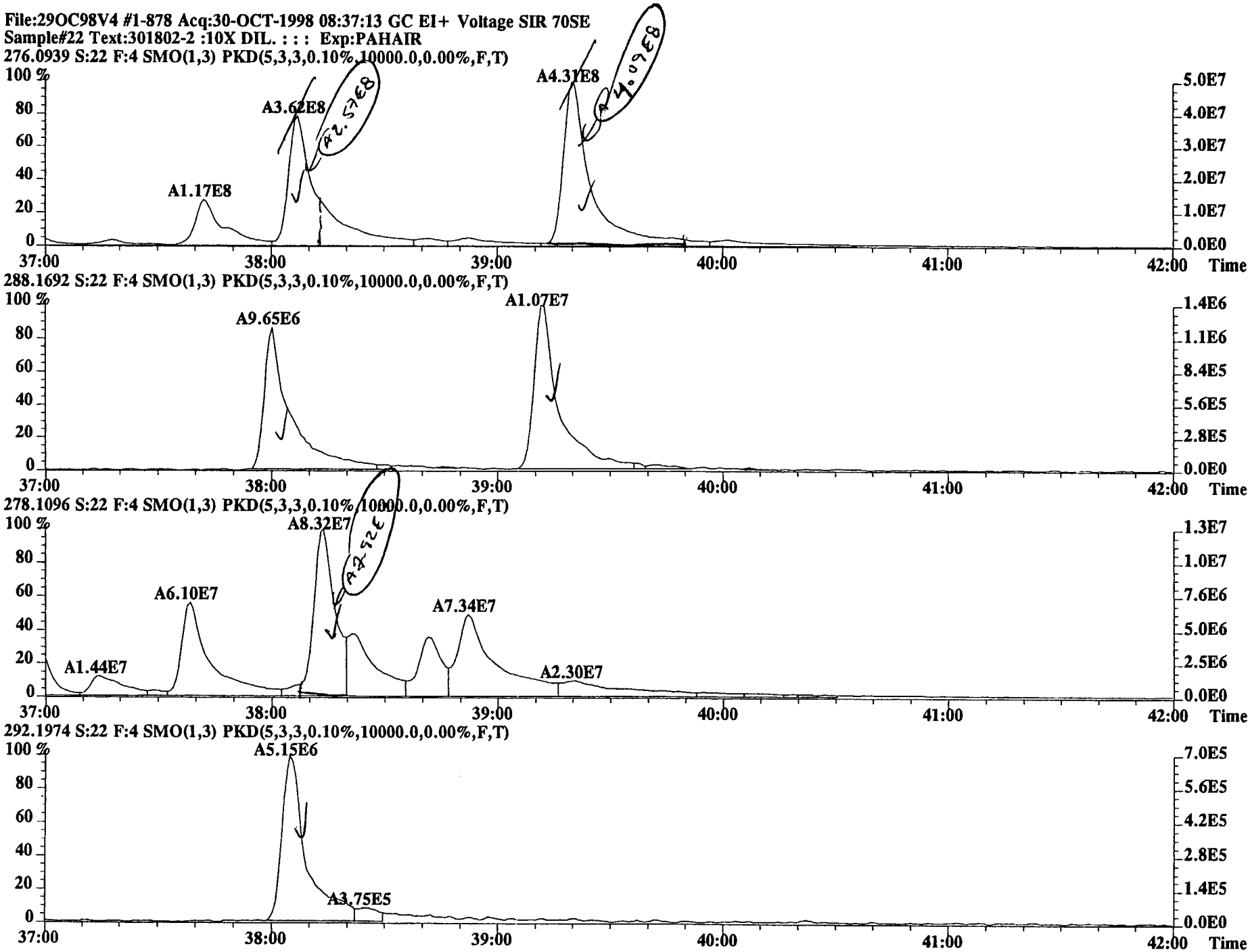
File:29OC98V4 #1-878 Acq:30-OCT-1998 08:37:13 GC EI+ Voltage SIR 70SE
Sample#22 Text:301802-2 :10X DIL. : : : Exp:PAHAIR
252.0939 S:22 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



264.1692 S:22 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

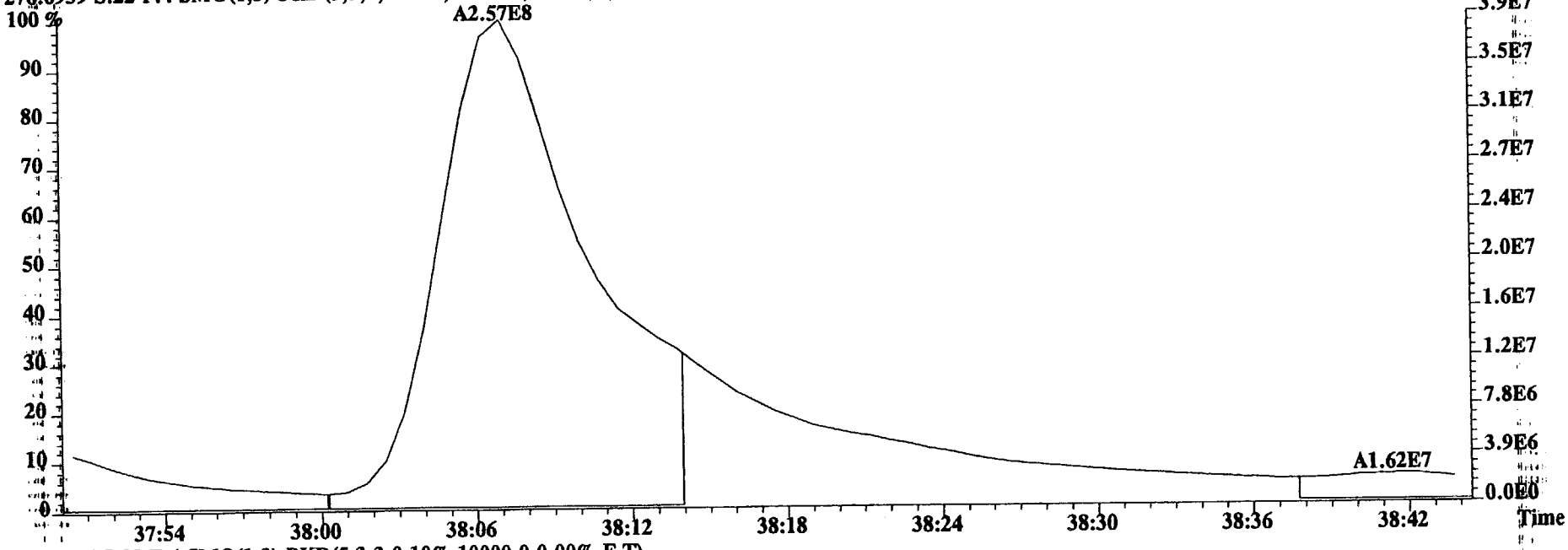


File:29OC98V4 #1-878 Acq:30-OCT-1998 08:37:13 GC EI+ Voltage SIR 70SE
Sample#22 Text:301802-2 :10X DIL. : : : Exp:PAHAIR

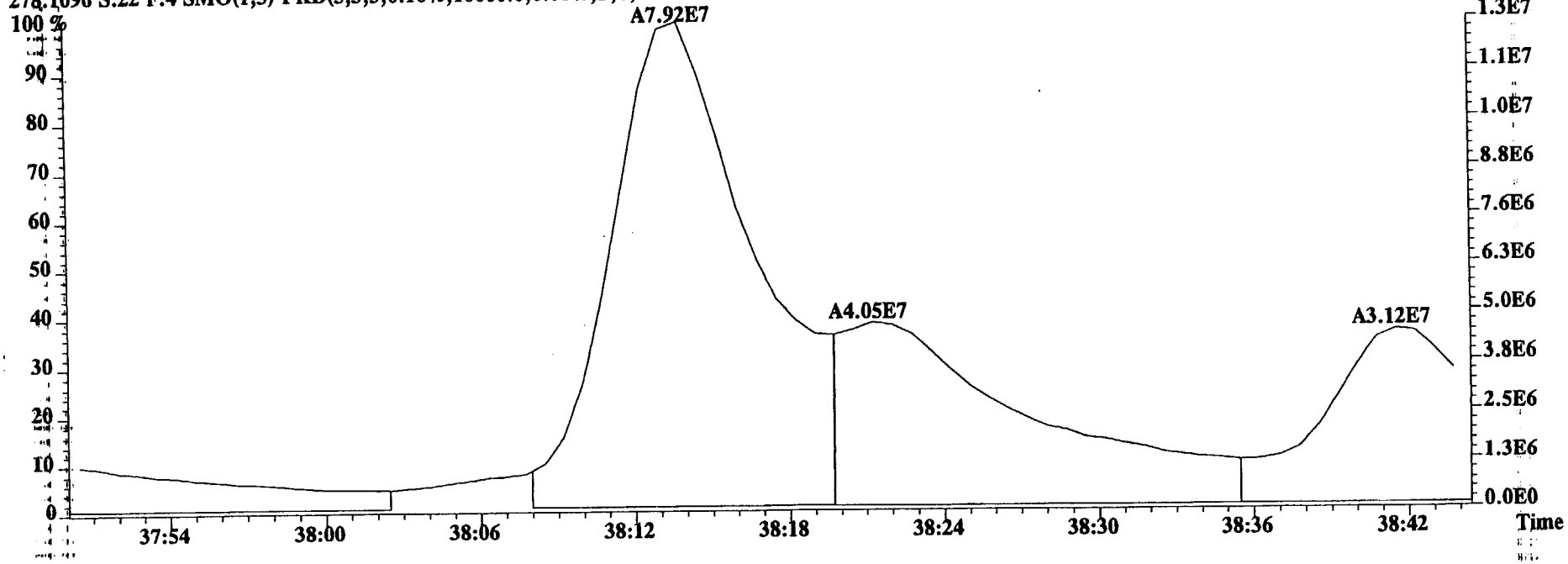


121

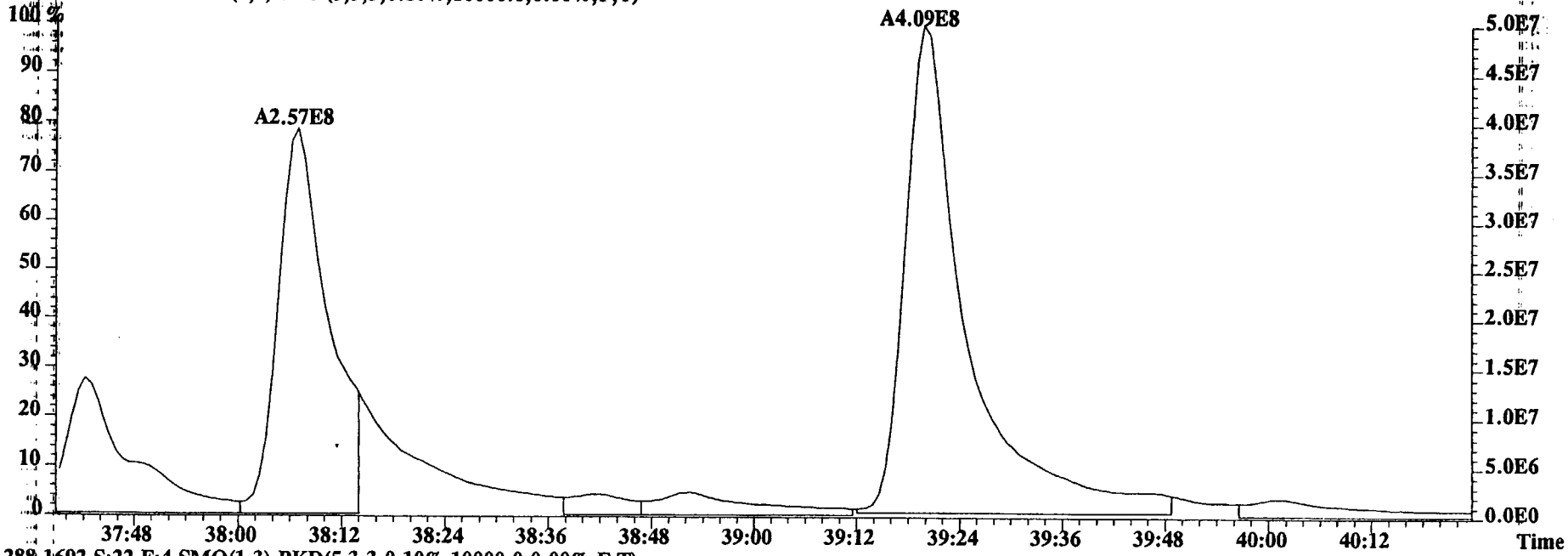
File:29OC98V4 #1-878 Acq:30-OCT-1998 08:37:13 GC EI+ Voltage SIR 70SE
Sample#22 Text:301802-2 :10X DIL. : : : Exp:PAHAIR
276.0939 S:22 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



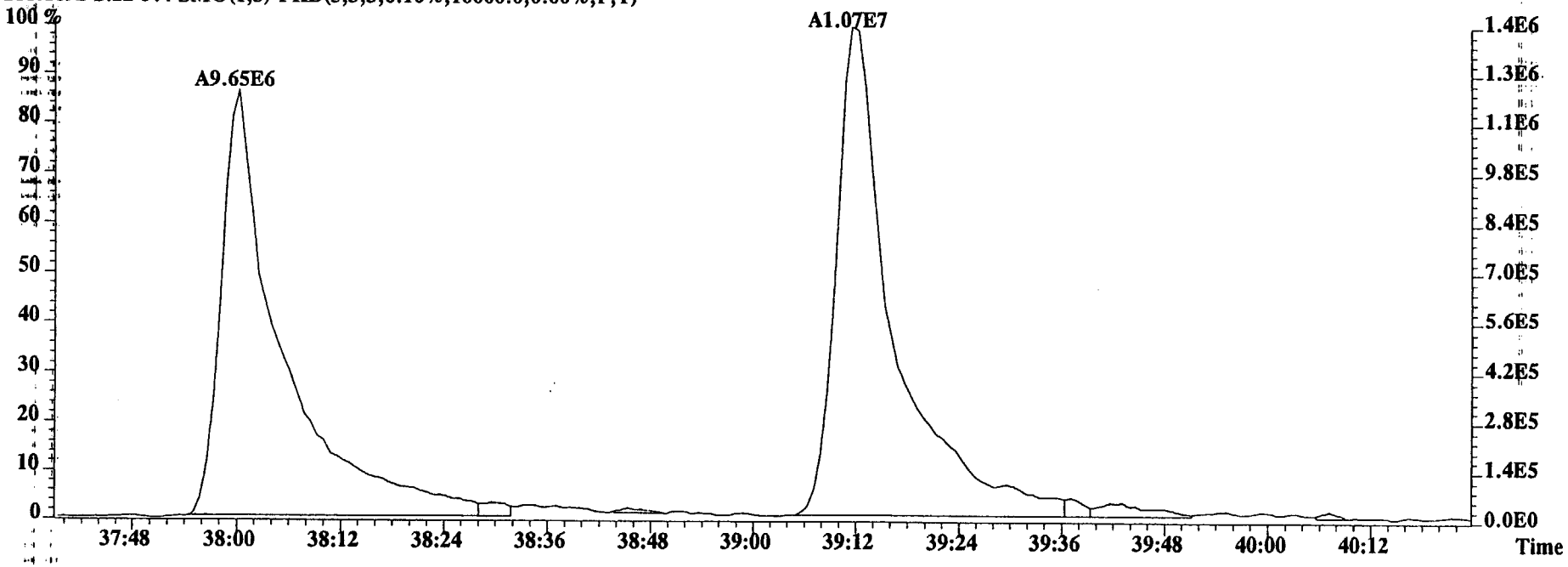
278.1096 S:22 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



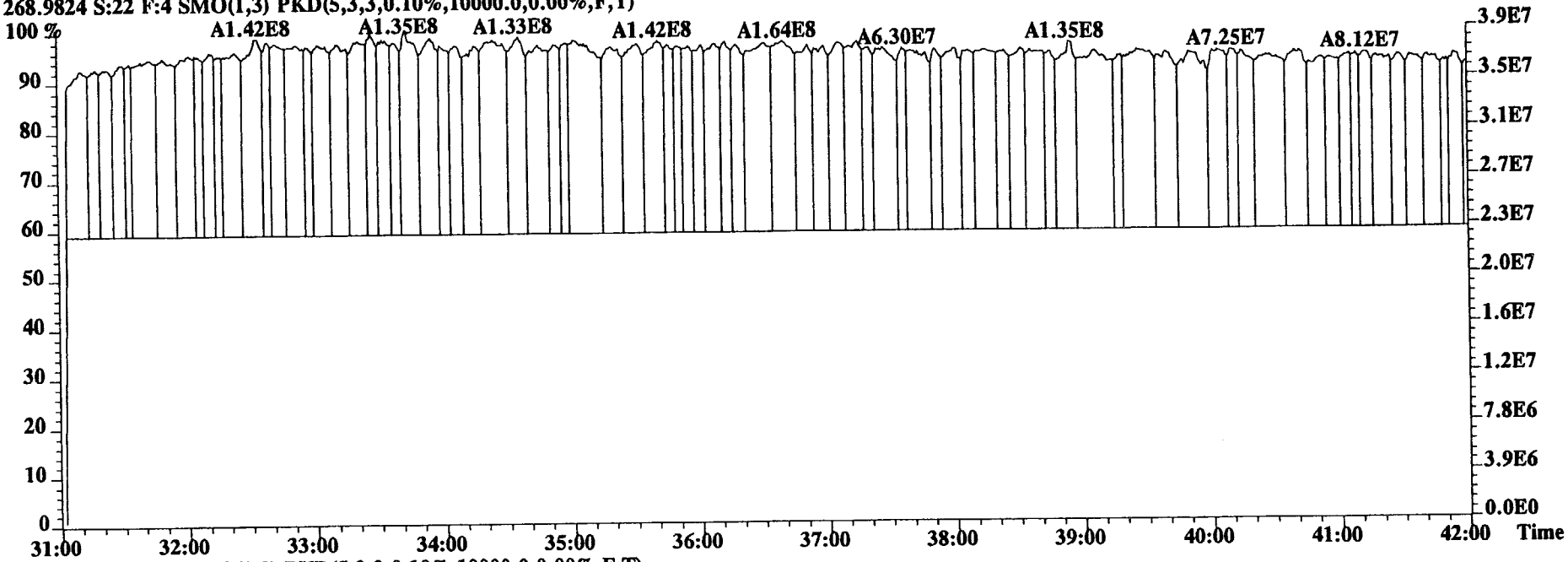
File:29OC98V4 #1-878 Acq:30-OCT-1998 08:37:13 GC EI+ Voltage SIR 70SE
Sample#22 Text:301802-2 :10X DIL. : : : Exp:PAHAIR
276.0939 S:22 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



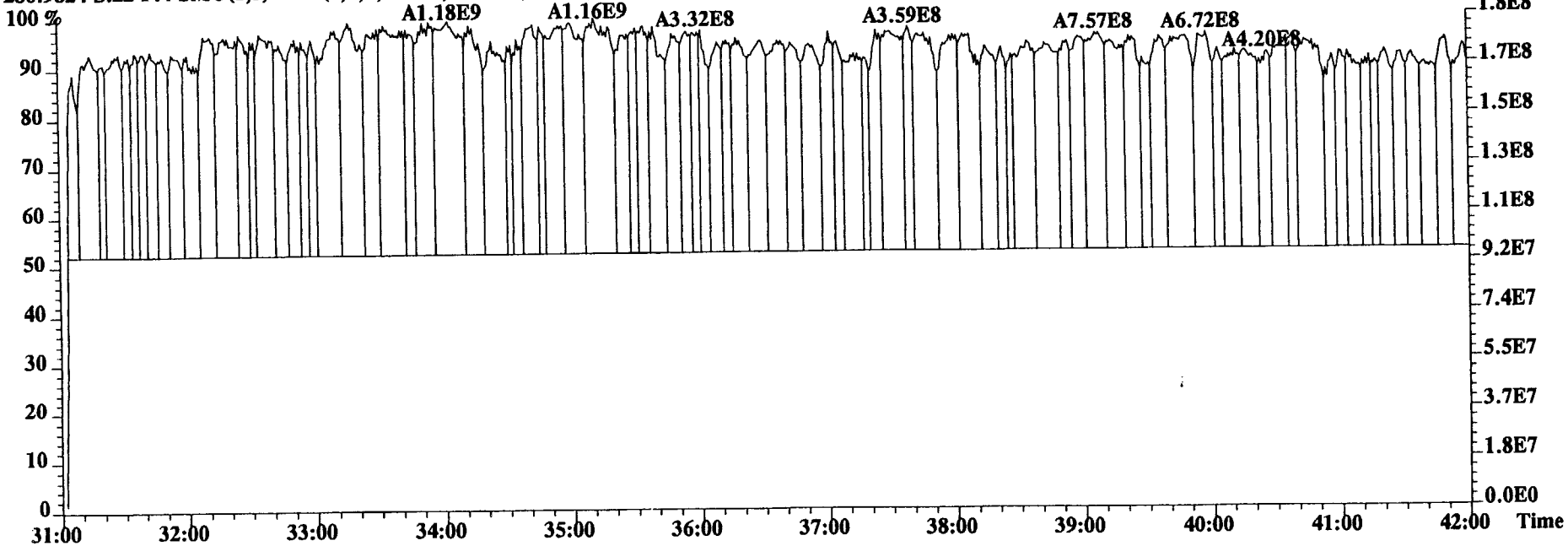
288.1692 S:22 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



File:29OC98V4 #1-878 Acq:30-OCT-1998 08:37:13 GC EI+ Voltage SIR 70SE
Sample#22 Text:301802-2 :10X DIL. : : : Exp:PAHAIR
268.9824 S:22 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



280.9824 S:22 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



124

04-NOV-1998 03:07:13 PM Dioxin Furan Unknown RESULTS

Mass Spec : VG-4 Results : 02NO98V4101.RES : PAHAIR.TRG
GC Column : DB-5 Date analyzed : 02-NOV-98
Data file : 02NO98V4 301802-2 100X DIL. : Ex Cal : PAHAIR02998V4.R
Weight : 0.5

Name	Total Response	Isotope Ratio	R. T. mm:ss	RRF	ng/ TRAIN	Rec/ MDL
d10-2-Methylnaphthalene	302000	1.00 Y	12: 29 Y	1.00	50.00	
d8-Naphthalene	508000	1.00 Y	10: 12 Y	2.24	37.54	75
Naphthalene	745170000	1.00 Y	10: 16 Y	1.23	1.2e+05	B E
d8-Acenaphthylene	214000	1.00 Y	15: 28 Y	1.21	29.19	58
Acenaphthylene	73468800	1.00 Y	15: 31 Y	0.94	3.6e+04	
d10-Acenaphthene	143292	1.00 Y	16: 2 Y	0.74	31.86	64
Acenaphthene	7620000	1.00 Y	16: 7 Y	1.25	4267.58	
d10-Anthracene	202000	1.00 Y	20: 55 Y	1.00	50.00	
d10-Phenanthrene	558000	1.00 Y	20: 45 Y	2.81	49.20	98
Phenanthrene	266236000	1.00 Y	20: 49 Y	0.89	5.3e+04	B E
d14-Terphenyl	534000	1.00 Y	26: 1 Y	1.00	50.00	
d10-Fluoranthene	470000	1.00 Y	24: 36 Y	1.41	31.19	62
Fluoranthene	91496200	1.00 Y	24: 39 Y	1.11	1.8e+04	

11-4-98
CP

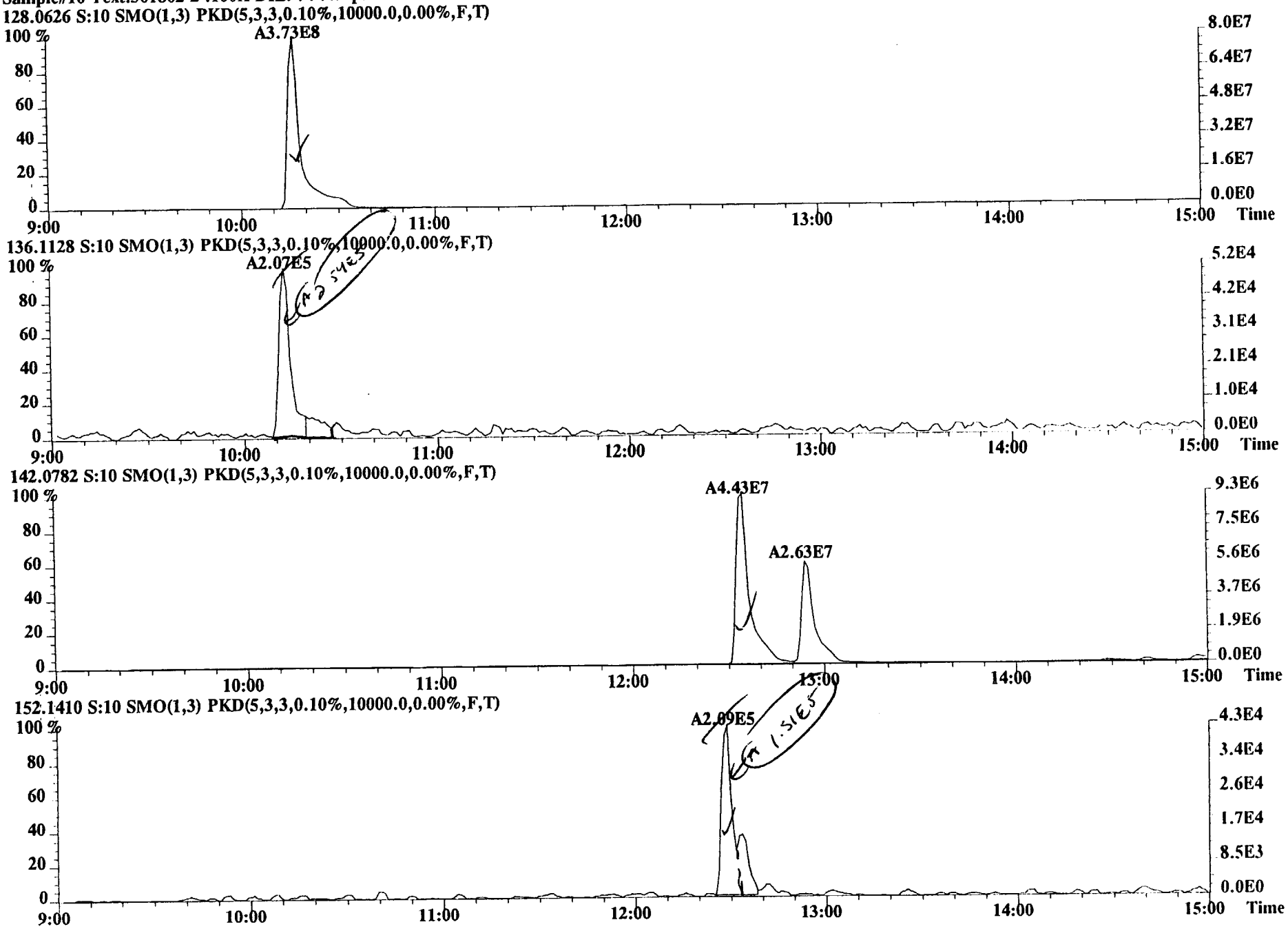
		0.5	
Rec/ MDL			
		151000	151000
	75	254000	254000
B	E	372585000	372585000
	58	107000	107000
		36734400	36734400
	64	71646	71646
		3810000	3810000
		101000	101000
	98	279000	279000
B	E	133118000	133118000
		267000	267000
	62	235000	235000
		45748100	45748100

03-NOV-1998 08:33:30 AM 429AIR Unknown RESULTS

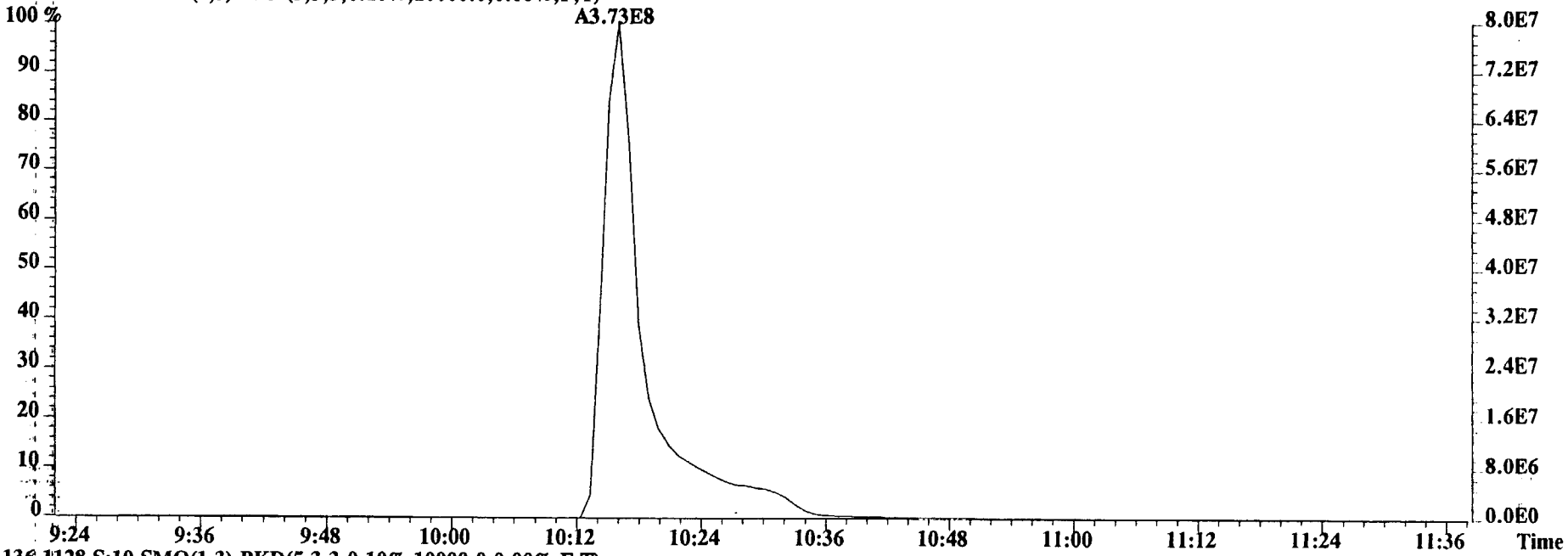
Mass Spec : VG-4 Results : 02NO98V4101.RES : PAHAIR.TRG
GC Column : DB-5 Date analyzed : 02-NOV-98
Data file : 02NO98V4 301802-2 :100X DIL. : : : Ex Cal : PAHAIR102998V4.R
Weight : 0.5

Name	Total Response	Isotope Ratio		R. T. mm:ss		RRF	ng/ TRAIN	Rec/ MDL
d10-2-Methylnaphthalene	418344	1.00	Y	12: 29	Y	1.00	50.00	
d8-Naphthalene	413156	1.00	Y	10: 12	Y	2.24	22.04	44
Naphthalene	745170000	1.00	Y	10: 16	Y	1.23	1.5e+05	0.000
2-Methylnaphthalene	88557800	1.00	Y	12: 34	Y	0.56	3.8e+04	0.000
d8-Acenaphthylene	199044	1.00	Y	15: 28	Y	1.21	19.60	39
Acenaphthylene	73468800	1.00	Y	15: 31	Y	0.94	3.9e+04	0.000
d10-Acenaphthene	143292	1.00	Y	16: 2	Y	0.74	23.00	46
Acenaphthene	9442080	1.00	Y	16: 7	Y	1.25	5288.04	0.000
d10-Anthracene	181369	1.00	Y	20: 55	Y	1.00	50.00	
d10-Fluorene	150584	1.00	Y	17: 42	Y	1.42	29.22	58
Fluorene	1530162	1.00	Y	17: 47	Y	1.16	875.60	0.000
d10-Phenanthrene	538016	1.00	Y	20: 45	Y	2.81	52.83	106
Phenanthrene	266236000	1.00	Y	20: 49	Y	0.89	5.5e+04	0.000
Anthracene	* No Peak	0.00	N	20: 59	N	0.80	0.00	0.000
d14-Terphenyl	515862	1.00	Y	26: 1	Y	1.00	50.00	
d10-Fluoranthene	431102	1.00	Y	24: 36	Y	1.41	29.62	59
Fluoranthene	91496200	1.00	Y	24: 39	Y	1.11	1.9e+04	0.000
d10-Pyrene	487738	1.00	Y	25: 17	Y	1.52	31.14	62
Pyrene	53965600	1.00	Y	25: 21	Y	1.21	9181.68	0.000
d12-Benzo(a)anthracene	422002	1.00	Y	29: 9	Y	0.90	45.45	91
Benzo(a)anthracene	21731600	1.00	Y	29: 12	Y	1.20	4275.32	0.000
d12-Chrysene	587974	1.00	Y	29: 15	Y	1.28	44.55	89
Chrysene	66603200	1.00	Y	29: 19	Y	1.08	1.0e+04	0.000
d12-Benzo(e)pyrene	835210	1.00	Y	33: 23	Y	1.00	50.00	
d12-Benzo(b)fluoranthene	228304	1.00	Y	32: 29	Y	0.45	30.11	60
Benzo(b)fluoranthene	32515000	1.00	Y	32: 34	Y	1.17	1.2e+04	0.000
d12-Benzo(k)fluoranthene	541238	1.00	Y	32: 34	Y	0.95	34.18	68
Benzo(k)fluoranthene	32515000	1.00	Y	32: 34	Y	1.16	5160.44	0.000
d12-Benzo(a)pyrene	422678	1.00	Y	33: 32	Y	0.68	37.39	75
Benzo(e)pyrene	14489580	1.00	Y	33: 27	Y	1.64	2089.21	0.000
Benzo(a)pyrene	8103760	1.00	Y	33: 38	Y	1.07	1788.51	0.000
d12-Perylene	91735	1.00	Y	33: 51	Y	0.63	8.71	17
Perylene	* No Peak	0.00	N	33: 56	N	1.71	0.00	0.000
d12-Indeno(123-cd)pyrene	90541	1.00	Y	38: 3	Y	0.44	12.19	24
Indeno(123-cd)pyrene	10478100	1.00	Y	38: 9	Y	0.62	1.9e+04	0.000
d14-Dibenz(ah)anthracene	* No Peak	0.00	N	38: 6	N	0.25	0.00	0
Dibenz(ah)anthracene	2920500	1.00	Y	38: 16	Y	1.40	*NoINoIs	
d12-Benzo(ghi)perylene	291436	1.00	Y	39: 15	Y	0.58	30.10	60
Benzo(ghi)perylene	16019160	1.00	Y	39: 21	Y	1.02	5409.99	0.000
d10-Fluorene	150584	1.00	Y	17: 42	Y	1.42	6.34	13
13C-Fluorene	* No Peak	0.00	N	17: 48	N	1.00	0.00	0.000

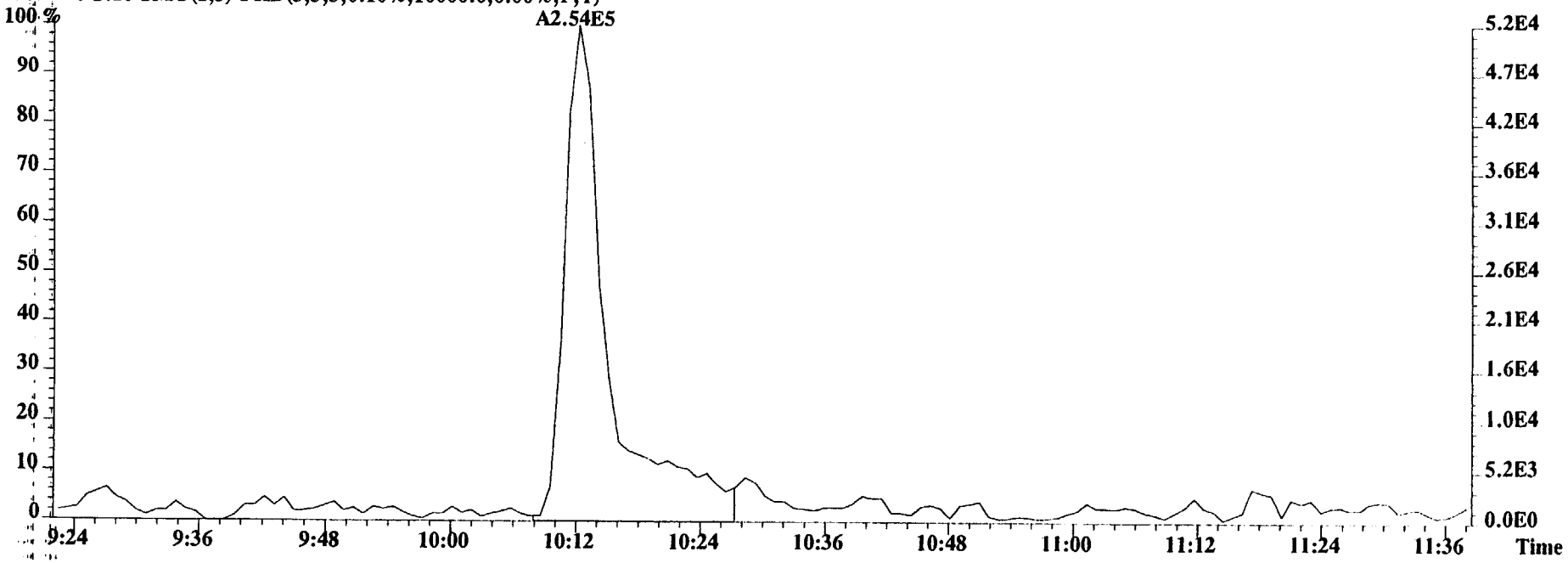
File:02NO98V4 #1-510 Acq: 2-NOV-1998 20:34:33 GC EI+ Voltage SIR 70SE
Sample#10 Text:301802-2 :100X DIL. : : : Exp:PAHAIR



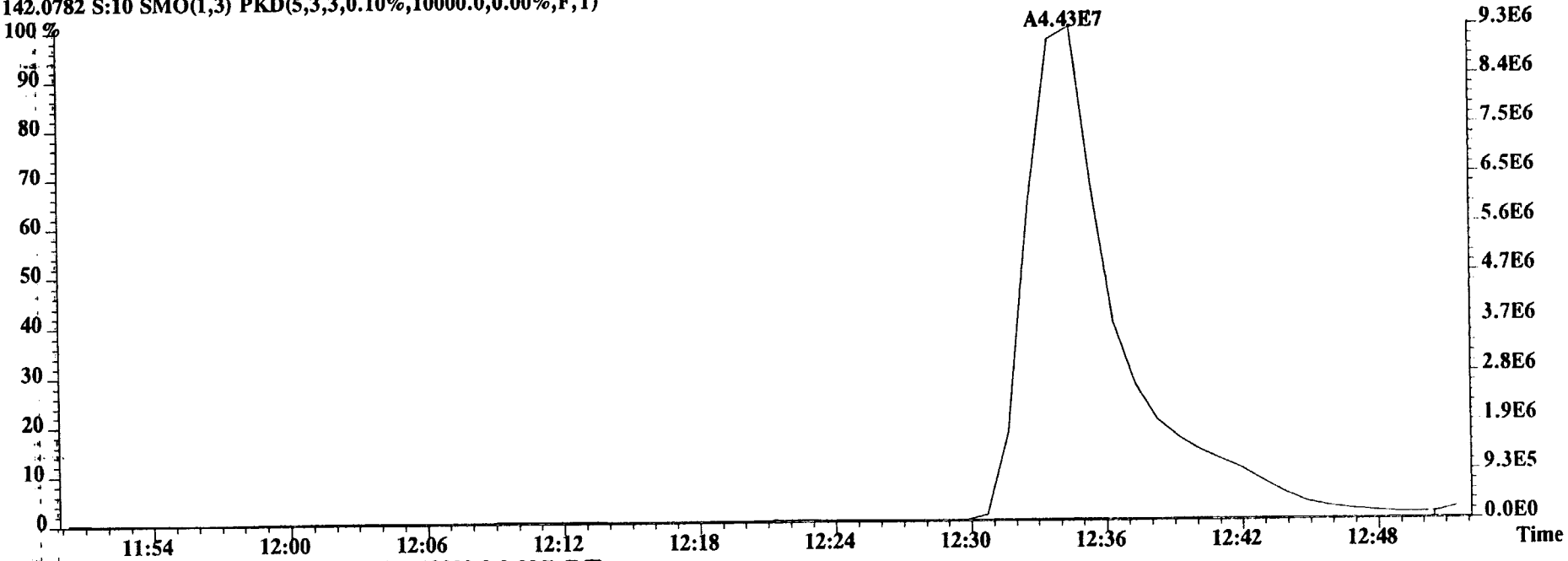
File:02NO98V4 #1-510 Acq: 2-NOV-1998 20:34:33 GC EI+ Voltage SIR 70SE
Sample#10 Text:301802-2 :100X DIL. : : : Exp:PAHAIR
128.0626 S:10 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



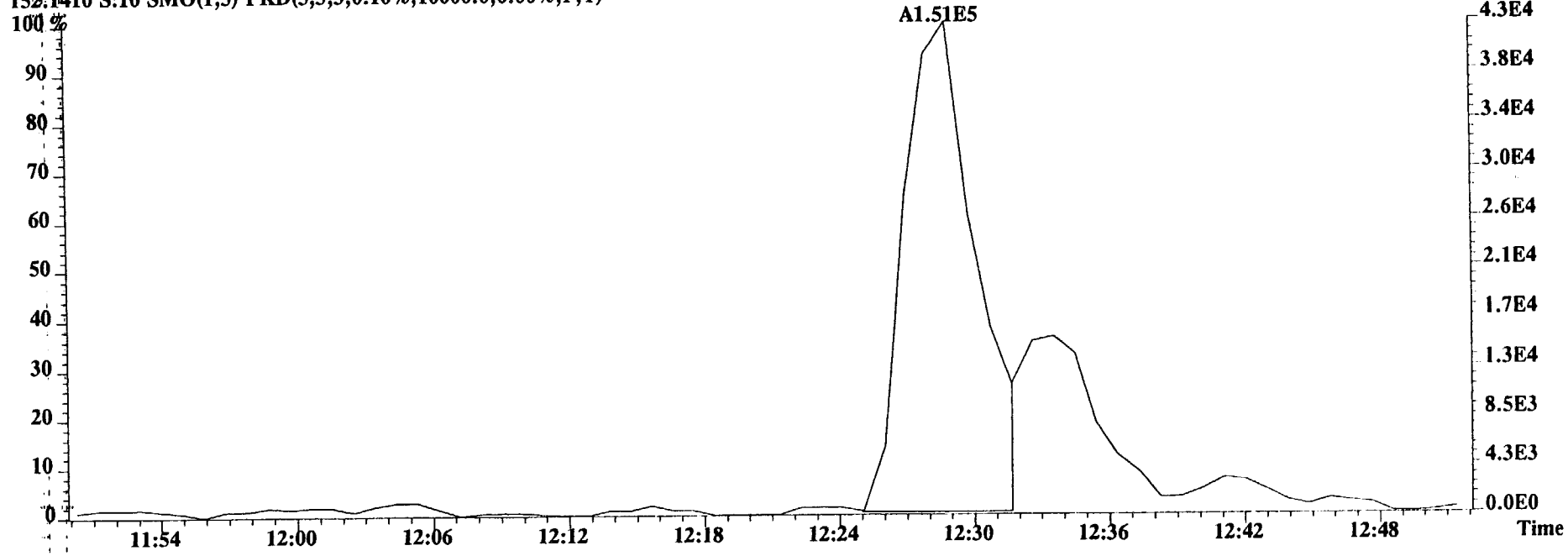
136.1128 S:10 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



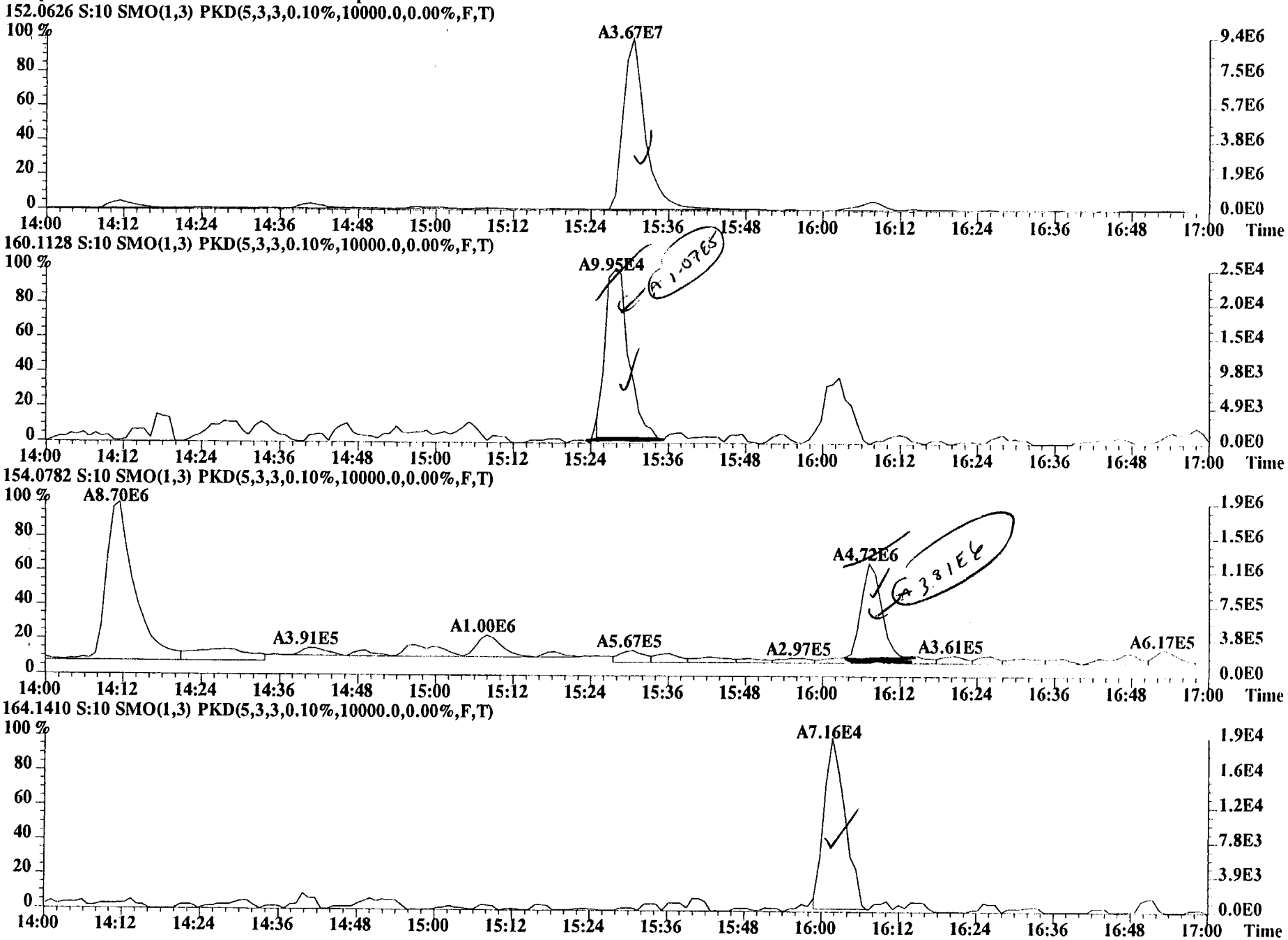
File:02NO98V4 #1-510 Acq: 2-NOV-1998 20:34:33 GC EI+ Voltage SIR 70SE
Sample#10 Text:301802-2 :100X DIL. : : : Exp:PAHAIR
142.0782 S:10 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



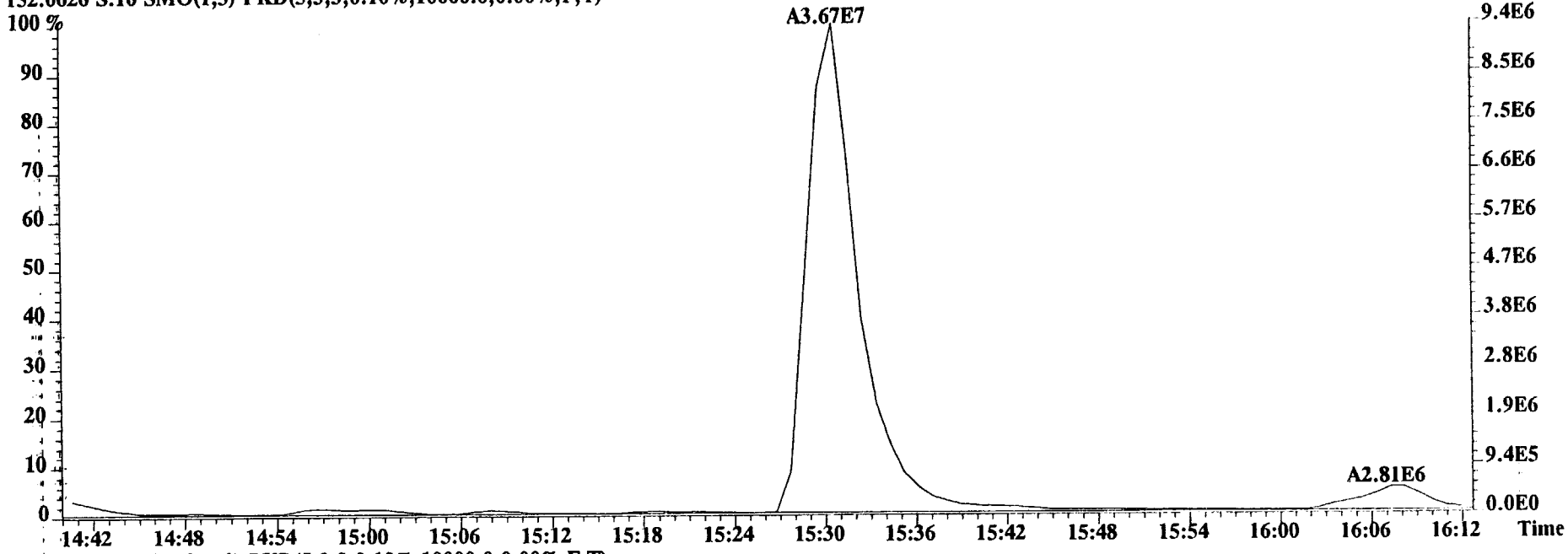
152.1410 S:10 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



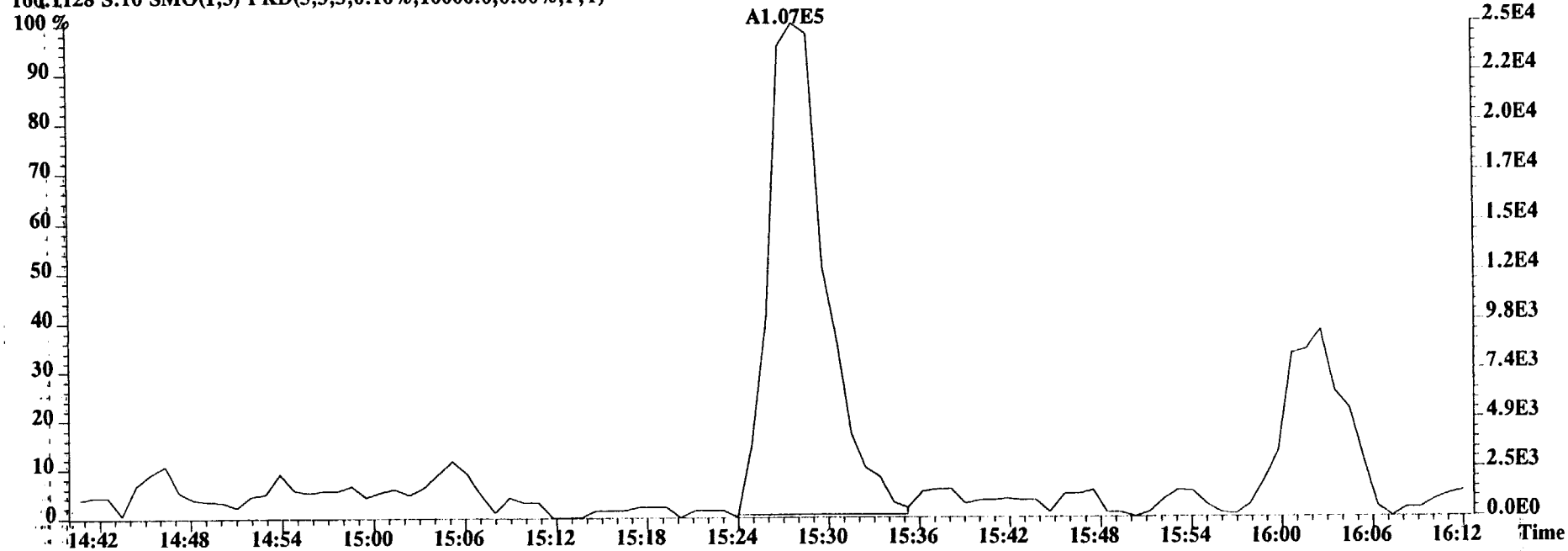
File:02NO98V4 #1-510 Acq: 2-NOV-1998 20:34:33 GC EI+ Voltage SIR 70SE
Sample#10 Text:301802-2 :100X DIL. : : : Exp:PAHAIR



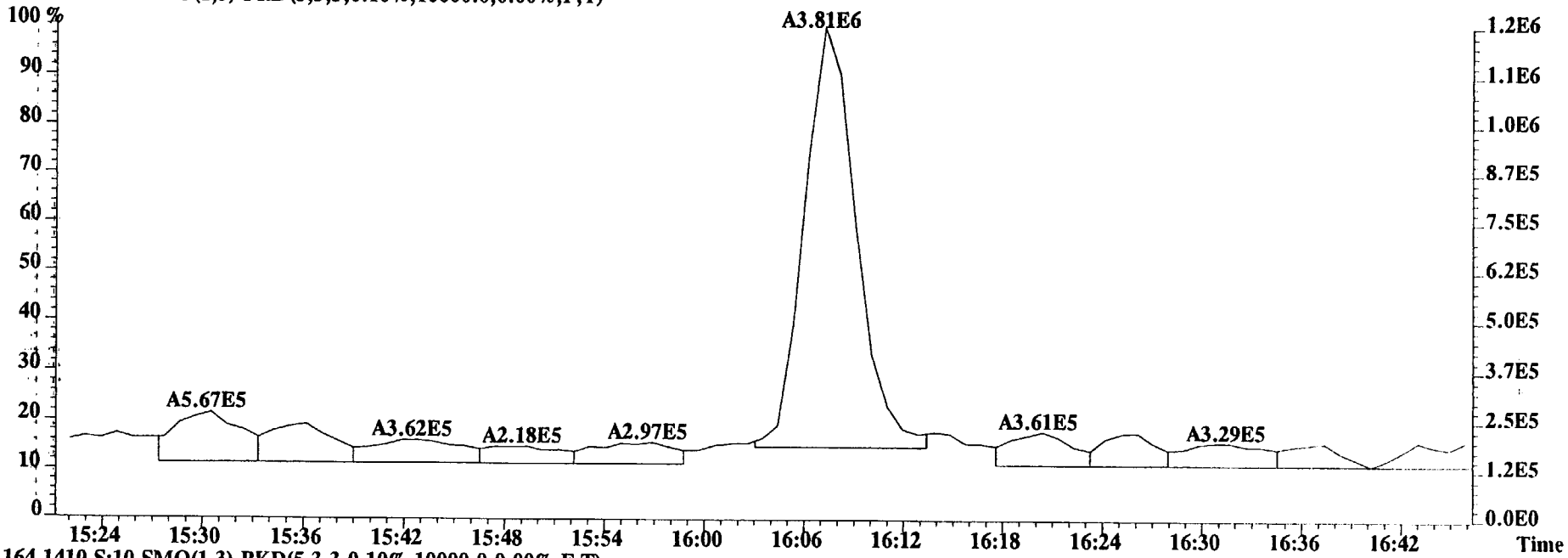
File:02NO98V4 #1-510 Acq: 2-NOV-1998 20:34:33 GC EI+ Voltage SIR 70SE
Sample#10 Text:301802-2 :100X DIL. : : : Exp:PAHAIR
152.0626 S:10 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



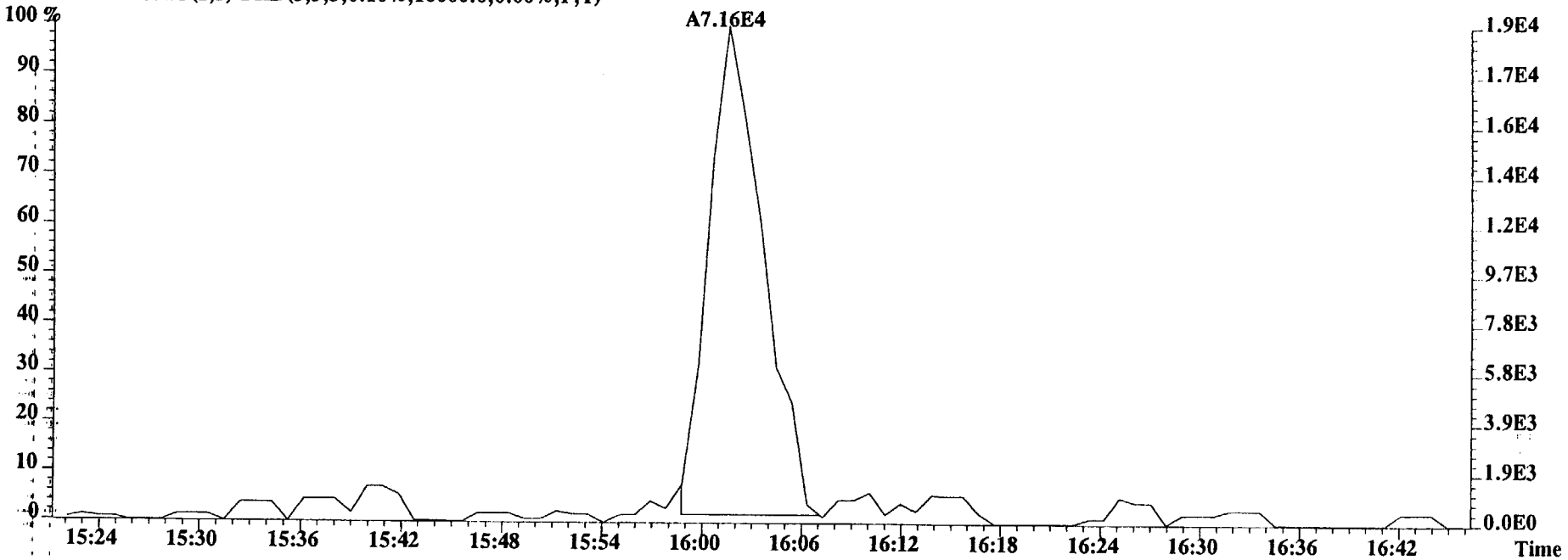
160.1128 S:10 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



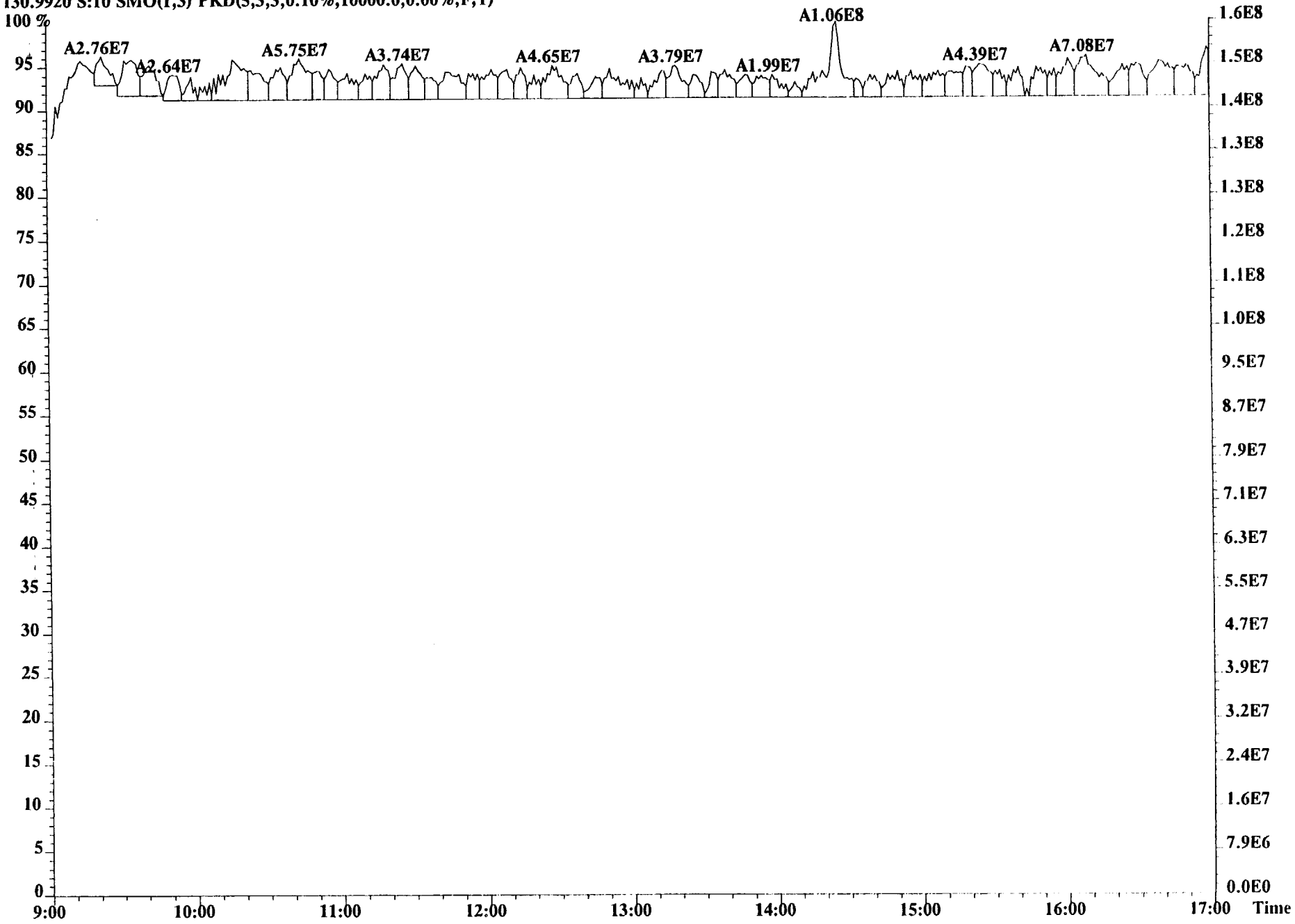
File:02NO98V4 #1-510 Acq: 2-NOV-1998 20:34:33 GC EI+ Voltage SIR 70SE
Sample#10 Text:301802-2 :100X DIL. : : : Exp:PAHAIR
154.0782 S:10 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



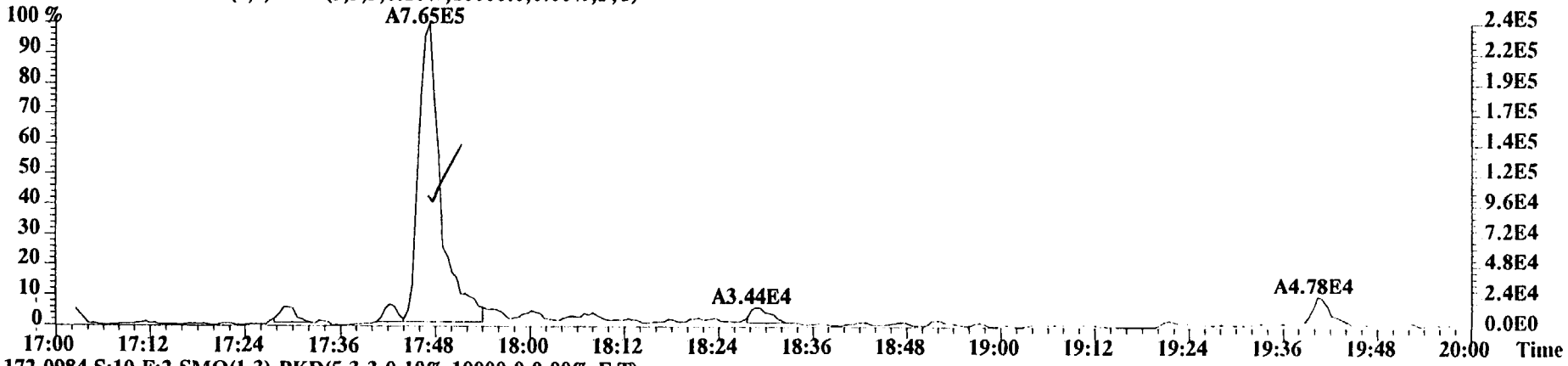
164.1410 S:10 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



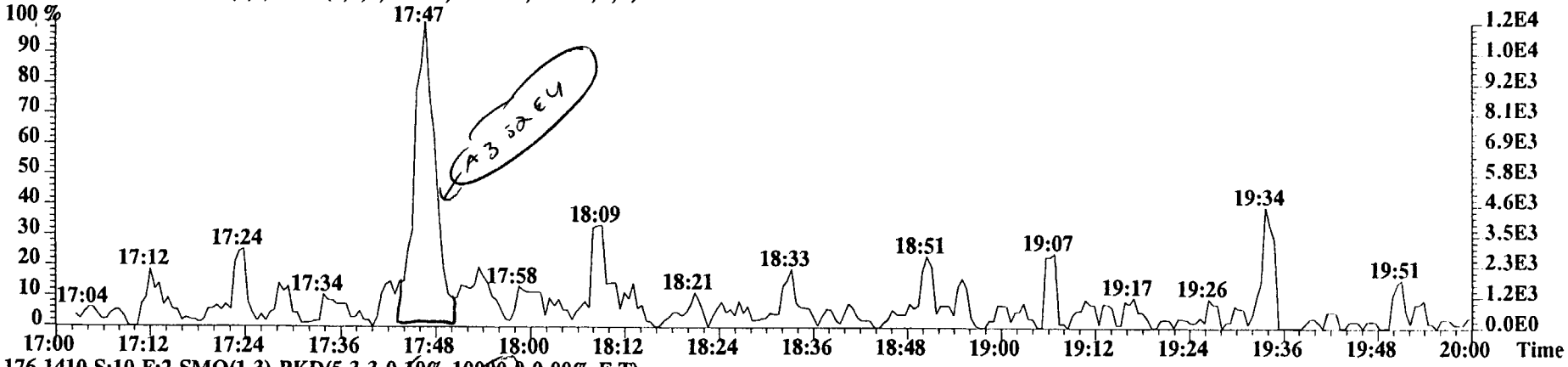
File:02NO98V4 #1-510 Acq: 2-NOV-1998 20:34:33 GC EI+ Voltage SIR 70SE
Sample#10 Text:301802-2 :100X DIL. : : : Exp:PAHAIR
130.9920 S:10 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



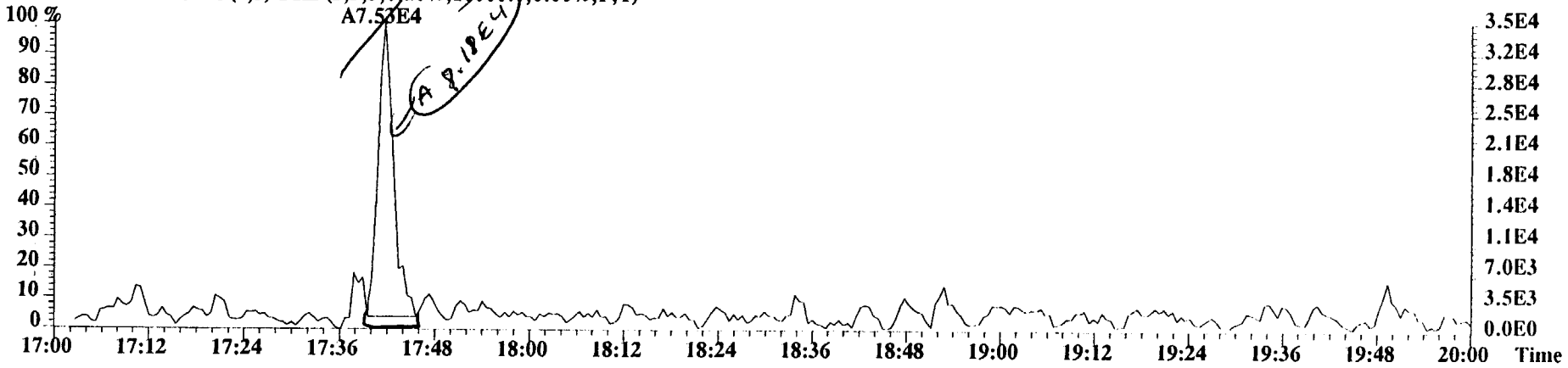
File:02NO98V4 #1-640 Acq: 2-NOV-1998 20:34:33 GC EI+ Voltage SIR 70SE
Sample#10 Text:301802-2 :100X DIL. : : : Exp:PAHAIR
166.0798 S:10 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



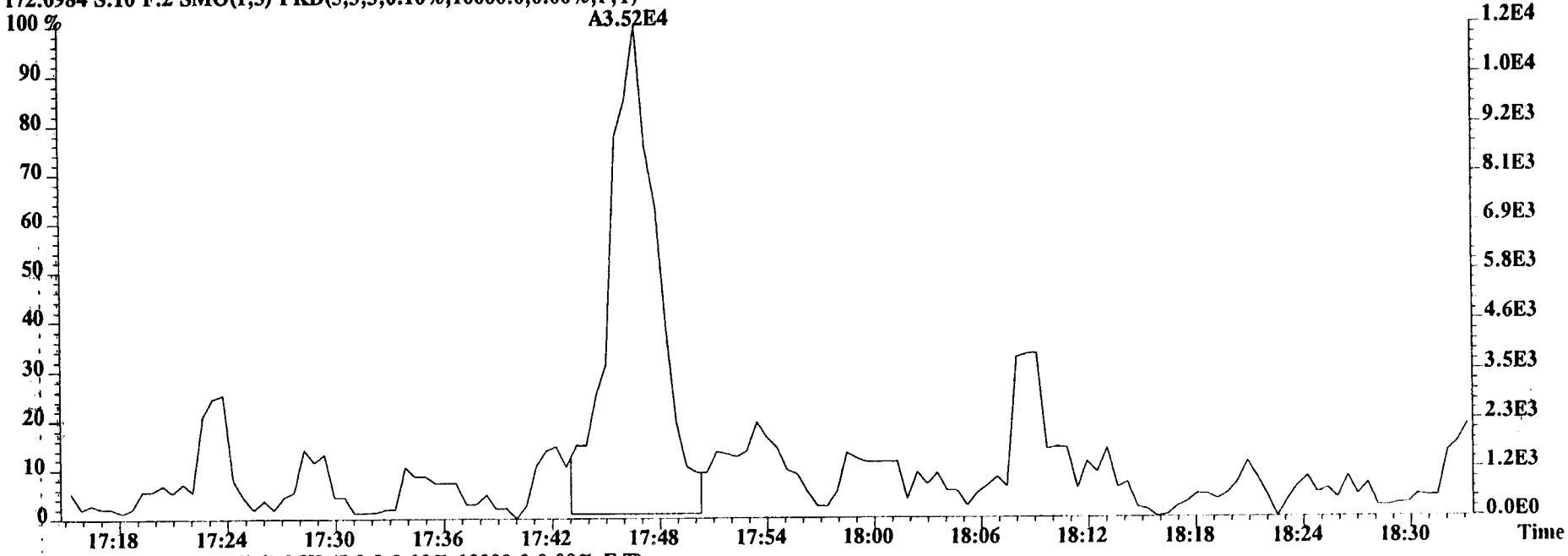
172.0984 S:10 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



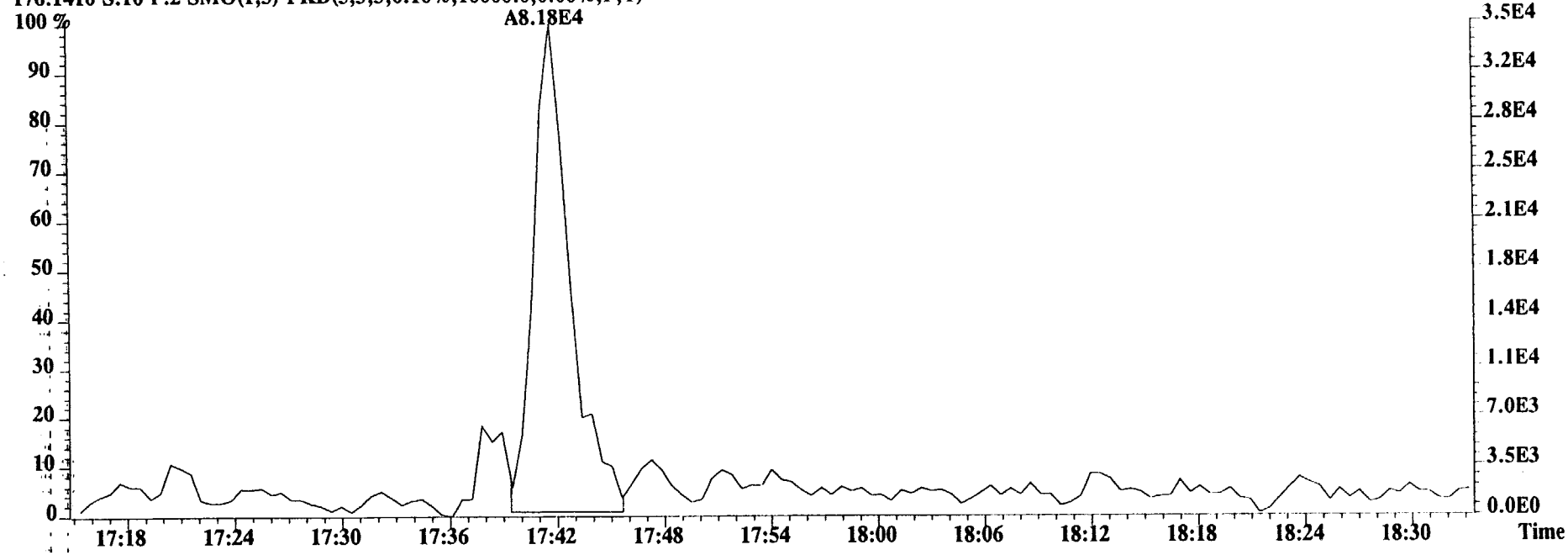
176.1410 S:10 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



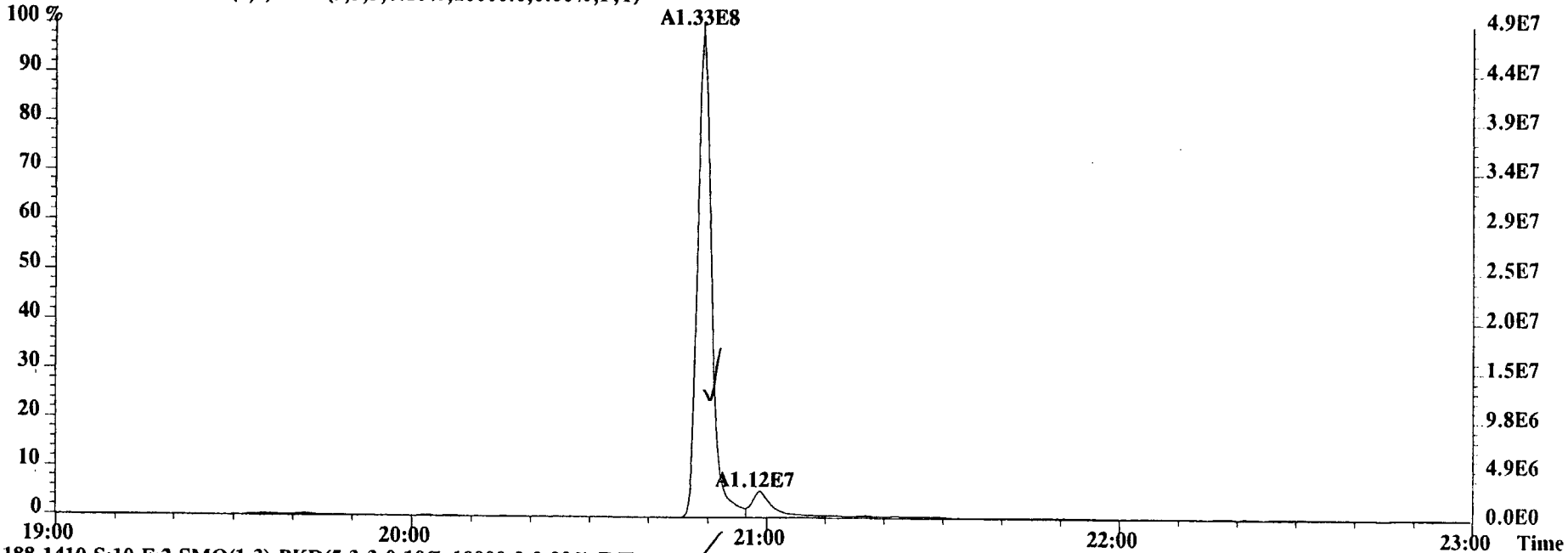
File:02NO98V4 #1-640 Acq: 2-NOV-1998 20:34:33 GC EI+ Voltage SIR 70SE
Sample#10 Text:301802-2 :100X DIL. : : : Exp:PAHAIR
172.0984 S:10 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



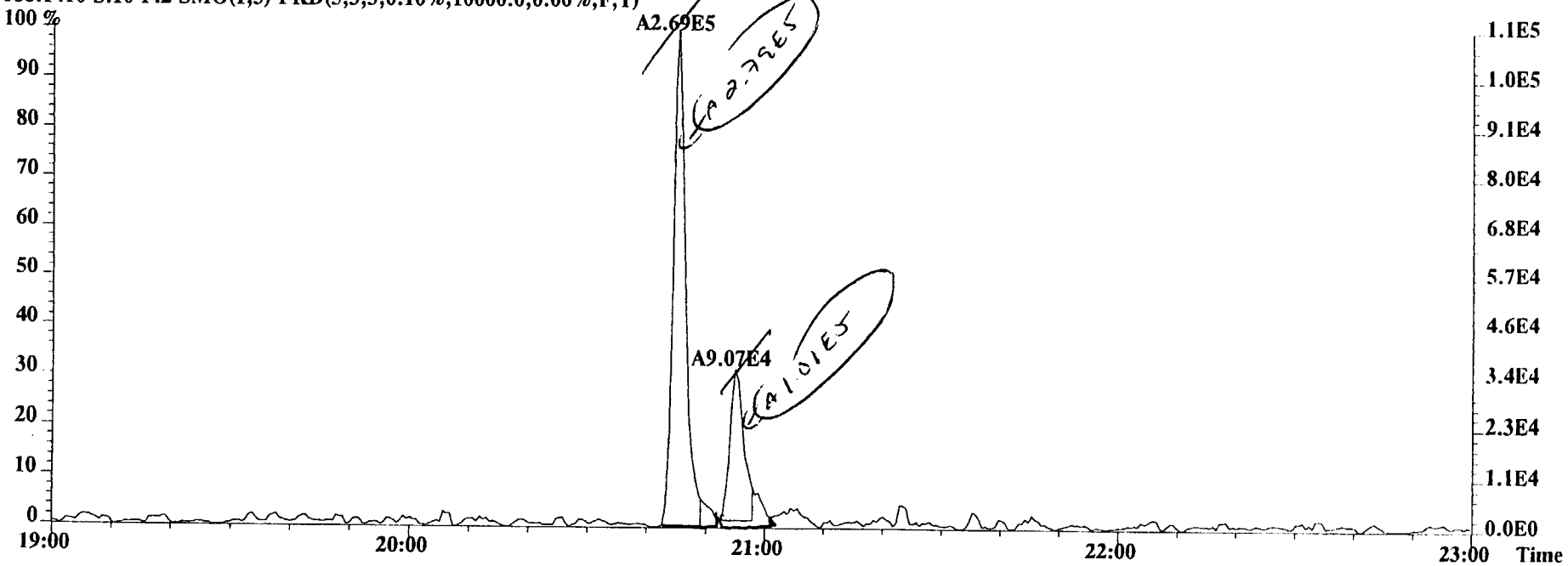
176.1410 S:10 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



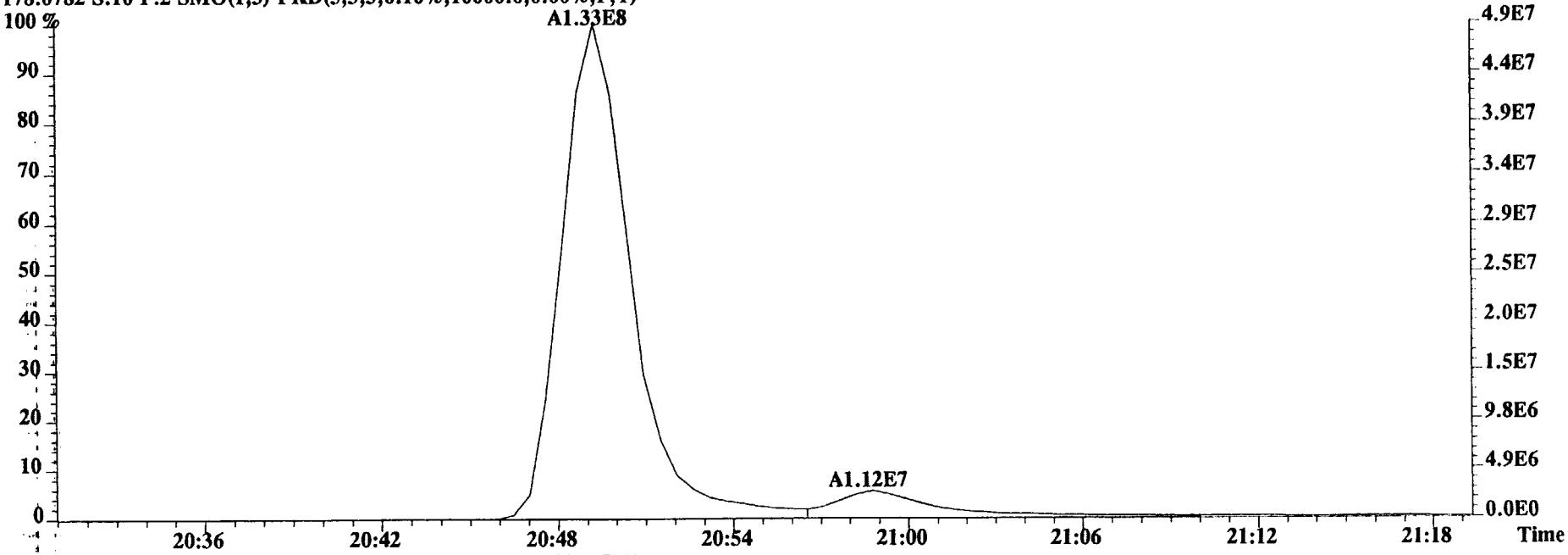
File:02NO98V4 #1-640 Acq: 2-NOV-1998 20:34:33 GC EI+ Voltage SIR 70SE
Sample#10 Text:301802-2 :100X DIL. : : : Exp:PAHAIR
178.0782 S:10 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



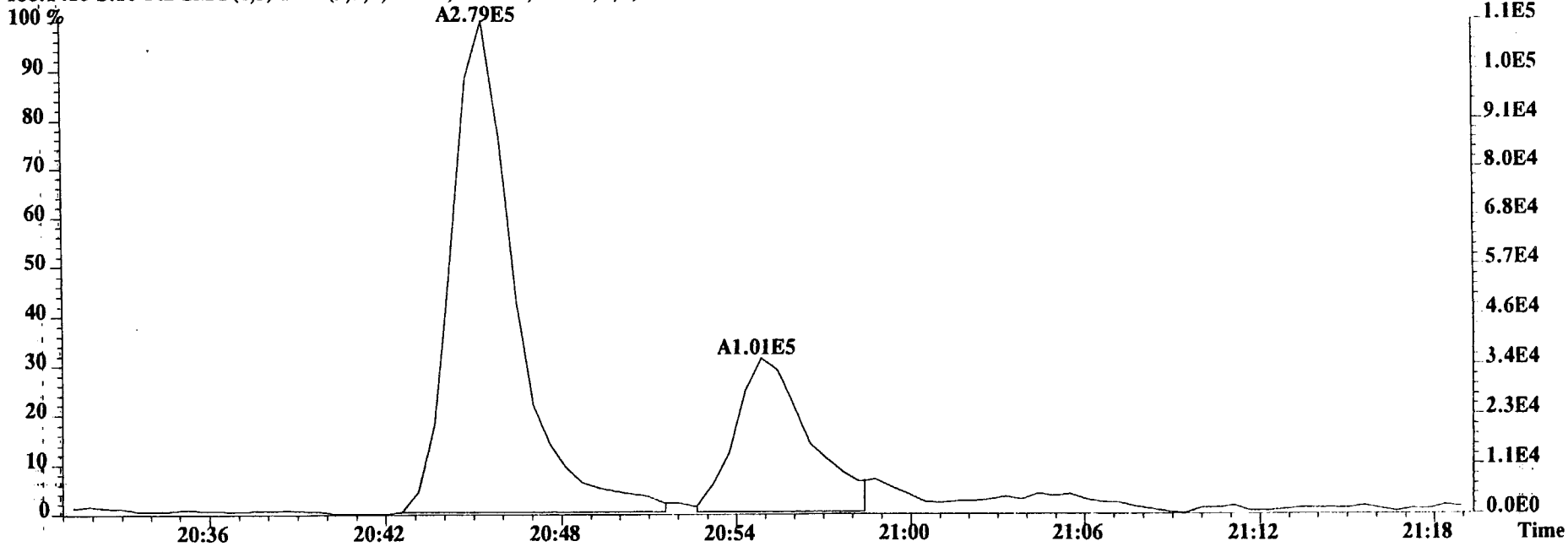
188.1410 S:10 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



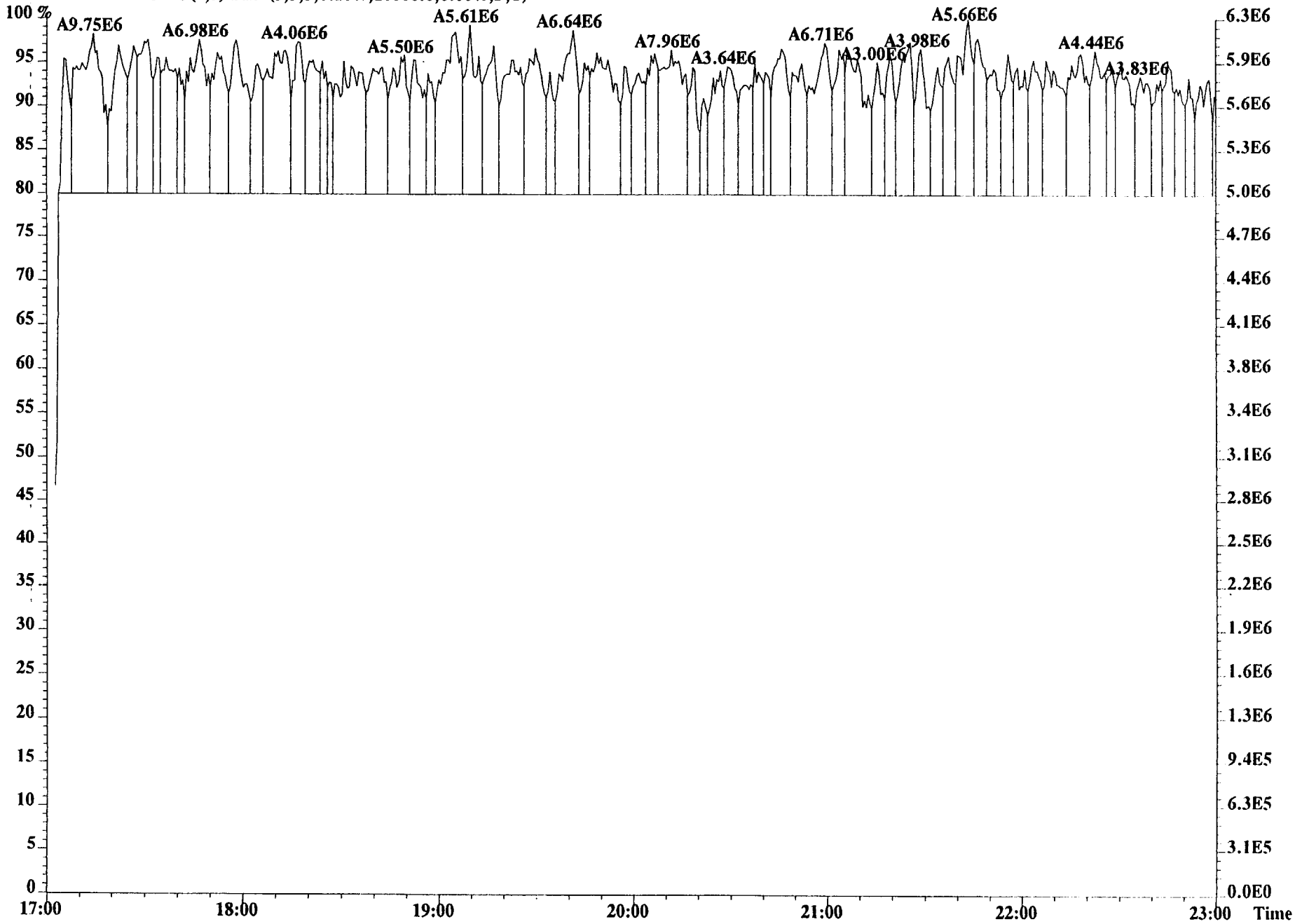
File:02NO98V4 #1-640 Acq: 2-NOV-1998 20:34:33 GC EI+ Voltage SIR 70SE
Sample#10 Text:301802-2 :100X DIL. : : : Exp:PAHAIR
178.0782 S:10 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



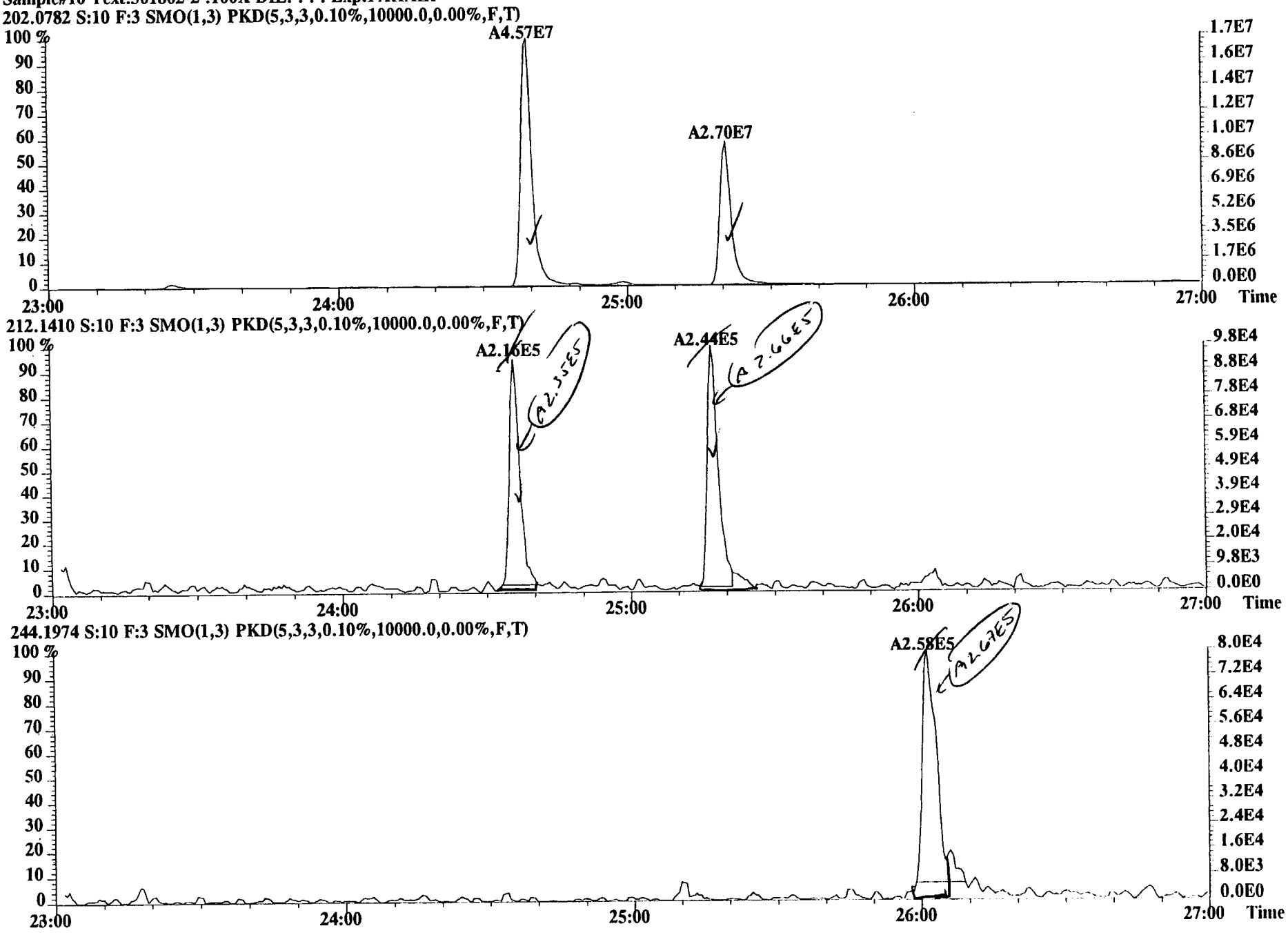
188.1410 S:10 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



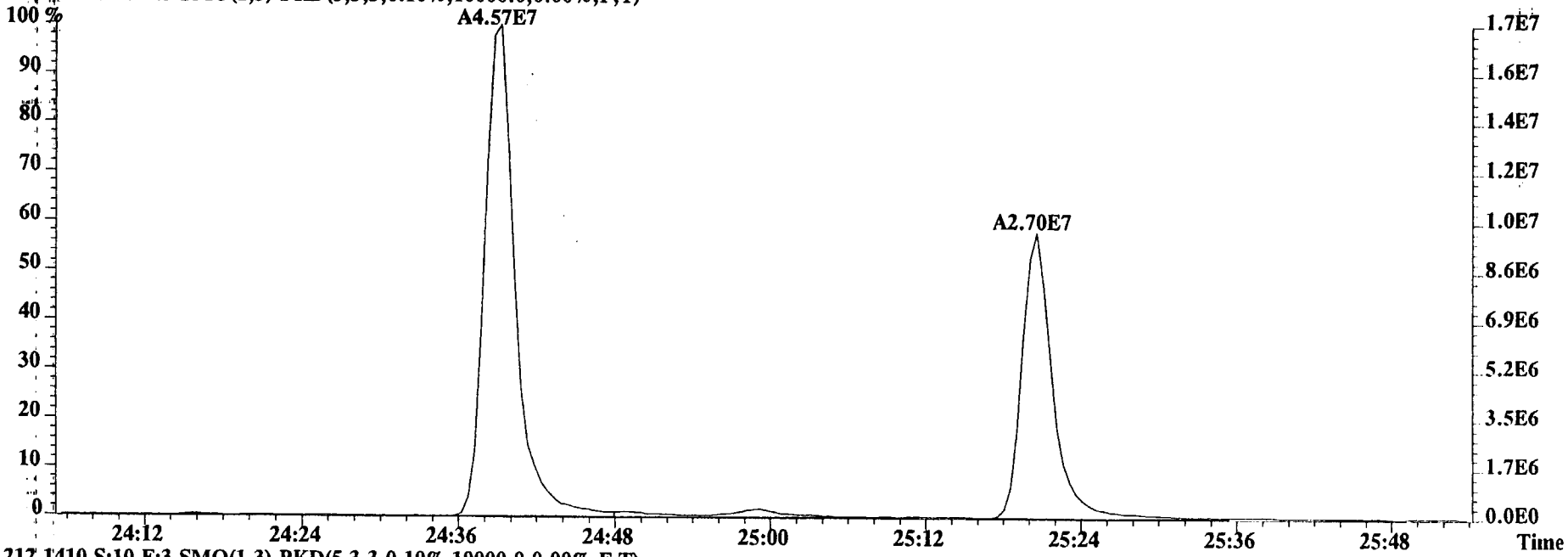
File:02NO98V4 #1-640 Acq: 2-NOV-1998 20:34:33 GC EI+ Voltage SIR 70SE
Sample#10 Text:301802-2 :100X DIL. : : : Exp:PAHAIR
204.9888 S:10 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



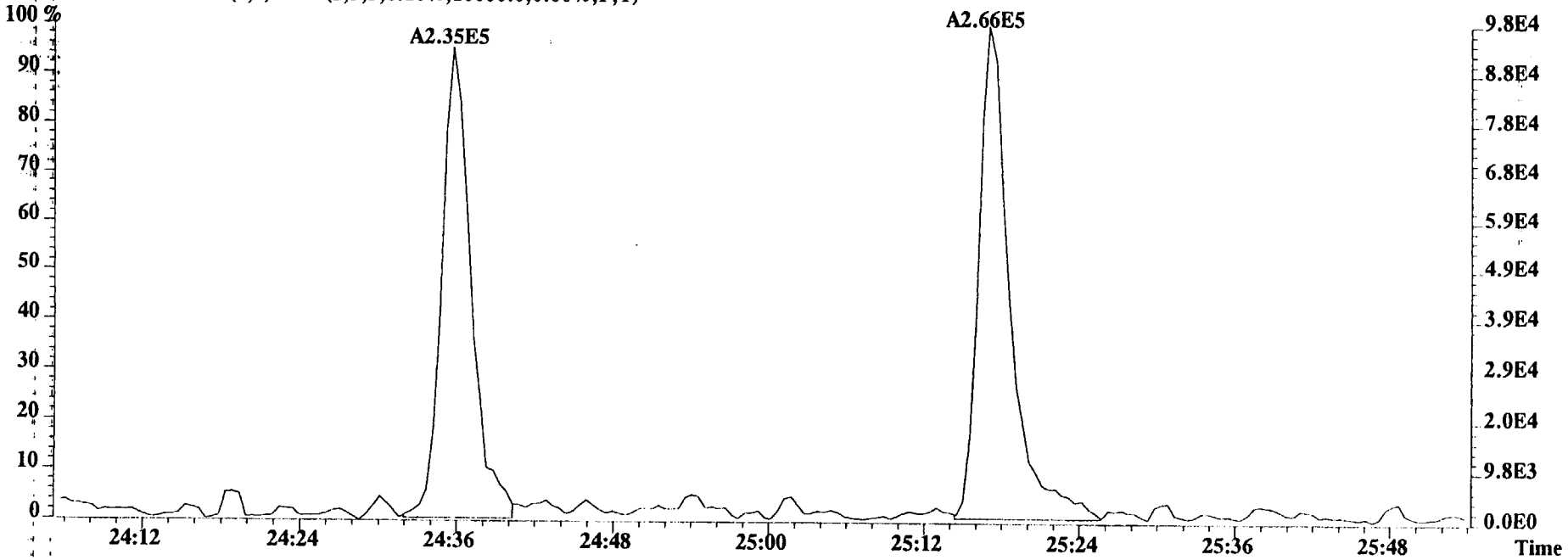
File:02NO98V4 #1-939 Acq: 2-NOV-1998 20:34:33 GC EI+ Voltage SIR 70SE
Sample#10 Text:301802-2 :100X DIL. : : : Exp:PAHAIR



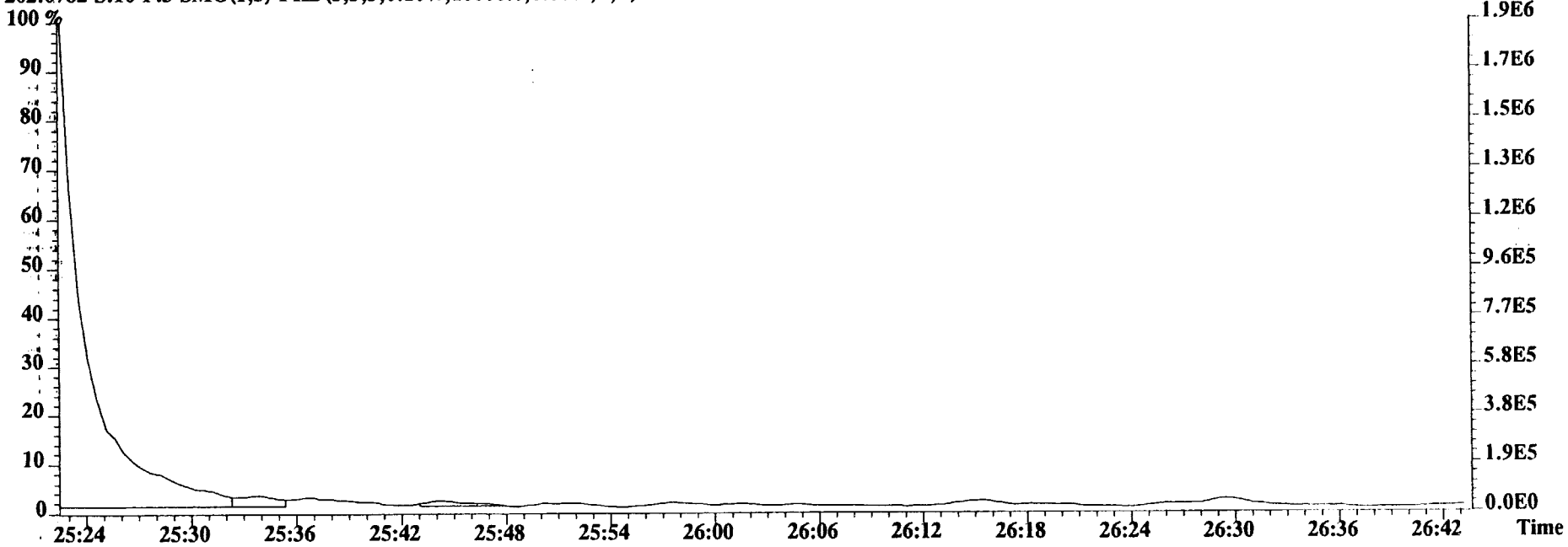
File:02NO98V4 #1-939 Acq: 2-NOV-1998 20:34:33 GC EI+ Voltage SIR 70SE
Sample#10 Text:301802-2 :100X DIL. : : : Exp:PAHAIR
202.0782 S:10 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



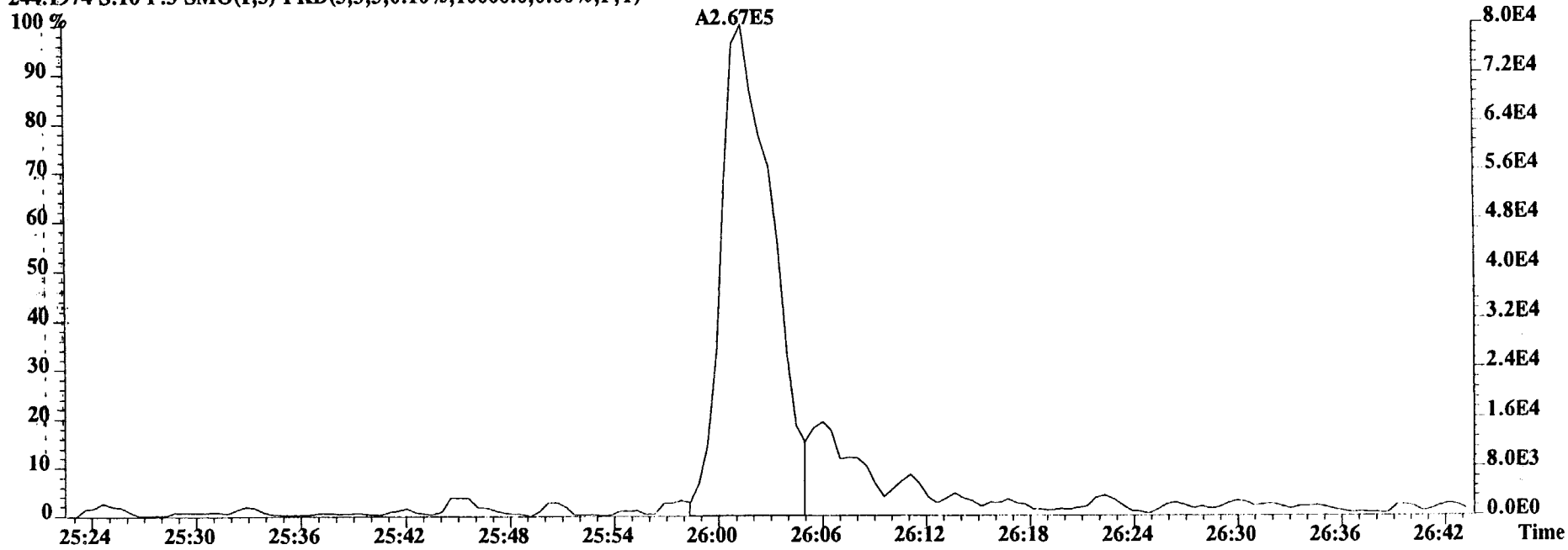
212.1410 S:10 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



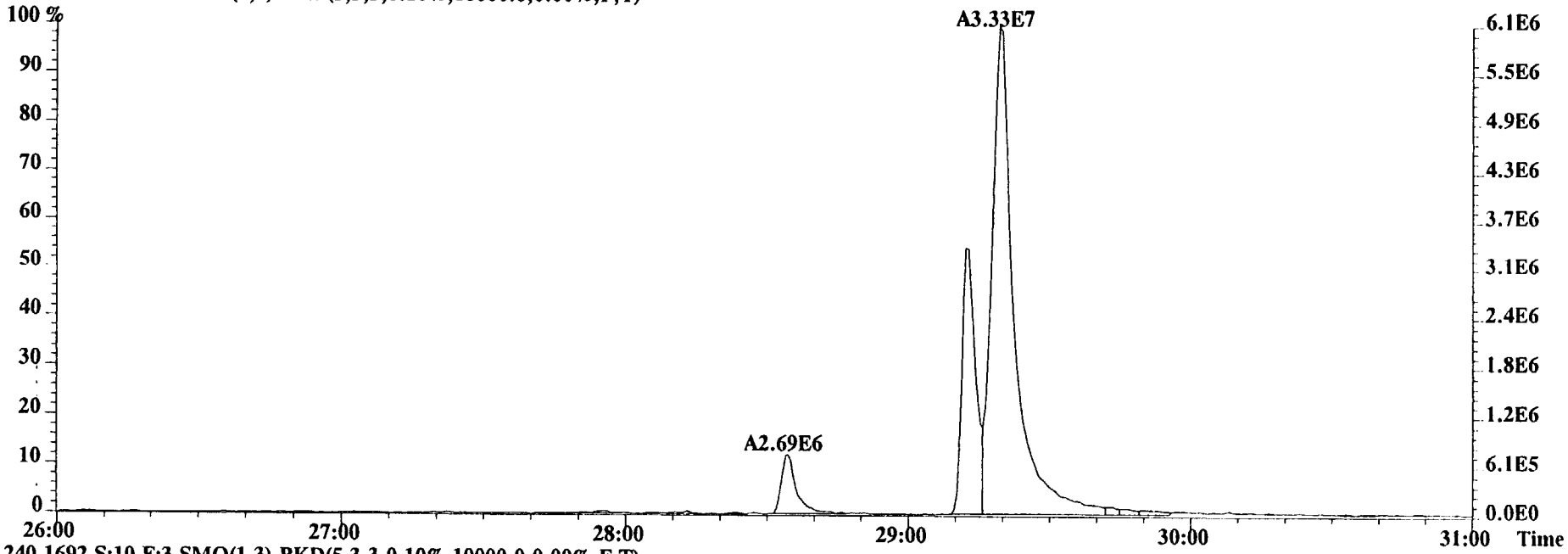
File:02NO98V4 #1-939 Acq: 2-NOV-1998 20:34:33 GC EI+ Voltage SIR 70SE
Sample#10 Text:301802-2 :100X DIL. : : : Exp:PAHAIR
202.0782 S:10 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



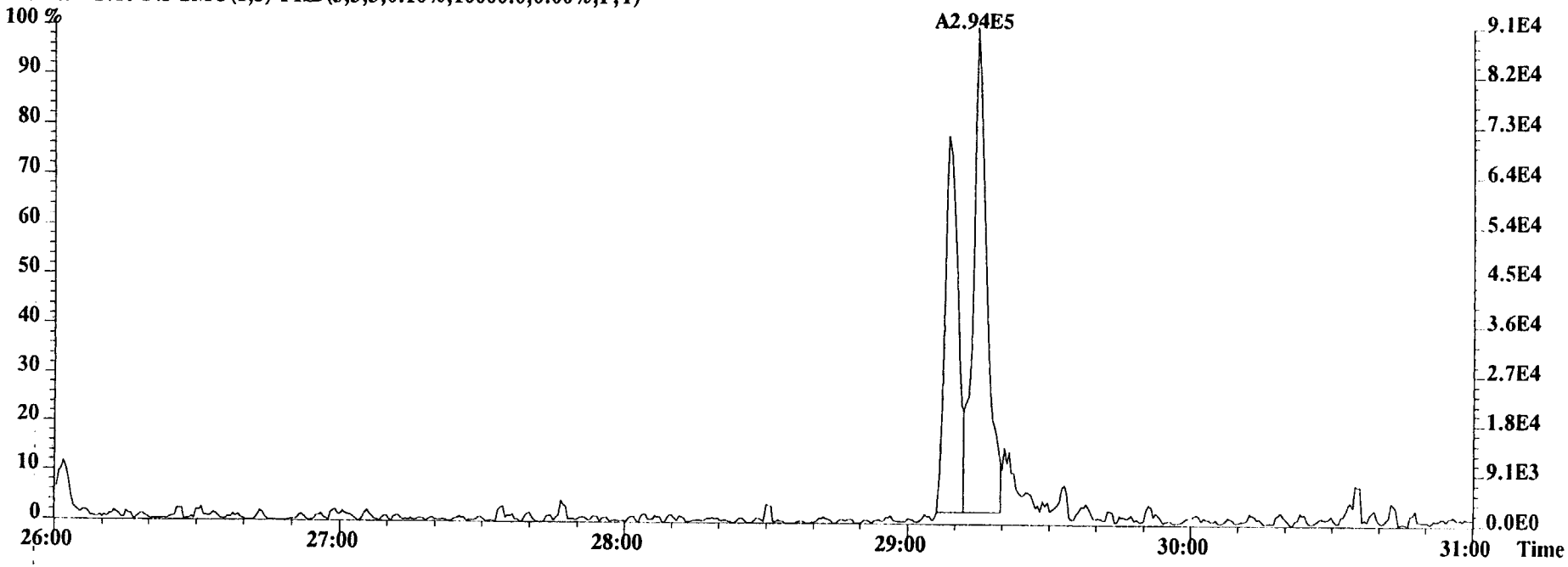
244.1974 S:10 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



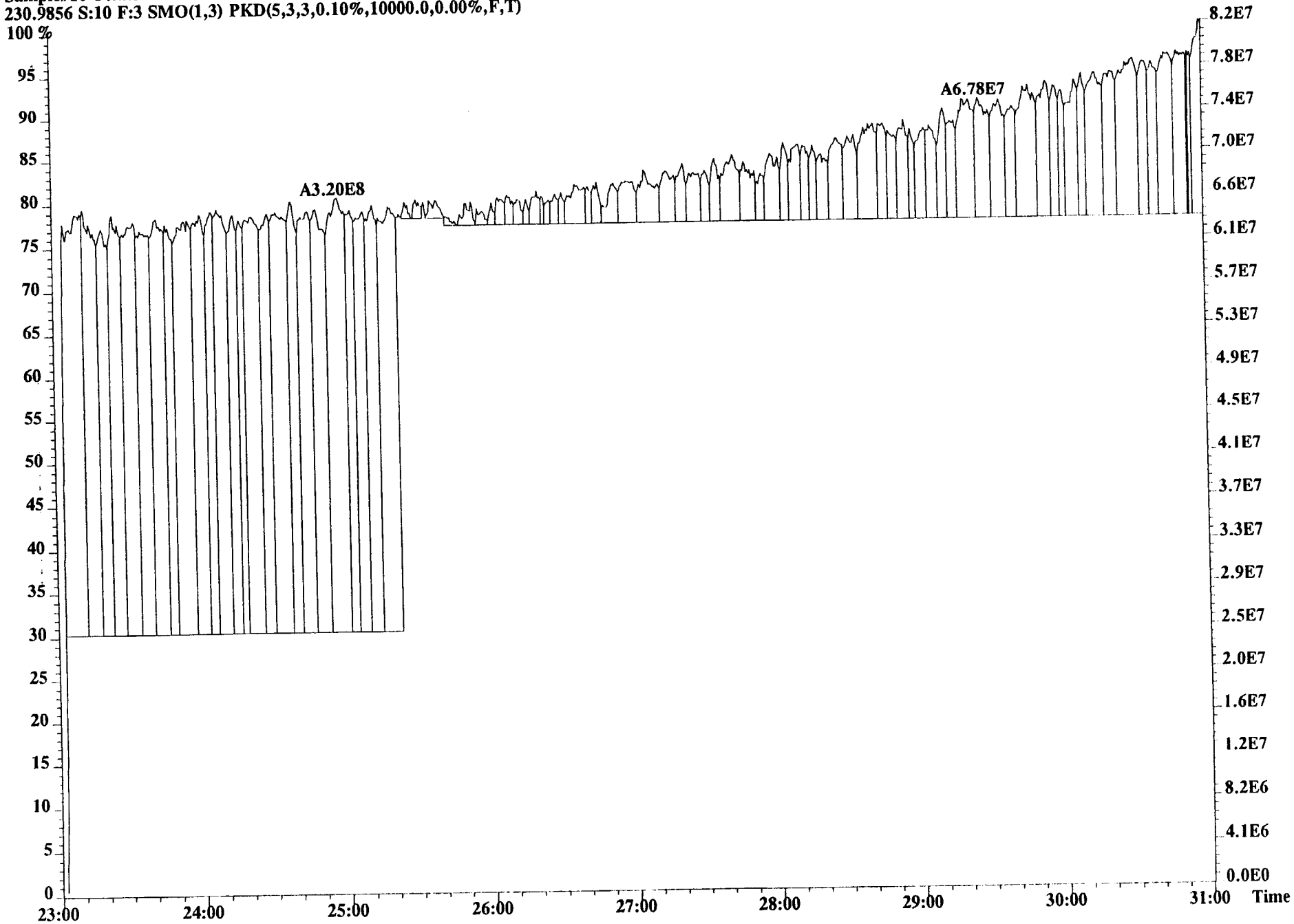
File:02NO98V4 #1-939 Acq: 2-NOV-1998 20:34:33 GC EI+ Voltage SIR 70SE
Sample#10 Text:301802-2 :100X DIL. : : : Exp:PAHAIR
228.0939 S:10 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



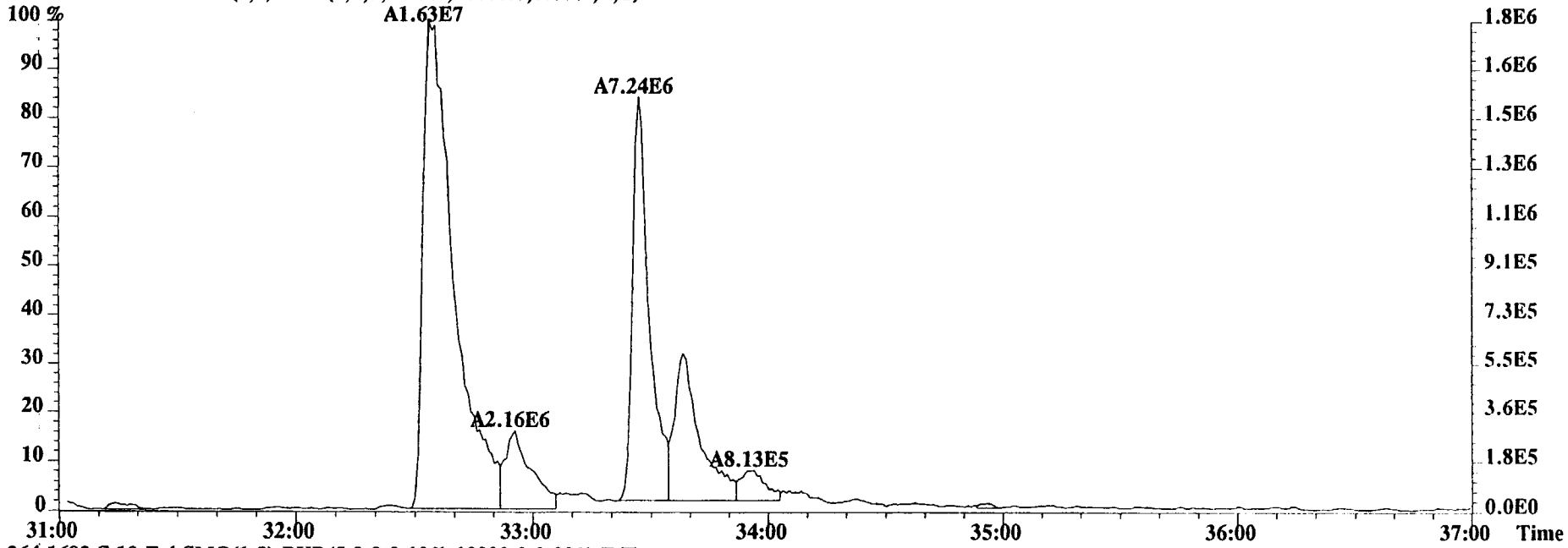
240.1692 S:10 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



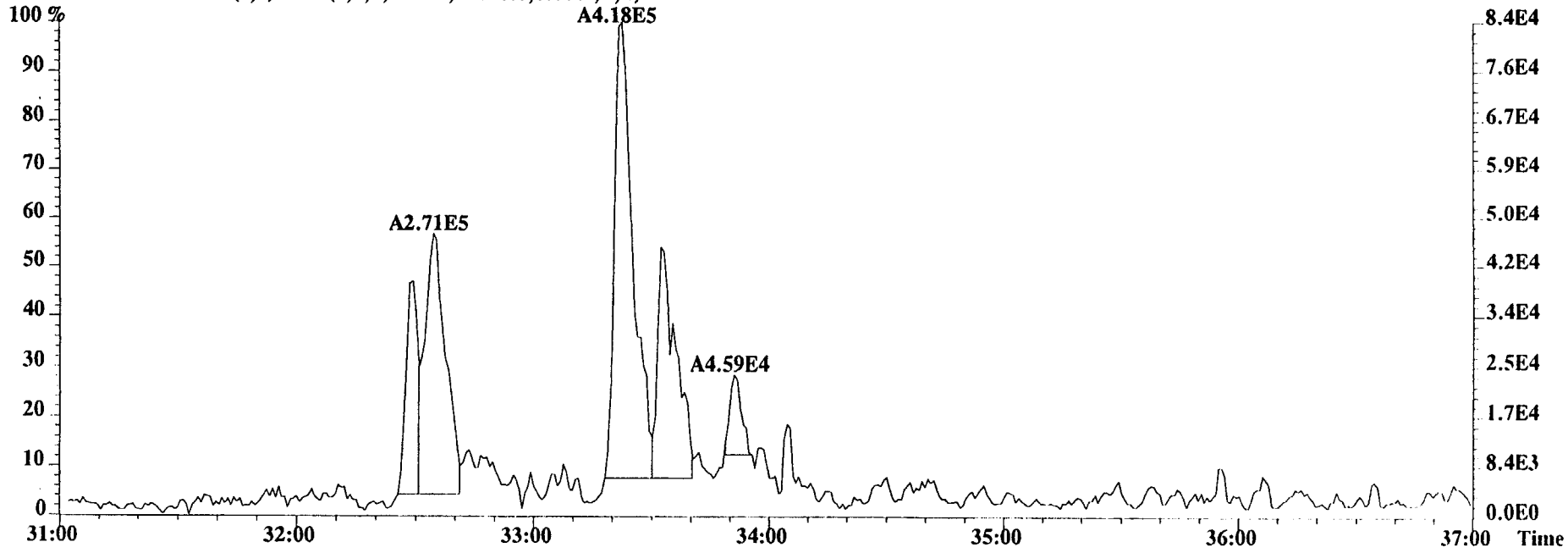
File:02NO98V4 #1-939 Acq: 2-NOV-1998 20:34:33 GC EI+ Voltage SIR 70SE
Sample#10 Text:301802-2 :100X DIL. : : : Exp:PAHAIR
230.9856 S:10 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



File:02NO98V4 #1-878 Acq: 2-NOV-1998 20:34:33 GC EI+ Voltage SIR 70SE
Sample#10 Text:301802-2 :100X DIL. : : : Exp:PAHAIR
252.0939 S:10 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

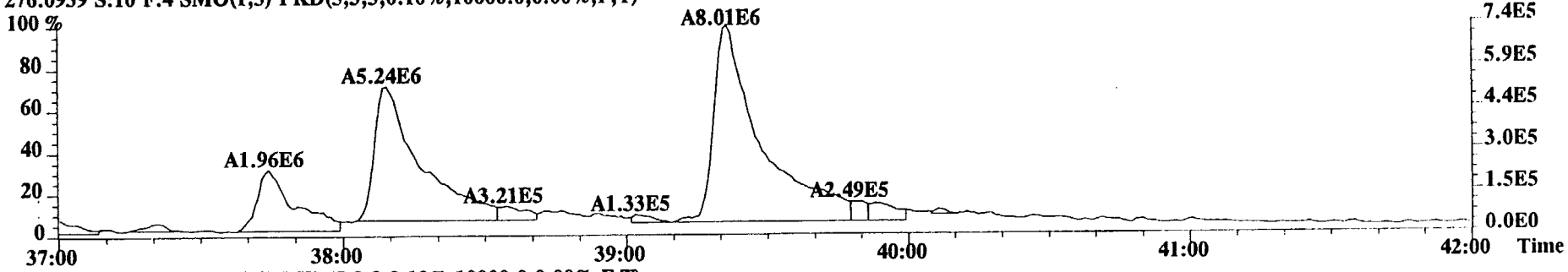


264.1692 S:10 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

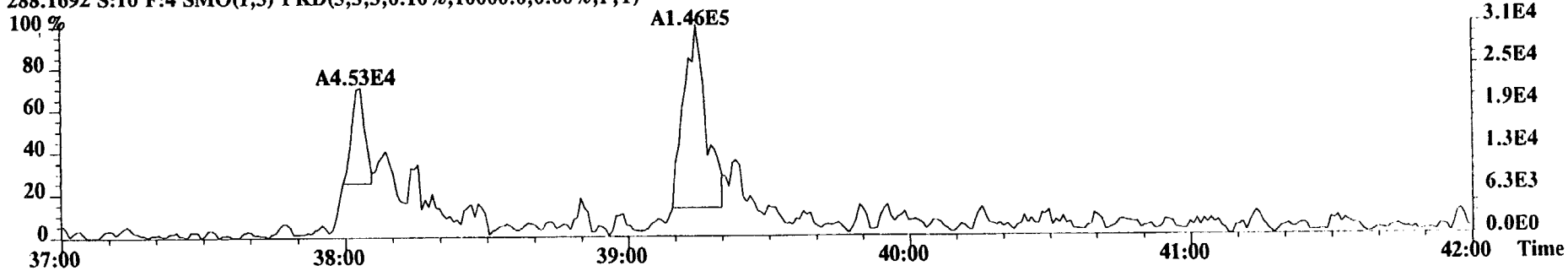


File:02NO98V4 #1-878 Acq: 2-NOV-1998 20:34:33 GC EI+ Voltage SIR 70SE
Sample#10 Text:301802-2 :100X DIL. : : : Exp:PAHAIR

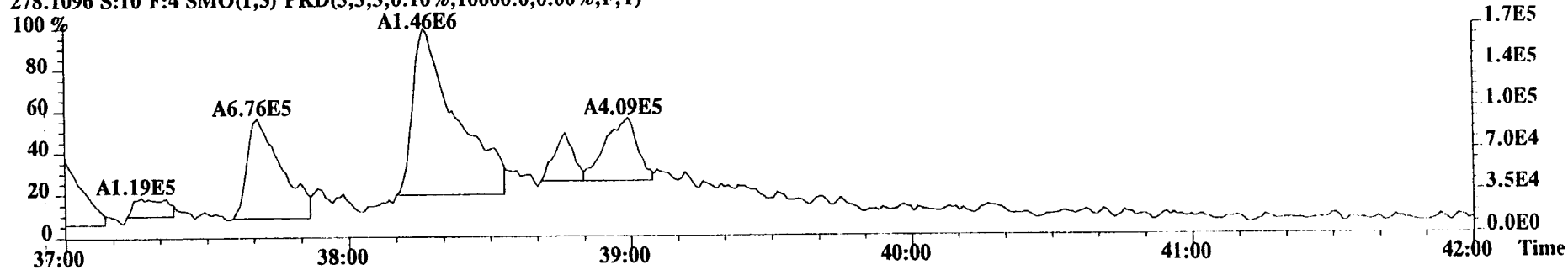
276.0939 S:10 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



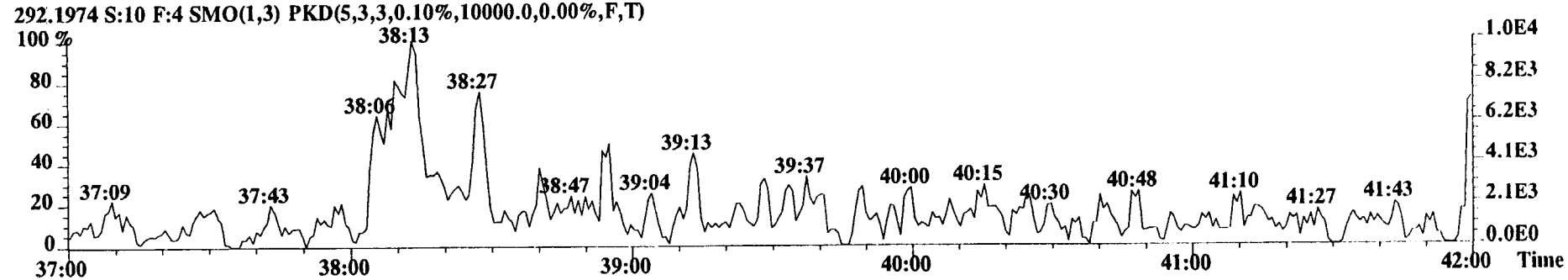
288.1692 S:10 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



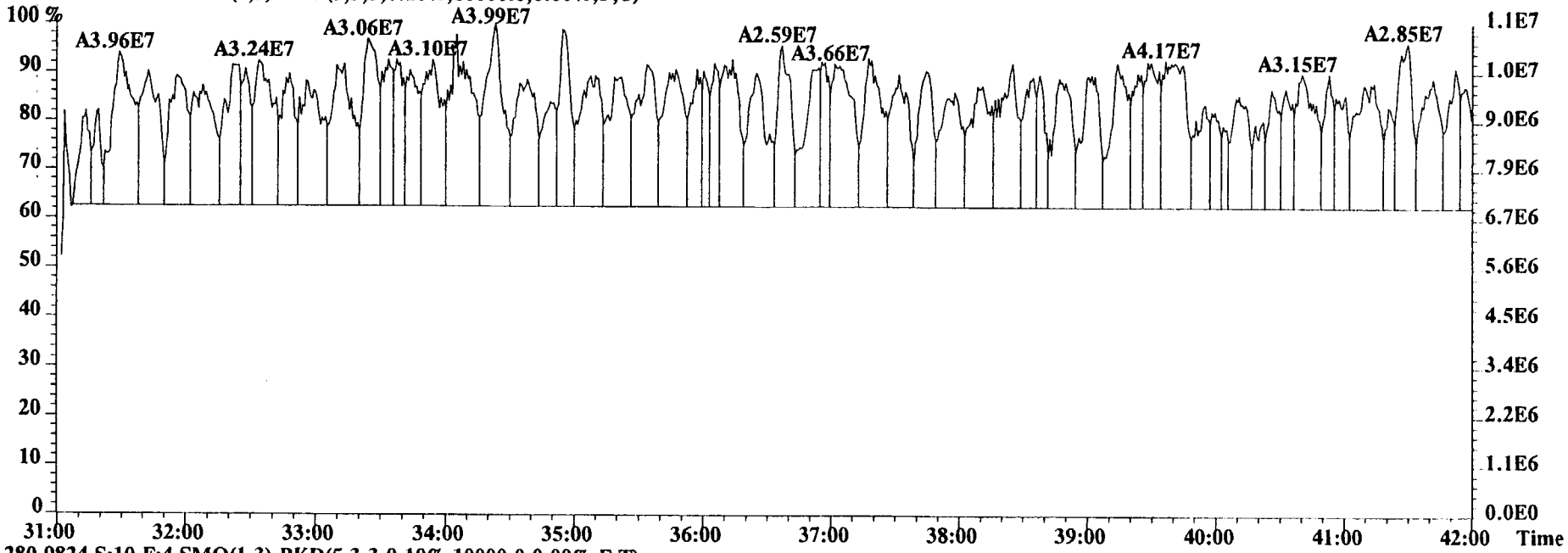
278.1096 S:10 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



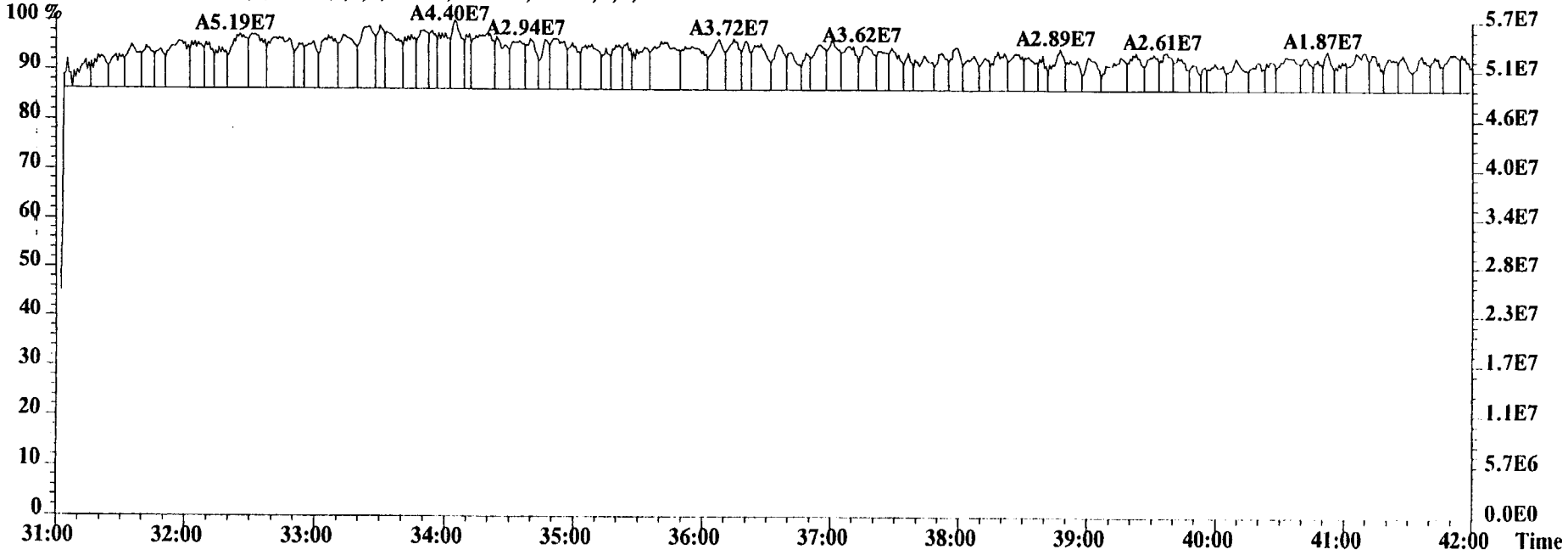
292.1974 S:10 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



File:02NO98V4 #1-878 Acq: 2-NOV-1998 20:34:33 GC EI+ Voltage SIR 70SE
Sample#10 Text:301802-2 :100X DIL. : : : Exp:PAHAIR
268.9824 S:10 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



280.9824 S:10 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



POLYNUCLEAR AROMATIC HYDROCARBONS
HIGH RESOLUTION GC/MS
Method HRGC/HRMS

Client Name: Pacific Environmental Services
Client ID: A-I-429-3
Lab ID: 301802-0003-SA
Matrix: AIRTRAIN Sampled: 23 SEP 98 Received: 29 SEP 98
Authorized: 29 SEP 98 Prepared: 03 OCT 98 Analyzed: 30 OCT 98
Dilution Factor: 1.0

Parameter	Result	Units	Reporting Limit	Data Qualifiers
Naphthalene	160000	ng/sample	--	BD
2-Methylnaphthalene	41000	ng/sample	--	BD
Acenaphthylene	33000	ng/sample	--	D
Acenaphthene	6300	ng/sample	--	D
Fluorene	18000	ng/sample	--	
Phenanthrene	66000	ng/sample	--	BD
Anthracene	9100	ng/sample	--	
Fluoranthene	25000	ng/sample	--	D
Pyrene	18000	ng/sample	--	
Benzo(a)anthracene	11000	ng/sample	--	
Chrysene	18000	ng/sample	--	
Benzo(b)fluoranthene	6100	ng/sample	--	
Benzo(k)fluoranthene	3600	ng/sample	--	
Benzo(e)pyrene	3300	ng/sample	--	
Benzo(a)pyrene	1800	ng/sample	--	
Perylene	280	ng/sample	--	
Indeno(1,2,3-cd)pyrene	3900	ng/sample	--	
Dibenz(a,h)anthracene	980	ng/sample	--	
Benzo(g,h,i)perylene	4000	ng/sample	--	

B = Compound is also detected in the blank.
D = Compound quantitated using a secondary dilution.

Reported By: Clark Pickell Approved By: Eric Redman

The cover letter is an integral part of this report.
Rev 230787

POLYNUCLEAR AROMATIC HYDROCARBONS
HIGH RESOLUTION GC/MS
Method HRGC/HRMS
(cont.)

Client Name: Pacific Environmental Services
Client ID: A-I-429-3
Lab ID: 301802-0003-SA
Matrix: AIRTRAIN Sampled: 23 SEP 98 Received: 29 SEP 98
Authorized: 29 SEP 98 Prepared: 03 OCT 98 Analyzed: 30 OCT 98
Dilution Factor: 1.0

Internal Standards	% Recovery	
Naphthalene-d8	77	D
Acenaphthylene-d8	58	D
Acenaphthene-d10	70	D
Fluorene-d10	50	
Phenanthrene-d10	99	D
Fluoranthene-d10	49	Dm
Pyrene-d10	80	
Benzo(a)anthracene-d12	75	
Perylene-d12	54	
Indeno(123-cd)pyrene-d12	90	
Chrysene-d12	68	
Benzo(b)fluoranthene-d12	99	
Benzo(k)fluoranthene-d12	73	
Benzo(a)pyrene-d12	68	
Dibenz(a,h)anthracene-d14	87	
Benzo(g,h,i)perylene-d12	68	

Field Surrogates	% Recovery
13C-Fluorene	94

D = Compound quantitated using a secondary dilution.
m = Internal Standard recovery is outside method recovery goal.

Reported By: Clark Pickell Approved By: Eric Redman

The cover letter is an integral part of this report.
Rev 230787

)4-NOV-1998 04:56:30 PM Dioxin Furan Unknown RESULTS

Mass Spec : VG-4 Results : 29OC98V4231.RES : PAHAIR.TRG
:C Column : DB-5 Date analyzed : 29-OCT-98
Data file : 29OC98V4231 30180Z-3 10X DIL. : Ex : PAHAIR102998V4.R
Weight : 0.5

Name	Total Response	Isotope Ratio		R. T. mm:ss		RRF	pg/ SAMPLE	Rec/ MDL
d10-2-Methylnaphthalene	3132140	1.00	Y	12: 28	Y	1.00	50.00	
d10-Anthracene	8497880	1.00	Y	20: 55	Y	1.00	50.00	
d10-Fluorene	5992040	1.00	Y	17: 41	Y	1.42	24.81	50
Fluorene	1233420000	1.00	Y	17: 46	Y	1.16	1.8e+04	E
d10-Phenanthrene	18510260	1.00	Y	20: 45	Y	2.81	38.79	78
Phenanthrene	7088220000	1.00	Y	20: 50	Y	0.89	-	SAT'D
Anthracene	1341438000	1.00	Y	20: 58	Y	0.80	9054.19	E
d14-Terphenyl	19624660	1.00	Y	26: 0	Y	1.00	50.00	
d10-Fluoranthene	23382400	1.00	Y	24: 35	Y	1.41	42.23	84
Fluoranthene	6301600000	1.00	Y	24: 39	Y	1.11	-	SAT'D
d10-Pyrene	23884800	1.00	Y	25: 17	Y	1.52	40.08	80
Pyrene	5274840000	1.00	Y	25: 20	Y	1.21	1.8e+04	E
d12-Benzo(a)anthracene	13300020	1.00	Y	29: 7	Y	0.90	37.65	75
Benzo(a)anthracene	1754802000	1.00	Y	29: 11	Y	1.20	1.1e+04	E
d12-Chrysene	17052780	1.00	Y	29: 14	Y	1.28	33.97	68
Chrysene	3397960000	1.00	Y	29: 19	Y	1.08	1.8e+04	E
d12-Benzo(e)pyrene	42941600	1.00	Y	33: 21	Y	1.00	50.00	
d12-Benzo(b)fluoranthene	19385000	1.00	Y	32: 28	Y	0.45	49.73	99
Benzo(b)fluoranthene	1370000000	1.00	Y	32: 33	Y	1.17	6054.65	E
d12-Benzo(k)fluoranthene	29788200	1.00	Y	32: 34	Y	0.95	36.58	73
Benzo(k)fluoranthene	1236000000	1.00	Y	32: 38	Y	1.16	3564.23	
d12-Benzo(a)pyrene	19833040	1.00	Y	33: 31	Y	0.68	34.13	68
Benzo(e)pyrene	1072592000	1.00	Y	33: 26	Y	1.64	3295.96	
Benzo(a)pyrene	392810000	1.00	Y	33: 37	Y	1.07	1847.59	
d12-Perylene	14616040	1.00	Y	33: 49	Y	0.63	27.00	54
Perylene	69000000	1.00	Y	33: 54	Y	1.71	275.49	
d12-Indeno(123-cd)pyrene	17111840	1.00	Y	38: 0	Y	0.44	44.82	90
Indeno(123-cd)pyrene	410000000	1.00	Y	38: 7	Y	0.62	3858.57	
d14-Dibenz(ah)anthracene	9231500	1.00	Y	38: 5	Y	0.25	43.73	87
Dibenz(ah)anthracene	126400000	1.00	Y	38: 14	Y	1.40	975.55	
d12-Benzo(ghi)perylene	16911140	1.00	Y	39: 11	Y	0.58	33.97	68
Benzo(ghi)perylene	687614000	1.00	Y	39: 20	Y	1.02	4001.95	
d10-Fluorene	5992040	1.00	Y	17: 41	Y	1.00	50.00	
13C-Fluorene	4554900	1.00	Y	17: 46	Y	0.81	46.92	94

11-4-98
CP

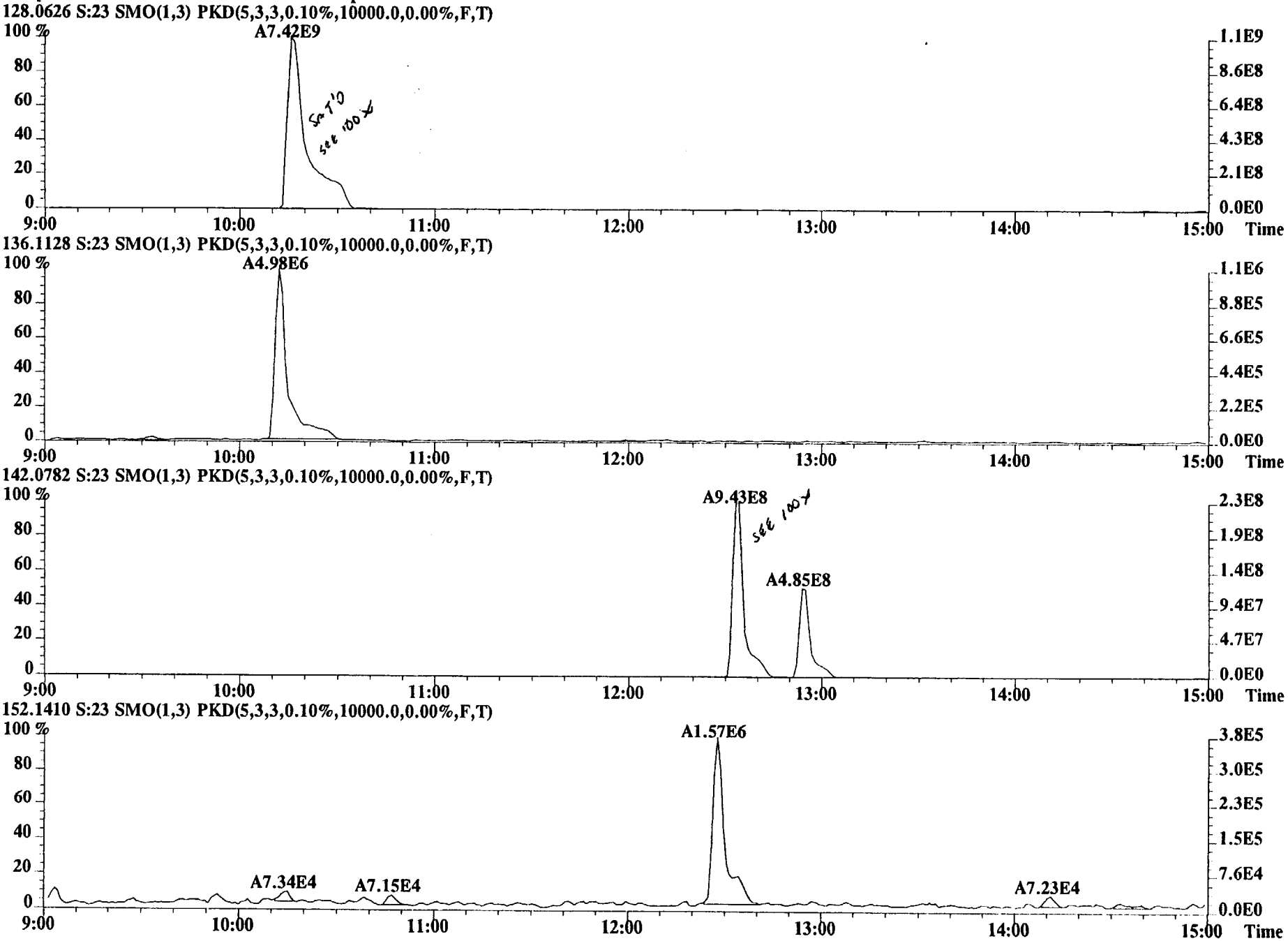
	1566070	1566070
	4248940	4248940
50	2996020	2996020
E	616710000	616710000
78	9255130	9255130
SAT'D	3544110000	3544110000
E	670719000	670719000
	9812330	9812330
84	11691200	11691200
SAT'D	3150800000	3150800000
80	11942400	11942400
E	2637420000	2637420000
75	6650010	6650010
E	877401000	877401000
68	8526390	8526390
E	1698980000	1698980000
	21470800	21470800
99	9692500	9692500
E	685000000	685000000
73	14894100	14894100
	618000000	618000000
68	9916520	9916520
	536296000	536296000
	196405000	196405000
54	7308020	7308020
	34500000	34500000
90	8555920	8555920
	205000000	205000000
87	4615750	4615750
	63200000	63200000
68	8455570	8455570
	343807000	343807000

02-NOV-1998 09:47:51 AM Dioxin Furan Unknown RESULTS

Mass Spec : VG-4 Results : 29OC98V4231.RES : PAHAIR.TRG
GC Column : DB-5 Date analyzed : 29-OCT-98
Data file : 29OC98V4 301802-3 :10X DIL. : : : Ex Cal : PAHAIR102998V4.R
Weight : 0.5

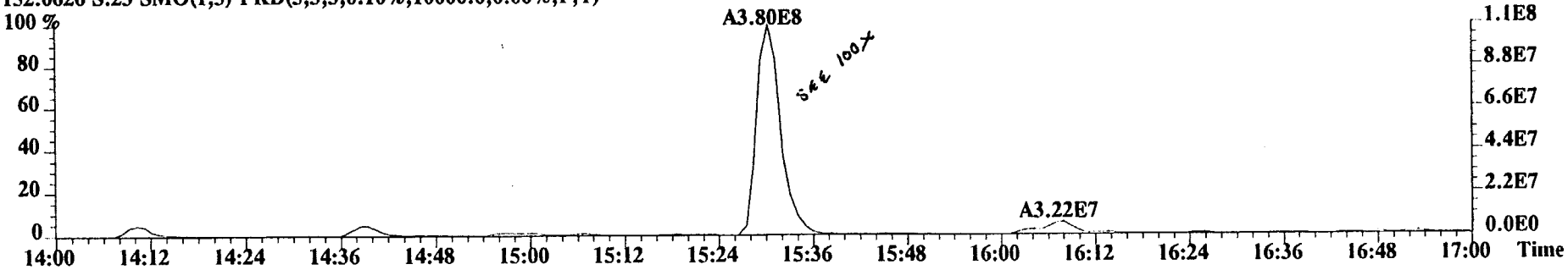
Name	Total Response	Isotope Ratio	R. T. mm:ss	RRF	pg/ SAMPLE	Rec/ MDL
d10-2-Methylnaphthalene	3132140	1.00 Y	12: 28 Y	1.00	50.00	
d8-Naphthalene	9950900	1.00 Y	10: 12 Y	2.24	70.89	142
Naphthalene	14849580000	1.00 Y	10: 16 Y	1.23	1.2e+05	0.000
2-Methylnaphthalene	1886674000	1.00 Y	12: 34 Y	0.56	3.4e+04	0.000
d8-Acenaphthylene	5457260	1.00 Y	15: 27 Y	1.21	71.77	144
Acenaphthylene	760106000	1.00 Y	15: 30 Y	0.94	1.5e+04	0.000
d10-Acenaphthene	515556	1.00 Y	16: 2 Y	0.74	11.05	22
Acenaphthene	86485400	1.00 Y	16: 8 Y	1.25	1.3e+04	0.000
d10-Anthracene	8497880	1.00 Y	20: 55 Y	1.00	50.00	
d10-Fluorene	5992040	1.00 Y	17: 41 Y	1.42	24.81	50
Fluorene	1233420000	1.00 Y	17: 46 Y	1.16	1.8e+04	0.000
d10-Phenanthrene	18510260	1.00 Y	20: 45 Y	2.81	38.79	78
Phenanthrene	7088220000	1.00 Y	20: 50 Y	0.89	4.3e+04	0.000
Anthracene	1341438000	1.00 Y	20: 58 Y	0.80	9054.19	0.000
d14-Terphenyl	19624660	1.00 Y	26: 0 Y	1.00	50.00	
d10-Fluoranthene	23382400	1.00 Y	24: 35 Y	1.41	42.23	84
Fluoranthene	6301600000	1.00 Y	24: 39 Y	1.11	2.4e+04	0.000
d10-Pyrene	23884800	1.00 Y	25: 17 Y	1.52	40.08	80
Pyrene	5274840000	1.00 Y	25: 20 Y	1.21	1.8e+04	0.000
d12-Benzo(a)anthracene	13300020	1.00 Y	29: 7 Y	0.90	37.65	75
Benzo(a)anthracene	1754802000	1.00 Y	29: 11 Y	1.20	1.1e+04	0.000
d12-Chrysene	17052780	1.00 Y	29: 14 Y	1.28	33.97	68
Chrysene	3397960000	1.00 Y	29: 19 Y	1.08	1.8e+04	0.000
d12-Benzo(e)pyrene	42941600	1.00 Y	33: 21 Y	1.00	50.00	
d12-Benzo(b)fluoranthene	19385000	1.00 Y	32: 28 Y	0.45	49.73	99
Benzo(b)fluoranthene	2624100000	1.00 Y	32: 33 Y	1.17	1.2e+04	0.000
d12-Benzo(k)fluoranthene	29788200	1.00 Y	32: 34 Y	0.95	36.58	73
Benzo(k)fluoranthene	2624100000	1.00 Y	32: 33 Y	1.16	7567.06	0.000
d12-Benzo(a)pyrene	19833040	1.00 Y	33: 31 Y	0.68	34.13	68
Benzo(e)pyrene	1072592000	1.00 Y	33: 26 Y	1.64	3295.96	0.000
Benzo(a)pyrene	392810000	1.00 Y	33: 37 Y	1.07	1847.59	0.000
d12-Perylene	14616040	1.00 Y	33: 49 Y	0.63	27.00	54
Perylene	* No Peak	0.00 N	33: 54 N	1.71	0.00	0.000
d12-Indeno(123-cd)pyrene	17111840	1.00 Y	38: 0 Y	0.44	44.82	90
Indeno(123-cd)pyrene	574154000	1.00 Y	38: 7 Y	0.62	5403.45	0.000
d14-Dibenz(ah)anthracene	9231500	1.00 Y	38: 5 Y	0.25	43.73	87
Dibenz(ah)anthracene	188216600	1.00 Y	38: 14 Y	1.40	1452.65	0.000
d12-Benzo(ghi)perylene	16911140	1.00 Y	39: 11 Y	0.58	33.97	68
Benzo(ghi)perylene	687614000	1.00 Y	39: 20 Y	1.02	4001.95	0.000
d10-Fluorene	5992040	1.00 Y	17: 41 Y	1.42	4.91	10
13C-Fluorene	4554900	1.00 Y	17: 46 Y	1.00	76.02	0.000

File:29OC98V4 #1-510 Acq:30-OCT-1998 09:26:14 GC EI+ Voltage SIR 70SE
Sample#23 Text:301802-3 :10X DIL. : : : Exp:PAHAIR

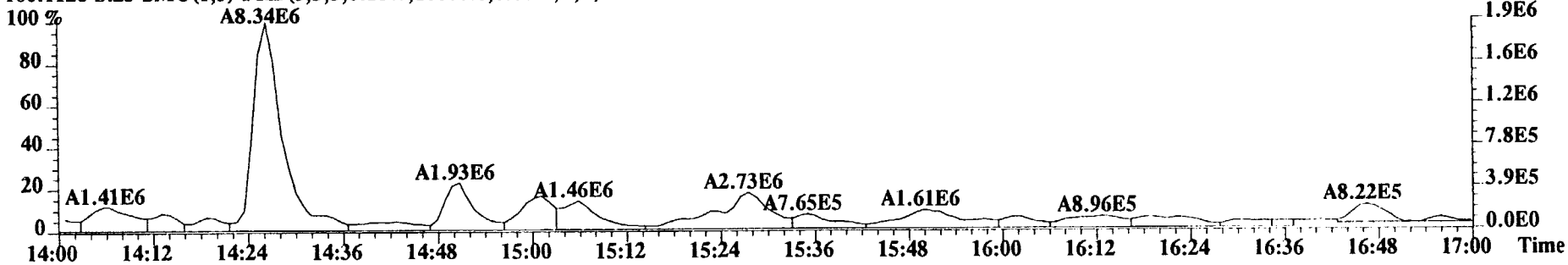


File:29OC98V4 #1-510 Acq:30-OCT-1998 09:26:14 GC EI+ Voltage SIR 70SE
Sample#23 Text:301802-3 :10X DIL. : : : Exp:PAHAIR

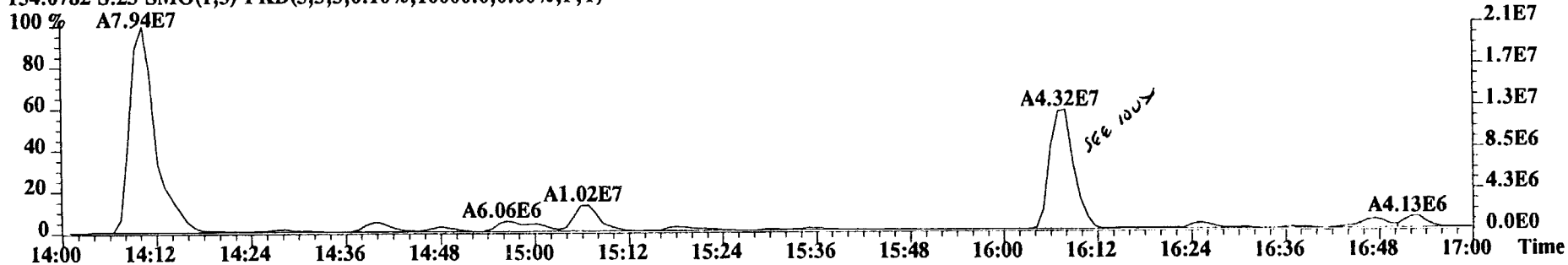
152.0626 S:23 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



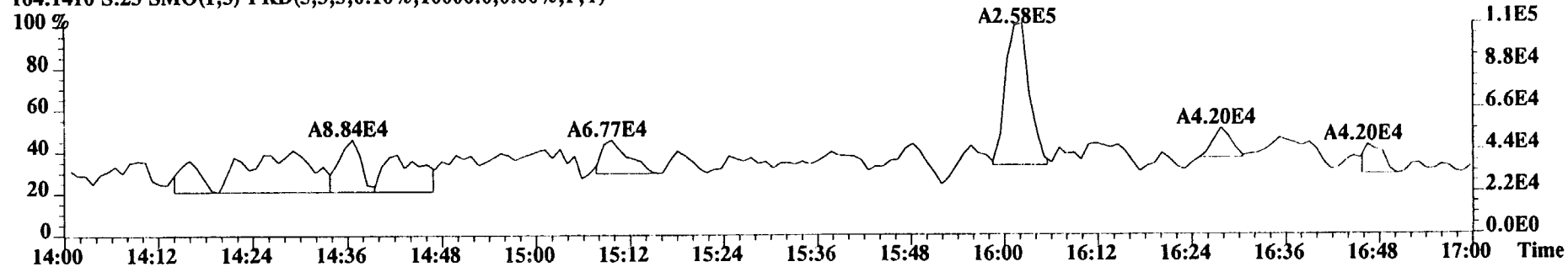
160.1128 S:23 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



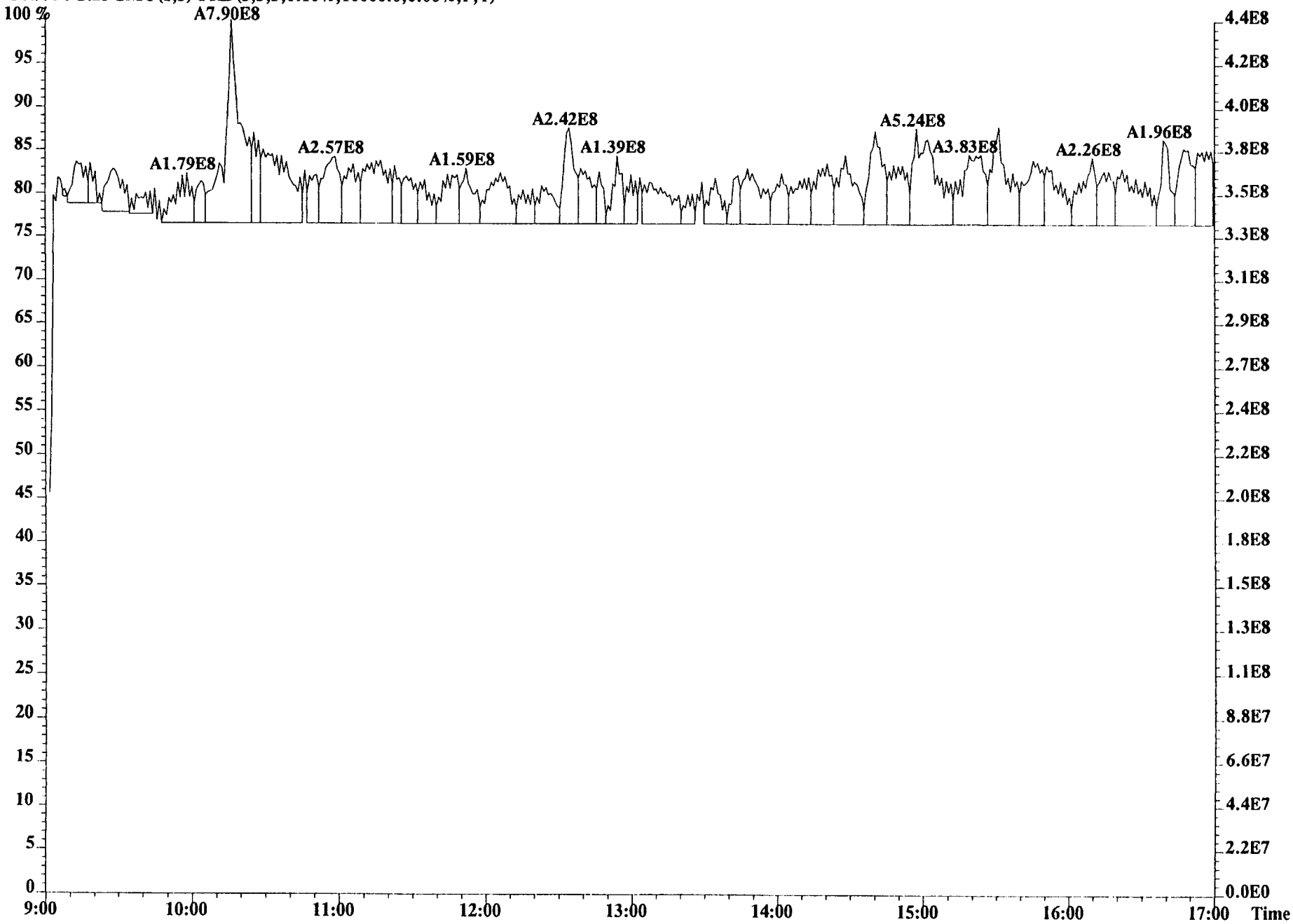
154.0782 S:23 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



164.1410 S:23 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

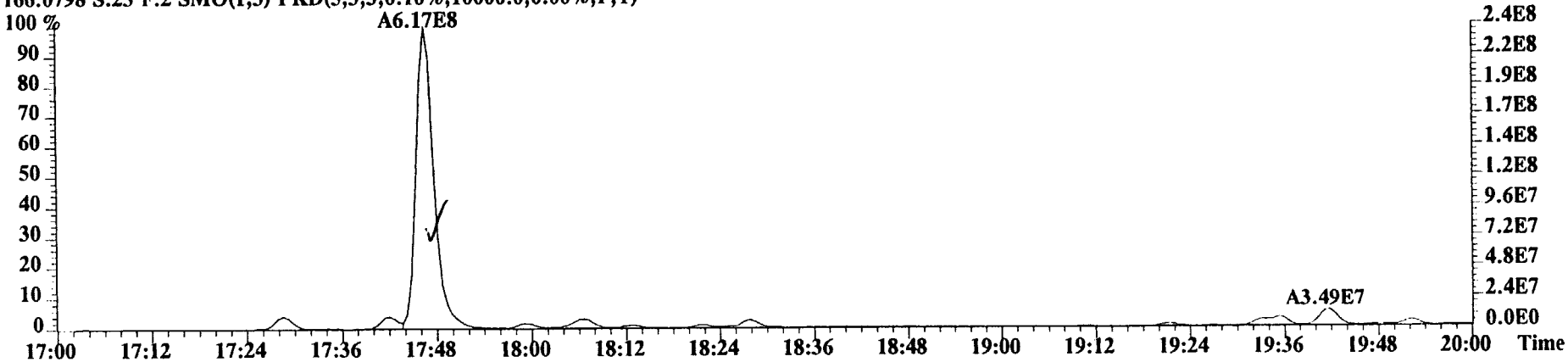


File:29OC98V4 #1-510 Acq:30-OCT-1998 09:26:14 GC EI+ Voltage SIR 70SE
Sample#23 Text:301802-3 :10X DIL. : : : Exp:PAHAIR
130.9920 S:23 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

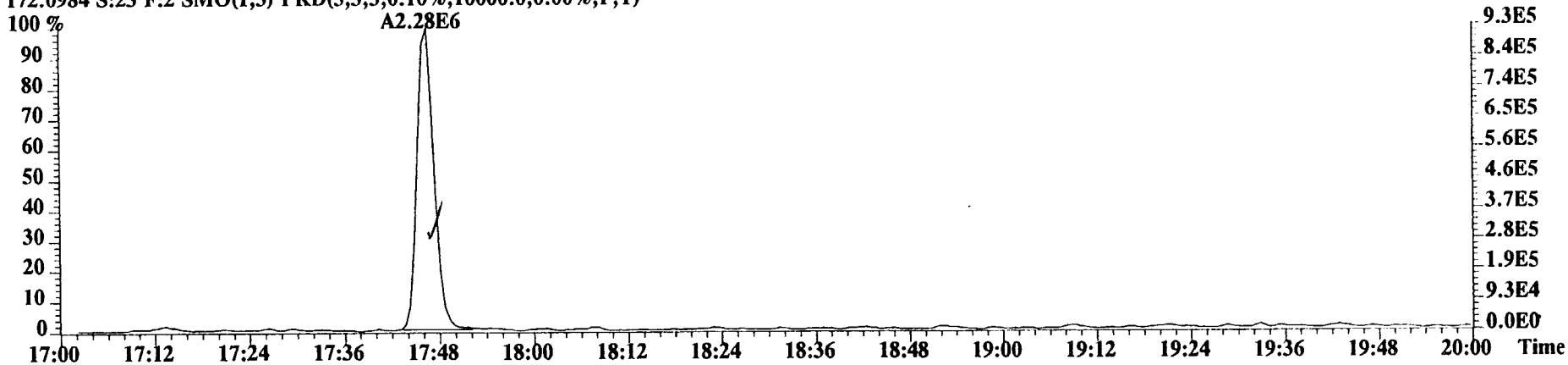


File:29OC98V4 #1-640 Acq:30-OCT-1998 09:26:14 GC EI+ Voltage SIR 70SE
Sample#23 Text:301802-3 :10X DIL. : : : Exp:PAHAIR

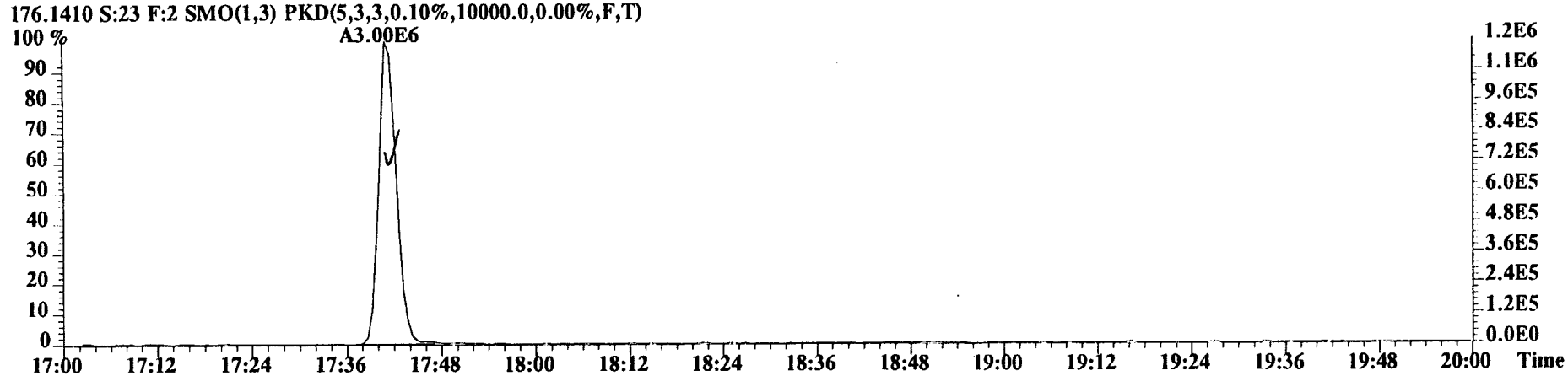
166.0798 S:23 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



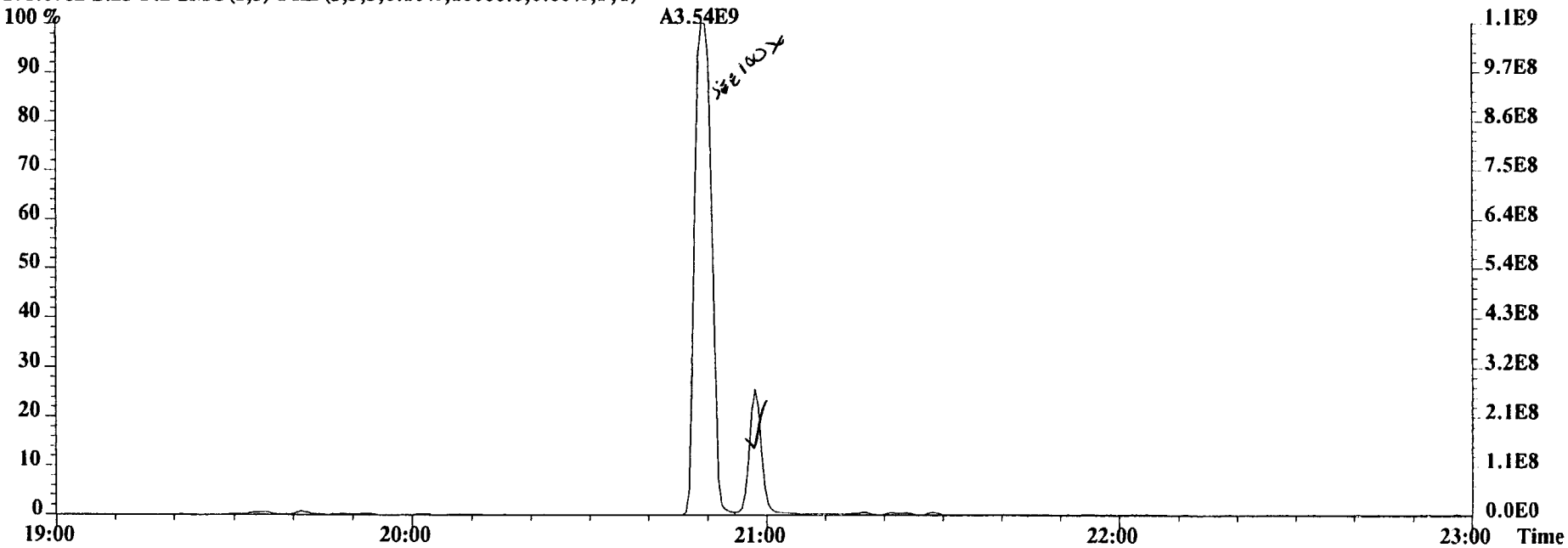
172.0984 S:23 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



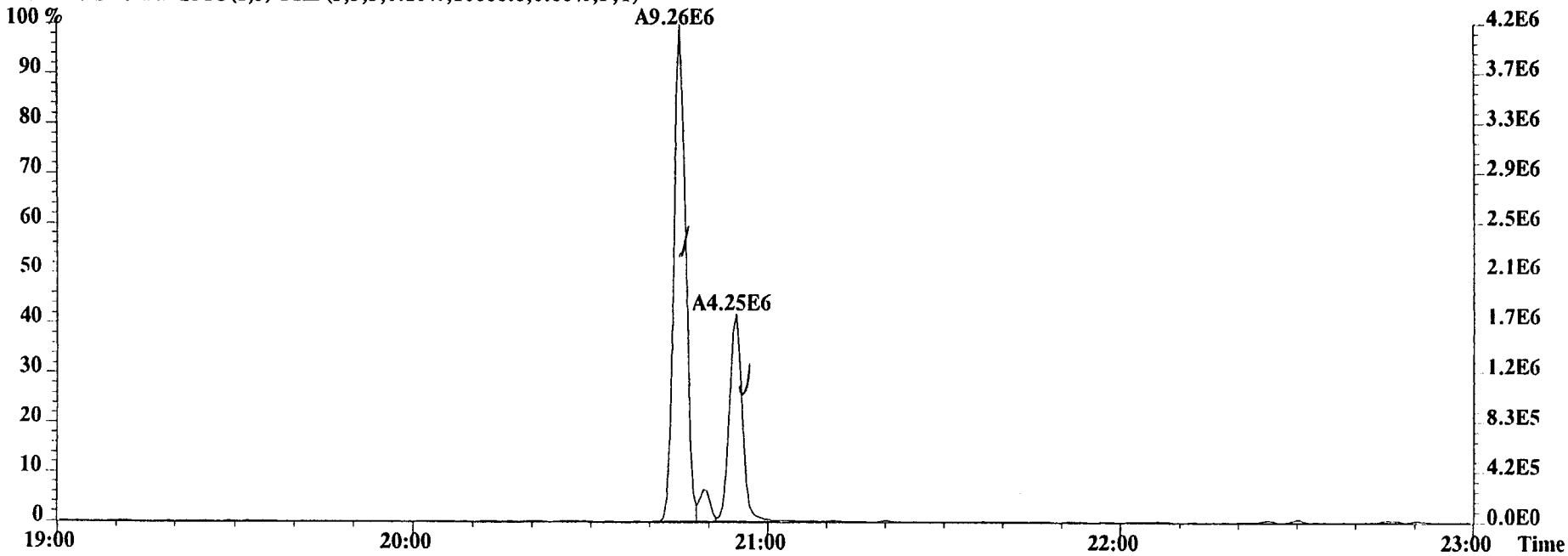
176.1410 S:23 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



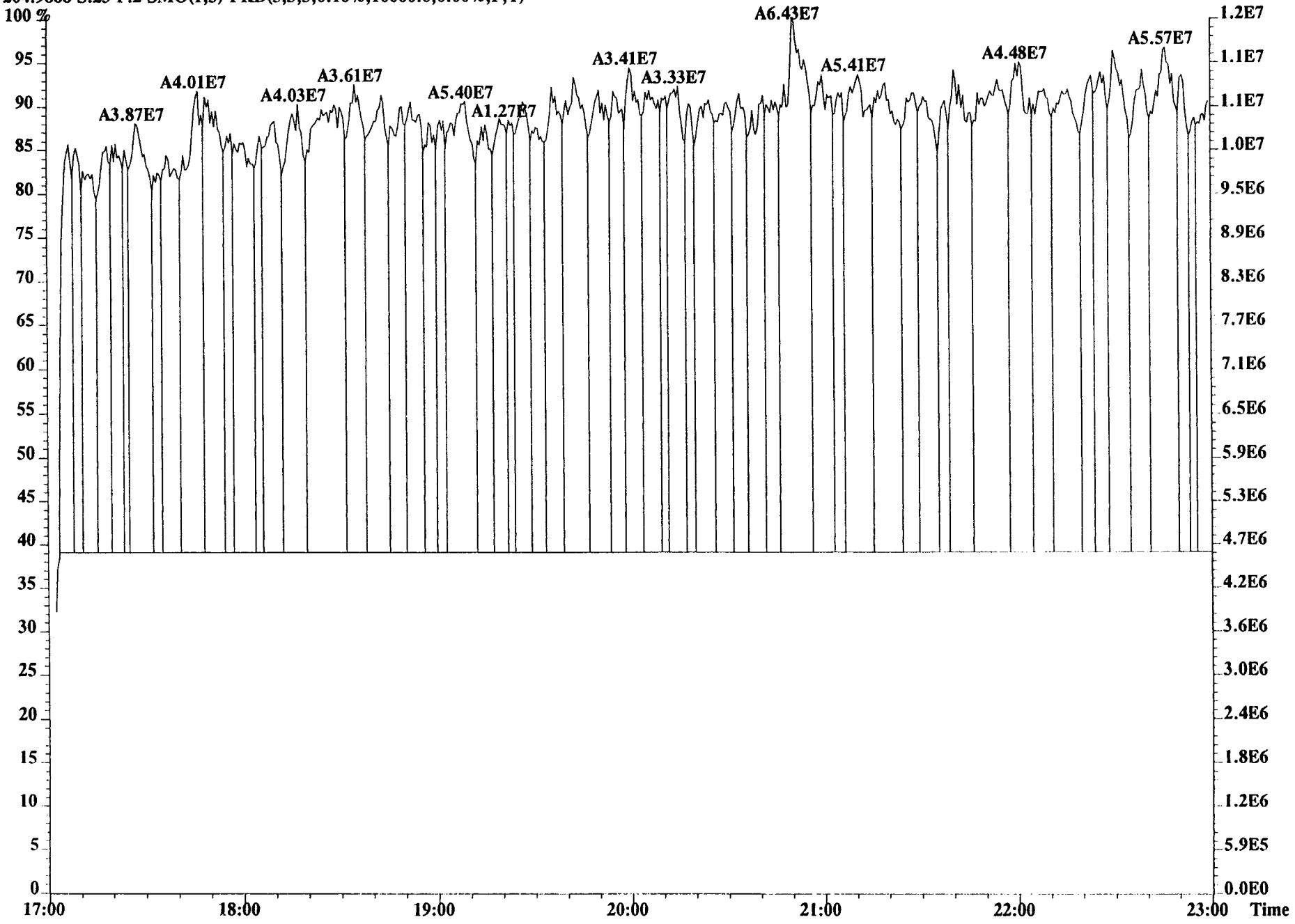
File:29OC98V4 #1-640 Acq:30-OCT-1998 09:26:14 GC EI+ Voltage SIR 70SE
Sample#23 Text:301802-3 :10X DIL. : : : Exp:PAHAIR
178.0782 S:23 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



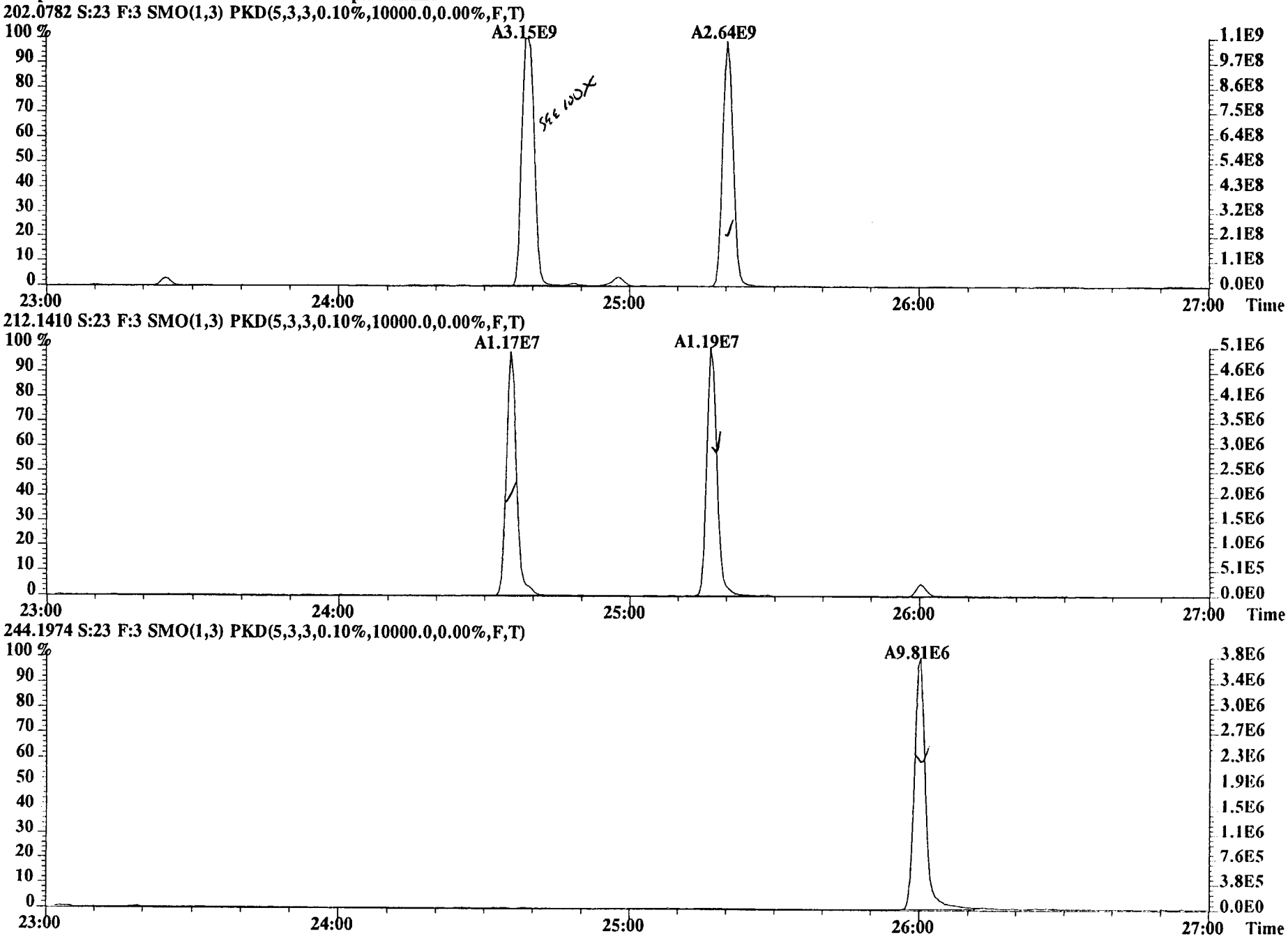
188.1410 S:23 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



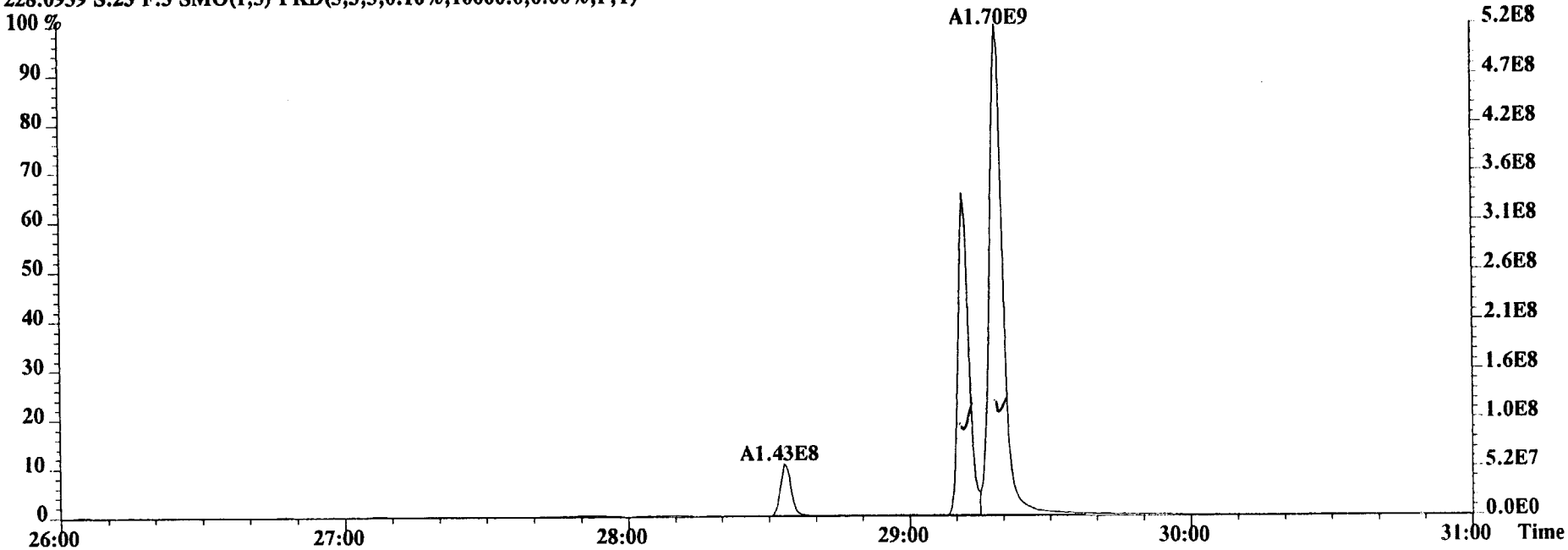
File:29OC98V4 #1-640 Acq:30-OCT-1998 09:26:14 GC EI+ Voltage SIR 70SE
Sample#23 Text:301802-3 :10X DIL. : : : Exp:PAHAIR
204.9888 S:23 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



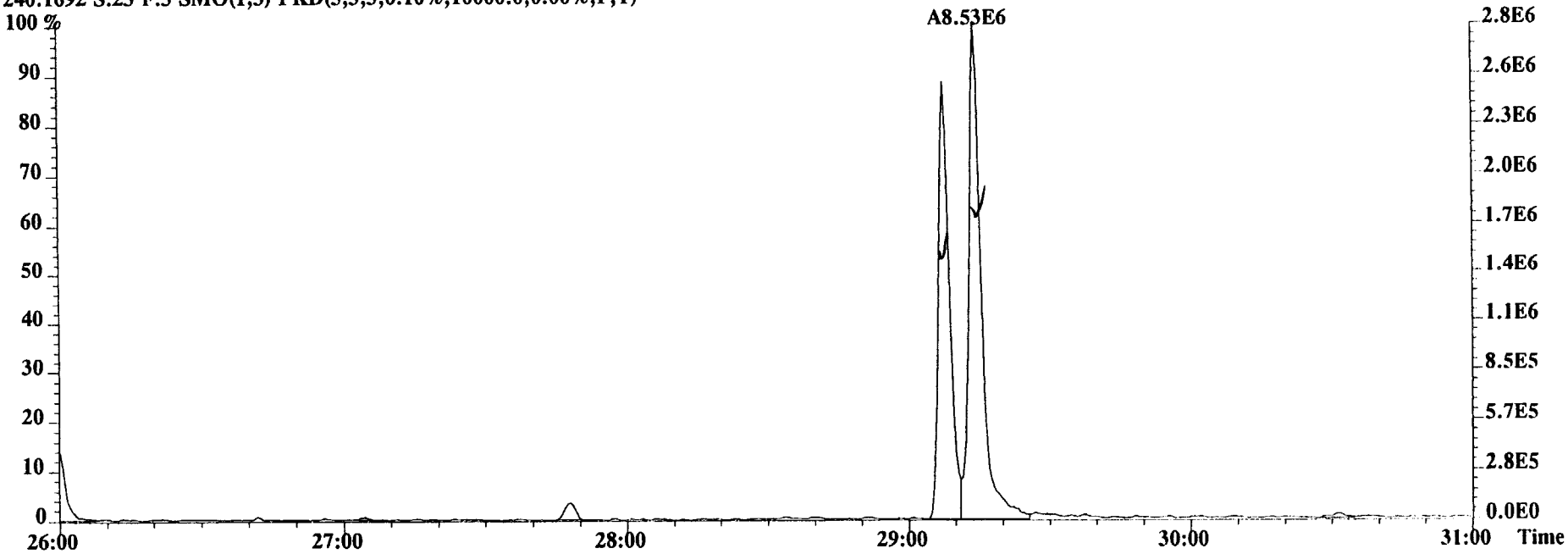
File:29OC98V4 #1-939 Acq:30-OCT-1998 09:26:14 GC EI+ Voltage SIR 70SE
Sample#23 Text:301802-3 :10X DIL. : : : Exp:PAHAIR



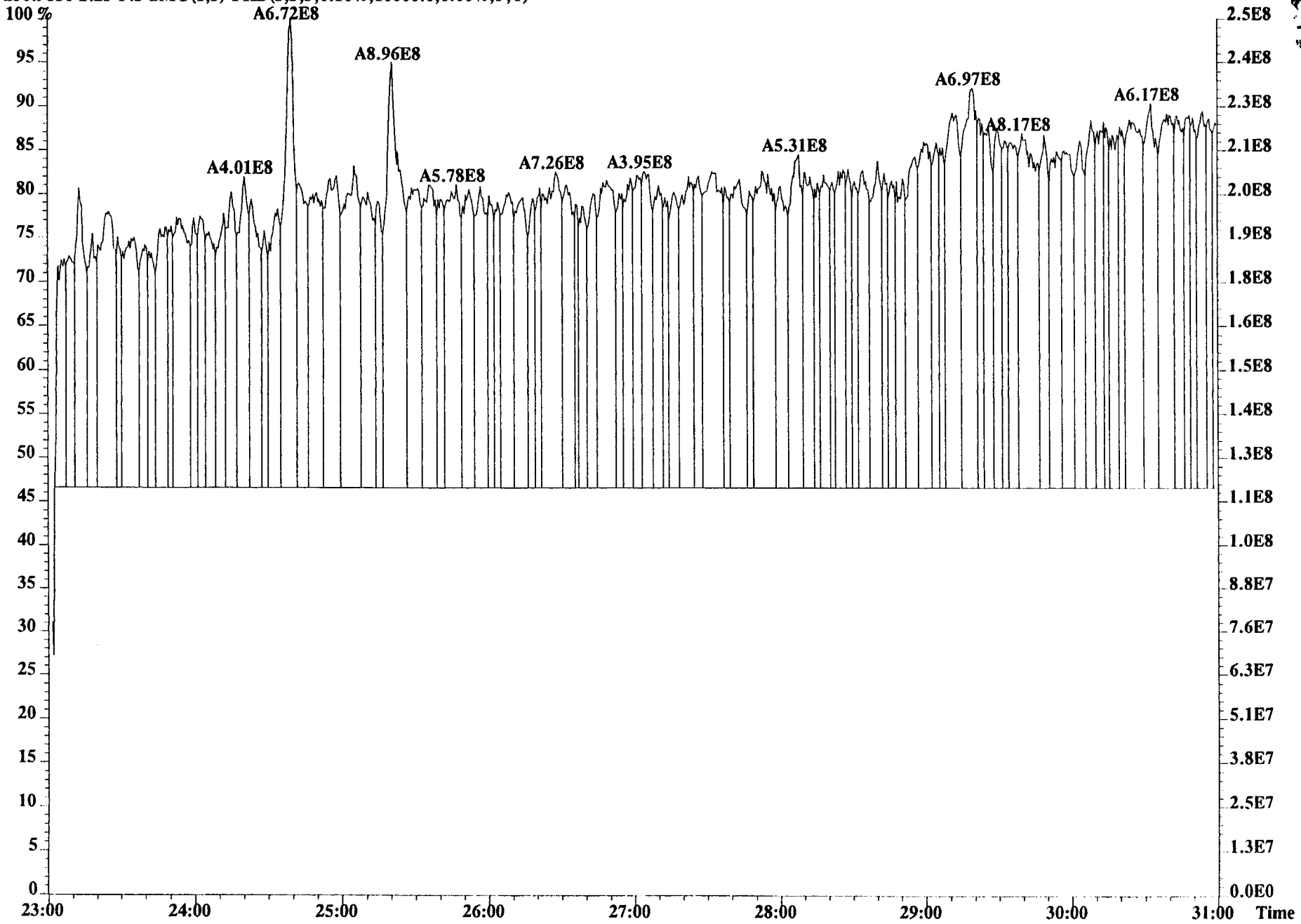
File:29OC98V4 #1-939 Acq:30-OCT-1998 09:26:14 GC EI+ Voltage SIR 70SE
Sample#23 Text:301802-3 :10X DIL. : : : Exp:PAHAIR
228.0939 S:23 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



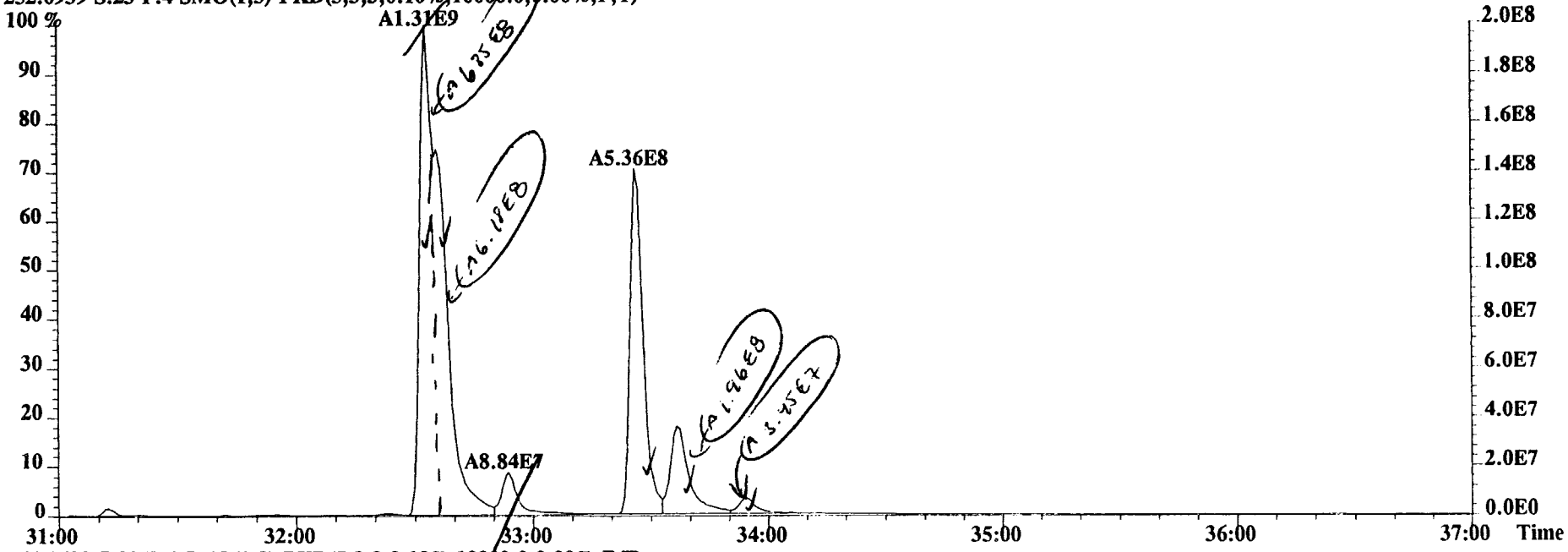
240.1692 S:23 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



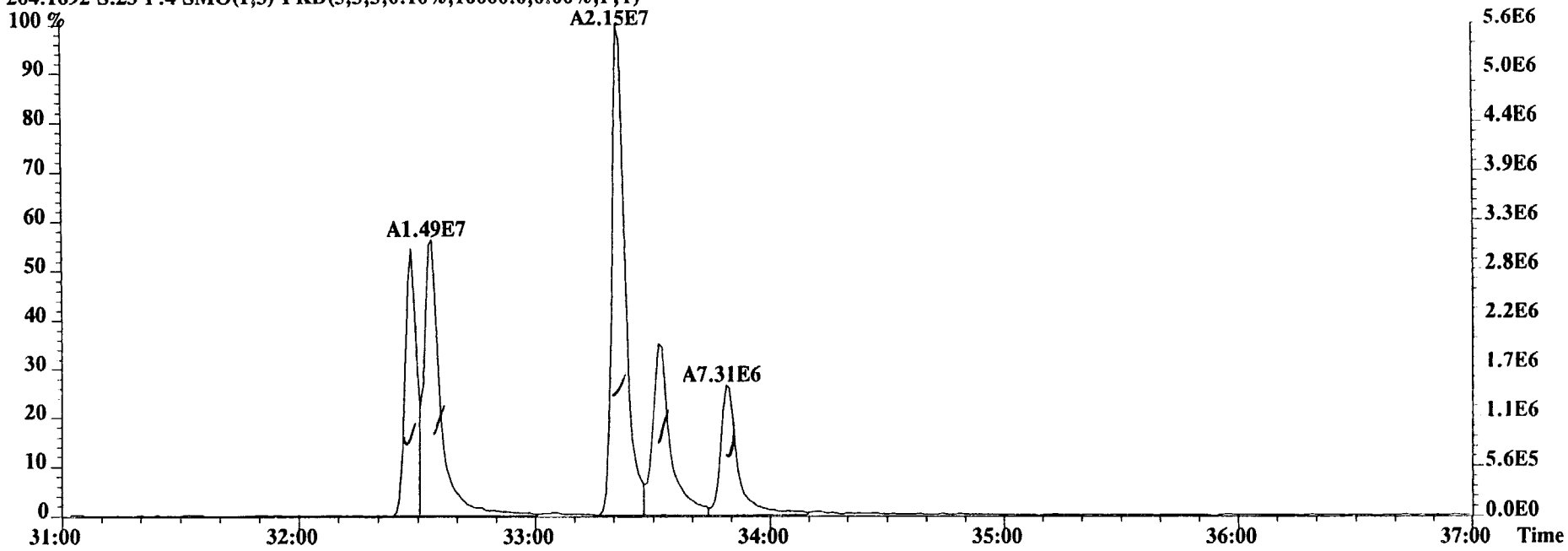
File:29OC98V4 #1-939 Acq:30-OCT-1998 09:26:14 GC EI+ Voltage SIR 70SE
Sample#23 Text:301802-3 :10X DIL. : : : Exp:PAHAIR
230.9856 S:23 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



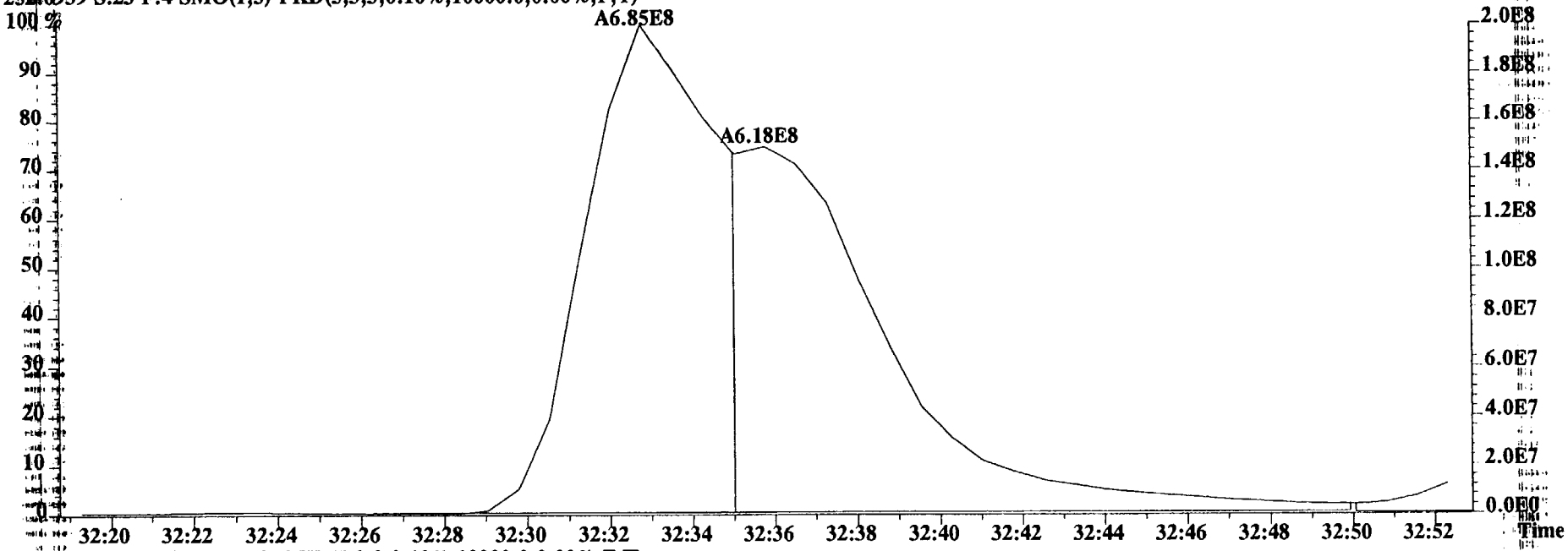
File:29OC98V4 #1-878 Acq:30-OCT-1998 09:26:14 GC EI+ Voltage SIR 70SE
Sample#23 Text:301802-3 :10X DIL. : : : Exp:PAHAIR
252.0939 S:23 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



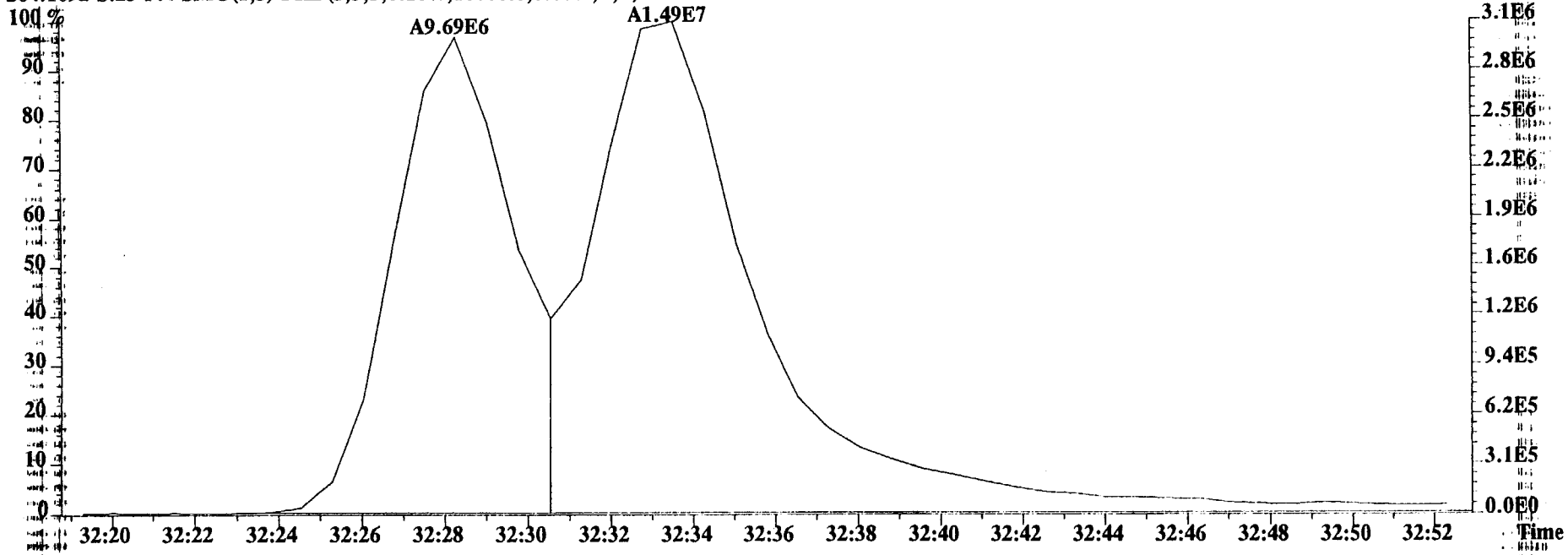
264.1692 S:23 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



File:29OC98V4 #1-878 Acq:30-OCT-1998 09:26:14 GC EI+ Voltage SIR 70SE
Sample#23 Text:301802-3 :10X DIL. : : : Exp:PAHAIR
252.0939 S:23 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

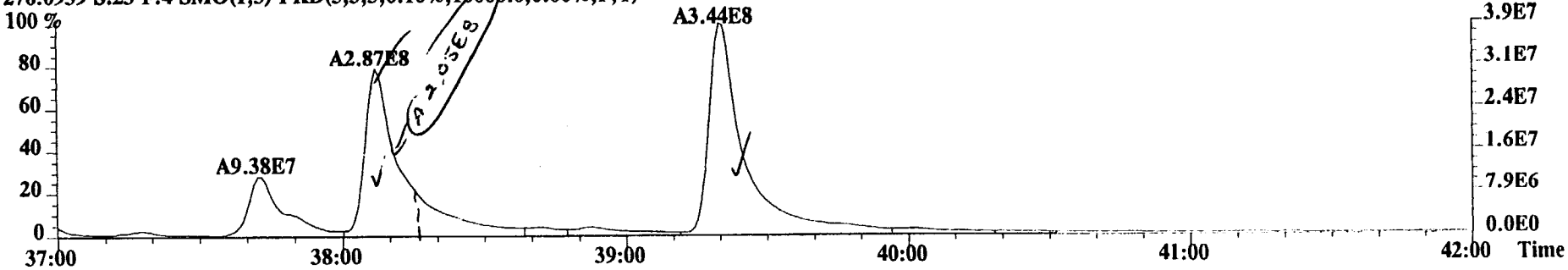


264.1692 S:23 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

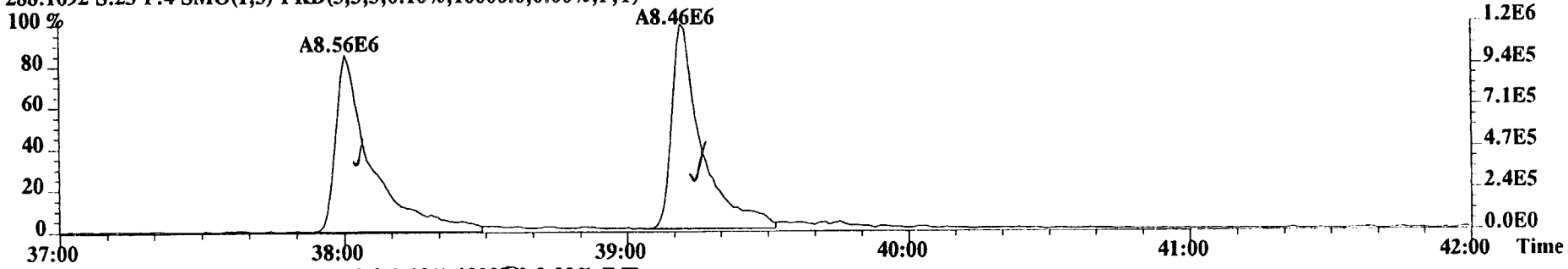


File:29OC98V4 #1-878 Acq:30-OCT-1998 09:26:14 GC EI+ Voltage SIR 70SE
Sample#23 Text:301802-3 :10X DIL. : : : Exp:PAHAIR

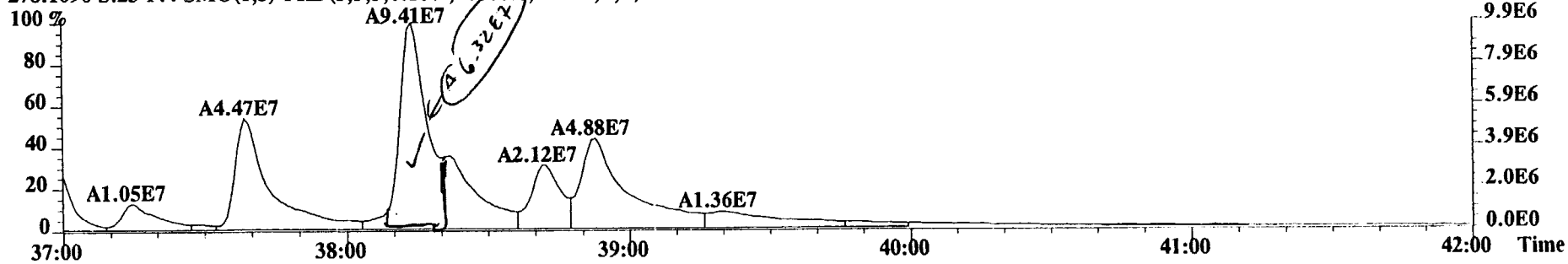
276.0939 S:23 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



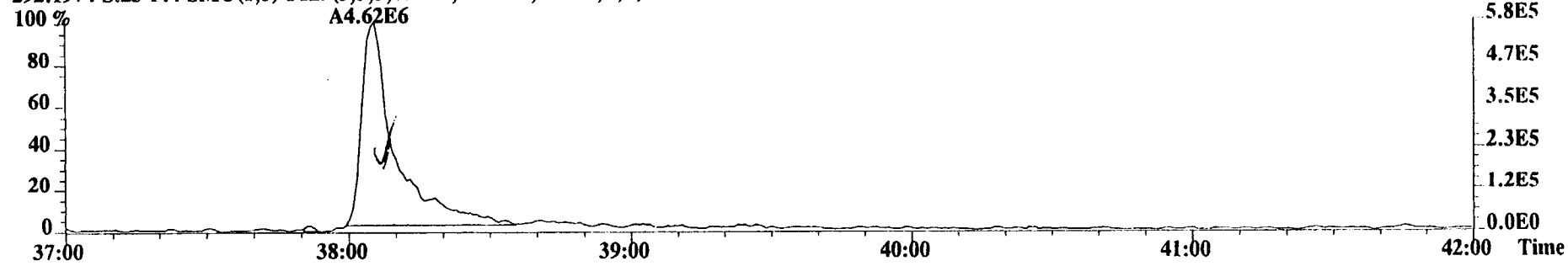
288.1692 S:23 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



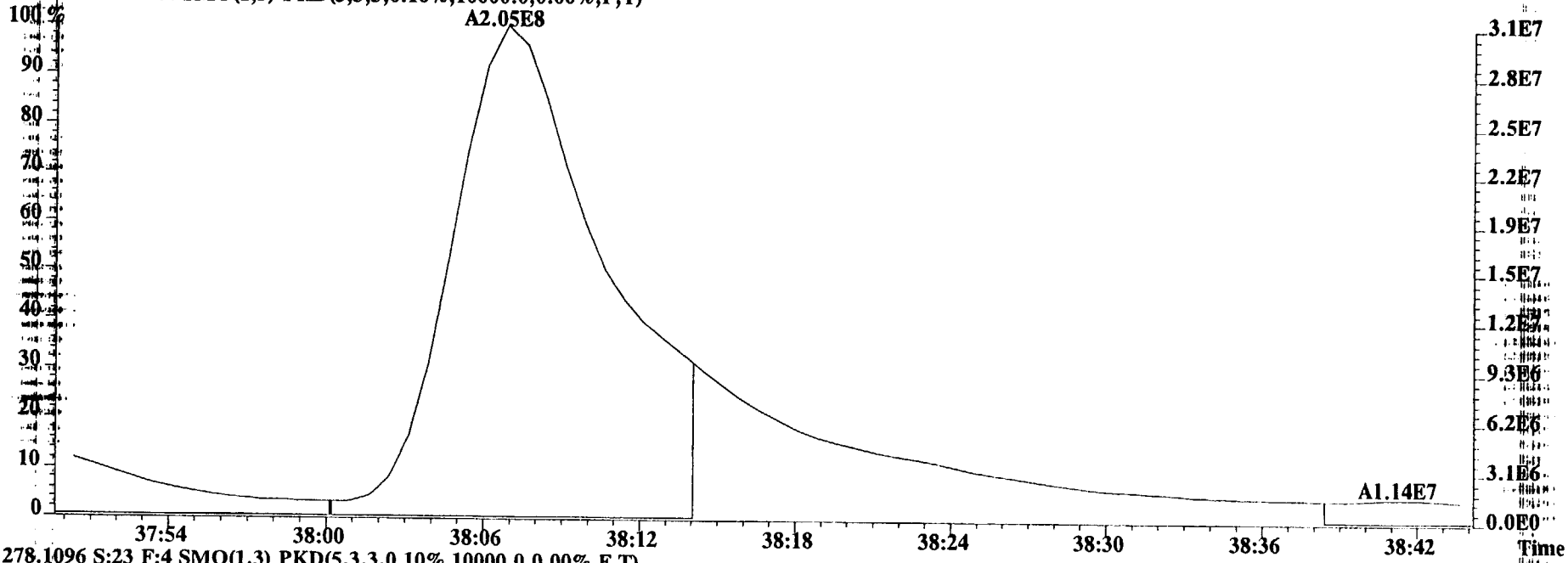
278.1096 S:23 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



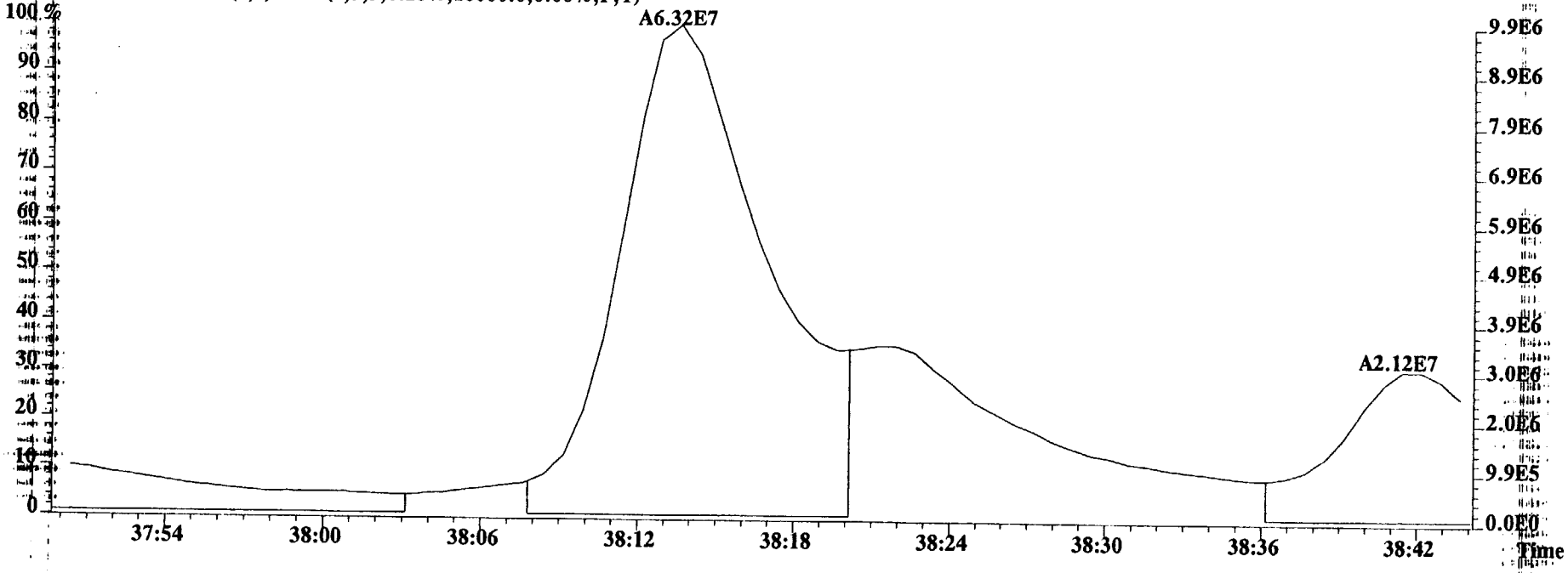
292.1974 S:23 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



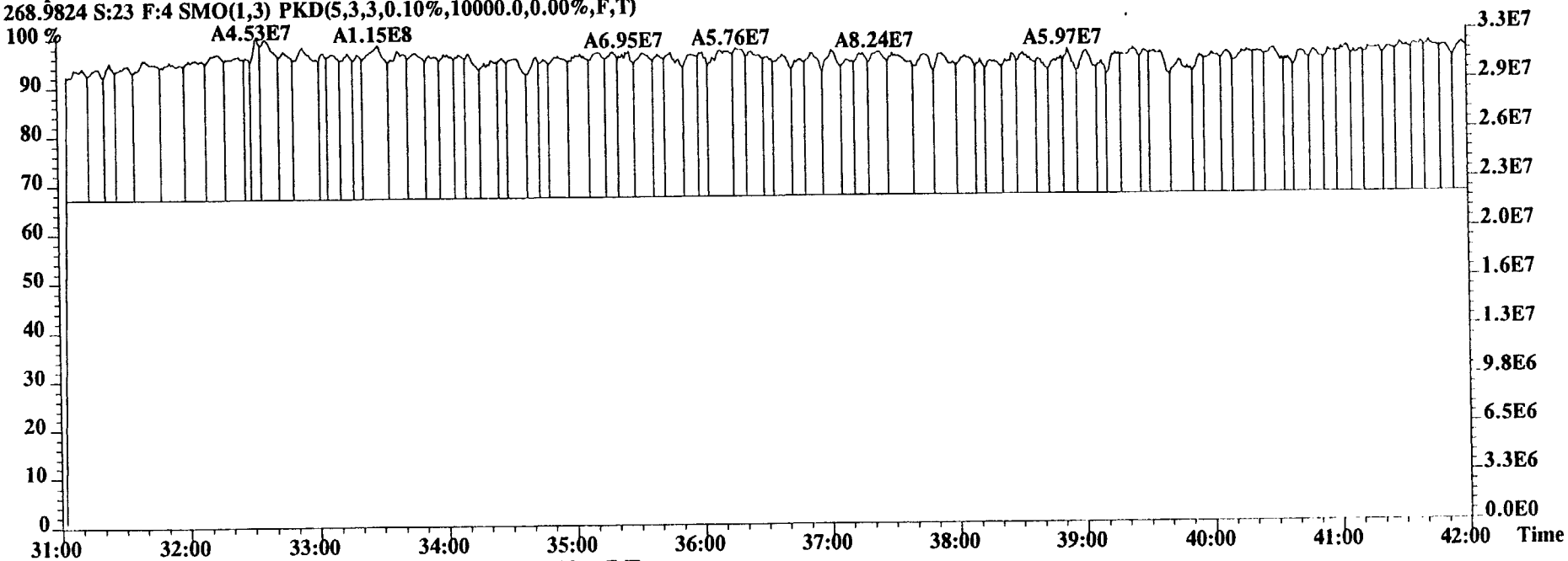
File:29OC98V4 #1-878 Acq:30-OCT-1998 09:26:14 GC EI+ Voltage SIR 70SE
Sample#23 Text:301802-3 :10X DIL. : : : Exp:PAHAIR
276.0939 S:23 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



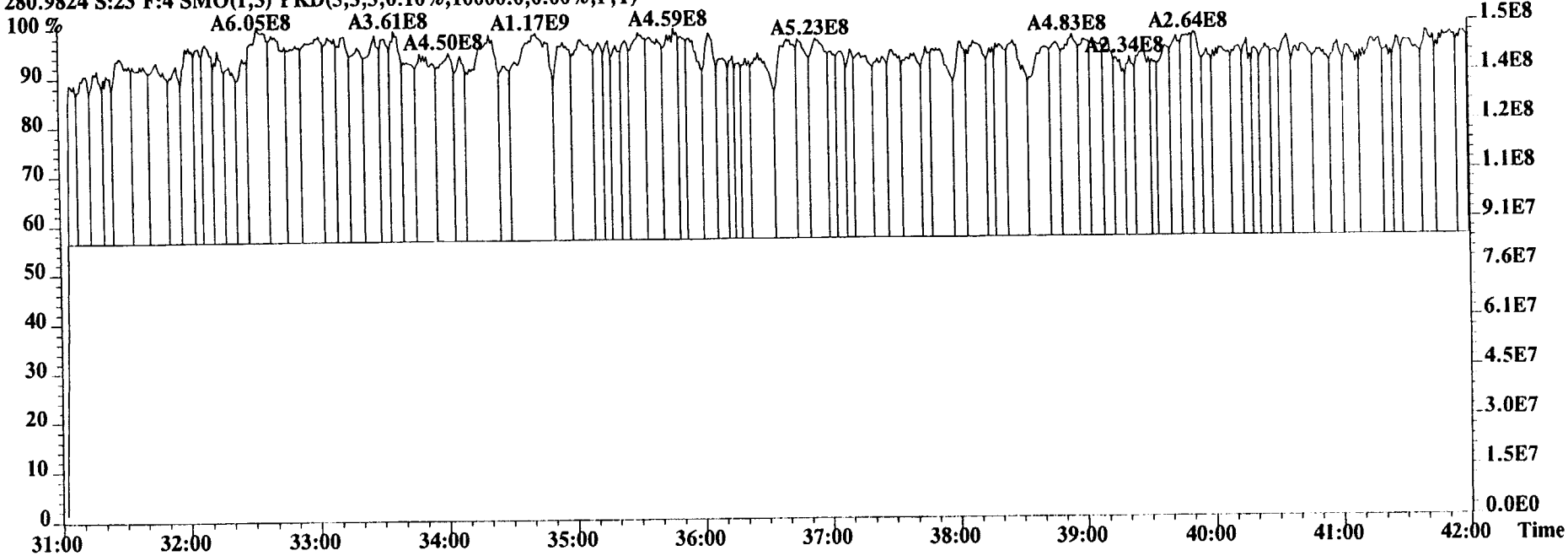
278.1096 S:23 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



File:29OC98V4 #1-878 Acq:30-OCT-1998 09:26:14 GC EI+ Voltage SIR 70SE
Sample#23 Text:301802-3 :10X DIL. : : : Exp:PAHAIR
268.9824 S:23 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



280.9824 S:23 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



04-NOV-1998 05:09:30 PM Dioxin Furan Unknown RESULTS

Mass Spec : VG-4 Results : 02NO98V4111.RES : PAHAIR.TRG
GC Column : DB-5 Date analyzed : 02-NOV-98
Data file : 02NO98V4 301802-3 :100X DIL. : : : Ex Cal : PAHAIR102998V4.R
Weight : 0.5

Name	Total Response	Isotope Ratio		R. T. mm:ss		RRF	ng/ TRAIN	Rec/ MDL	
d10-2-Methylnaphthalene	289378	1.00	Y	12: 28	Y	1.00	50.00		
d8-Naphthalene	498000	1.00	Y	10: 12	Y	2.24	38.40	77	
Naphthalene	961520000	1.00	Y	10: 16	Y	1.23	1.6e+05	B ~~E~~	
2-Methylnaphthalene	114770200	1.00	Y	12: 34	Y	0.56	4.1e+04	B	
d8-Acenaphthylene	202984	1.00	Y	15: 28	Y	1.21	28.90	58	
Acenaphthylene	64111400	1.00	Y	15: 31	Y	0.94	3.3e+04		
d10-Acenaphthene	150263	1.00	Y	16: 2	Y	0.74	34.87	70	
Acenaphthene	11882380	1.00	Y	16: 7	Y	1.25	6346.01		
d10-Anthracene	166005	1.00	Y	20: 55	Y	1.00	50.00		
d10-Phenanthrene	462260	1.00	Y	20: 45	Y	2.81	49.59	99	
Phenanthrene	272442000	1.00	Y	20: 49	Y	0.89	6.6e+04	B ~~E~~	
d14-Terphenyl	542000	1.00	Y	26: 2	Y	1.00	50.00		
d10-Fluoranthene	374000	1.00	Y	24: 35	Y	1.41	24.46	49	m
Fluoranthene	103869200	1.00	Y	24: 39	Y	1.11	2.5e+04		

11-4-98
cl

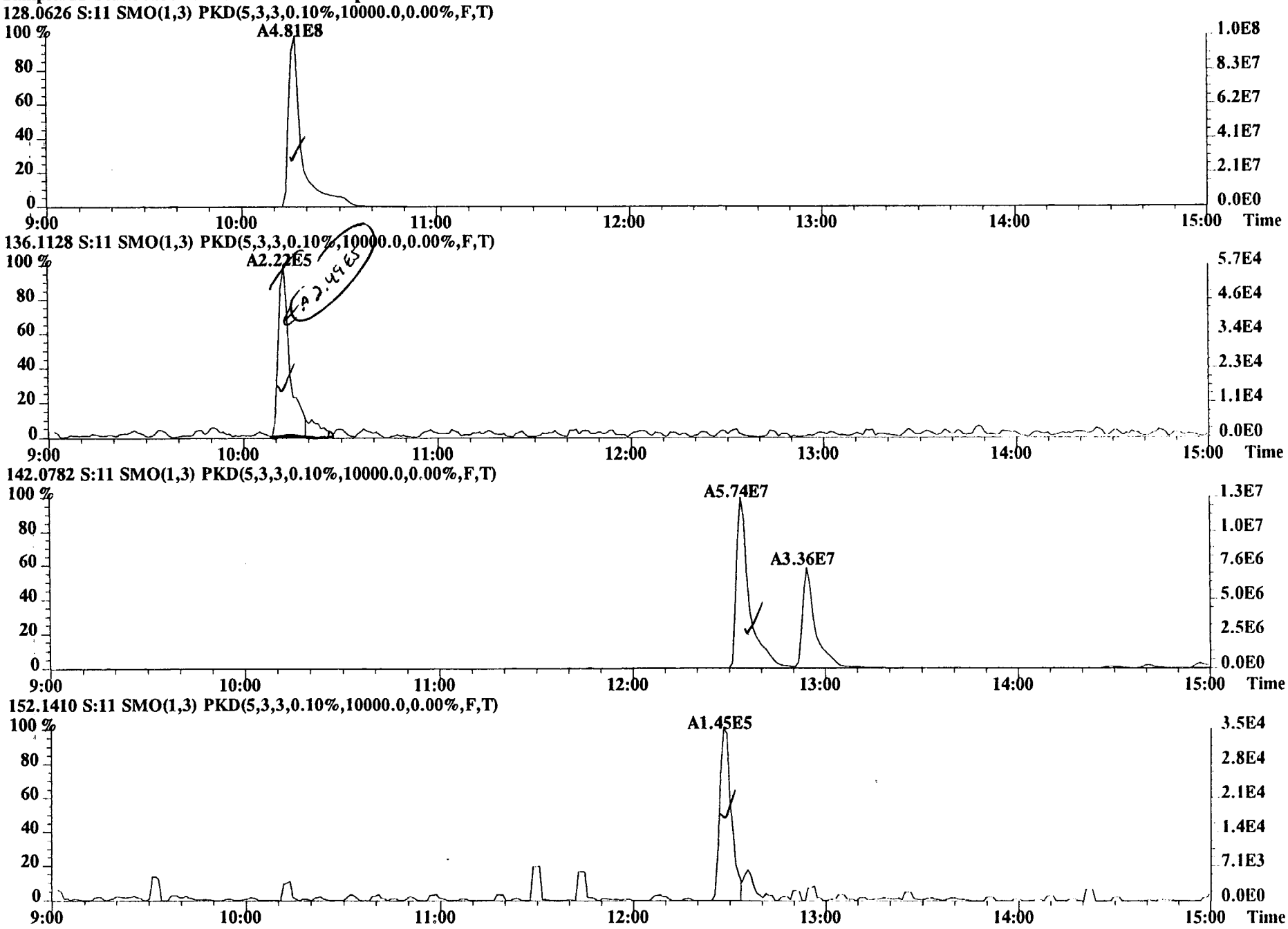
		0.5	
		Rec/ MDL	
		144689	144689
	77	249000	249000
B	E	480760000	480760000
	B	57385100	57385100
	58	101492	101492
		32055700	32055700
	70	75132	75132
		5941190	5941190
		83002	83002
	99	231130	231130
B	E	136221000	136221000
		271000	271000
	49	187000	187000
		51934600	51934600

03-NOV-1998 08:37:07 AM 429AIR Unknown RESULTS

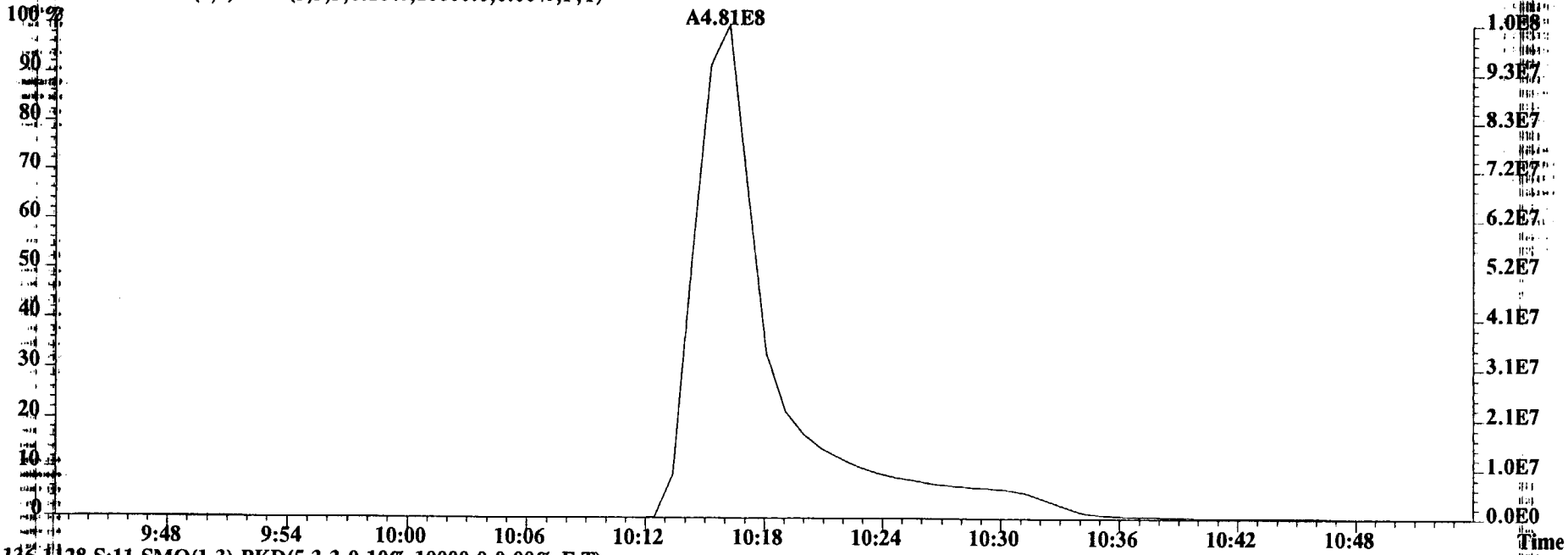
Mass Spec : VG-4 Results : 02NO98V4111.RES : PAHAIR.TRG
GC Column : DB-5 Date analyzed : 02-NOV-98
Data file : 02NO98V4 301802-3 :100X DIL. : : : Ex Cal : PAHAIR102998V4.R
Weight : 0.5

Name	Total Response	Isotope Ratio	R. T. mm:ss	RRF	ng/ TRAIN	Rec/ MDL
d10-2-Methylnaphthalene	289378	1.00 Y	12: 28 Y	1.00	50.00	
d8-Naphthalene	444984	1.00 Y	10: 12 Y	2.24	34.31	69
Naphthalene	961520000	1.00 Y	10: 16 Y	1.23	1.8e+05	0.000
2-Methylnaphthalene	114770200	1.00 Y	12: 34 Y	0.56	4.6e+04	0.000
d8-Acenaphthylene	202984	1.00 Y	15: 28 Y	1.21	28.90	58
Acenaphthylene	64111400	1.00 Y	15: 31 Y	0.94	3.3e+04	0.000
d10-Acenaphthene	150263	1.00 Y	16: 2 Y	0.74	34.87	70
Acenaphthene	11882380	1.00 Y	16: 7 Y	1.25	6346.01	0.000
d10-Anthracene	166005	1.00 Y	20: 55 Y	1.00	50.00	
d10-Fluorene	75455	1.00 Y	17: 41 Y	1.42	15.99	32
Fluorene	1165690	1.00 Y	17: 46 Y	1.16	1331.20	0.000
d10-Phenanthrene	462260	1.00 Y	20: 45 Y	2.81	49.59	99
Phenanthrene	272442000	1.00 Y	20: 49 Y	0.89	6.6e+04	0.000
Anthracene	* No Peak	0.00 N	20: 59 N	0.80	0.00	0.000
d14-Terphenyl	501878	1.00 Y	26: 2 Y	1.00	50.00	
d10-Fluoranthene	314968	1.00 Y	24: 35 Y	1.41	22.24	44
Fluoranthene	103869200	1.00 Y	24: 39 Y	1.11	3.0e+04	0.000
d10-Pyrene	415390	1.00 Y	25: 17 Y	1.52	27.26	55
Pyrene	72381000	1.00 Y	25: 20 Y	1.21	1.4e+04	0.000
d12-Benzo(a)anthracene	327288	1.00 Y	29: 8 Y	0.90	36.23	72
Benzo(a)anthracene	33901000	1.00 Y	29: 12 Y	1.20	8599.51	0.000
d12-Chrysene	469998	1.00 Y	29: 15 Y	1.28	36.60	73
Chrysene	90611800	1.00 Y	29: 19 Y	1.08	1.8e+04	0.000
d12-Benzo(e)pyrene	794292	1.00 Y	33: 21 Y	1.00	50.00	
d12-Benzo(b)fluoranthene	252920	1.00 Y	32: 29 Y	0.45	35.08	70
Benzo(b)fluoranthene	31804200	1.00 Y	32: 34 Y	1.17	1.1e+04	0.000
d12-Benzo(k)fluoranthene	287312	1.00 Y	32: 35 Y	0.95	19.08	38
Benzo(k)fluoranthene	31804200	1.00 Y	32: 34 Y	1.16	9508.72	0.000
d12-Benzo(a)pyrene	341496	1.00 Y	33: 33 Y	0.68	31.77	64
Benzo(e)pyrene	13925560	1.00 Y	33: 27 Y	1.64	2485.21	0.000
Benzo(a)pyrene	6532300	1.00 Y	33: 38 Y	1.07	1784.41	0.000
d12-Perylene	* No Peak	0.00 N	33: 48 N	0.63	0.00	0
Perylene	* No Peak	0.00 N	33: 54 N	1.71	*NoINoIs	
d12-Indeno(123-cd)pyrene	121646	1.00 Y	38: 2 Y	0.44	17.23	34
Indeno(123-cd)pyrene	7905860	1.00 Y	38: 9 Y	0.62	1.0e+04	0.000
d14-Dibenz(ah)anthracene	* No Peak	0.00 N	38: 4 N	0.25	0.00	0
Dibenz(ah)anthracene	2401180	1.00 Y	38: 17 Y	1.40	*NoINoIs	
d12-Benzo(ghi)perylene	175940	1.00 Y	39: 14 Y	0.58	19.10	38
Benzo(ghi)perylene	12347540	1.00 Y	39: 22 Y	1.02	6907.42	0.000
d10-Fluorene	75455	1.00 Y	17: 41 Y	1.42	3.34	7
13C-Fluorene	57304	1.00 Y	17: 46 Y	1.00	75.94	0.000

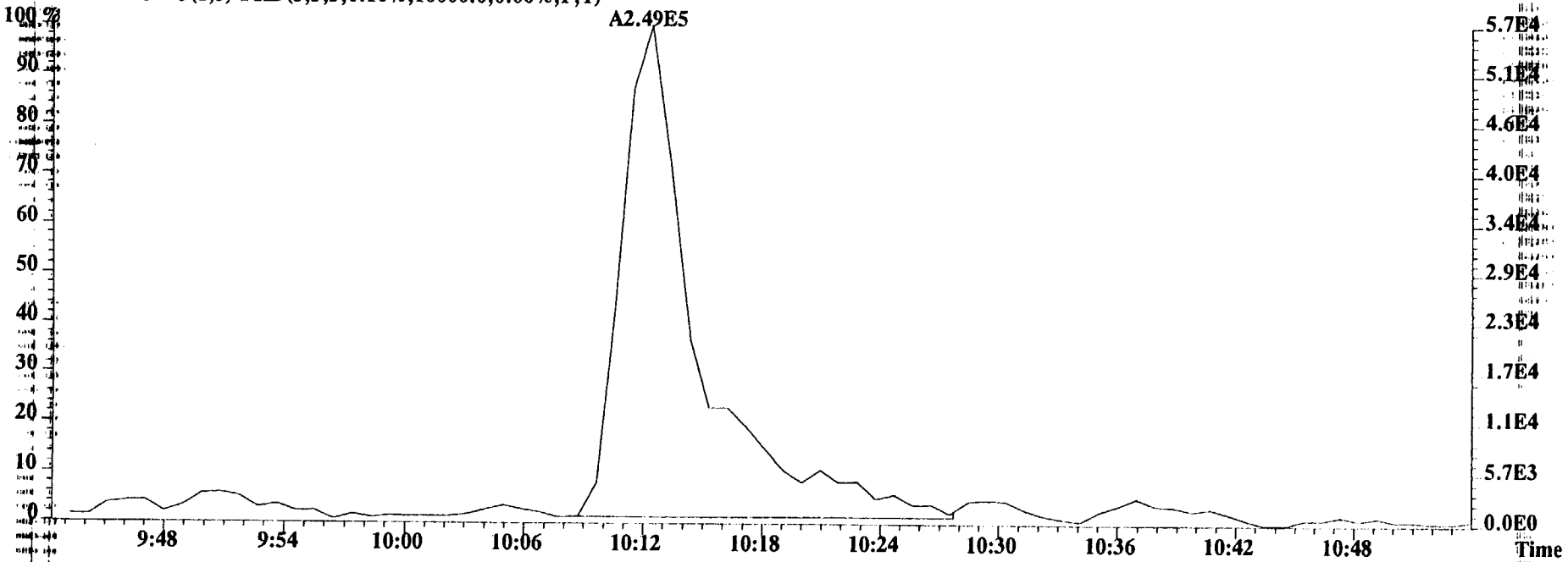
File:02NO98V4 #1-509 Acq: 2-NOV-1998 21:23:33 GC EI+ Voltage SIR 70SE
Sample#11 Text:301802-3 :100X DIL. : : : Exp:PAHAIR



File:02NO98V4 #1-509 Acq: 2-NOV-1998 21:23:33 GC EI+ Voltage SIR 70SE
Sample#11 Text:301802-3 :100X DIL. : : : Exp:PAHAIR
128.0626 S:11 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

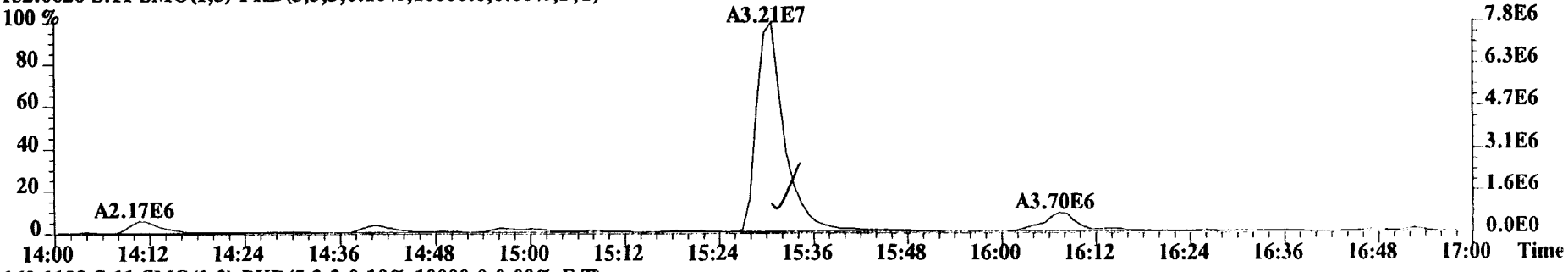


136.1128 S:11 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

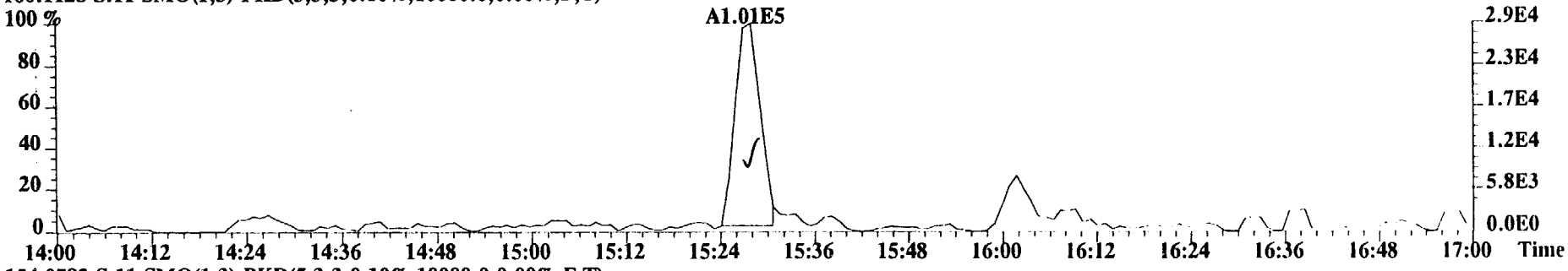


File:02NO98V4 #1-509 Acq: 2-NOV-1998 21:23:33 GC EI+ Voltage SIR 70SE
Sample#11 Text:301802-3 :100X DIL. : : : Exp:PAHAIR

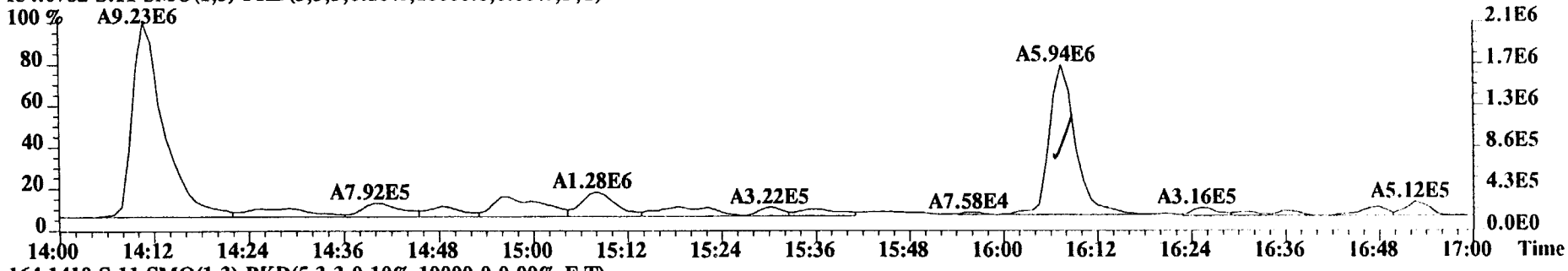
152.0626 S:11 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



160.1128 S:11 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

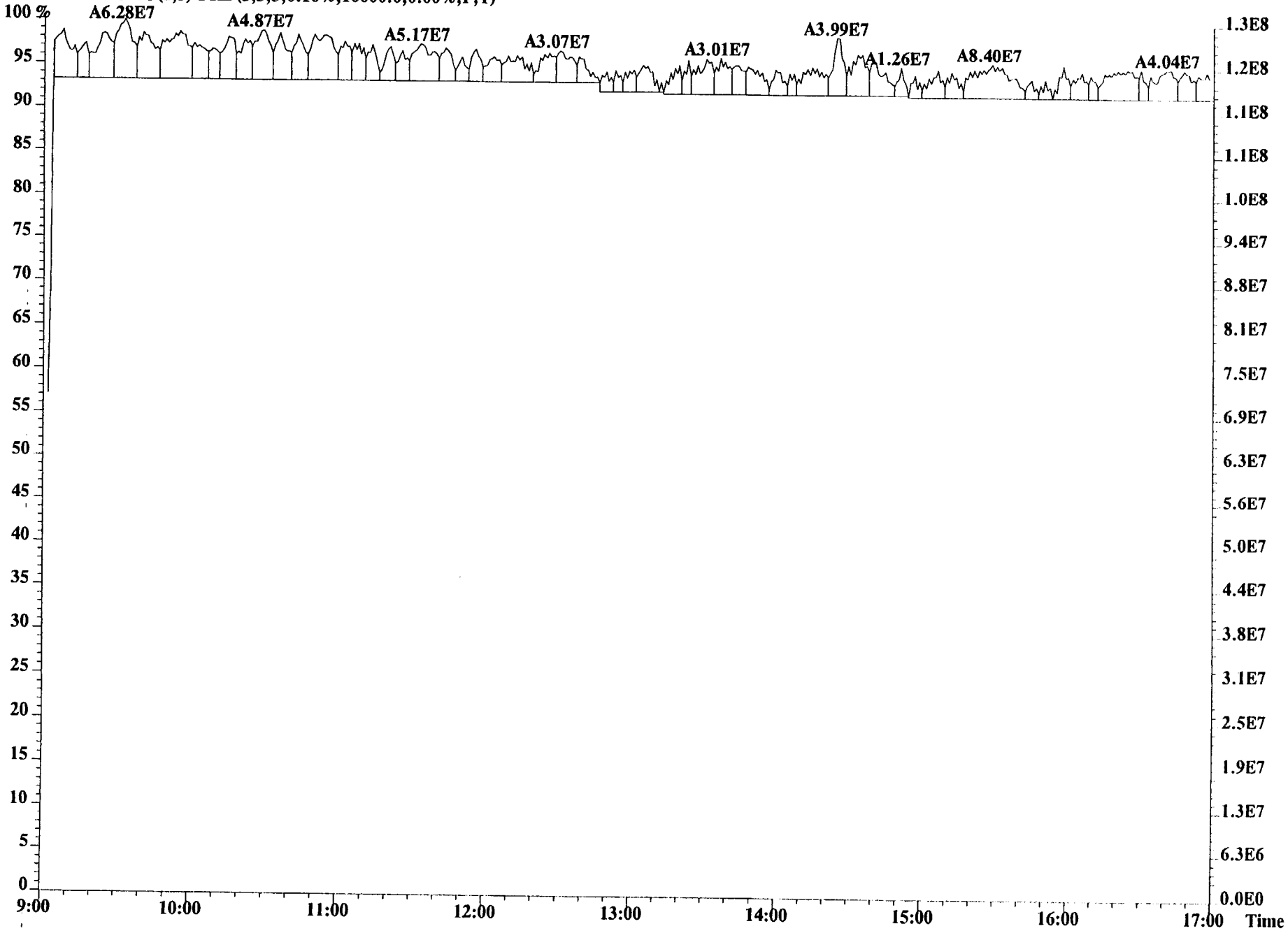


154.0782 S:11 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

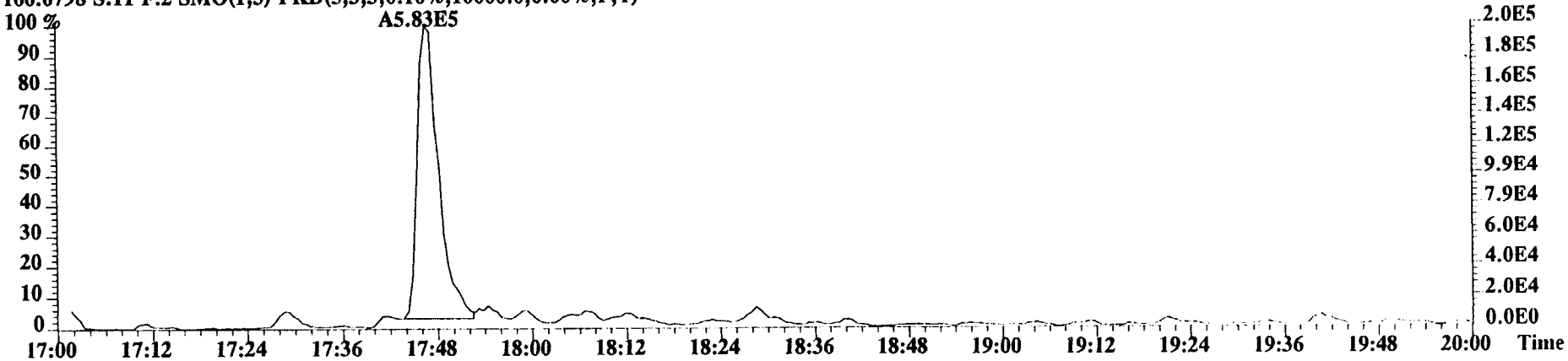


164.1410 S:11 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

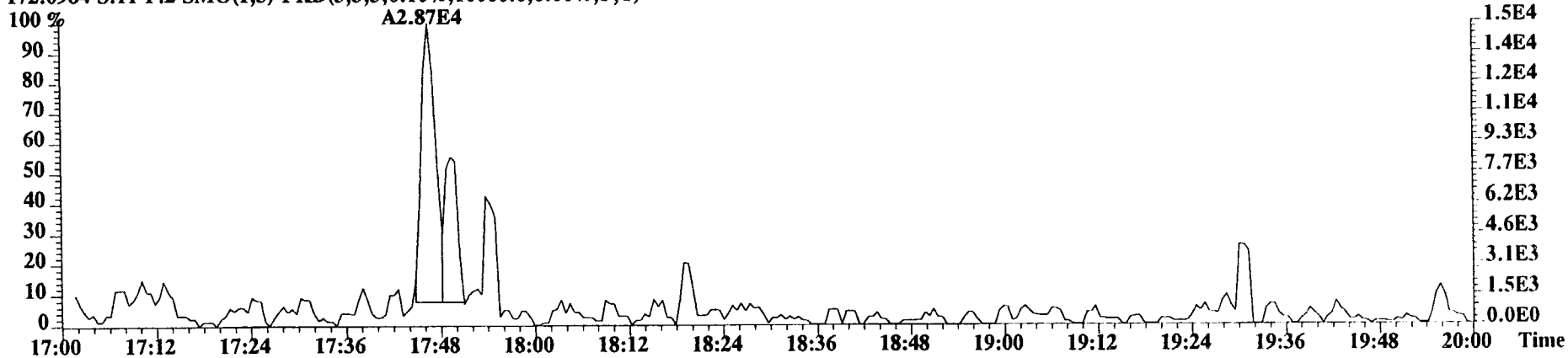
File:02NO98V4 #1-509 Acq: 2-NOV-1998 21:23:33 GC EI+ Voltage SIR 70SE
Sample#11 Text:301802-3 :100X DIL. : : : Exp:PAHAIR
130.9920 S:11 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



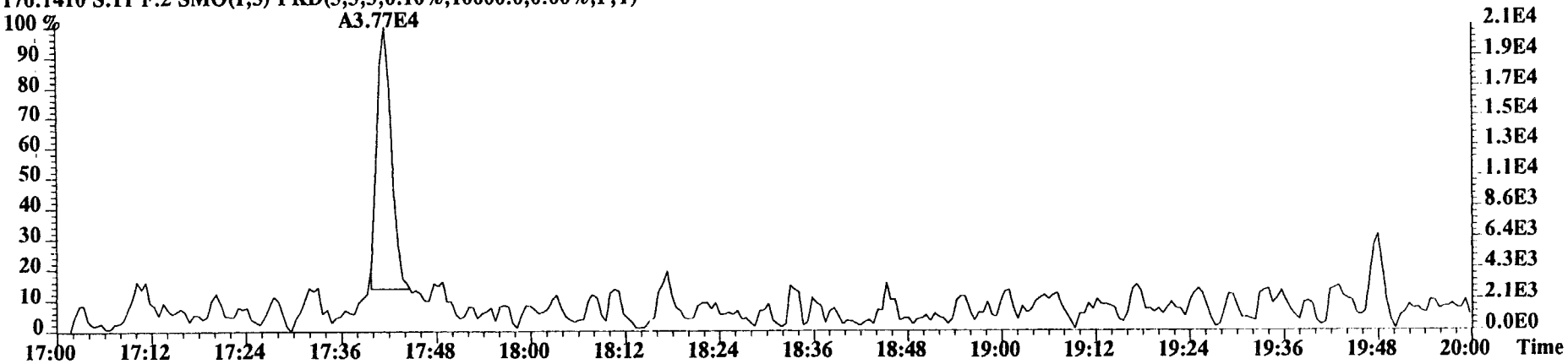
File:02NO98V4 #1-641 Acq: 2-NOV-1998 21:23:33 GC EI+ Voltage SIR 70SE
Sample#11 Text:301802-3 :100X DIL. : : : Exp:PAHAIR
166.0798 S:11 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



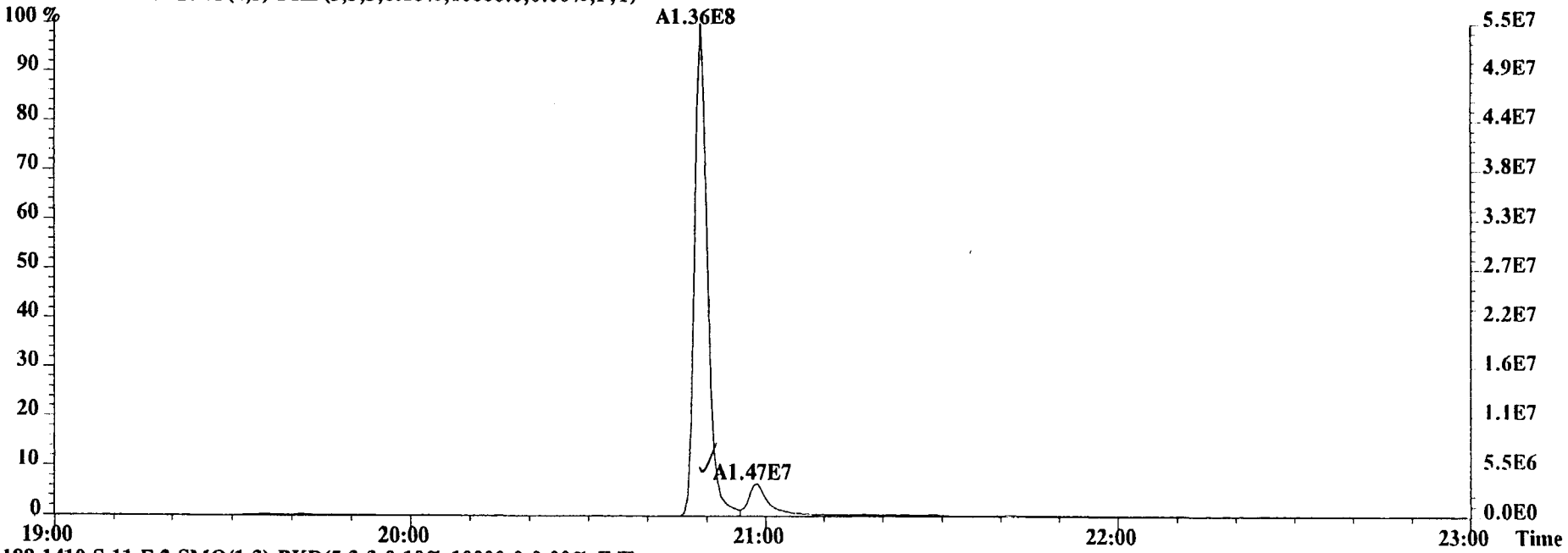
172.0984 S:11 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



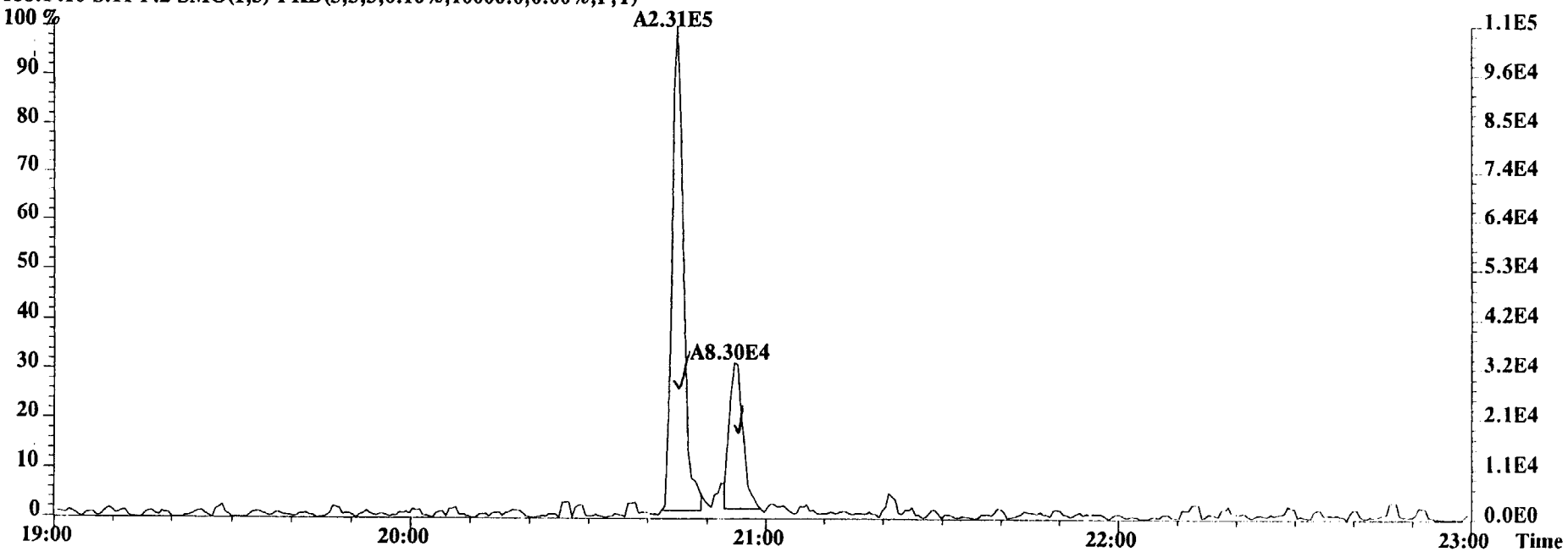
176.1410 S:11 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



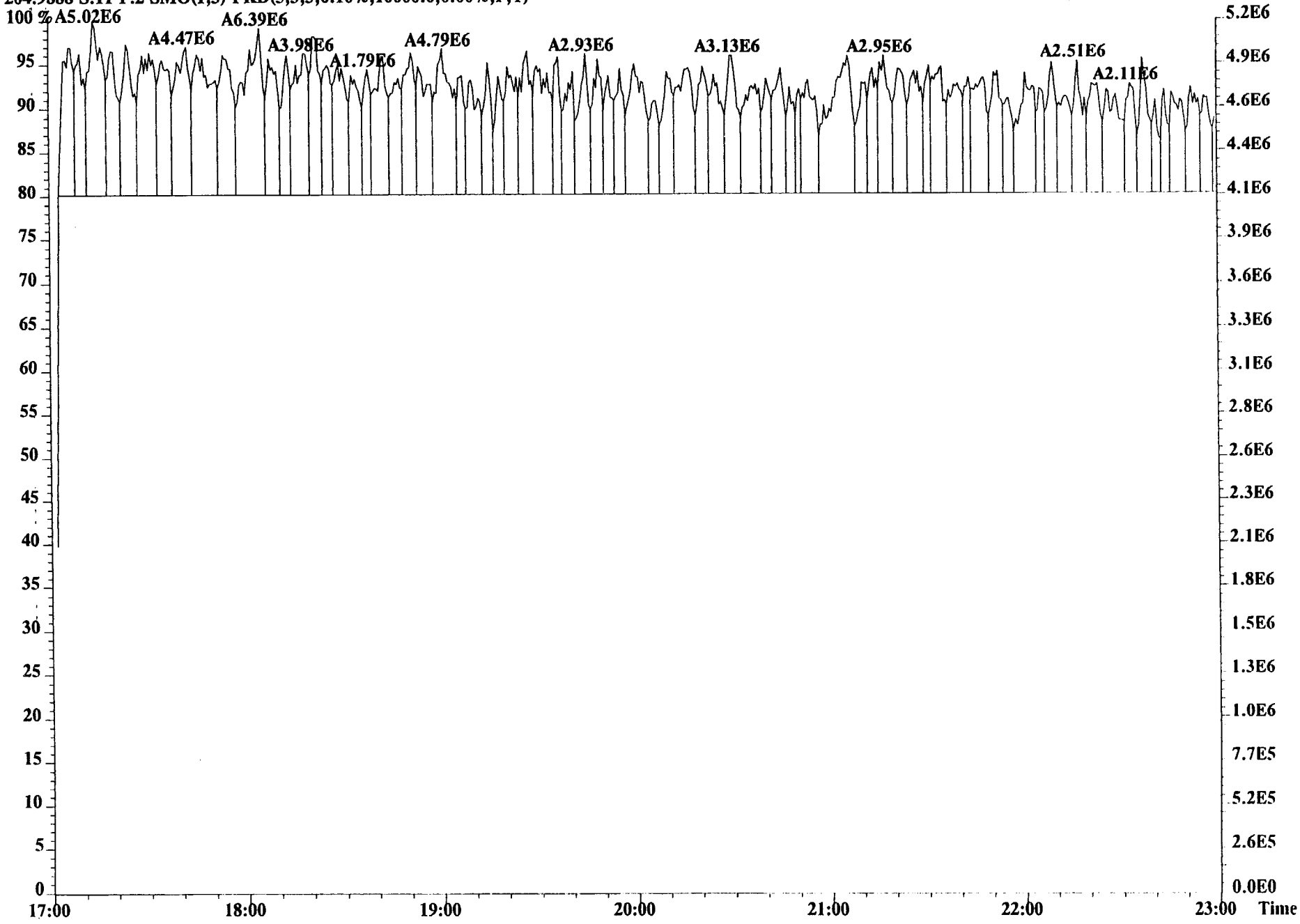
File:02NO98V4 #1-641 Acq: 2-NOV-1998 21:23:33 GC EI+ Voltage SIR 70SE
Sample#11 Text:301802-3 :100X DIL. : : : Exp:PAHAIR
178.0782 S:11 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



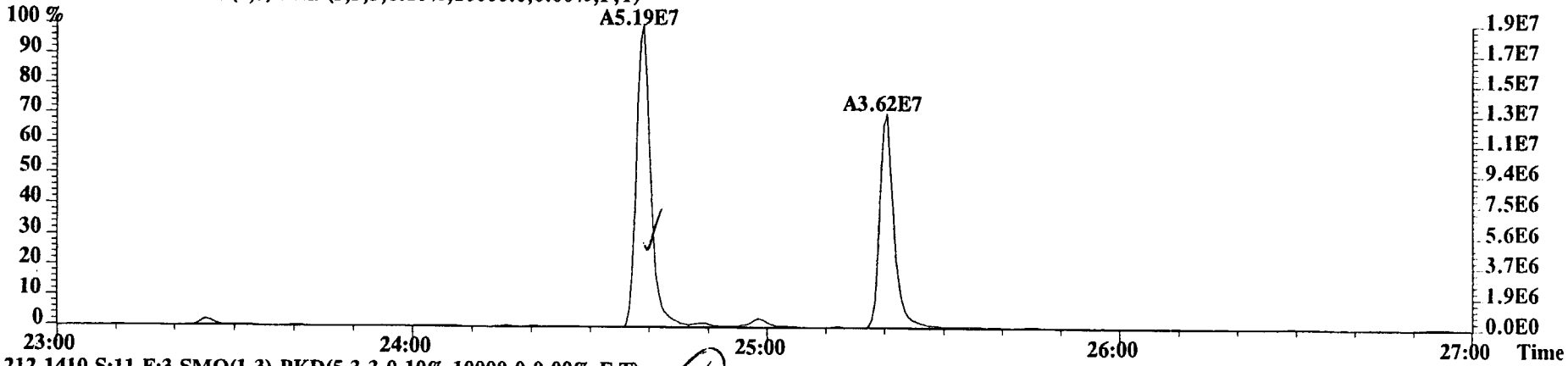
188.1410 S:11 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



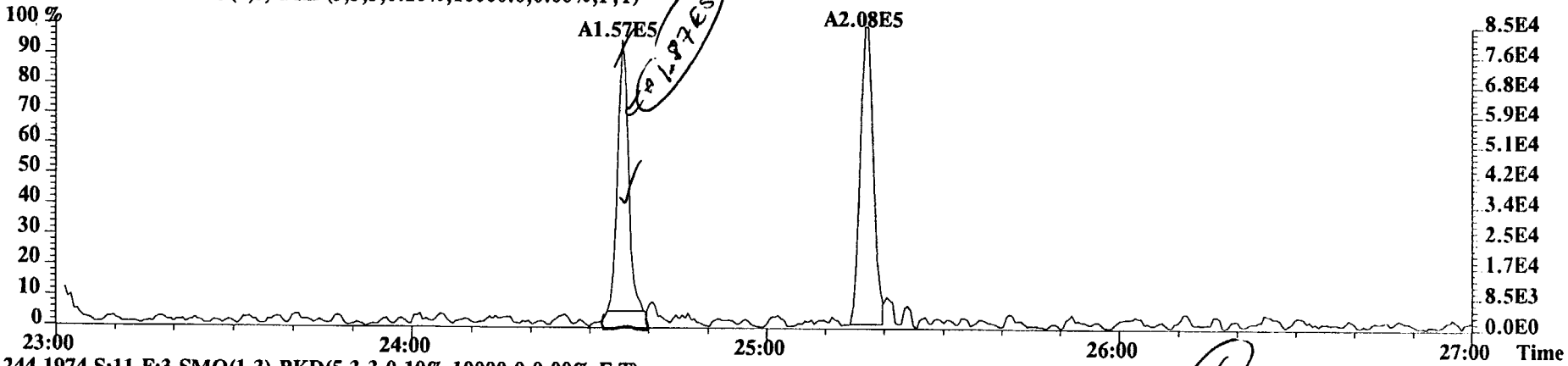
File:02NO98V4 #1-641 Acq: 2-NOV-1998 21:23:33 GC EI+ Voltage SIR 70SE
Sample#11 Text:301802-3 :100X DIL. : : : Exp:PAHAIR
204.9888 S:11 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



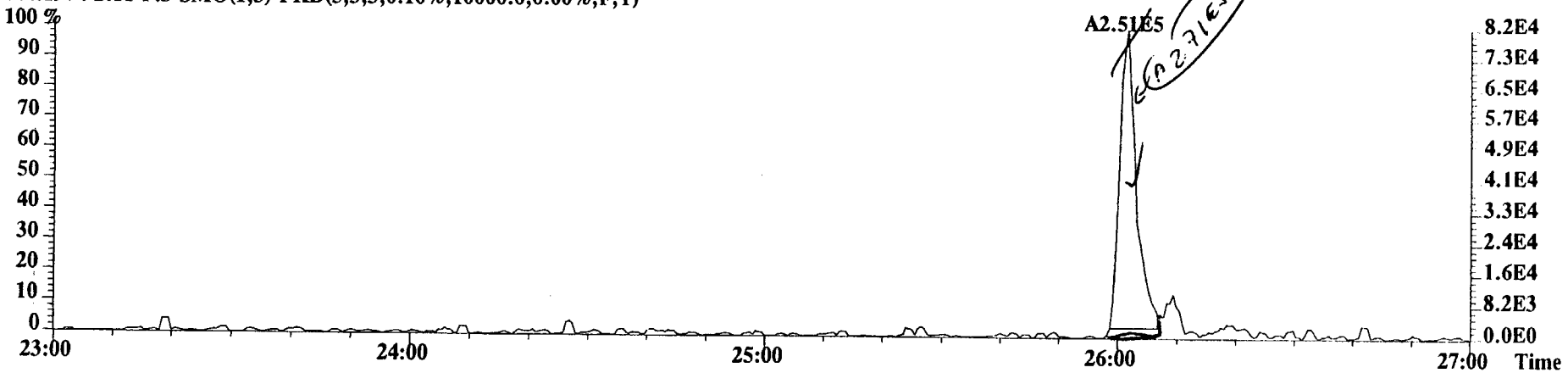
File:02NO98V4 #1-939 Acq: 2-NOV-1998 21:23:33 GC EI+ Voltage SIR 70SE
Sample#11 Text:301802-3 :100X DIL. : : : Exp:PAHAIR
202.0782 S:11 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



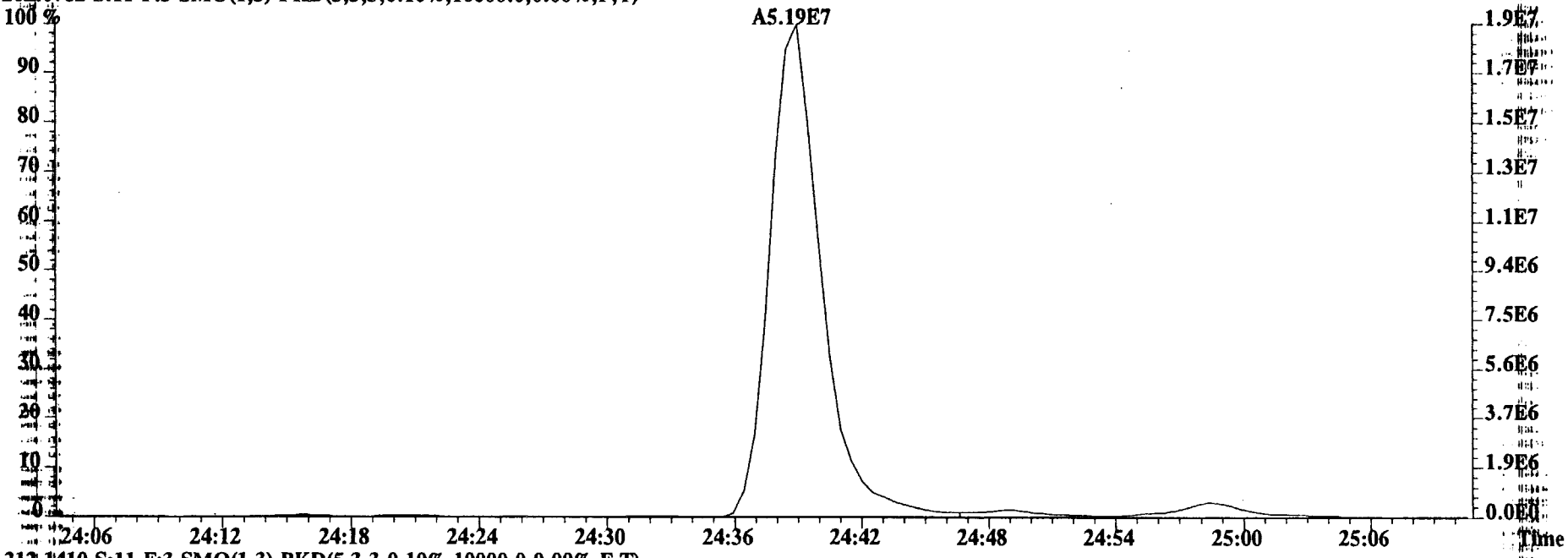
212.1410 S:11 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



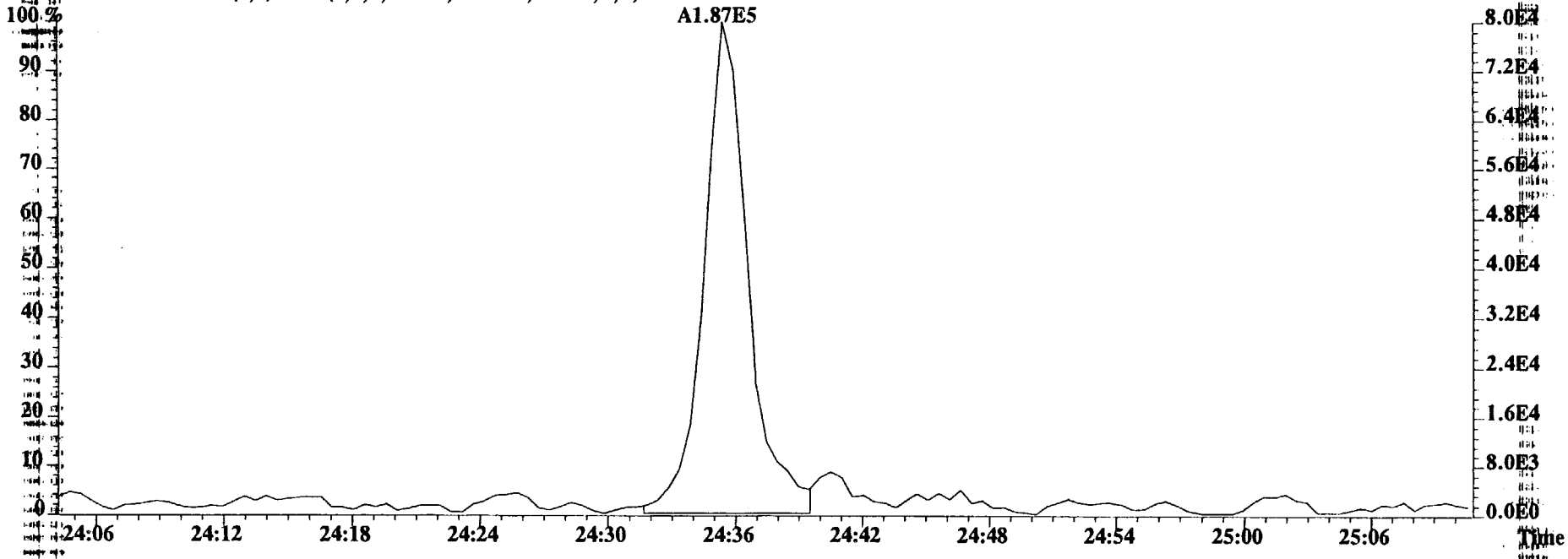
244.1974 S:11 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



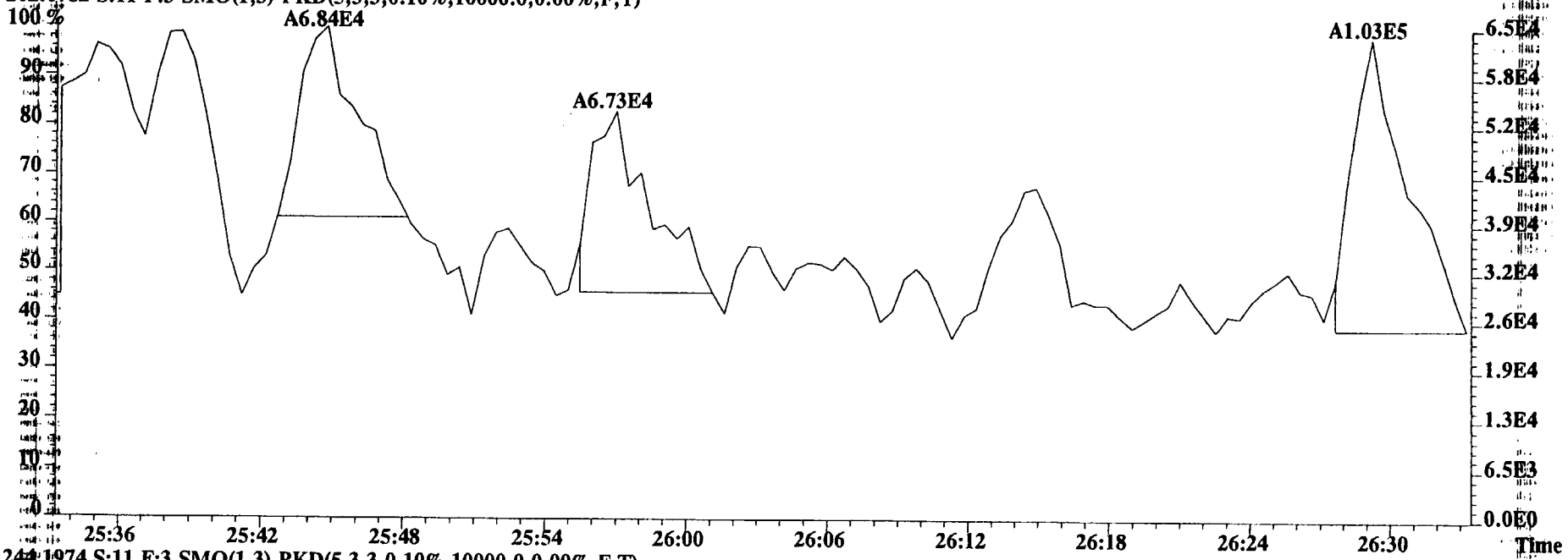
File:02NO98V4 #1-939 Acq: 2-NOV-1998 21:23:33 GC EI+ Voltage SIR 70SE
Sample#11 Text:301802-3 :100X DIL. : : : Exp:PAHAIR
202.0782 S:11 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



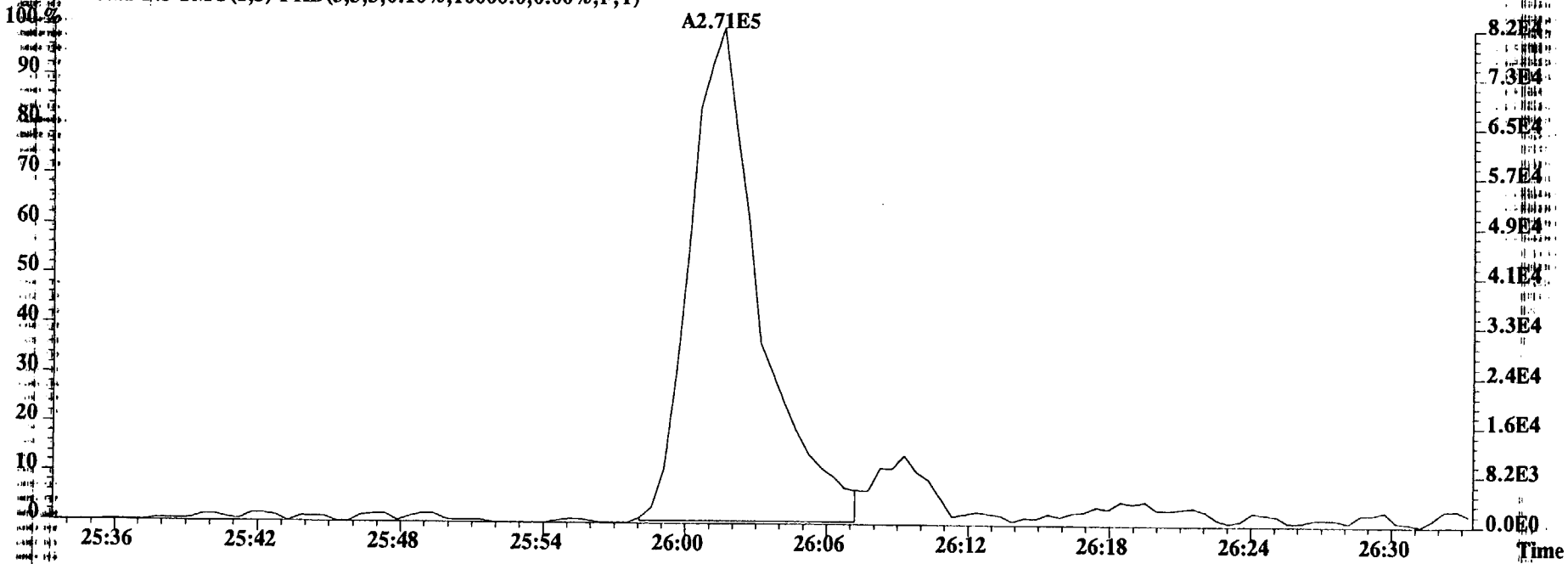
212.1410 S:11 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



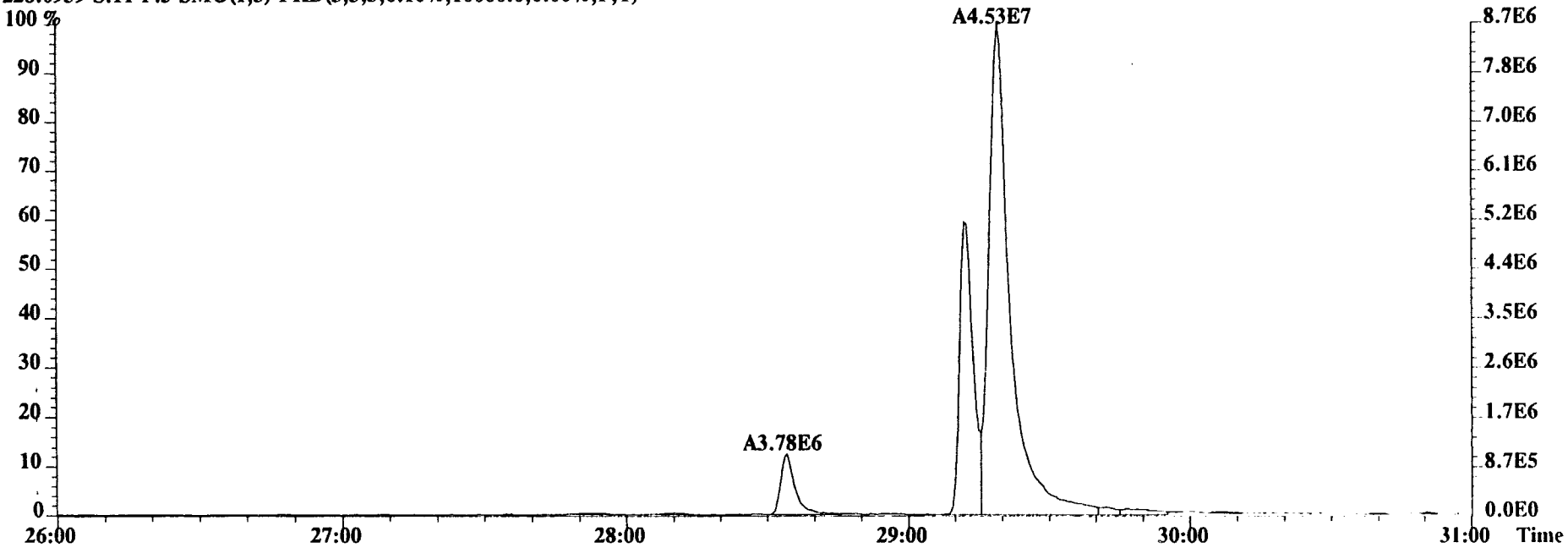
File:02NO98V4 #1-939 Acq: 2-NOV-1998 21:23:33 GC EI+ Voltage SIR 70SE
Sample#11 Text:301802-3 :100X DIL. : : : Exp:PAHAIR
202.0782 S:11 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



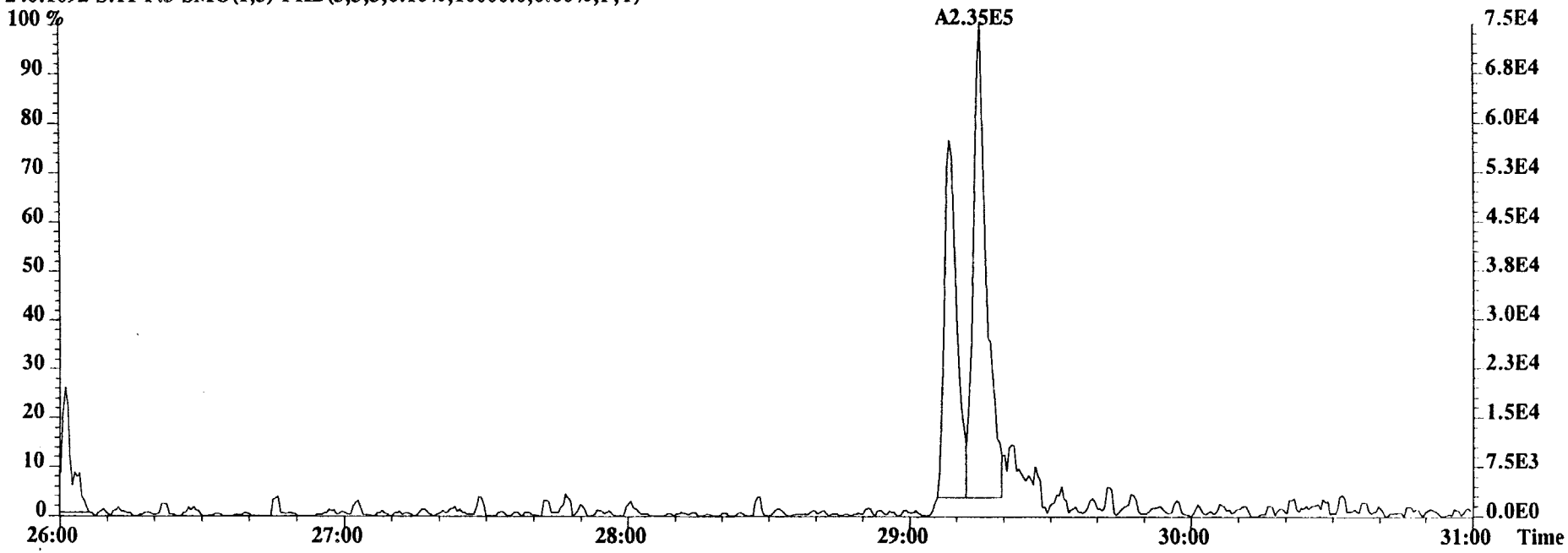
244.1974 S:11 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



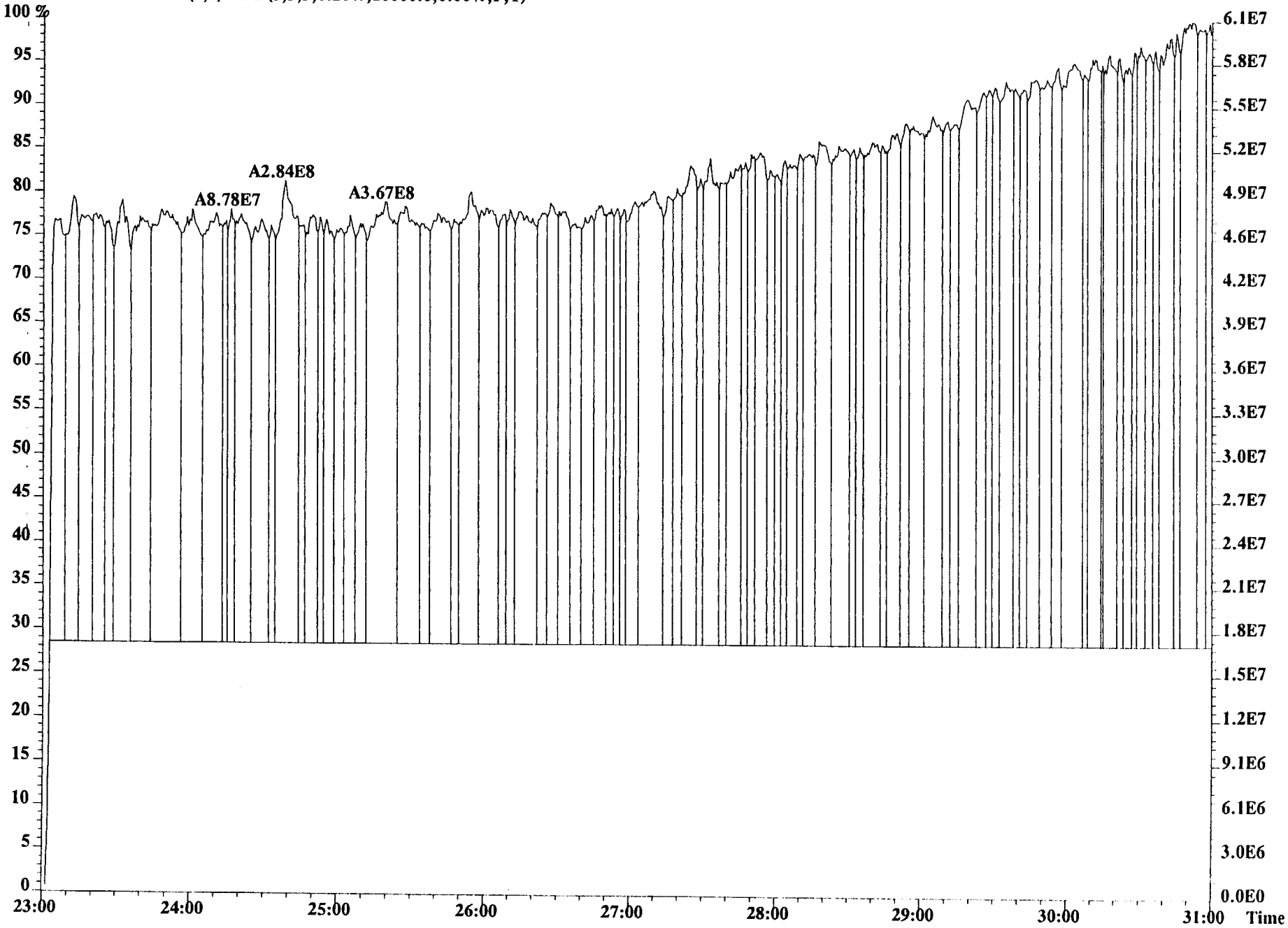
File:02NO98V4 #1-939 Acq: 2-NOV-1998 21:23:33 GC EI+ Voltage SIR 70SE
Sample#11 Text:301802-3 :100X DIL. : : : Exp:PAHAIR
228.0939 S:11 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



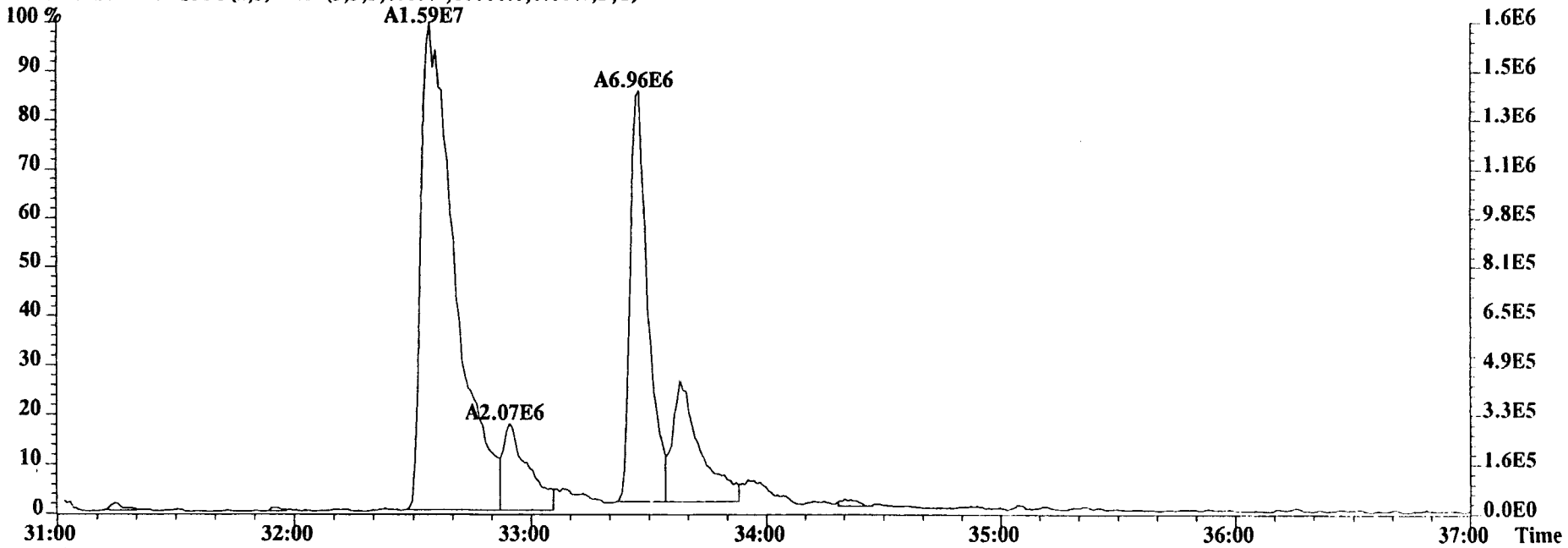
240.1692 S:11 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



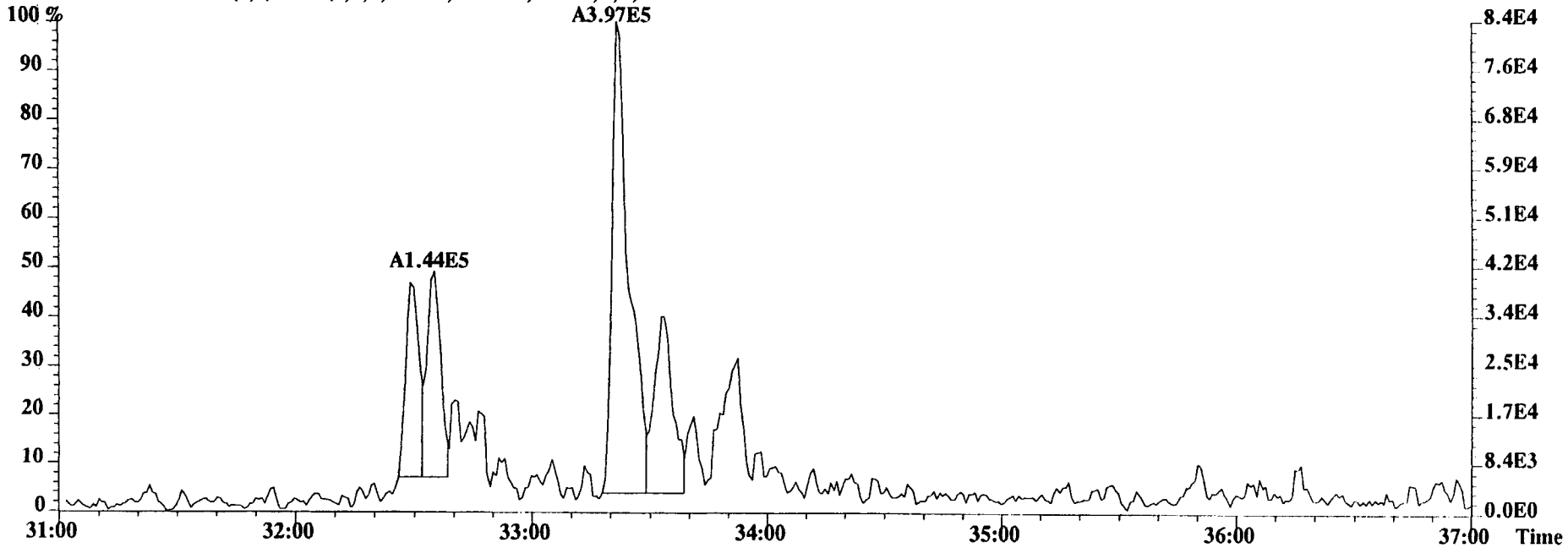
File:02NO98V4 #1-939 Acq: 2-NOV-1998 21:23:33 GC EI+ Voltage SIR 70SE
Sample#11 Text:301802-3 :100X DIL. : : : Exp:PAHAIR
230.9856 S:11 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



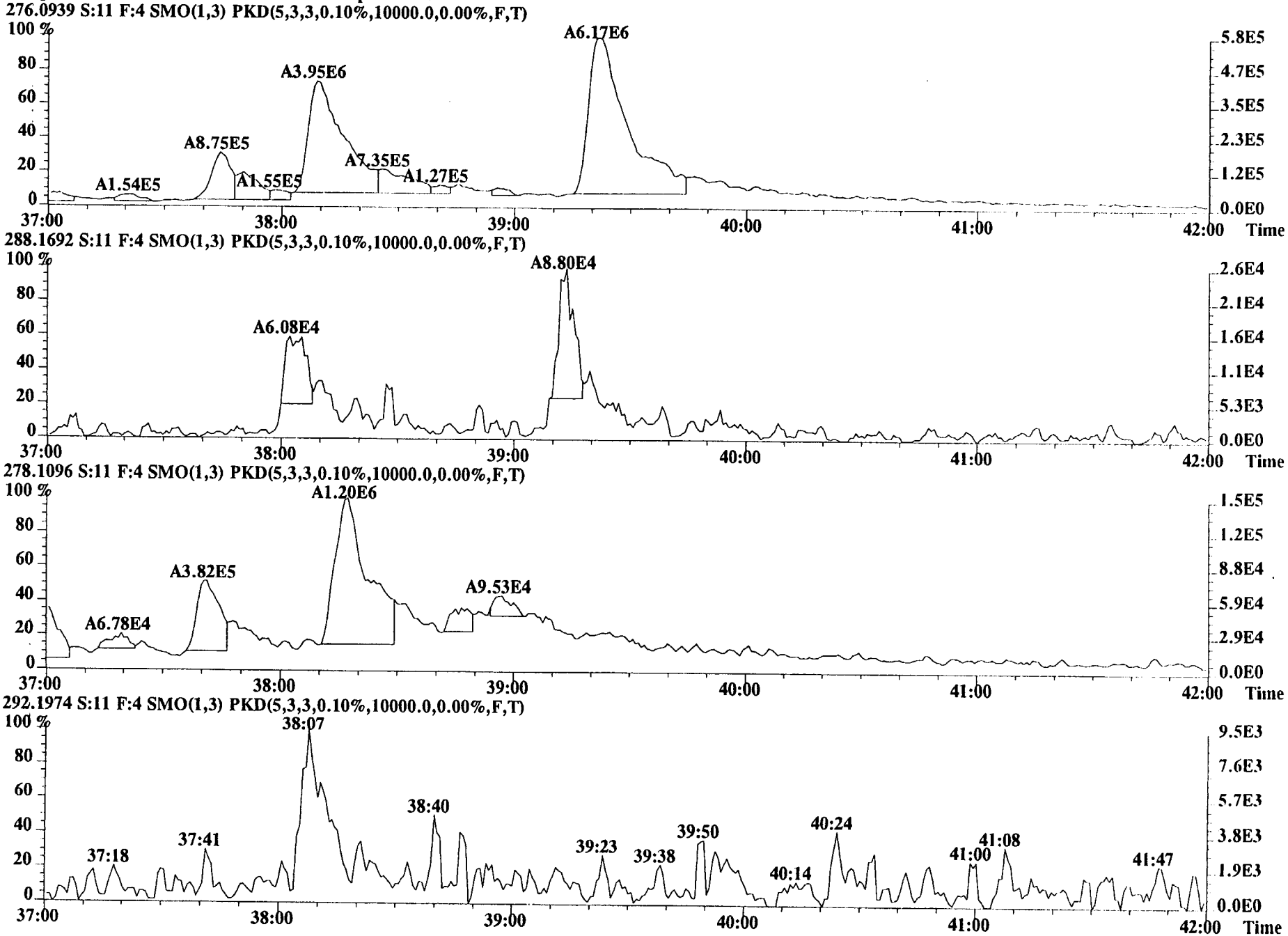
File:02NO98V4 #1-878 Acq: 2-NOV-1998 21:23:33 GC EI+ Voltage SIR 70SE
Sample#11 Text:301802-3 :100X DIL. : : : Exp:PAHAIR
252.0939 S:11 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



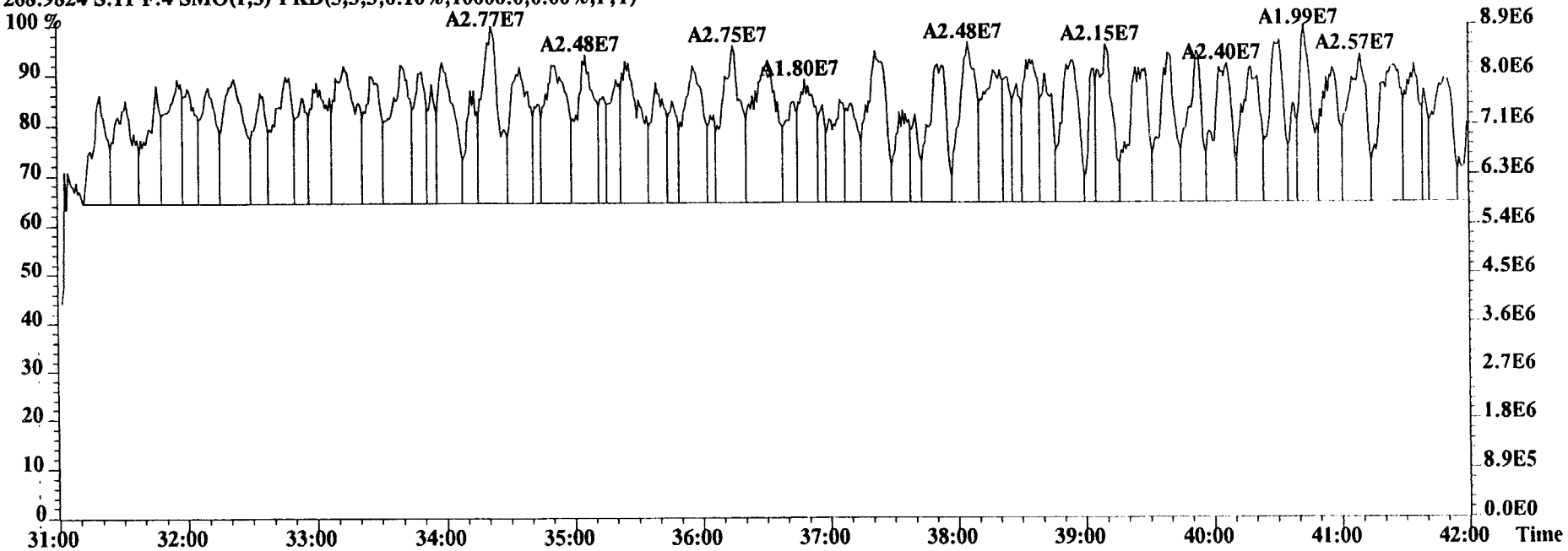
264.1692 S:11 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



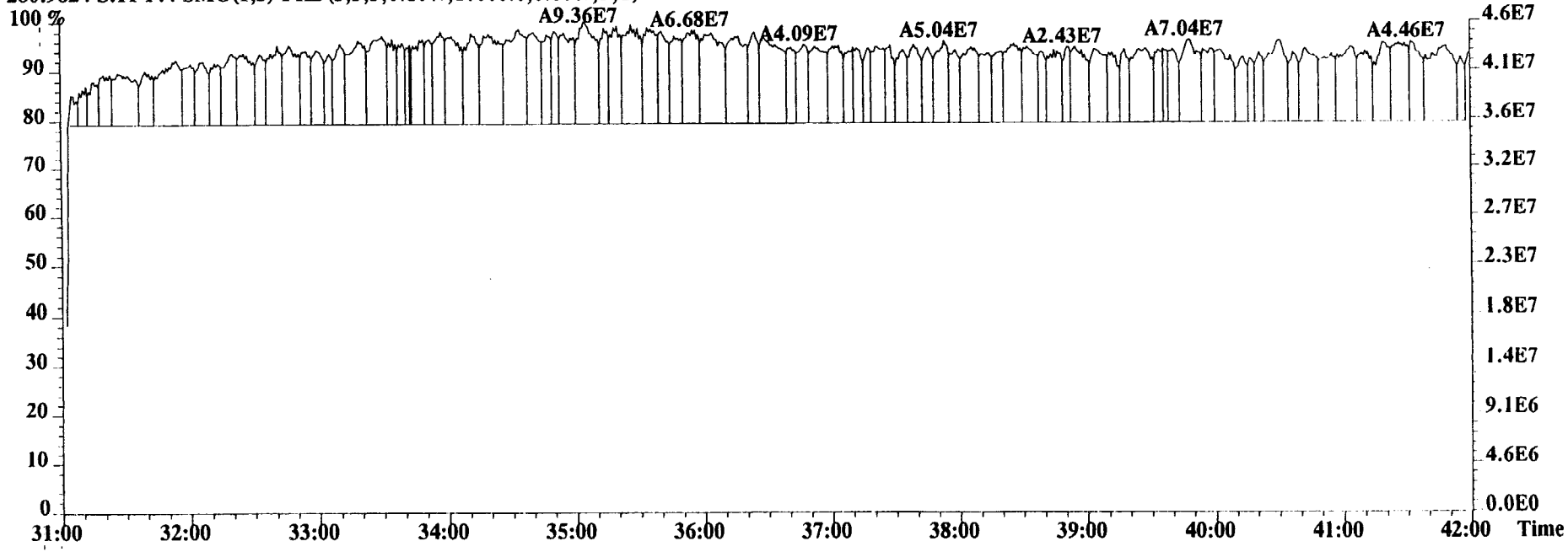
File:02NO98V4 #1-878 Acq: 2-NOV-1998 21:23:33 GC EI+ Voltage SIR 70SE
Sample#11 Text:301802-3 :100X DIL. : : : Exp:PAHAIR



File:02NO98V4 #1-878 Acq: 2-NOV-1998 21:23:33 GC EI+ Voltage SIR 70SE
Sample#11 Text:301802-3 :100X DIL. : : : Exp:PAHAIR
268.9824 S:11 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



280.9824 S:11 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



POLYNUCLEAR AROMATIC HYDROCARBONS
HIGH RESOLUTION GC/MS
Method HRGC/HRMS

Client Name: Pacific Environmental Services
Client ID: A-0-429-1
Lab ID: 301802-0004-SA
Matrix: AIRTRAIN Sampled: 21 SEP 98 Received: 29 SEP 98
Authorized: 29 SEP 98 Prepared: 03 OCT 98 Analyzed: 30 OCT 98
Dilution Factor: 1.0

Parameter	Result	Units	Reporting Limit	Data Qualifiers
Naphthalene	290000	ng/sample	--	BD
2-Methylnaphthalene	55000	ng/sample	--	B
Acenaphthylene	50000	ng/sample	--	
Acenaphthene	7000	ng/sample	--	
Fluorene	21000	ng/sample	--	
Phenanthrene	66000	ng/sample	--	BD
Anthracene	20000	ng/sample	--	
Fluoranthene	32000	ng/sample	--	
Pyrene	16000	ng/sample	--	
Benzo(a)anthracene	290	ng/sample	--	
Chrysene	740	ng/sample	--	
Benzo(b)fluoranthene	200	ng/sample	--	
Benzo(k)fluoranthene	200	ng/sample	--	
Benzo(e)pyrene	130	ng/sample	--	
Benzo(a)pyrene	ND	ng/sample	100	
Perylene	ND	ng/sample	100	
Indeno(1,2,3-cd)pyrene	ND	ng/sample	100	
Dibenz(a,h)anthracene	ND	ng/sample	100	
Benzo(g,h,i)perylene	ND	ng/sample	100	

B = Compound is also detected in the blank.
D = Compound quantitated using a secondary dilution.
ND = Not Detected

Reported By: Clark Pickell Approved By: Eric Redman

The cover letter is an integral part of this report.
Rev 230787

POLYNUCLEAR AROMATIC HYDROCARBONS
HIGH RESOLUTION GC/MS
Method HRGC/HRMS
(cont.)

Client Name: Pacific Environmental Services
Client ID: A-0-429-1
Lab ID: 301802-0004-SA
Matrix: AIRTRAIN Sampled: 21 SEP 98 Received: 29 SEP 98
Authorized: 29 SEP 98 Prepared: 03 OCT 98 Analyzed: 30 OCT 98
Dilution Factor: 1.0

Internal Standards	% Recovery	
Naphthalene-d8	92	D
Acenaphthylene-d8	90	
Acenaphthene-d10	74	
Fluorene-d10	69	
Phenanthrene-d10	99	D
Fluoranthene-d10	69	
Pyrene-d10	70	
Benzo(a)anthracene-d12	81	
Perylene-d12	60	
Indeno(123-cd)pyrene-d12	81	
Chrysene-d12	79	
Benzo(b)fluoranthene-d12	88	
Benzo(k)fluoranthene-d12	87	
Benzo(a)pyrene-d12	77	
Dibenz(a,h)anthracene-d14	77	
Benzo(g,h,i)perylene-d12	69	

Field Surrogates	% Recovery
13C-Fluorene	124

D = Compound quantitated using a secondary dilution.

Reported By: Clark Pickell Approved By: Eric Redman

The cover letter is an integral part of this report.
Rev 230787

04-NOV-1998 05:20:20 PM Dioxin Furan Unknown RESULTS

Mass Spec : VG-4 Results : 30OC98V4071.RES : PAHAIR.TRG
GC Column : DB-5 Date analyzed : 30-OCT-98
Data file : 30OC98V4 301802-4 :10X DIL. : : : Ex Cal : PAHAIR102998V4.R
Weight : 0.5

Name	Total Response	Isotope Ratio	R. T. mm:ss	RRF	pg/ SAMP	Rec/ MDL
d10-2-Methylnaphthalene	7457740	1.00 Y	12: 27 Y	1.00	50.00	
d8-Naphthalene	9240880	1.00 Y	10: 12 Y	2.24	27.65	~~55~~ see IC
Naphthalene	16866340000	1.00 Y	10: 17 Y	1.23	-	SAT'D
2-Methylnaphthalene	2860720000	1.00 Y	12: 34 Y	0.56	5.5e+04	B E
d8-Acenaphthylene	8161300	1.00 Y	15: 27 Y	1.21	45.08	90
Acenaphthylene	3825700000	1.00 Y	15: 30 Y	0.94	5.0e+04	E
d10-Acenaphthene	4122640	1.00 Y	16: 1 Y	0.74	37.12	74
Acenaphthene	360320000	1.00 Y	16: 8 Y	1.25	7013.95	E
d10-Anthracene	4943880	1.00 Y	20: 54 Y	1.00	50.00	
d10-Fluorene	4844600	1.00 Y	17: 41 Y	1.42	34.48	69
Fluorene	1184008000	1.00 Y	17: 46 Y	1.16	2.1e+04	E
d10-Phenanthrene	11013880	1.00 Y	20: 45 Y	2.81	39.67	~~79~~ see IC
Phenanthrene	6958000000	1.00 Y	20: 49 Y	0.89	-	SAT'D
Anthracene	1740686000	1.00 Y	20: 58 Y	0.80	2.0e+04	E
d14-Terphenyl	12499040	1.00 Y	26: 0 Y	1.00	50.00	
d10-Fluoranthene	12185280	1.00 Y	24: 35 Y	1.41	34.55	69
Fluoranthene	4313220000	1.00 Y	24: 39 Y	1.11	3.2e+04	E
d10-Pyrene	13191400	1.00 Y	25: 17 Y	1.52	34.76	70
Pyrene	2604420000	1.00 Y	25: 20 Y	1.21	1.6e+04	E
d12-Benzo(a)anthracene	9067480	1.00 Y	29: 9 Y	0.90	40.30	81
Benzo(a)anthracene	31934600	1.00 Y	29: 13 Y	1.20	292.39	
d12-Chrysene	12696540	1.00 Y	29: 15 Y	1.28	39.71	79
Chrysene	102244400	1.00 Y	29: 19 Y	1.08	742.91	
d12-Benzo(e)pyrene	23610600	1.00 Y	33: 23 Y	1.00	50.00	
d12-Benzo(b)fluoranthene	9475040	1.00 Y	32: 30 Y	0.45	44.21	88
Benzo(b)fluoranthene	22600000	1.00 Y	32: 35 Y	1.17	204.34	
d12-Benzo(k)fluoranthene	19441240	1.00 Y	32: 35 Y	0.95	43.43	87
Benzo(k)fluoranthene	45000000	1.00 Y	32: 38 Y	1.16	198.83	
d12-Benzo(a)pyrene	12272020	1.00 Y	33: 35 Y	0.68	38.41	77
Benzo(e)pyrene	25393800	1.00 Y	33: 28 Y	1.64	126.11	
Benzo(a)pyrene	10389980	1.00 Y	33: 39 Y	1.07	<RL=100.00	
d12-Perylene	8936560	1.00 Y	33: 51 Y	0.63	30.03	60
Perylene	* No Peak	0.00 N	33: 56 N	1.71	<RL=100.00	
d12-Indeno(123-cd)pyrene	8485960	1.00 Y	38: 3 Y	0.44	40.43	81
Indeno(123-cd)pyrene	5621240	1.00 Y	38: 10 Y	0.62	<RL=100.00	
d14-Dibenz(ah)anthracene	4440720	1.00 Y	38: 9 Y	0.25	38.26	77
Dibenz(ah)anthracene	798102	1.00 Y	38: 18 Y	1.40	<RL=100.00	
d12-Benzo(ghi)perylene	9383680	1.00 Y	39: 14 Y	0.58	34.28	69
Benzo(ghi)perylene	9286240	1.00 Y	39: 23 Y	1.02	<RL=100.00	
d10-Fluorene	4844600	1.00 Y	17: 41 Y	1.00	50.00	
13C-Fluorene	4864380	1.00 Y	17: 46 Y	0.81	61.98	124

11-4-98
CP

04-NOV-1998 05:20:16 PM Dioxin Furan Unknown RESULTS

0.5

98V4.RRF

Rec/ MDL		
	3728870	3728870
55	4620440	4620440
SAT'D	8433170000	8433170000
B E	1430360000	1430360000
90	4080650	4080650
E	1912850000	1912850000
74	2061320	2061320
E	180160000	180160000
	2471940	2471940
69	2422300	2422300
E	592004000	592004000
79	5506940	5506940
SAT'D	3479000000	3479000000
E	870343000	870343000
	6249520	6249520
69	6092640	6092640
E	2156610000	2156610000
70	6595700	6595700
E	1302210000	1302210000
81	4533740	4533740
	15967300	15967300
79	6348270	6348270
	51122200	51122200
	11805300	11805300
88	4737520	4737520
	11300000	11300000
87	9720620	9720620
	22500000	22500000
77	6136010	6136010
	12696900	12696900
100.00	5194990	5194990
60	4468280	4468280
100.00	0	0
81	4242980	4242980
100.00	2810620	2810620
77	2220360	2220360
100.00	399051	399051
69	4691840	4691840
100.00	4643120	4643120

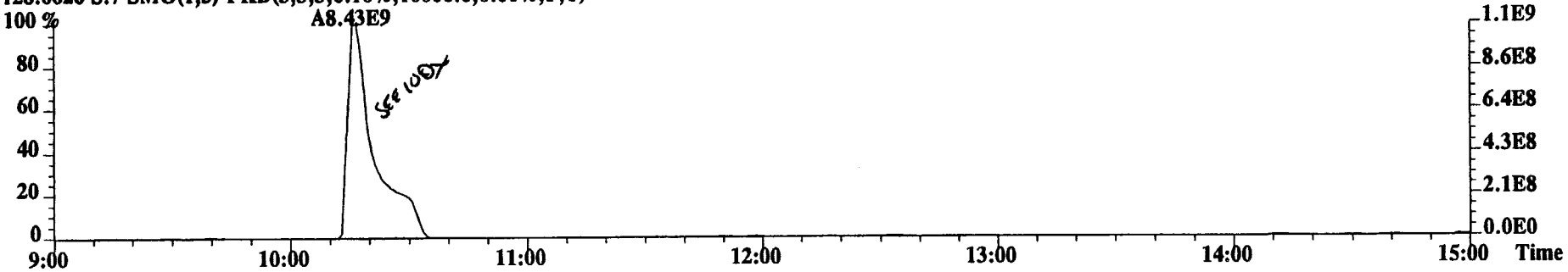
02-NOV-1998 08:45:21 AM Dioxin Furan Unknown RESULTS

Mass Spec : VG-4 Results : 30OC98V4071.RES : PAHAIR.TRG
GC Column : DB-5 Date analyzed : 30-OCT-98
Data file : 30OC98V4 301802-4 :10X DIL. : : : Ex Cal : PAHAIR102998V4.R
Weight : 0.5

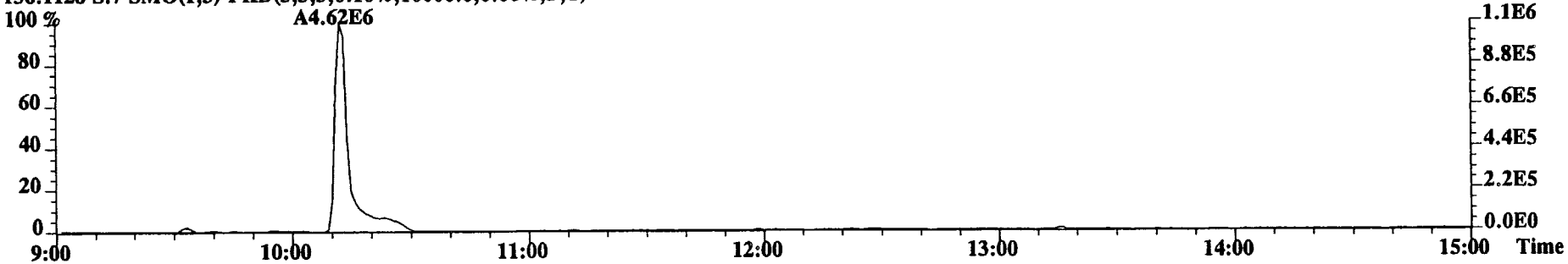
Name	Total Response	Isotope Ratio		R. T. mm:ss		RRF	pg/ SAMP	Rec/ MDL
d10-2-Methylnaphthalene	7457740	1.00	Y	12: 27	Y	1.00	50.00	
d8-Naphthalene	9240880	1.00	Y	10: 12	Y	2.24	27.65	55
Naphthalene	16866340000	1.00	Y	10: 17	Y	1.23	1.5e+05	0.000
2-Methylnaphthalene	2860720000	1.00	Y	12: 34	Y	0.56	5.5e+04	0.000
d8-Acenaphthylene	8161300	1.00	Y	15: 27	Y	1.21	45.08	90
Acenaphthylene	3825700000	1.00	Y	15: 30	Y	0.94	5.0e+04	0.000
d10-Acenaphthene	4122640	1.00	Y	16: 1	Y	0.74	37.12	74
Acenaphthene	360320000	1.00	Y	16: 8	Y	1.25	7013.95	0.000
d10-Anthracene	4943880	1.00	Y	20: 54	Y	1.00	50.00	
d10-Fluorene	4844600	1.00	Y	17: 41	Y	1.42	34.48	69
Fluorene	1184008000	1.00	Y	17: 46	Y	1.16	2.1e+04	0.000
d10-Phenanthrene	11013880	1.00	Y	20: 45	Y	2.81	39.67	79
Phenanthrene	6958000000	1.00	Y	20: 49	Y	0.89	7.1e+04	0.000
Anthracene	1740686000	1.00	Y	20: 58	Y	0.80	2.0e+04	0.000
d14-Terphenyl	12499040	1.00	Y	26: 0	Y	1.00	50.00	
d10-Fluoranthene	12185280	1.00	Y	24: 35	Y	1.41	34.55	69
Fluoranthene	4313220000	1.00	Y	24: 39	Y	1.11	3.2e+04	0.000
d10-Pyrene	13191400	1.00	Y	25: 17	Y	1.52	34.76	70
Pyrene	2604420000	1.00	Y	25: 20	Y	1.21	1.6e+04	0.000
d12-Benzo(a)anthracene	9067480	1.00	Y	29: 9	Y	0.90	40.30	81
Benzo(a)anthracene	31934600	1.00	Y	29: 13	Y	1.20	292.39	0.000
d12-Chrysene	12696540	1.00	Y	29: 15	Y	1.28	39.71	79
Chrysene	102244400	1.00	Y	29: 19	Y	1.08	742.91	0.000
d12-Benzo(e)pyrene	23610600	1.00	Y	33: 23	Y	1.00	50.00	
d12-Benzo(b)fluoranthene	9475040	1.00	Y	32: 30	Y	0.45	44.21	88
Benzo(b)fluoranthene	67298200	1.00	Y	32: 35	Y	1.17	608.49	0.000
d12-Benzo(k)fluoranthene	19441240	1.00	Y	32: 35	Y	0.95	43.43	87
Benzo(k)fluoranthene	67298200	1.00	Y	32: 35	Y	1.16	297.35	0.000
d12-Benzo(a)pyrene	12272020	1.00	Y	33: 35	Y	0.68	38.41	77
Benzo(e)pyrene	25393800	1.00	Y	33: 28	Y	1.64	126.11	0.000
Benzo(a)pyrene	10389980	1.00	Y	33: 39	Y	1.07	78.98	0.000
d12-Perylene	8936560	1.00	Y	33: 51	Y	0.63	30.03	60
Perylene	* No Peak	0.00	N	33: 56	N	1.71	0.00	0.000
d12-Indeno(123-cd)pyrene	8485960	1.00	Y	38: 3	Y	0.44	40.43	81
Indeno(123-cd)pyrene	5621240	1.00	Y	38: 10	Y	0.62	106.68	0.000
d14-Dibenz(ah)anthracene	4440720	1.00	Y	38: 9	Y	0.25	38.26	77
Dibenz(ah)anthracene	798102	1.00	Y	38: 18	Y	1.40	12.81	0.000
d12-Benzo(ghi)perylene	9383680	1.00	Y	39: 14	Y	0.58	34.28	69
Benzo(ghi)perylene	9286240	1.00	Y	39: 23	Y	1.02	97.40	0.000
d10-Fluorene	4844600	1.00	Y	17: 41	Y	1.42	7.22	14
13C-Fluorene	4864380	1.00	Y	17: 46	Y	1.00	100.41	0.000

File:30OC98V4 #1-510 Acq:30-OCT-1998 21:39:37 GC EI+ Voltage SIR 70SE
Sample#7 Text:301802-4 :10X DIL. : : : Exp:PAHAIR

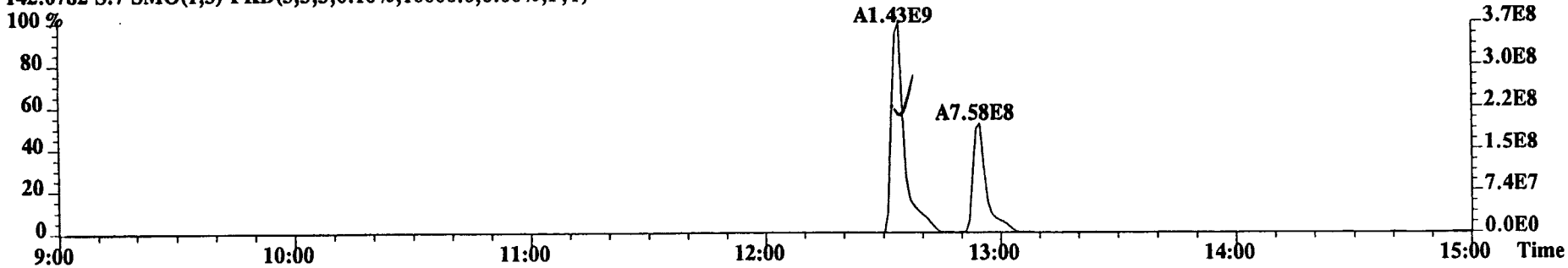
128.0626 S:7 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



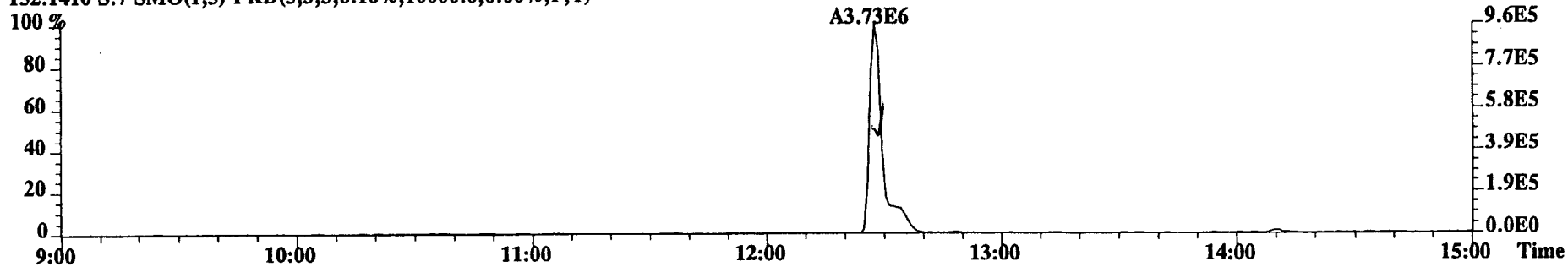
136.1128 S:7 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



142.0782 S:7 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

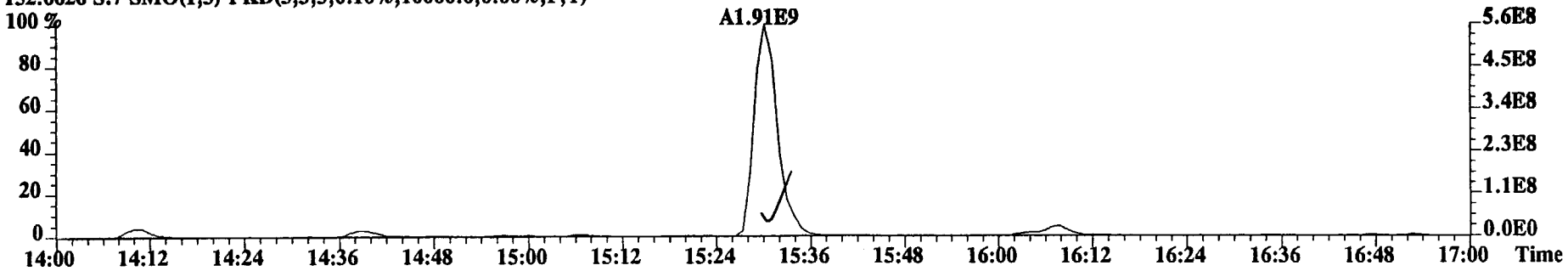


152.1410 S:7 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

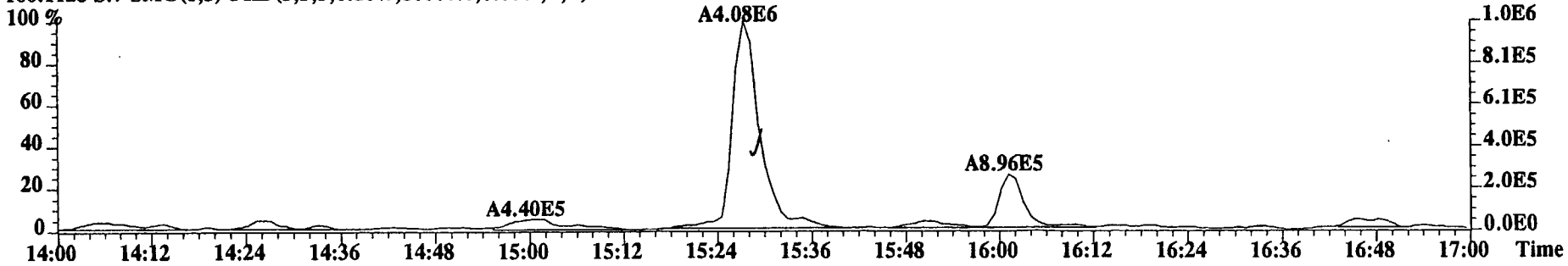


File:30OC98V4 #1-510 Acq:30-OCT-1998 21:39:37 GC EI+ Voltage SIR 70SE
Sample#7 Text:301802-4 :10X DIL. : : : Exp:PAHAIR

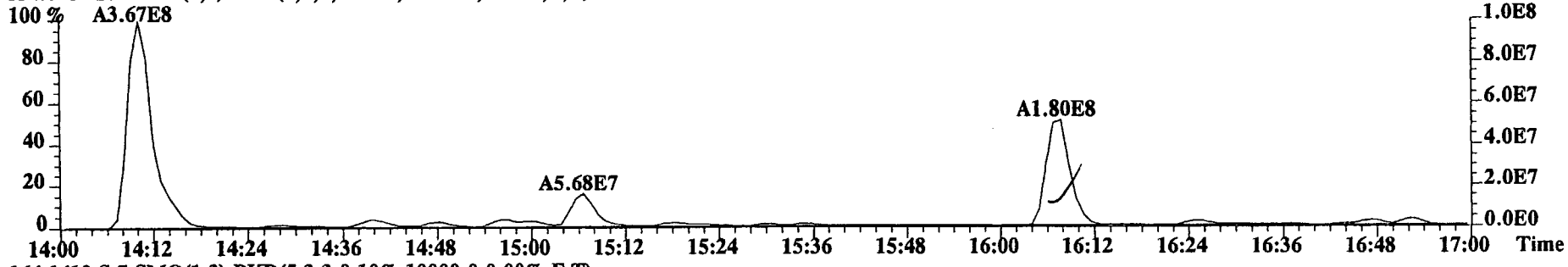
152.0626 S:7 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



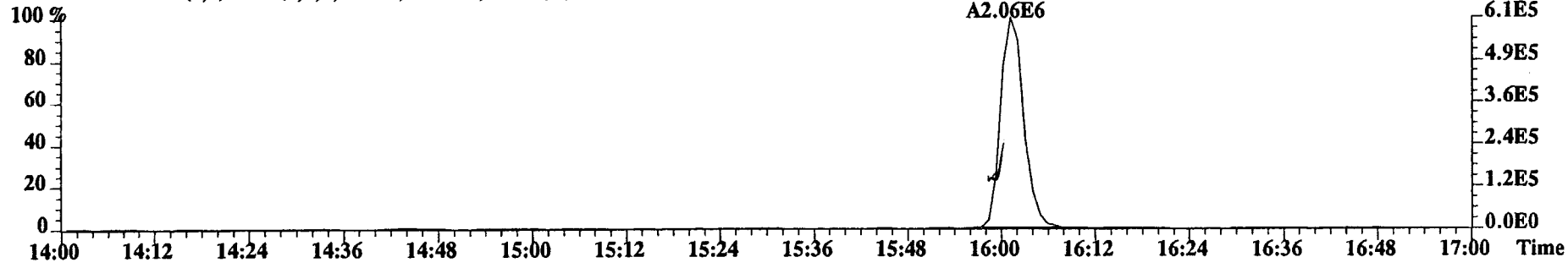
160.1128 S:7 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



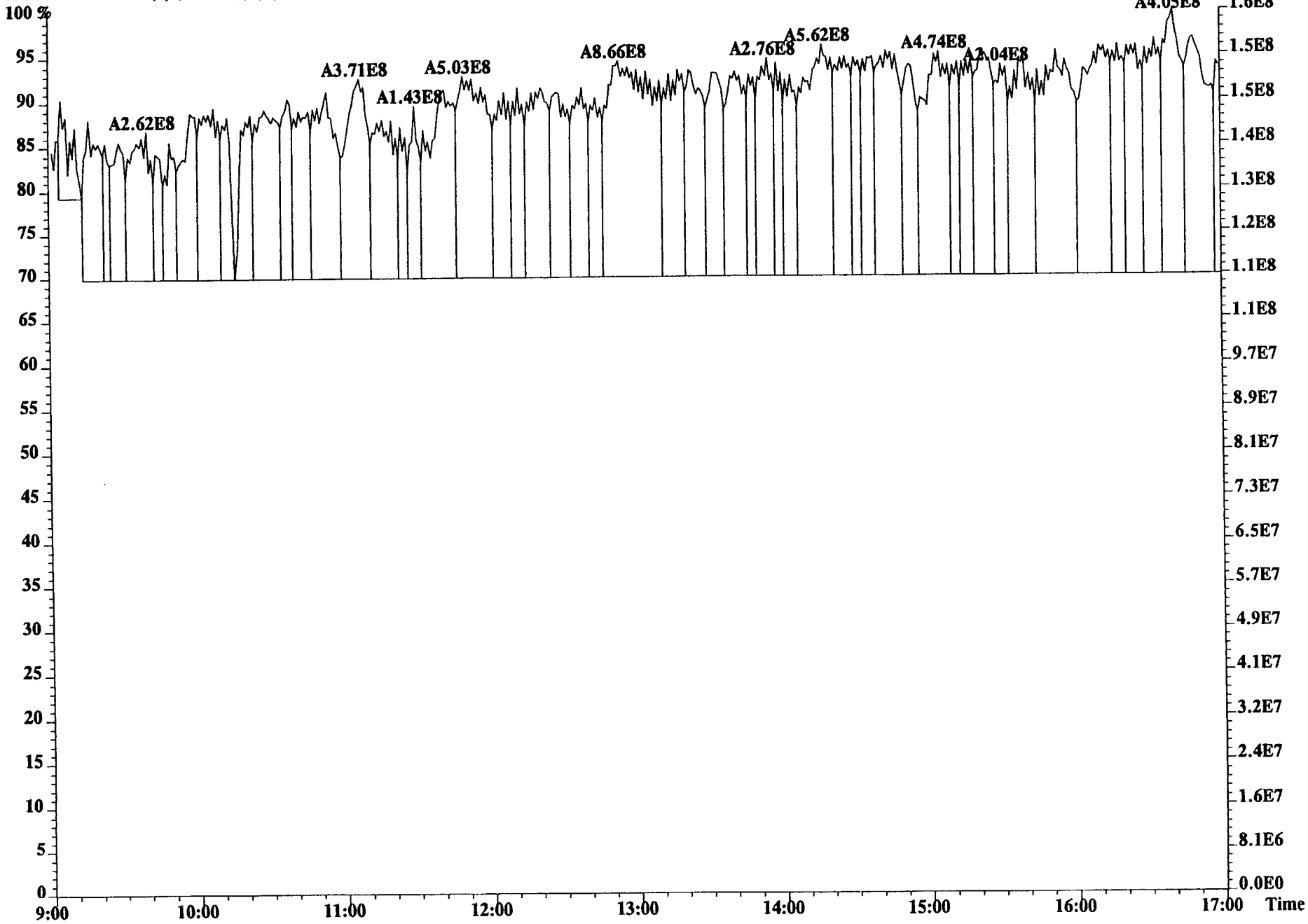
154.0782 S:7 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



164.1410 S:7 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

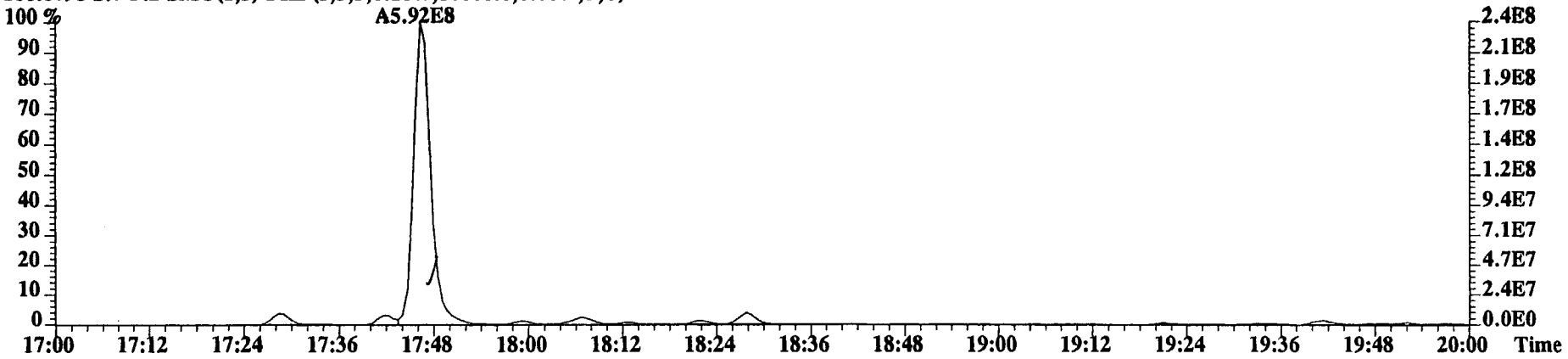


File:30OC98V4 #1-510 Acq:30-OCT-1998 21:39:37 GC EI+ Voltage SIR 70SE
Sample#7 Text:301802-4 :10X DIL. : : : Exp:PAHAIR
130.9920 S:7 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

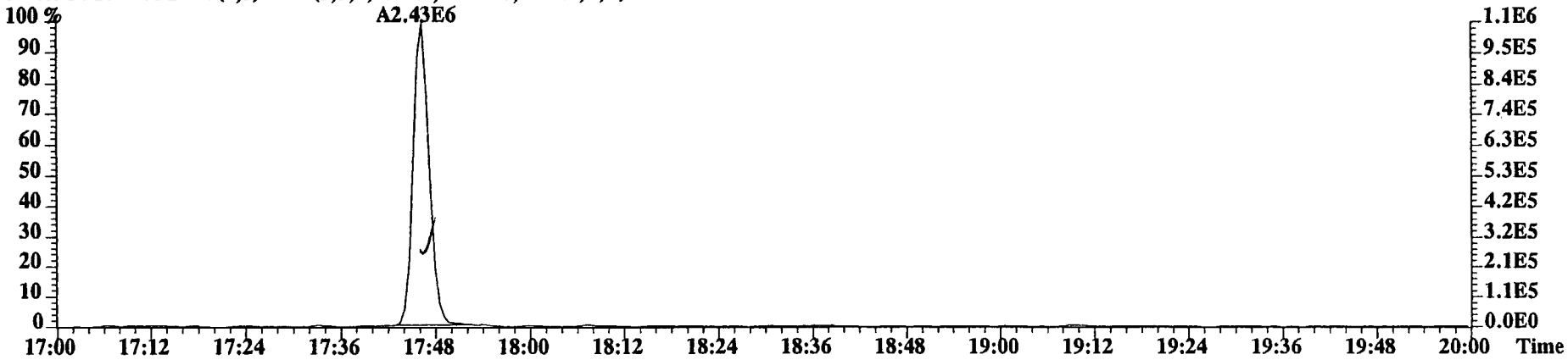


132

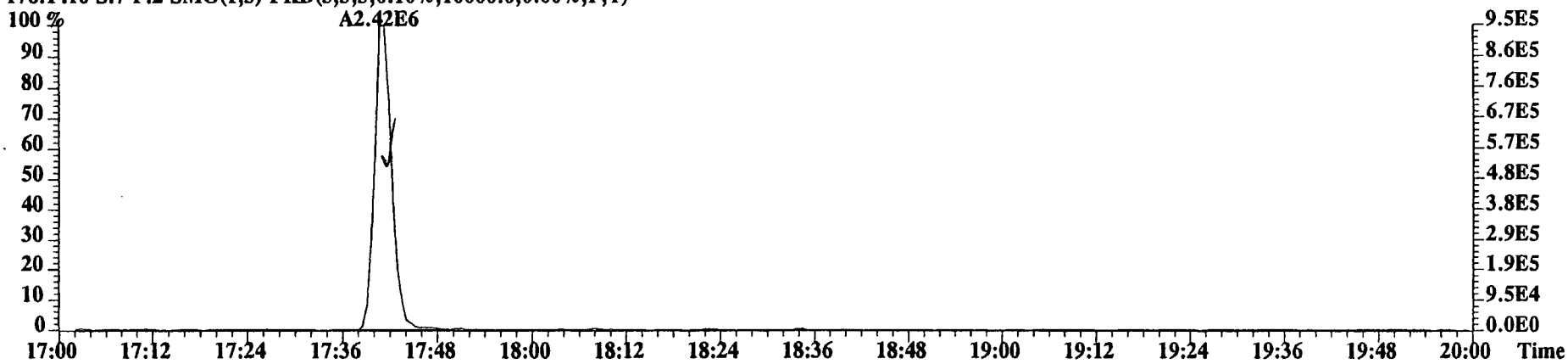
File:30OC98V4 #1-641 Acq:30-OCT-1998 21:39:37 GC EI+ Voltage SIR 70SE
Sample#7 Text:301802-4 :10X DIL. : : : Exp:PAHAIR
166.0798 S:7 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



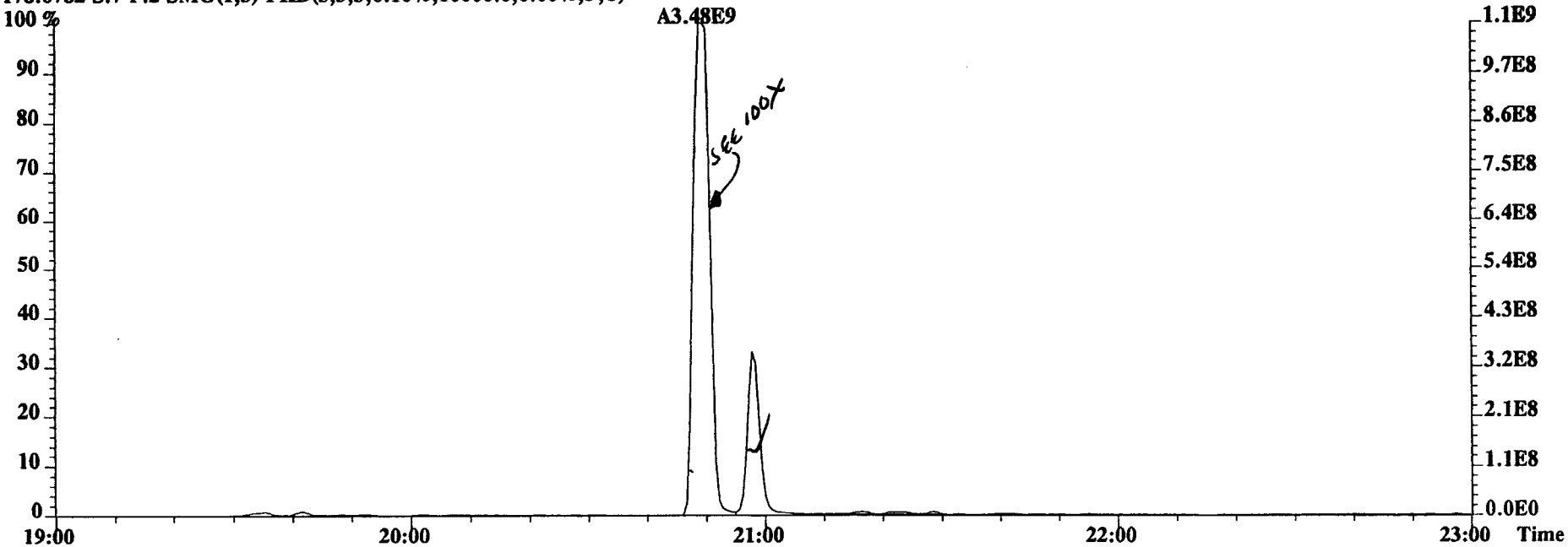
172.0984 S:7 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



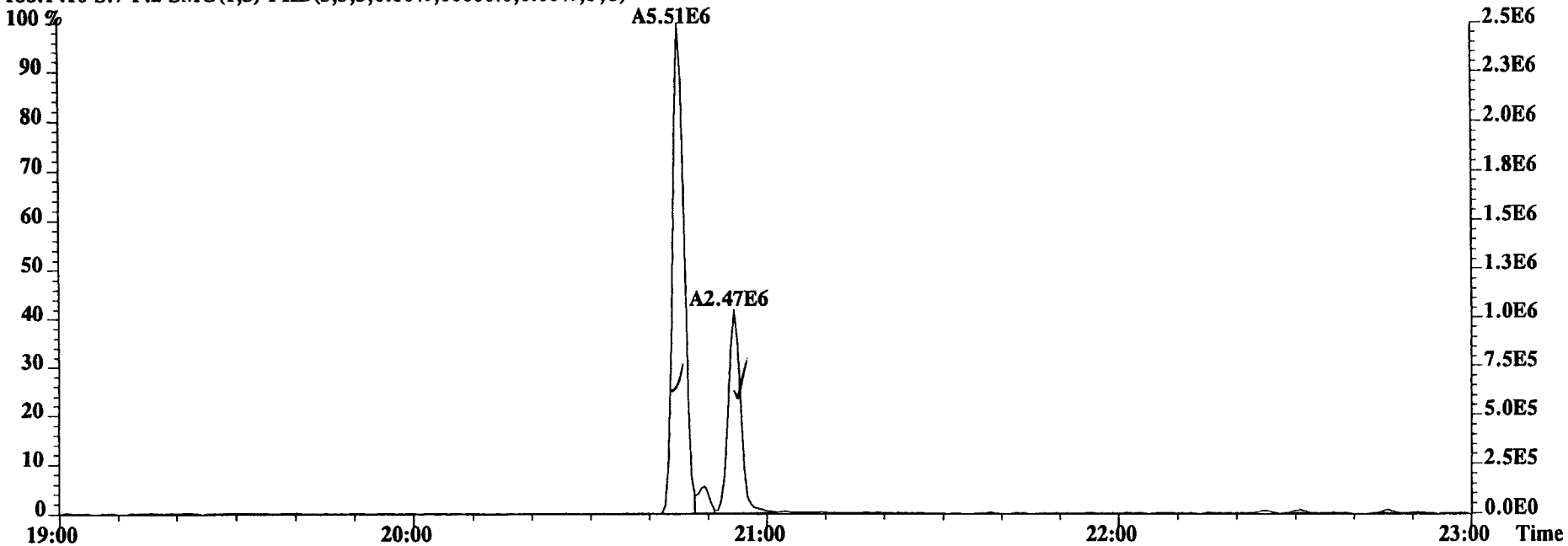
176.1410 S:7 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



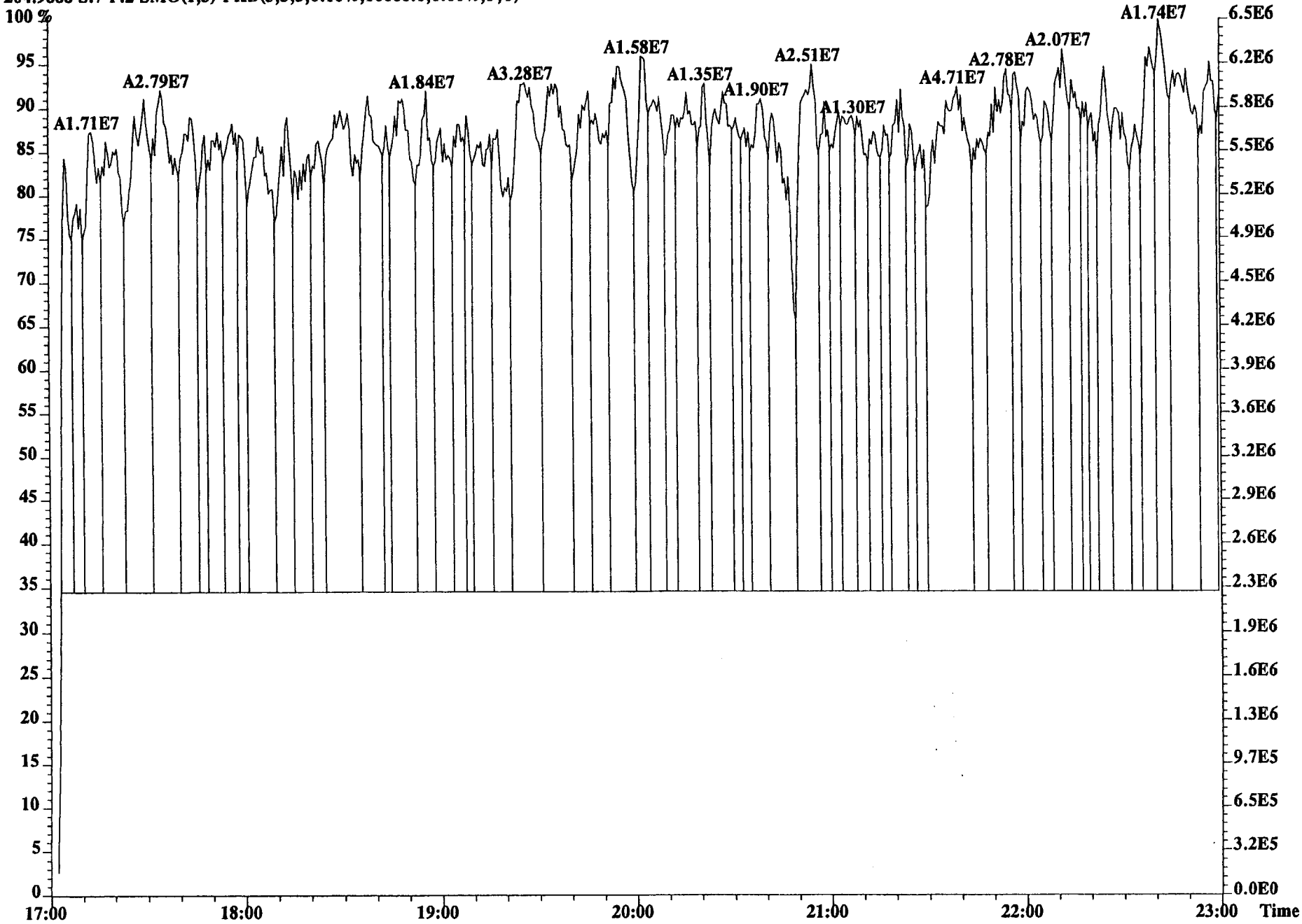
File:30OC98V4 #1-641 Acq:30-OCT-1998 21:39:37 GC EI+ Voltage SIR 70SE
Sample#7 Text:301802-4 :10X DIL. : : : Exp:PAHAIR
178.0782 S:7 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



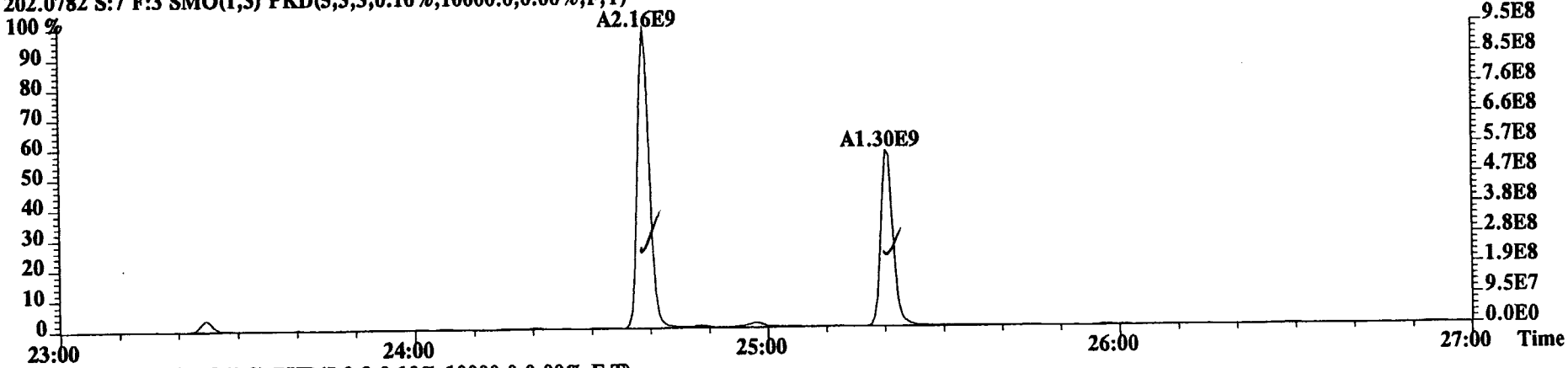
188.1410 S:7 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



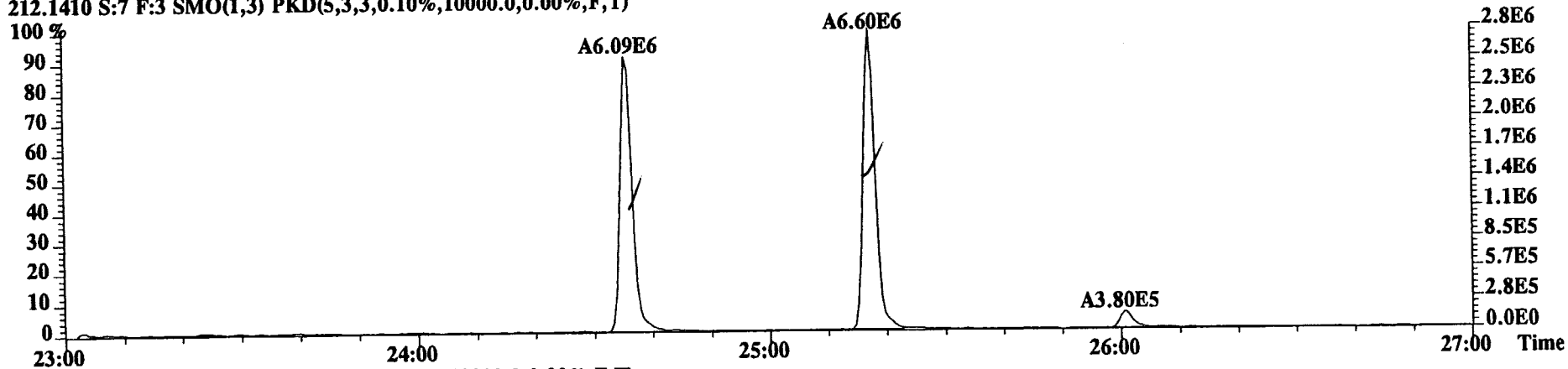
File:30OC98V4 #1-641 Acq:30-OCT-1998 21:39:37 GC EI+ Voltage SIR 70SE
Sample#7 Text:301802-4 :10X DIL. : : : Exp:PAHAIR
204.9888 S:7 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



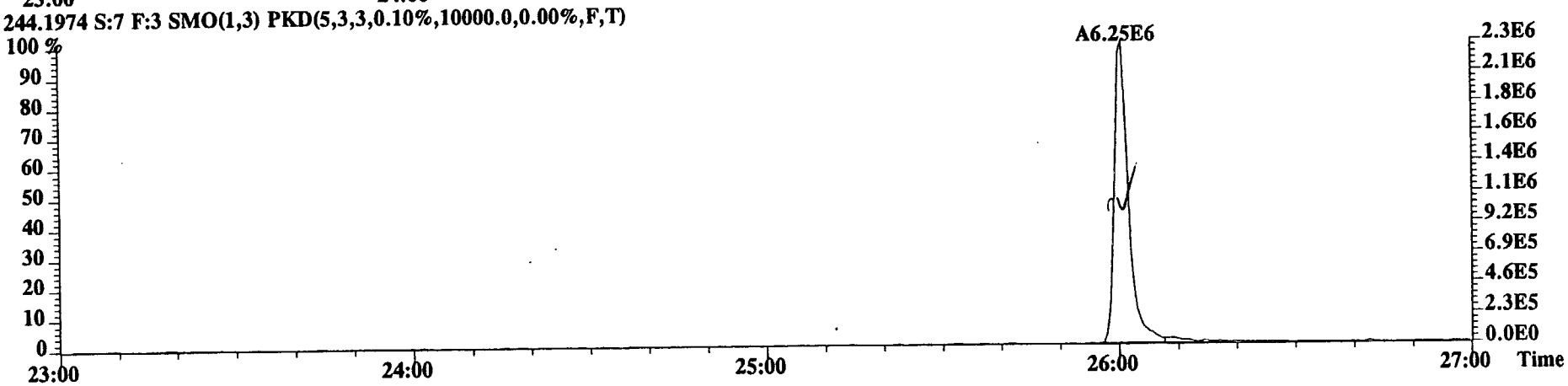
File:30OC98V4 #1-939 Acq:30-OCT-1998 21:39:37 GC EI+ Voltage SIR 70SE
Sample#7 Text:301802-4 :10X DIL. : : : Exp:PAHAIR
202.0782 S:7 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



212.1410 S:7 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

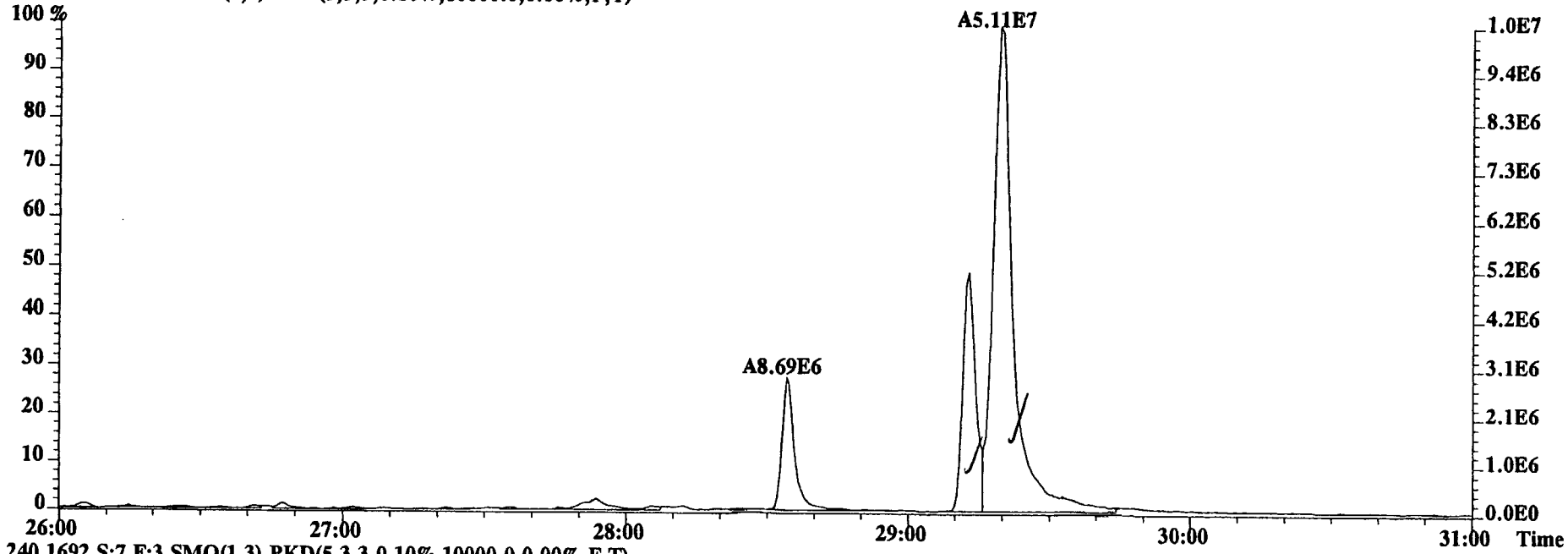


244.1974 S:7 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

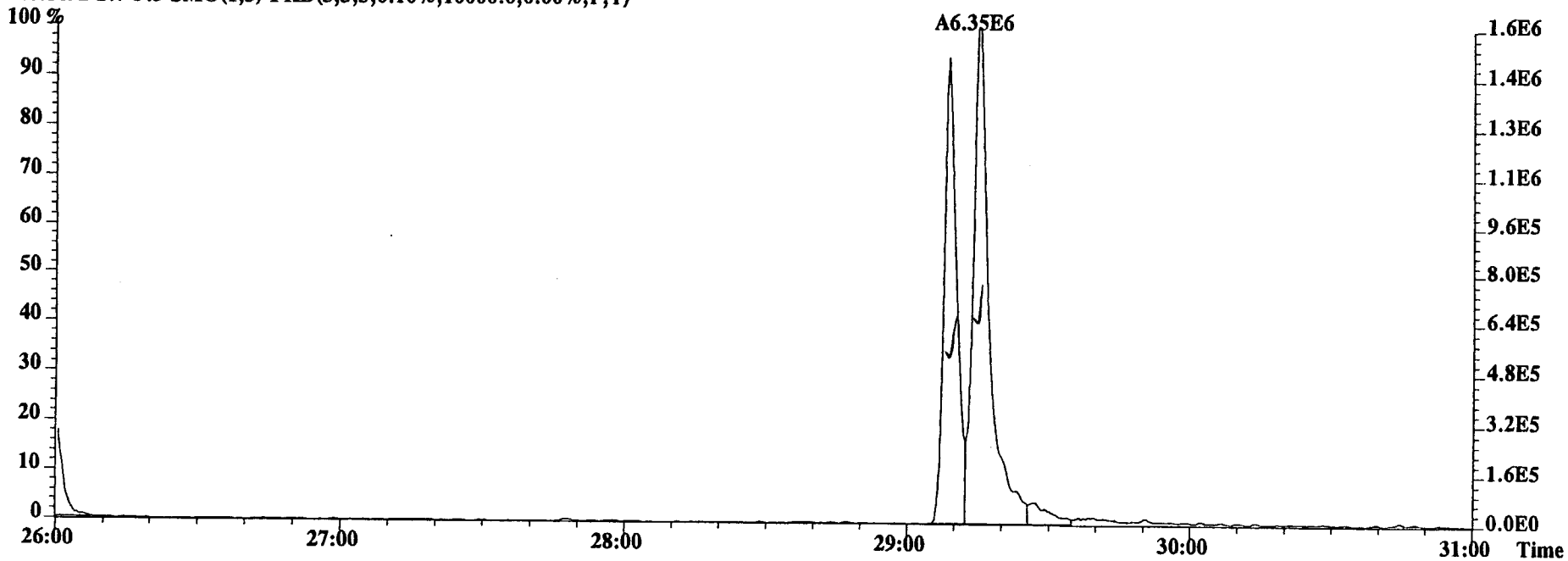


196

File:30OC98V4 #1-939 Acq:30-OCT-1998 21:39:37 GC EI+ Voltage SIR 70SE
Sample#7 Text:301802-4 :10X DIL. : : : Exp:PAHAIR
228.0939 S:7 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

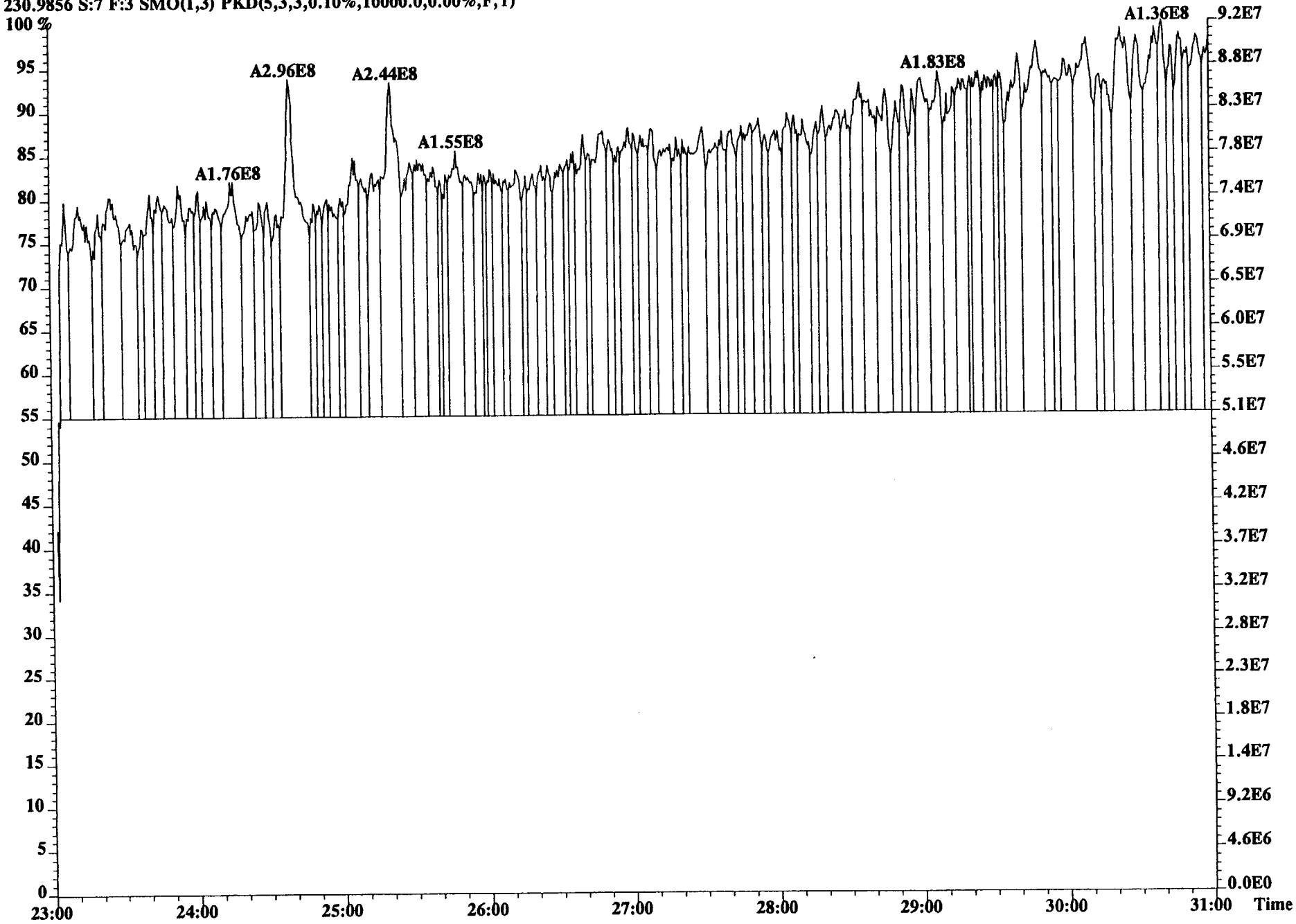


240.1692 S:7 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

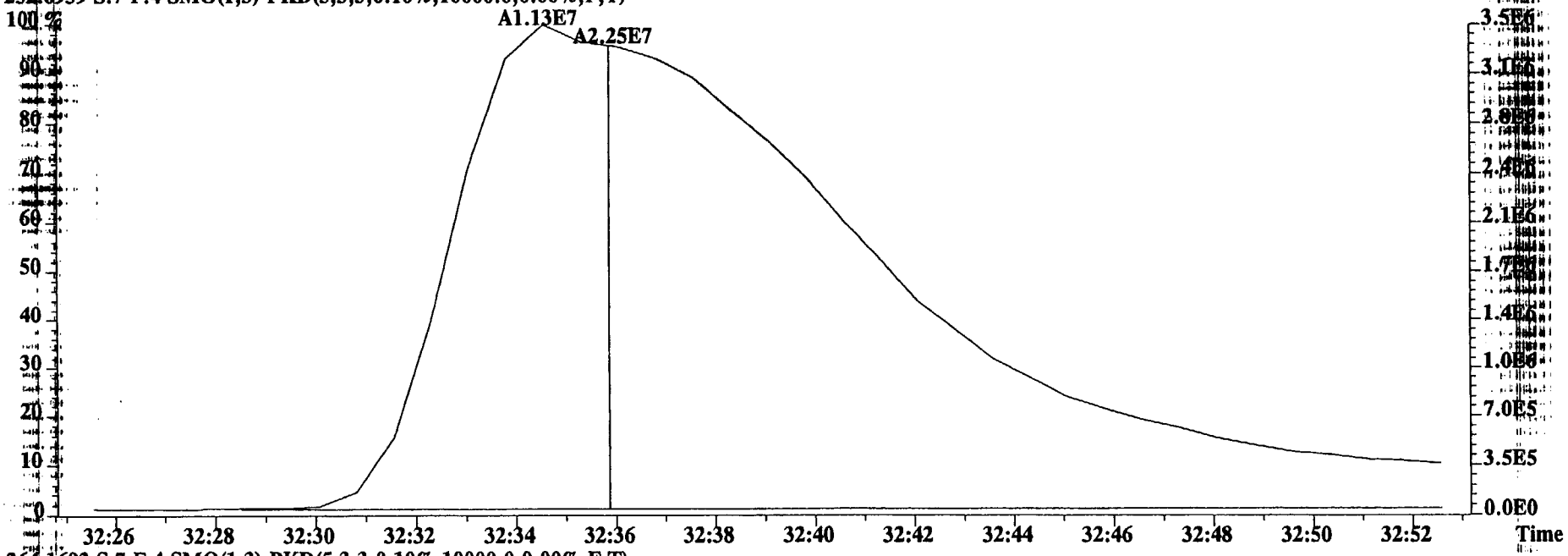


197

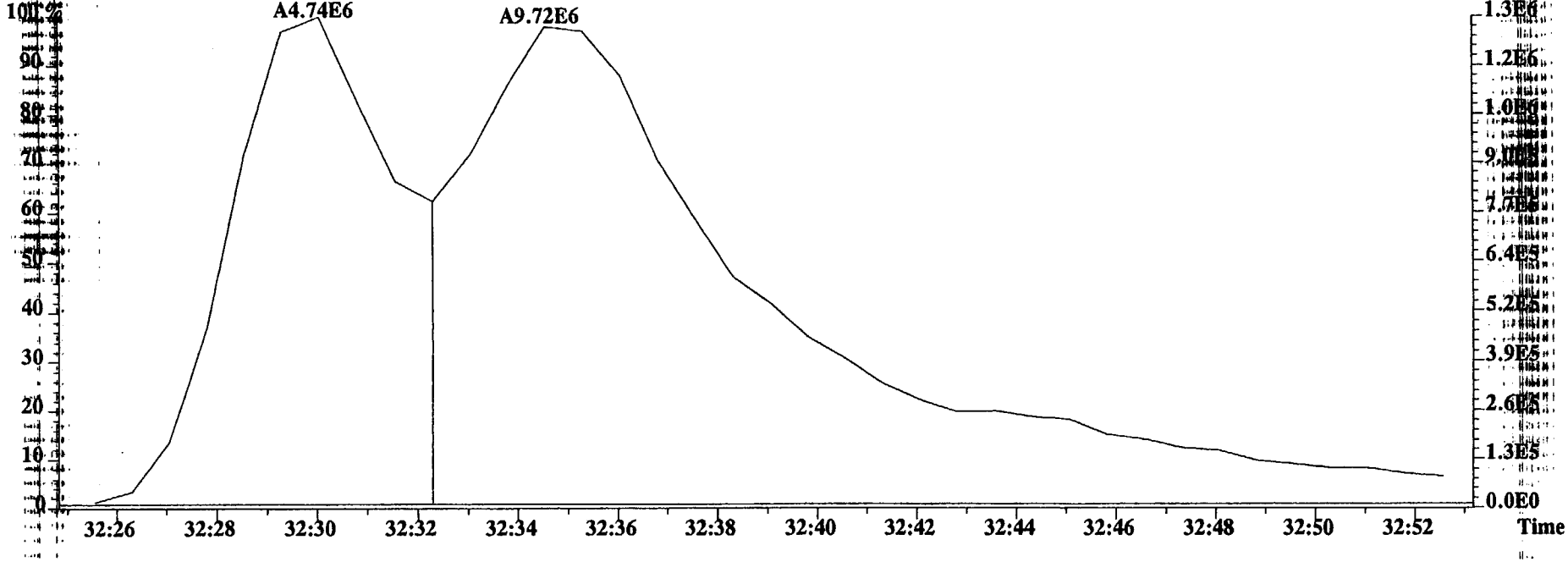
File:30OC98V4 #1-939 Acq:30-OCT-1998 21:39:37 GC EI+ Voltage SIR 70SE
Sample#7 Text:301802-4 :10X DIL. : : : Exp:PAHAIR
230.9856 S:7 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



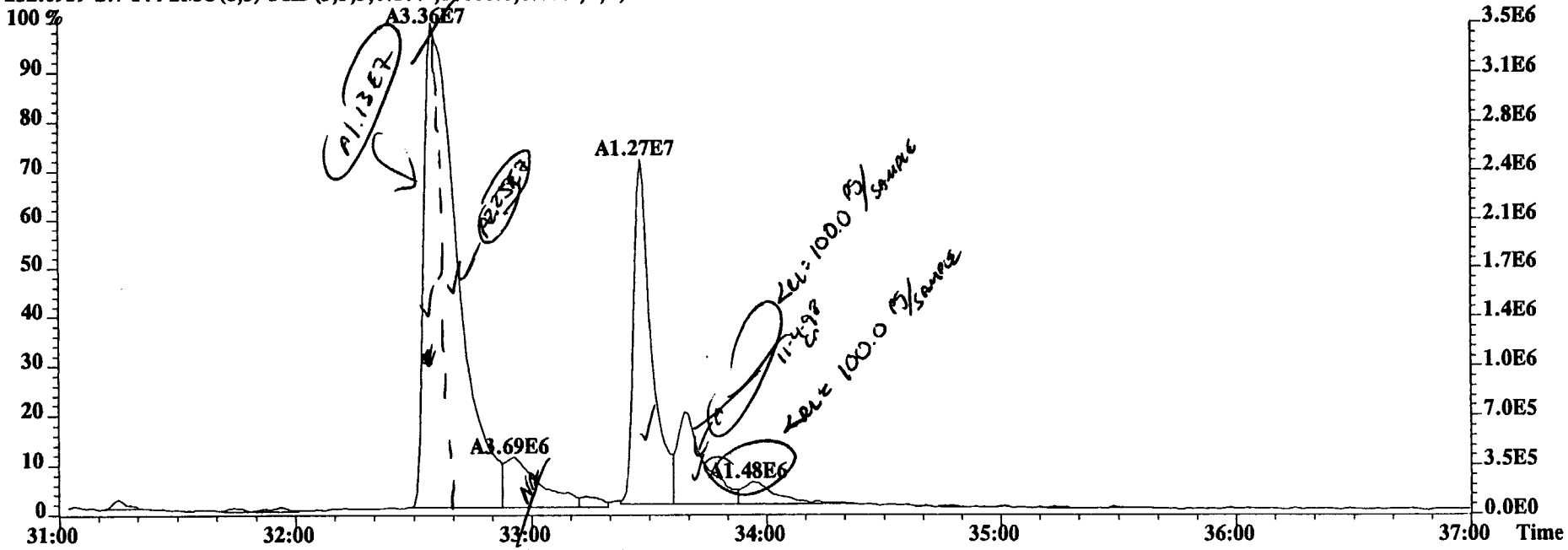
File:30OC98V4 #1-878 Acq:30-OCT-1998 21:39:37 GC EI+ Voltage SIR 70SE
Sample#7 Text:301802-4 :10X DIL. : : : Exp:PAHAIR
252.0939 S:7 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



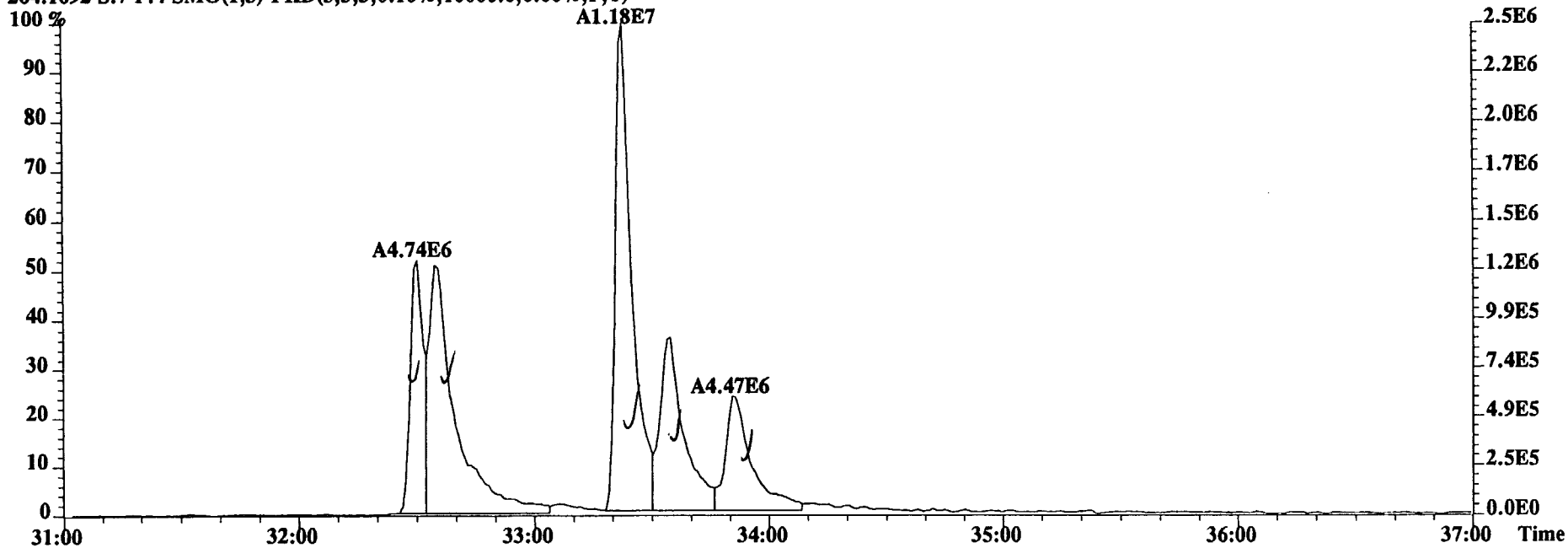
264.1692 S:7 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



File:30OC98V4 #1-878 Acq:30-OCT-1998 21:39:37 GC EI+ Voltage SIR 70SE
Sample#7 Text:301802-4 :10X DIL. : : : Exp:PAHAIR
252.0939 S:7 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



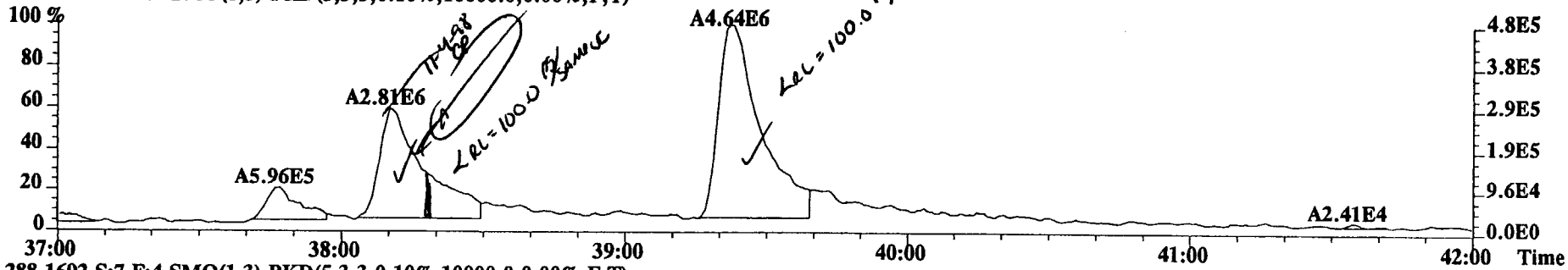
264.1692 S:7 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



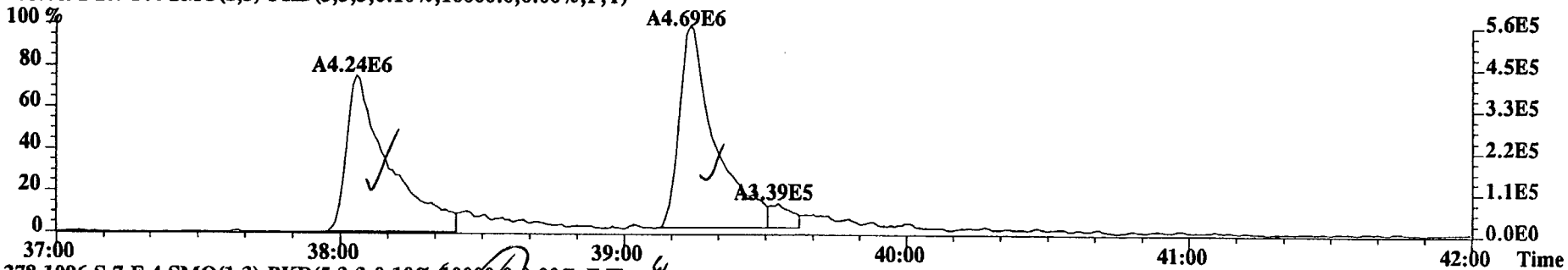
200

File:30OC98V4 #1-878 Acq:30-OCT-1998 21:39:37 GC EI+ Voltage SIR 70SE
Sample#7 Text:301802-4 :10X DIL. : : : Exp:PAHAIR

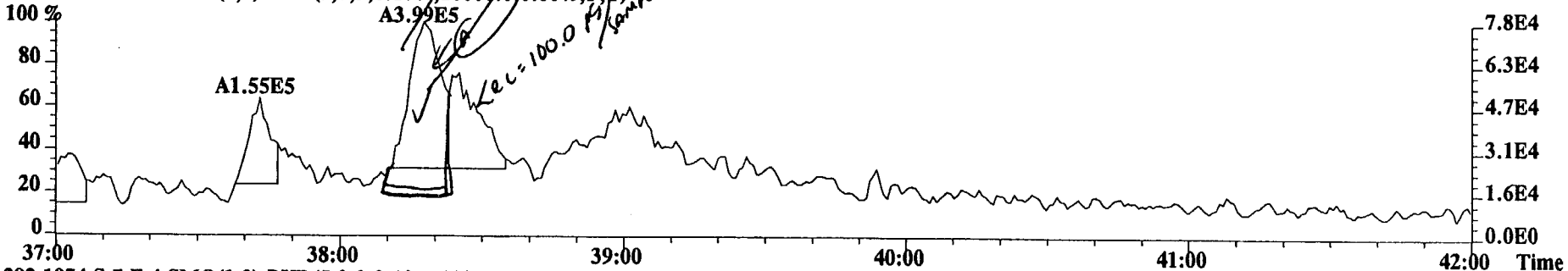
276.0939 S:7 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



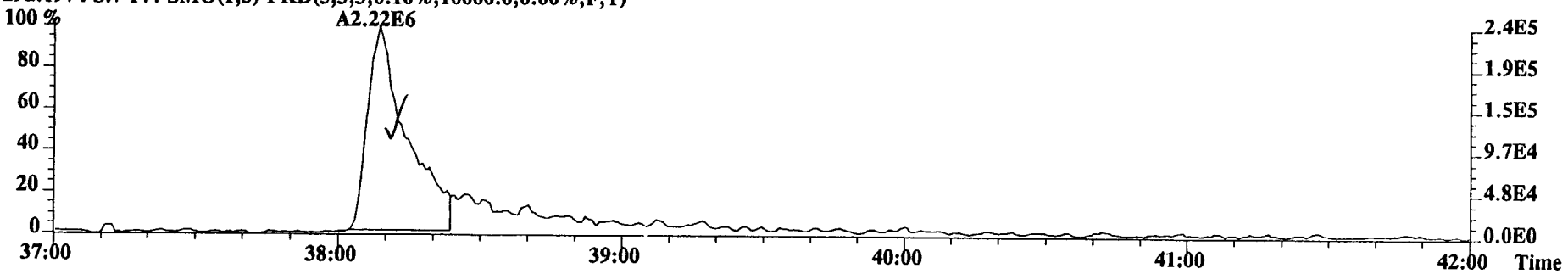
288.1692 S:7 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



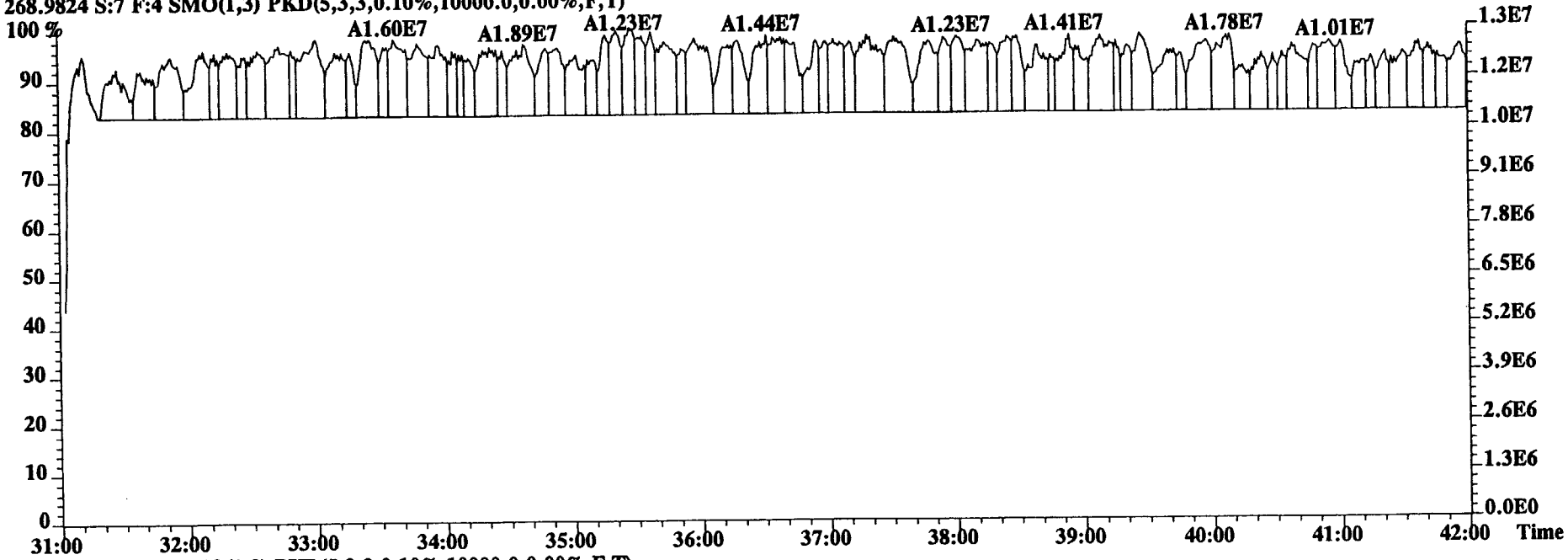
278.1096 S:7 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



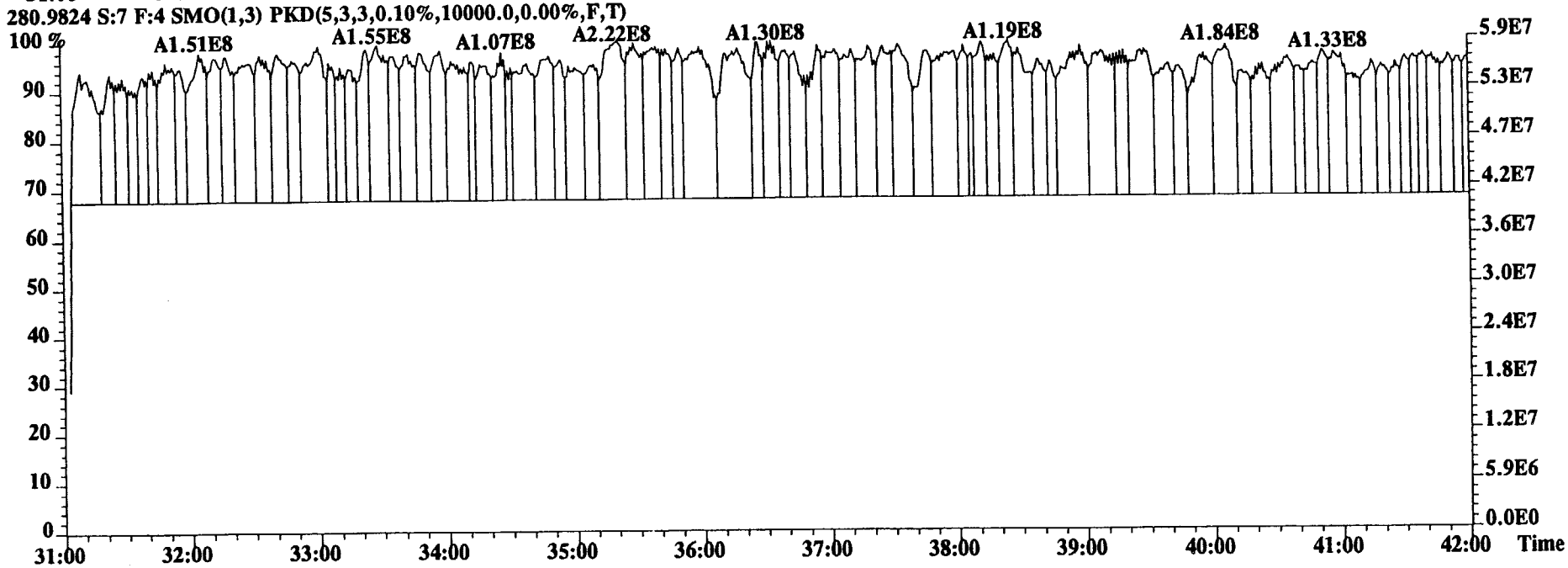
292.1974 S:7 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



File:30OC98V4 #1-878 Acq:30-OCT-1998 21:39:37 GC EI+ Voltage SIR 70SE
Sample#7 Text:301802-4 :10X DIL. : : : Exp:PAHAIR
268.9824 S:7 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



280.9824 S:7 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



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04-NOV-1998 05:24:48 PM Dioxin Furan Unknown RESULTS

Mass Spec : VG-4 Results : 02NO98V4121.RES : PAHAIR.TRG
GC Column : DB-5 Date analyzed : 02-NOV-98
Data file : 02NO98V4 301802-4 :100X DIL. : : : Ex Cal : PAHAIR102998V4.R
Weight : 0.5

Name	Total Response	Isotope Ratio	R. T. mm:ss	RRF	ng/ TRAIN	Rec/ MDL
d10-2-Methylnaphthalene	368292	1.00 Y	12: 28 Y	1.00	50.00	
d8-Naphthalene	758000	1.00 Y	10: 12 Y	2.24	45.93	92
Naphthalene	2696480000	1.00 Y	10: 16 Y	1.23	2.9e+05	B ~~E~~
d10-Anthracene	252000	1.00 Y	20: 55 Y	1.00	50.00	
d10-Phenanthrene	703560	1.00 Y	20: 45 Y	2.81	49.72	99
Phenanthrene	415930000	1.00 Y	20: 49 Y	0.89	6.6e+04	B ~~E~~

11-4-98
CP

04-NOV-1998 05:24:45 PM Dioxin Furan Unknown RESULTS

0.5

98V4.RRF

Rec/ MDL			
		184146	184146
	92	379000	379000
B	E	1348240000	1348240000
		126000	126000
	99	351780	351780
B	E	207965000	207965000

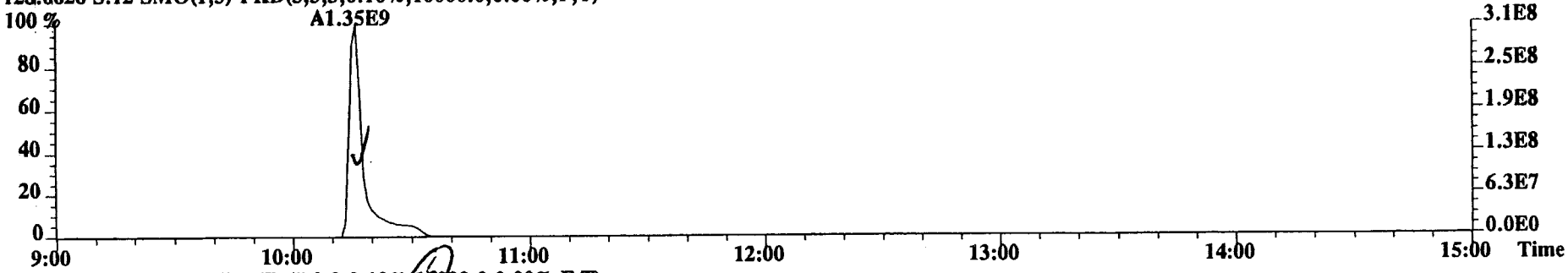
03-NOV-1998 08:40:26 AM 429AIR Unknown RESULTS

Mass Spec : VG-4 Results : 02NO98V4121.RES : PAHAIR.TRG
GC Column : DB-5 Date analyzed : 02-NOV-98
Data file : 02NO98V4 301802-4 :100X DIL. : : : Ex Cal : PAHAIR102998V4.R
Weight : 0.5

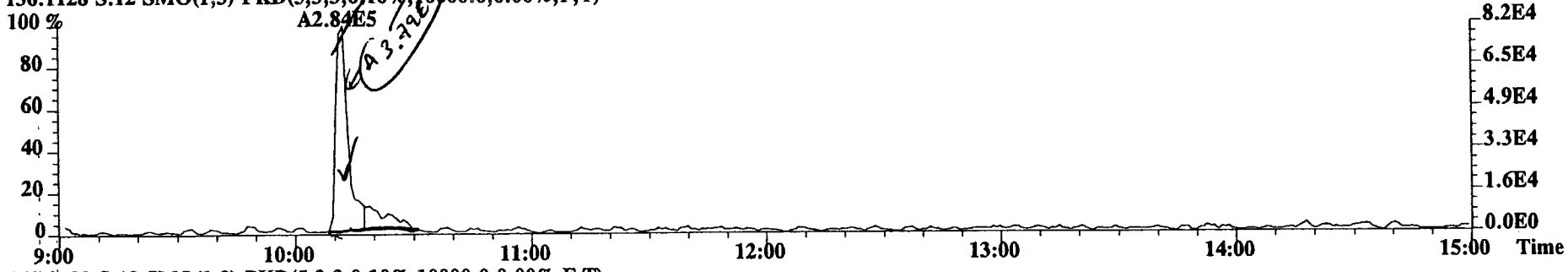
Name	Total Response	Isotope Ratio	R. T. mm:ss	RRF	ng/ TRAIN	Rec/ MDL
d10-2-Methylnaphthalene	368292	1.00 Y	12: 28 Y	1.00	50.00	
d8-Naphthalene	567694	1.00 Y	10: 12 Y	2.24	34.40	69
Naphthalene	2696480000	1.00 Y	10: 16 Y	1.23	3.9e+05	0.000
2-Methylnaphthalene	227550000	1.00 Y	12: 33 Y	0.56	7.2e+04	0.000
d8-Acenaphthylene	314266	1.00 Y	15: 28 Y	1.21	35.15	70
Acenaphthylene	178146800	1.00 Y	15: 30 Y	0.94	6.0e+04	0.000
d10-Acenaphthene	132801	1.00 Y	16: 1 Y	0.74	24.21	48
Acenaphthene	23286400	1.00 Y	16: 7 Y	1.25	1.4e+04	0.000
d10-Anthracene	208312	1.00 Y	20: 55 Y	1.00	50.00	
d10-Fluorene	171793	1.00 Y	17: 41 Y	1.42	29.02	58
Fluorene	2357760	1.00 Y	17: 46 Y	1.16	1182.61	0.000
d10-Phenanthrene	703560	1.00 Y	20: 45 Y	2.81	60.15	120
Phenanthrene	415930000	1.00 Y	20: 49 Y	0.89	6.6e+04	0.000
Anthracene	* No Peak	0.00 N	20: 59 N	0.80	0.00	0.000
d14-Terphenyl	609830	1.00 Y	26: 2 Y	1.00	50.00	
d10-Fluoranthene	480184	1.00 Y	24: 35 Y	1.41	27.91	56
Fluoranthene	74667600	1.00 Y	24: 39 Y	1.11	1.4e+04	0.000
d10-Pyrene	534432	1.00 Y	25: 17 Y	1.52	28.86	58
Pyrene	47295400	1.00 Y	25: 20 Y	1.21	7343.75	0.000
d12-Benzo(a)anthracene	385960	1.00 Y	29: 11 Y	0.90	35.16	70
Benzo(a)anthracene	906706	1.00 Y	29: 16 Y	1.20	195.04	0.000
d12-Chrysene	632880	1.00 Y	29: 18 Y	1.28	40.57	81
Chrysene	6244520	1.00 Y	29: 23 Y	1.08	910.25	0.000
d12-Benzo(e)pyrene	811912	1.00 Y	33: 25 Y	1.00	50.00	
d12-Benzo(b)fluoranthene	* No Peak	0.00 N	32: 31 N	0.45	0.00	0
Benzo(b)fluoranthene	602824	1.00 Y	32: 39 Y	1.17	*NoINoIs	
d12-Benzo(k)fluoranthene	566782	1.00 Y	32: 38 Y	0.95	36.82	74
Benzo(k)fluoranthene	602824	1.00 Y	32: 39 Y	1.16	91.36	0.000
d12-Benzo(a)pyrene	* No Peak	0.00 N	33: 35 N	0.68	0.00	0
Benzo(e)pyrene	394882	1.00 Y	33: 32 Y	1.64	*NoINoIs	
Benzo(a)pyrene	33591	1.00 Y	33: 40 Y	1.07	*NoINoIs	
d12-Perylene	139080	1.00 Y	33: 53 Y	0.63	13.59	27
Perylene	* No Peak	0.00 N	33: 58 N	1.71	0.00	0.000
d12-Indeno(123-cd)pyrene	* No Peak	0.00 N	38: 4 N	0.44	0.00	0
Indeno(123-cd)pyrene	* No Peak	0.00 N	38: 11 N	0.62	*NoINoIs	
d14-Dibenz(ah)anthracene	* No Peak	0.00 N	38: 8 N	0.25	0.00	0
Dibenz(ah)anthracene	* No Peak	0.00 N	38: 18 N	1.40	*NoINoIs	
d12-Benzo(ghi)perylene	* No Peak	0.00 N	39: 16 N	0.58	0.00	0
Benzo(ghi)perylene	201974	1.00 Y	39: 27 Y	1.02	*NoINoIs	
d10-Fluorene	171793	1.00 Y	17: 41 Y	1.42	7.45	15
13C-Fluorene	98612	1.00 Y	17: 45 Y	1.00	57.40	0.000

File:02NO98V4 #1-510 Acq: 2-NOV-1998 22:12:35 GC EI+ Voltage SIR 70SE
Sample#12 Text:301802-4 :100X DIL. : : : Exp:PAHAIR

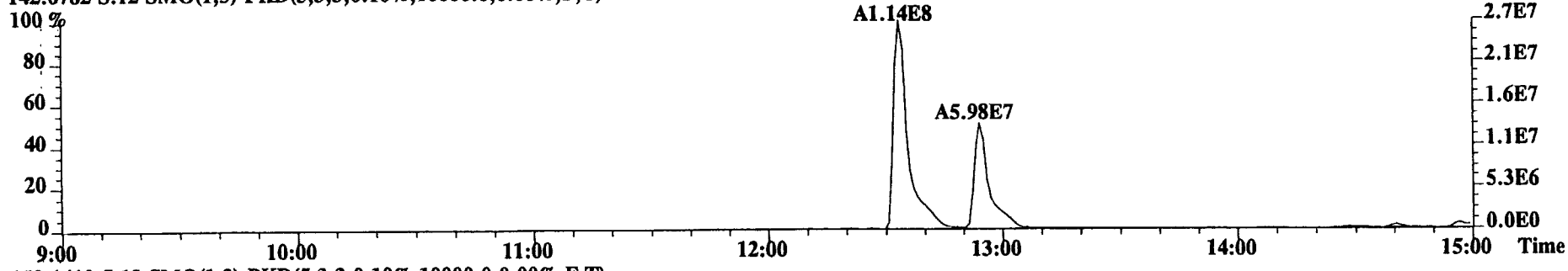
128.0626 S:12 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



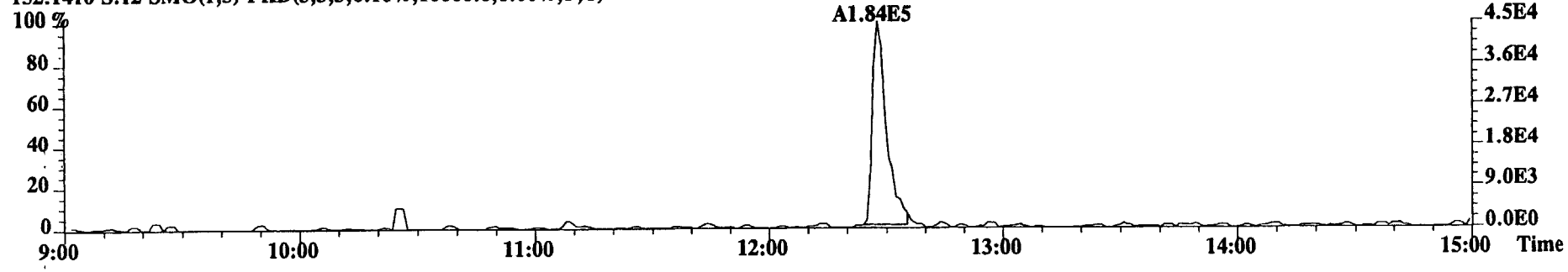
136.1128 S:12 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



142.0782 S:12 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

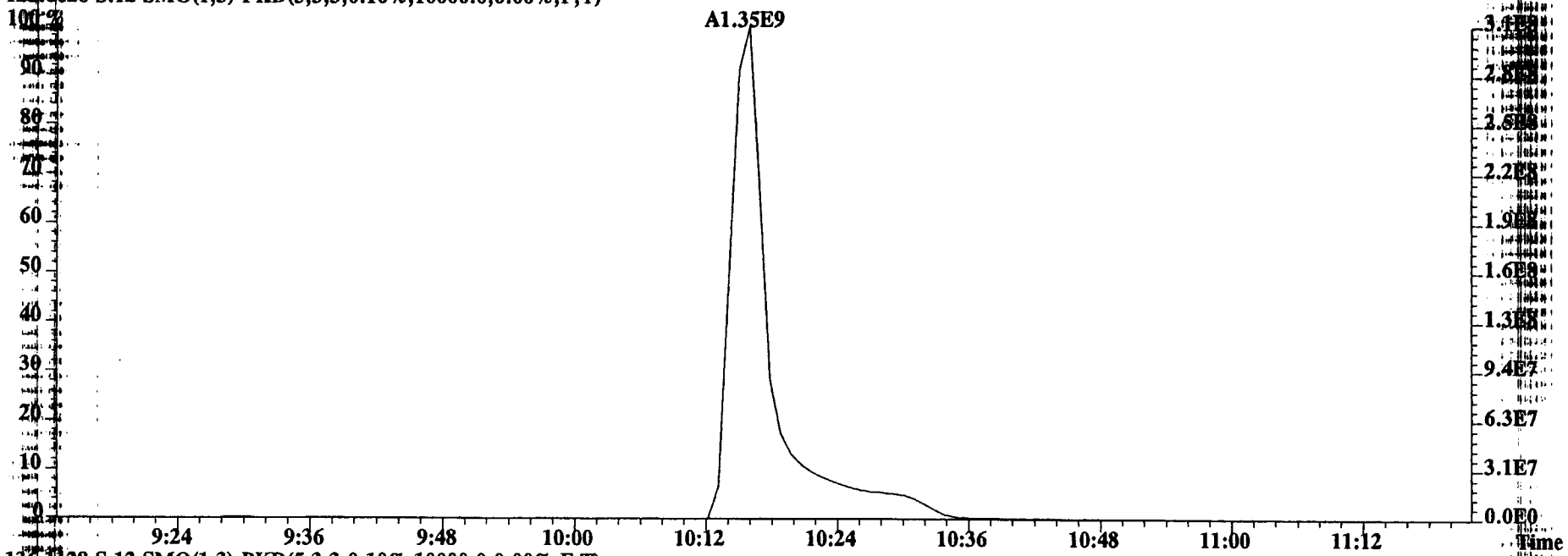


152.1410 S:12 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

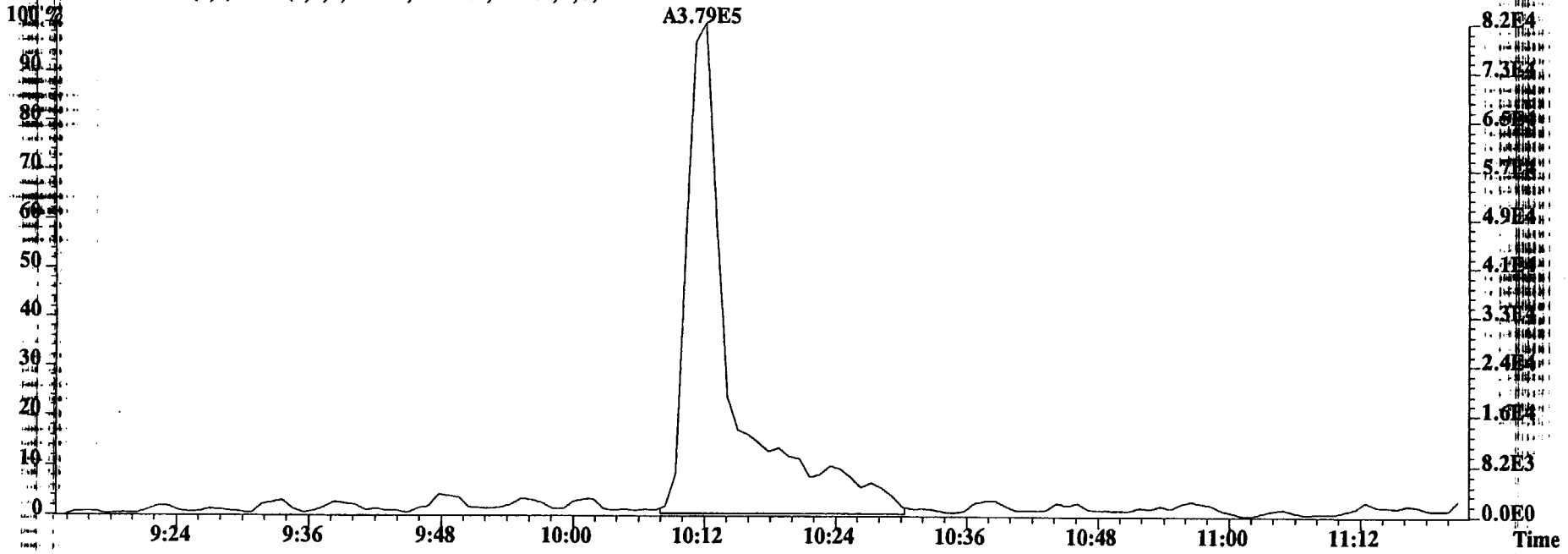


206

File:02NO98V4 #1-510 Acq: 2-NOV-1998 22:12:35 GC EI+ Voltage SIR 70SE
Sample#12 Text:301802-4 :100X DIL. : : : Exp:PAHAIR
128.0626 S:12 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

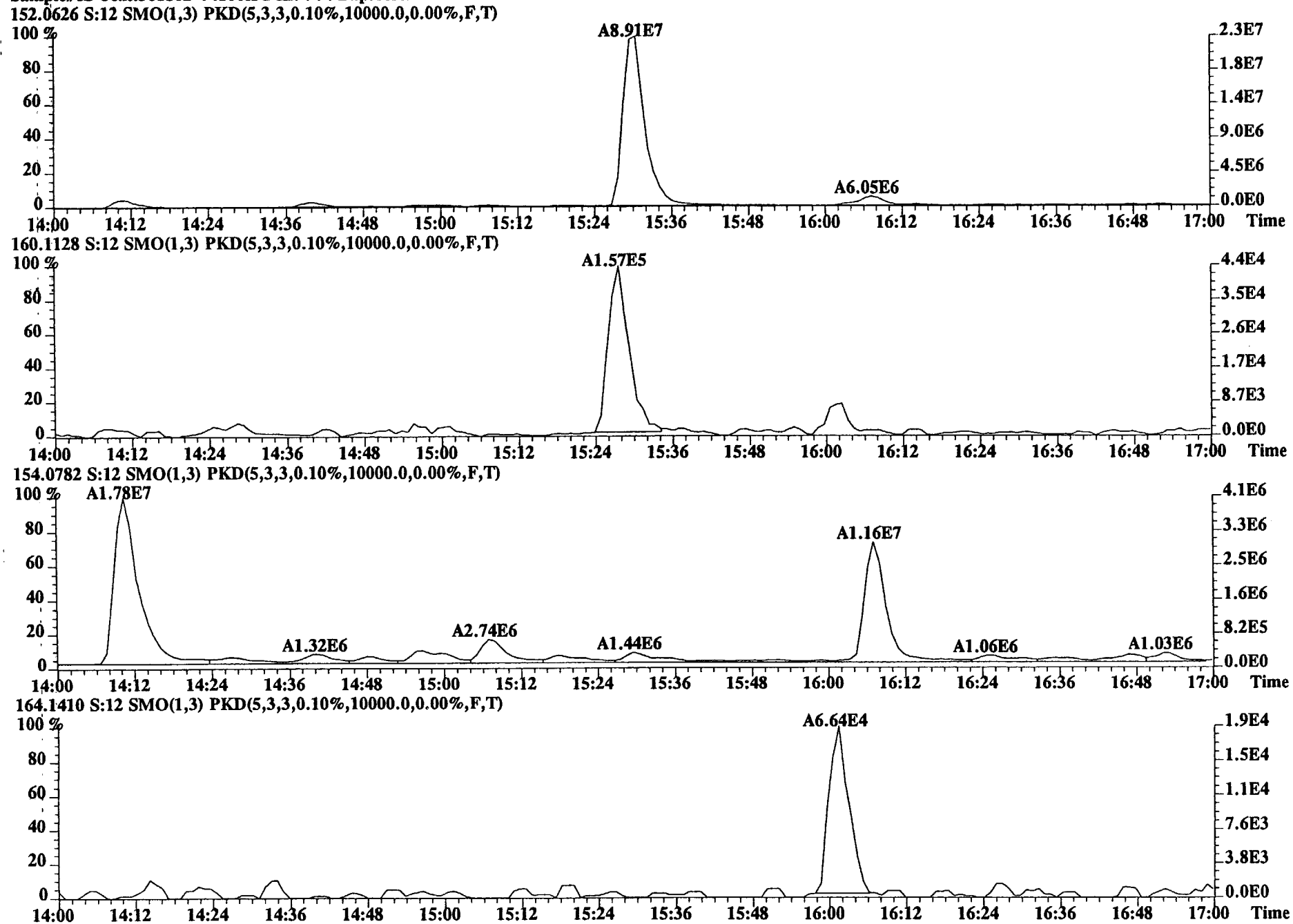


136.1128 S:12 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

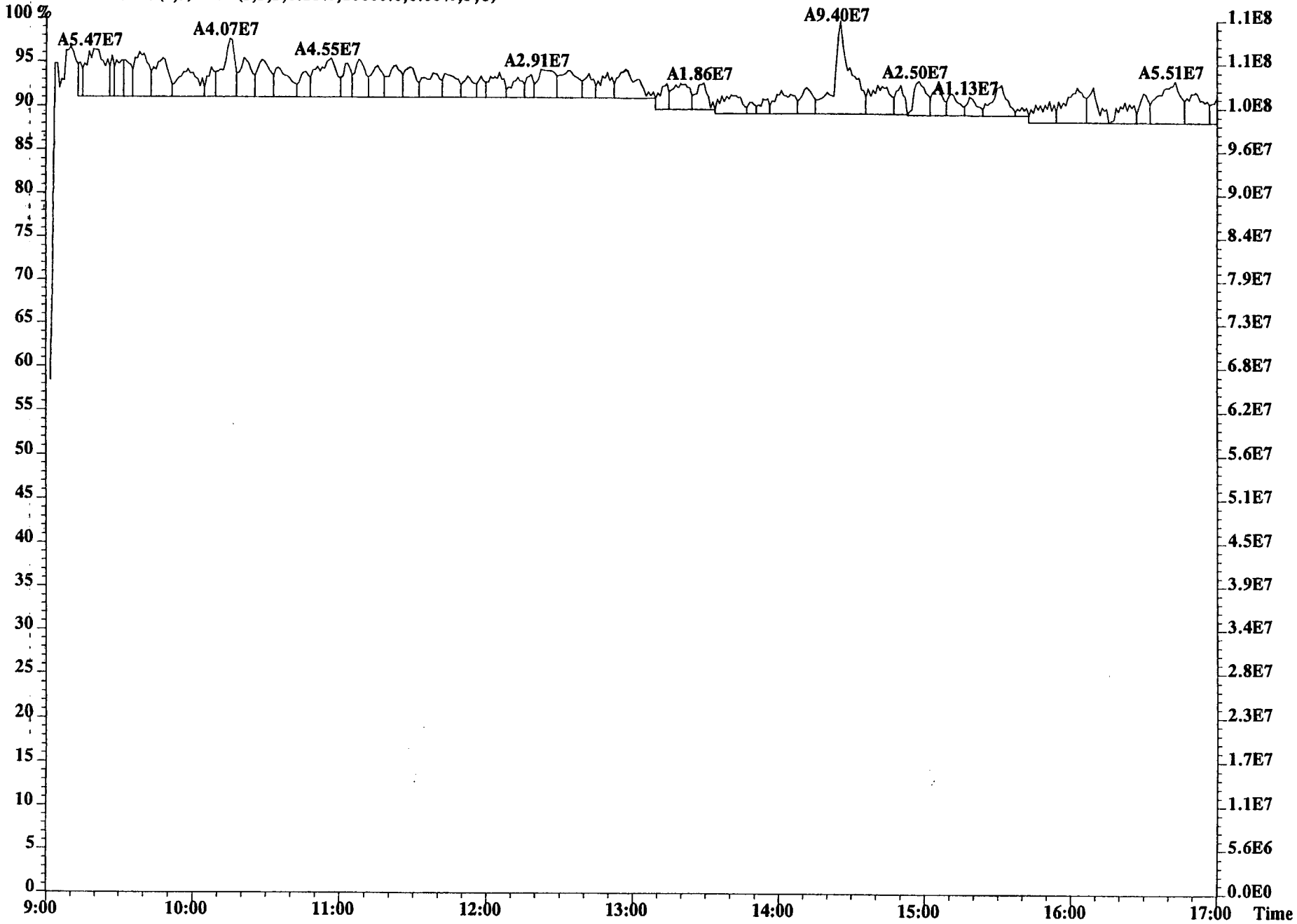


202 ?

File:02NO98V4 #1-510 Acq: 2-NOV-1998 22:12:35 GC EI+ Voltage SIR 70SE
Sample#12 Text:301802-4 :100X DIL. : : : Exp:PAHAIR

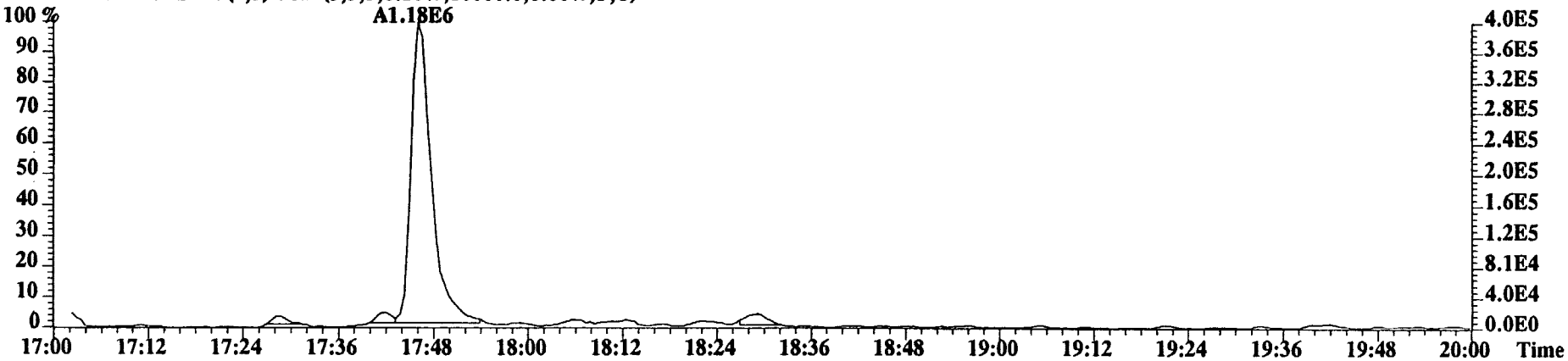


File:02NO98V4 #1-510 Acq: 2-NOV-1998 22:12:35 GC EI+ Voltage SIR 70SE
Sample#12 Text:301802-4 :100X DIL. : : : Exp:PAHAIR
130.9920 S:12 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

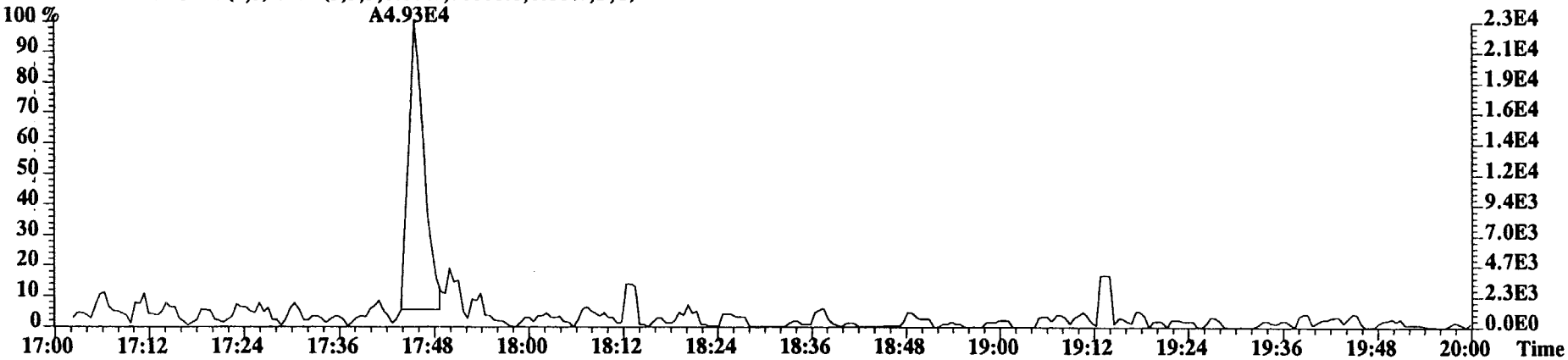


602 10

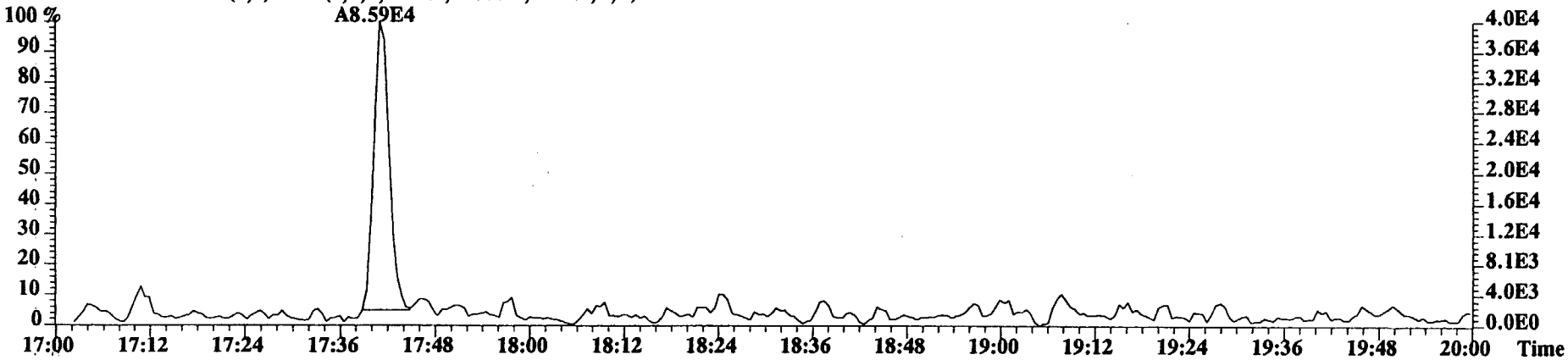
File:02NO98V4 #1-640 Acq: 2-NOV-1998 22:12:35 GC EI+ Voltage SIR 70SE
Sample#12 Text:301802-4 :100X DIL. : : : Exp:PAHAIR
166.0798 S:12 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



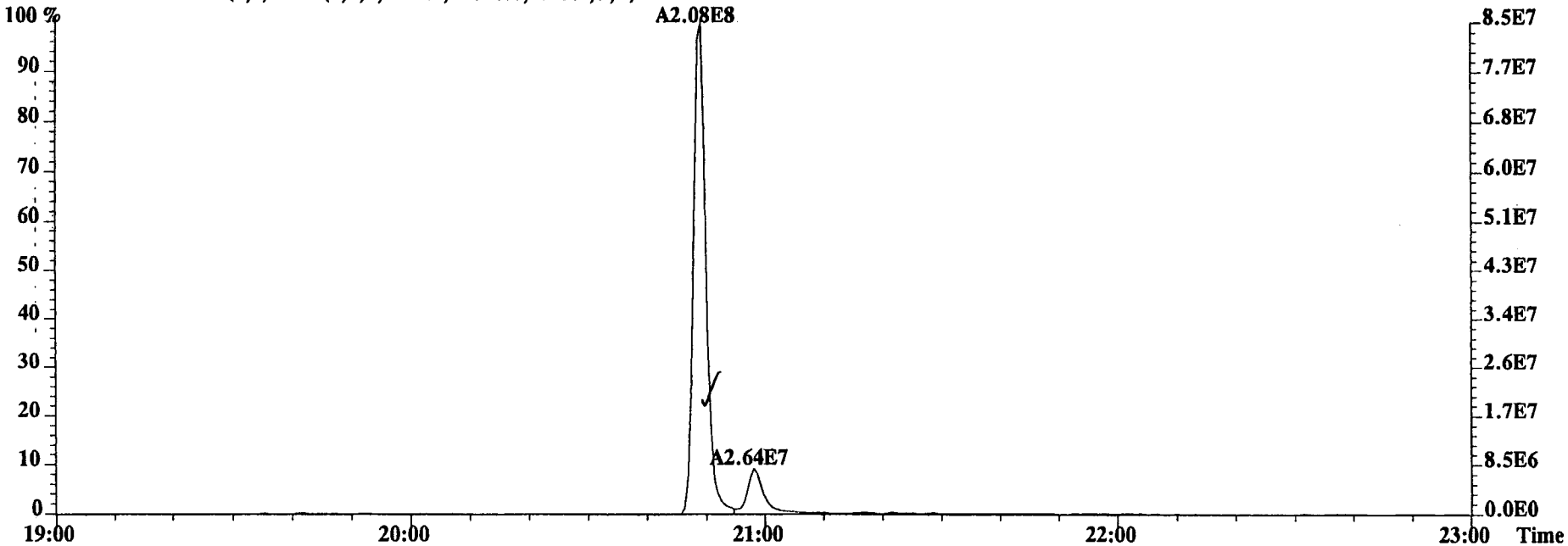
172.0984 S:12 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



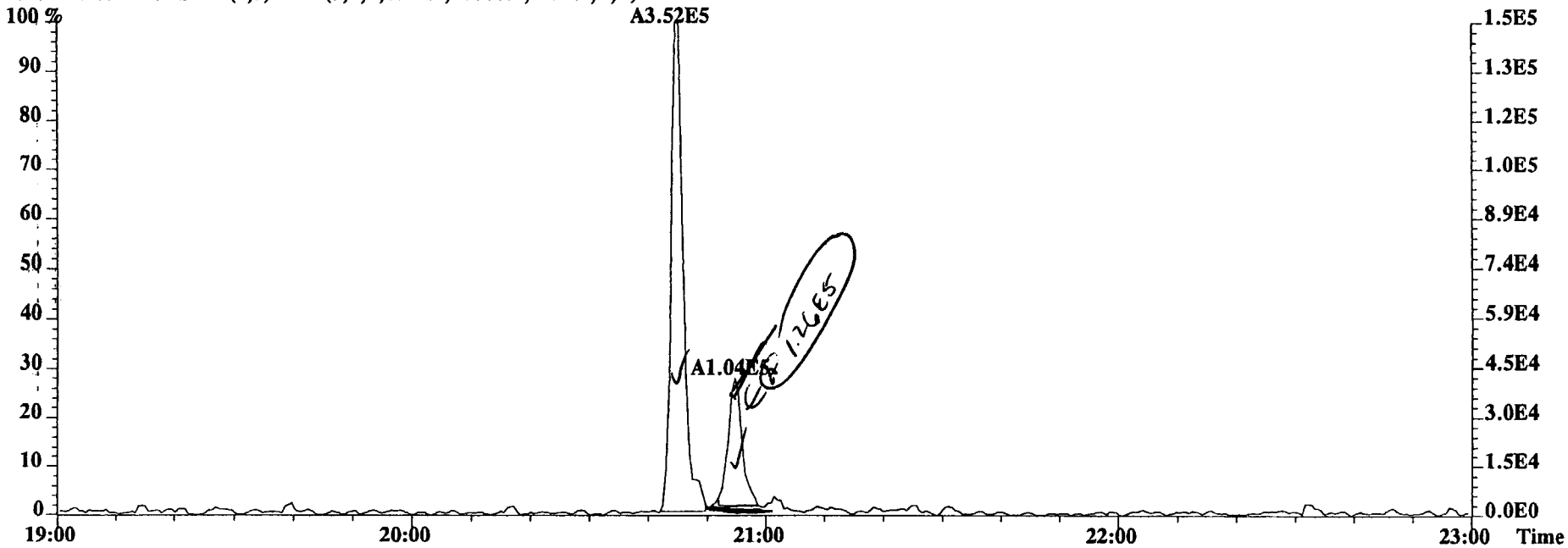
176.1410 S:12 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



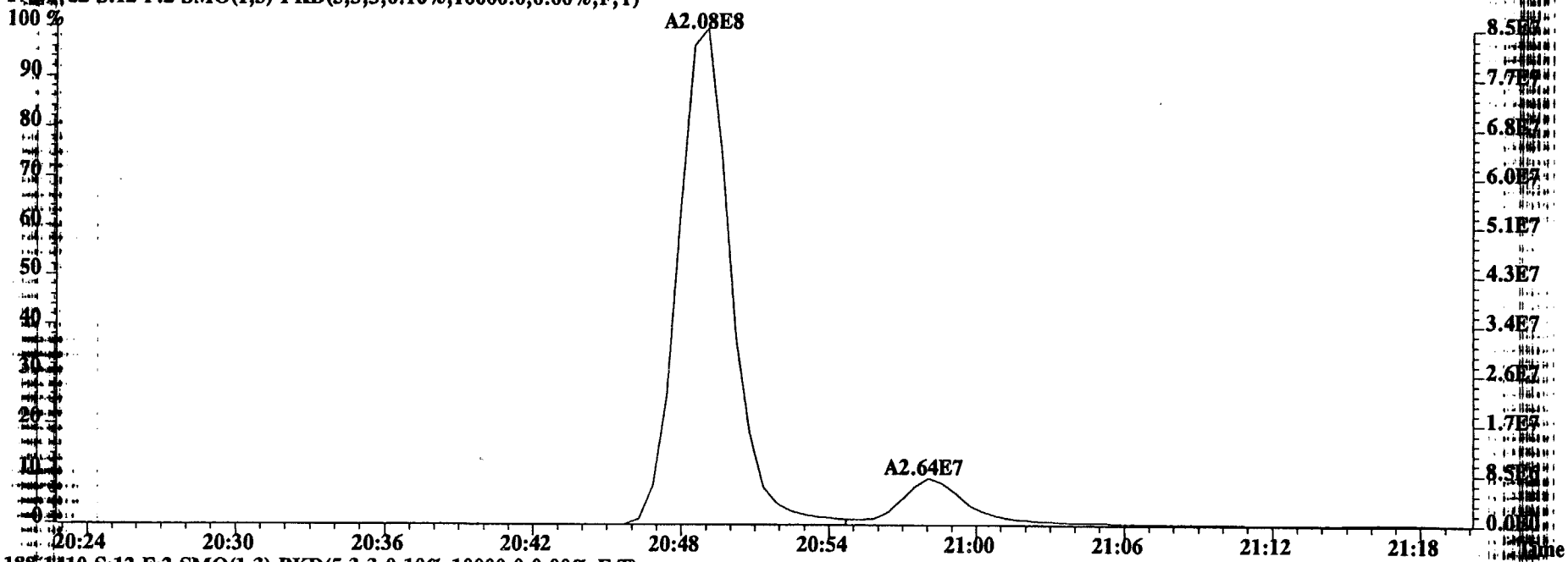
File:02NO98V4 #1-640 Acq: 2-NOV-1998 22:12:35 GC EI+ Voltage SIR 70SE
Sample#12 Text:301802-4 :100X DIL. : : : Exp:PAHAIR
178.0782 S:12 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



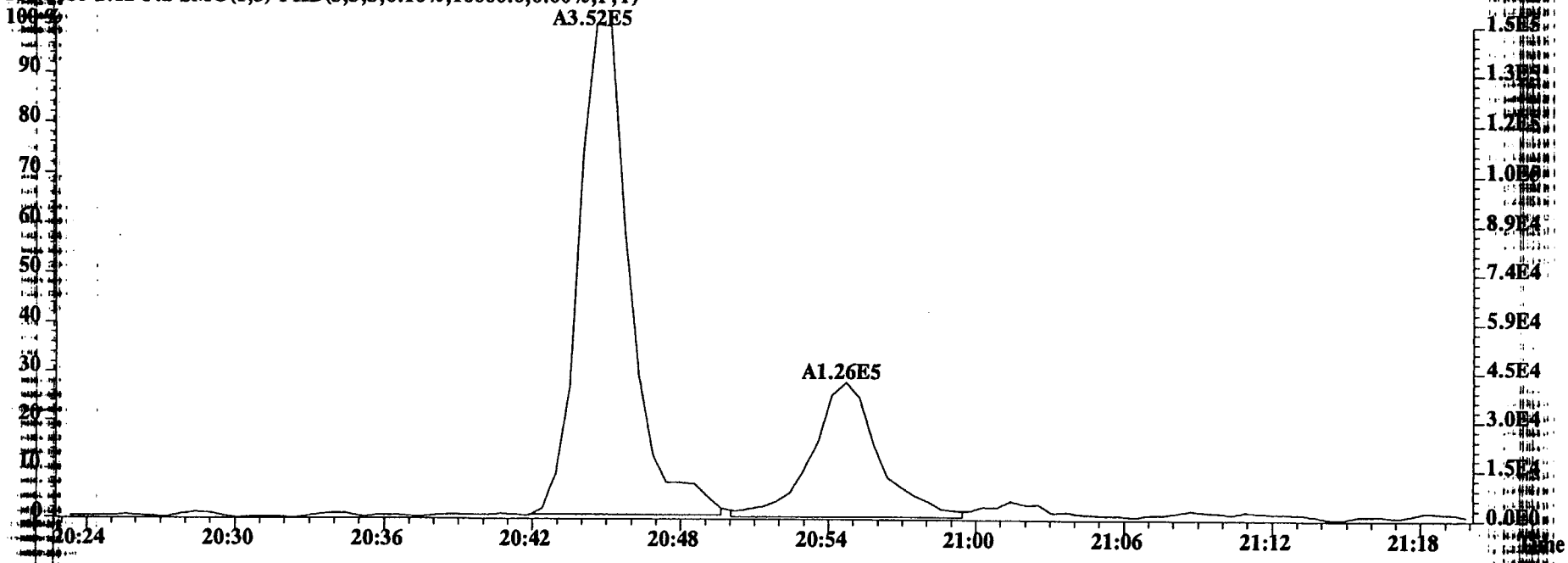
188.1410 S:12 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



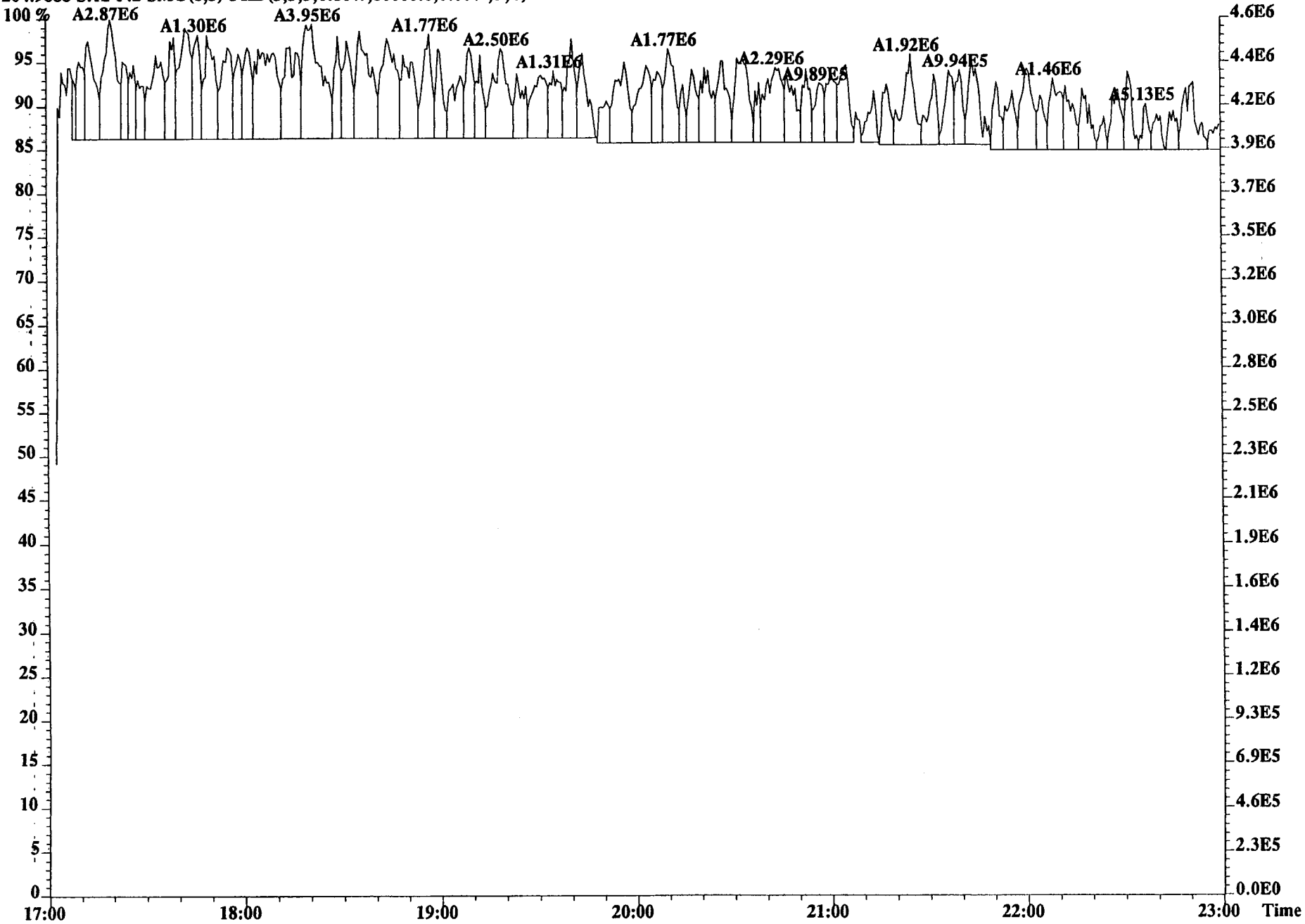
File:02NO98V4 #1-640 Acq: 2-NOV-1998 22:12:35 GC EI+ Voltage SIR 70SE
Sample#12 Text:301802-4 :100X DIL. : : : Exp:PAHAIR
178.0782 S:12 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



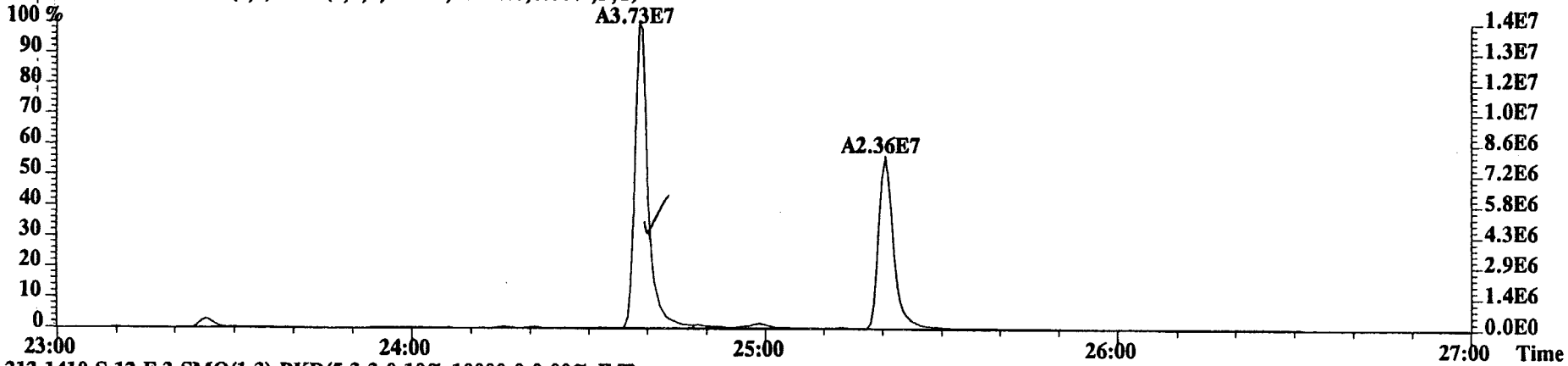
188.1310 S:12 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



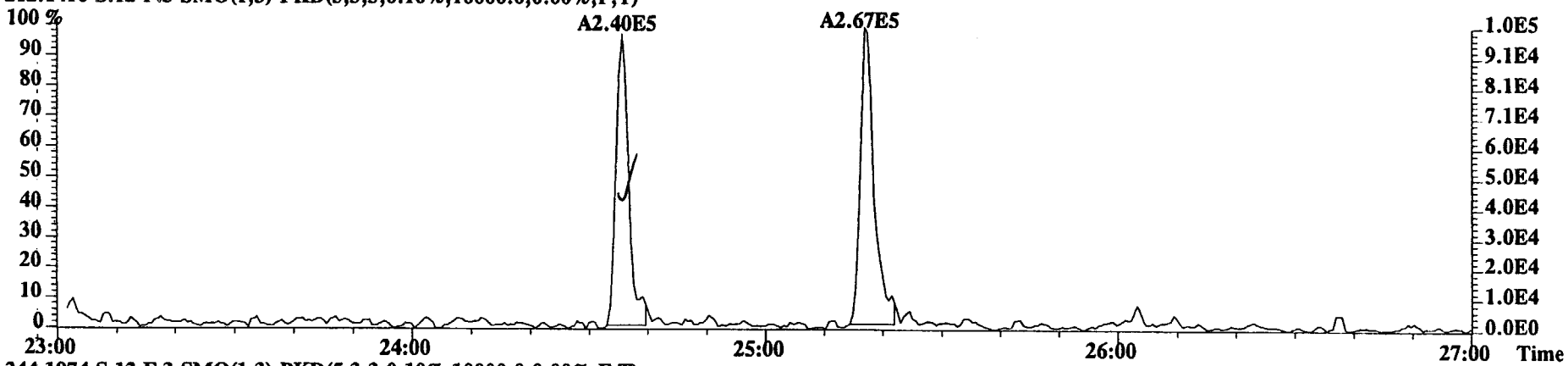
File:02NO98V4 #1-640 Acq: 2-NOV-1998 22:12:35 GC EI+ Voltage SIR 70SE
Sample#12 Text:301802-4 :100X DIL. : : : Exp:PAHAIR
204.9888 S:12 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



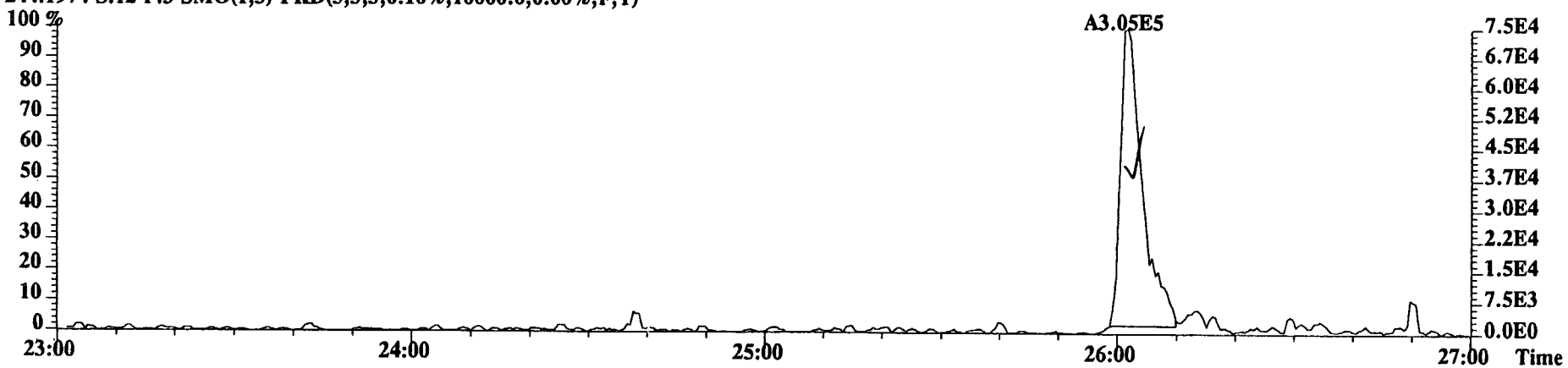
File:02NO98V4 #1-939 Acq: 2-NOV-1998 22:12:35 GC EI+ Voltage SIR 70SE
Sample#12 Text:301802-4 :100X DIL. : : : Exp:PAHAIR
202.0782 S:12 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



212.1410 S:12 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

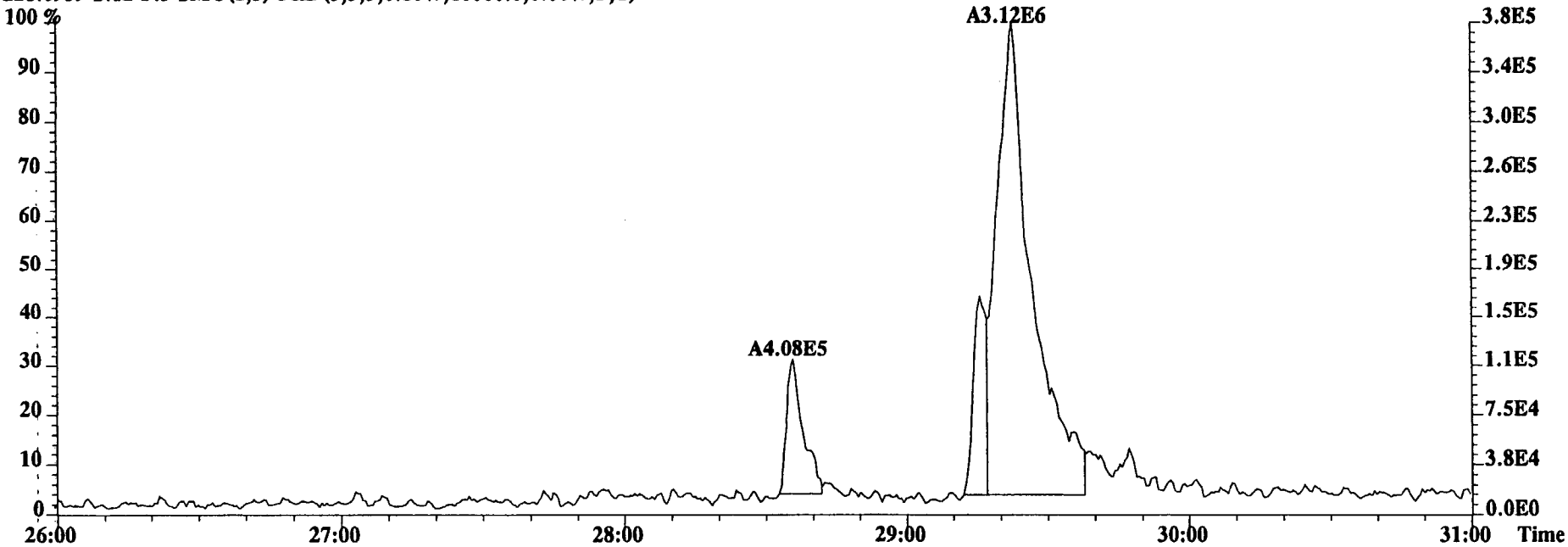


244.1974 S:12 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

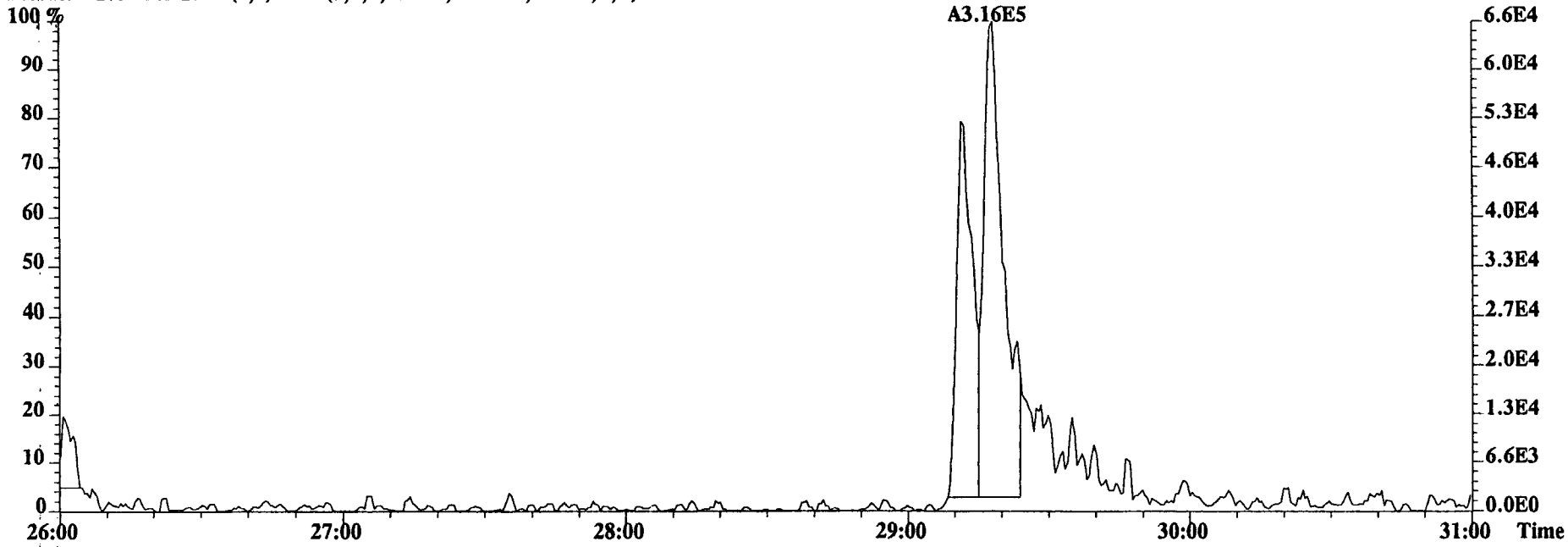


213

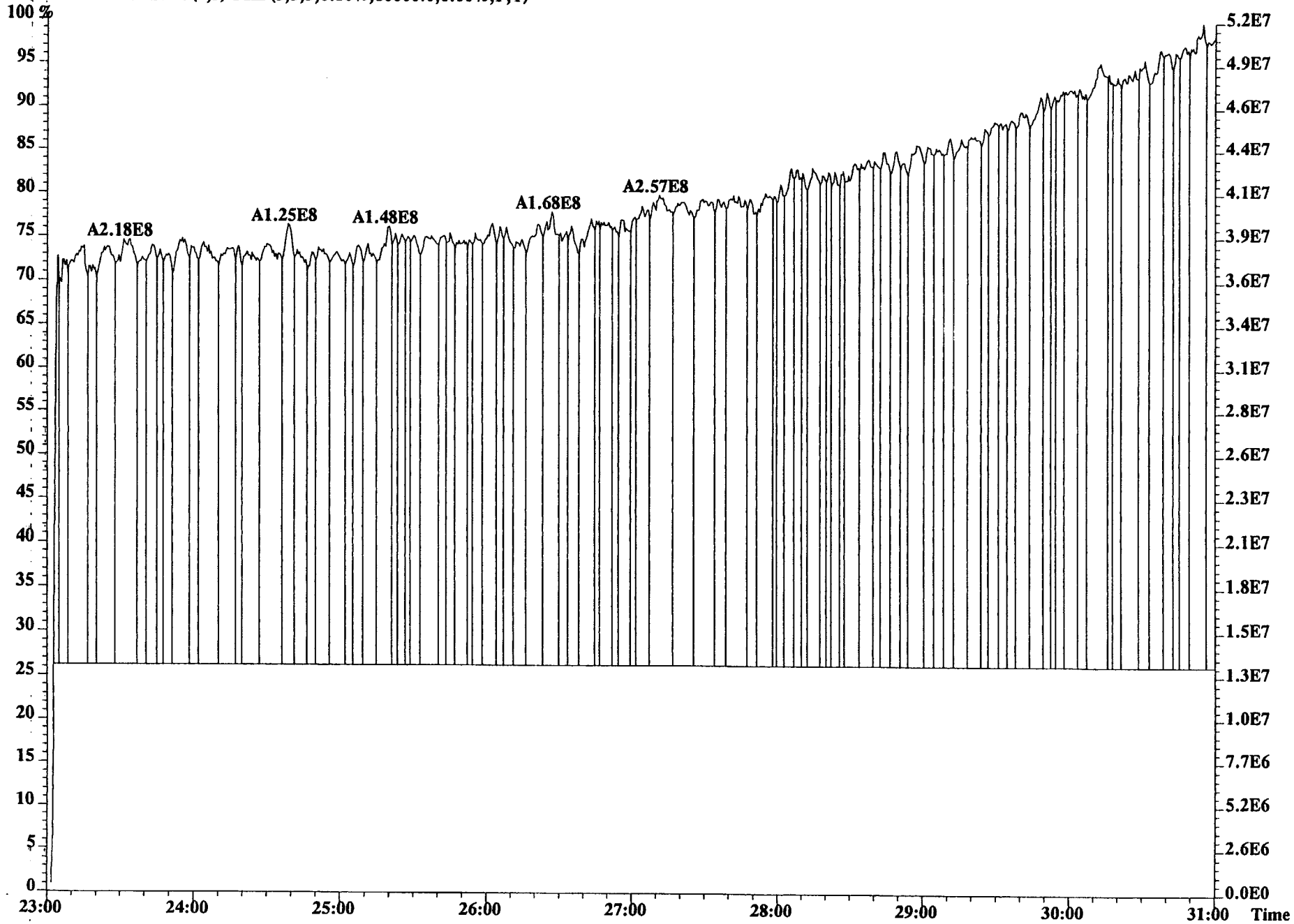
File:02NO98V4 #1-939 Acq: 2-NOV-1998 22:12:35 GC EI+ Voltage SIR 70SE
Sample#12 Text:301802-4 :100X DIL. : : : Exp:PAHAIR
228.0939 S:12 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



240.1692 S:12 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

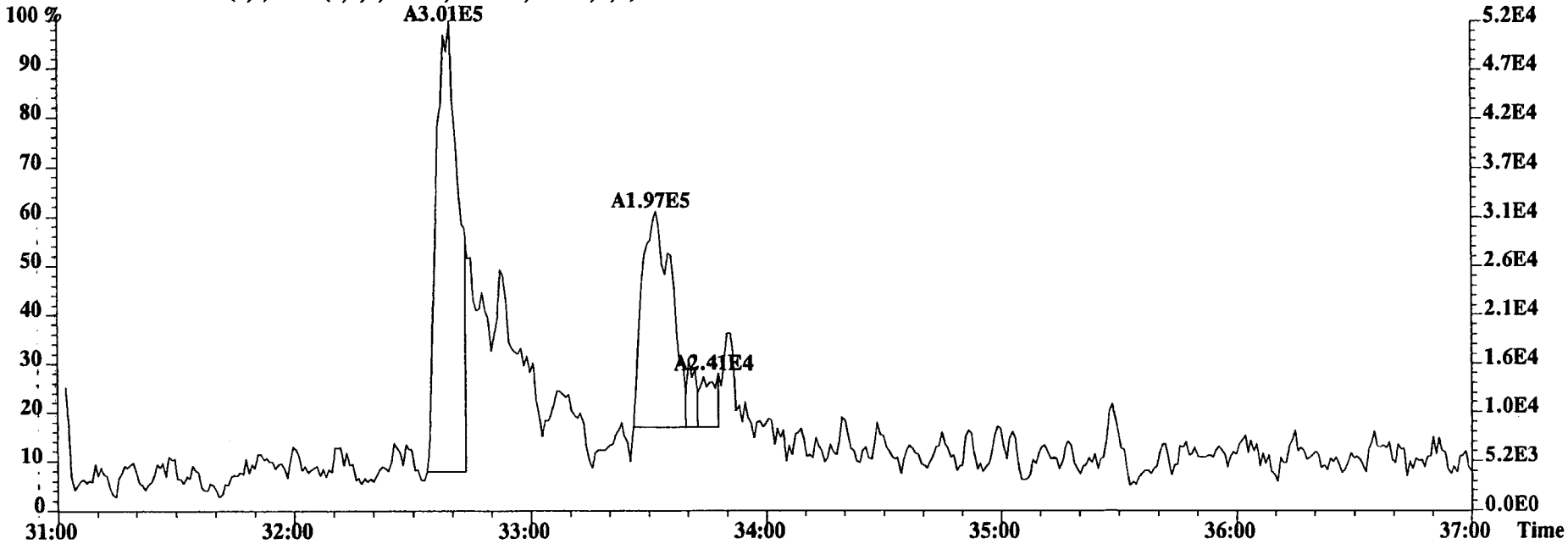


File:02NO98V4 #1-939 Acq: 2-NOV-1998 22:12:35 GC EI+ Voltage SIR 70SE
Sample#12 Text:301802-4 :100X DIL. : : : Exp:PAHAIR
230.9856 S:12 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

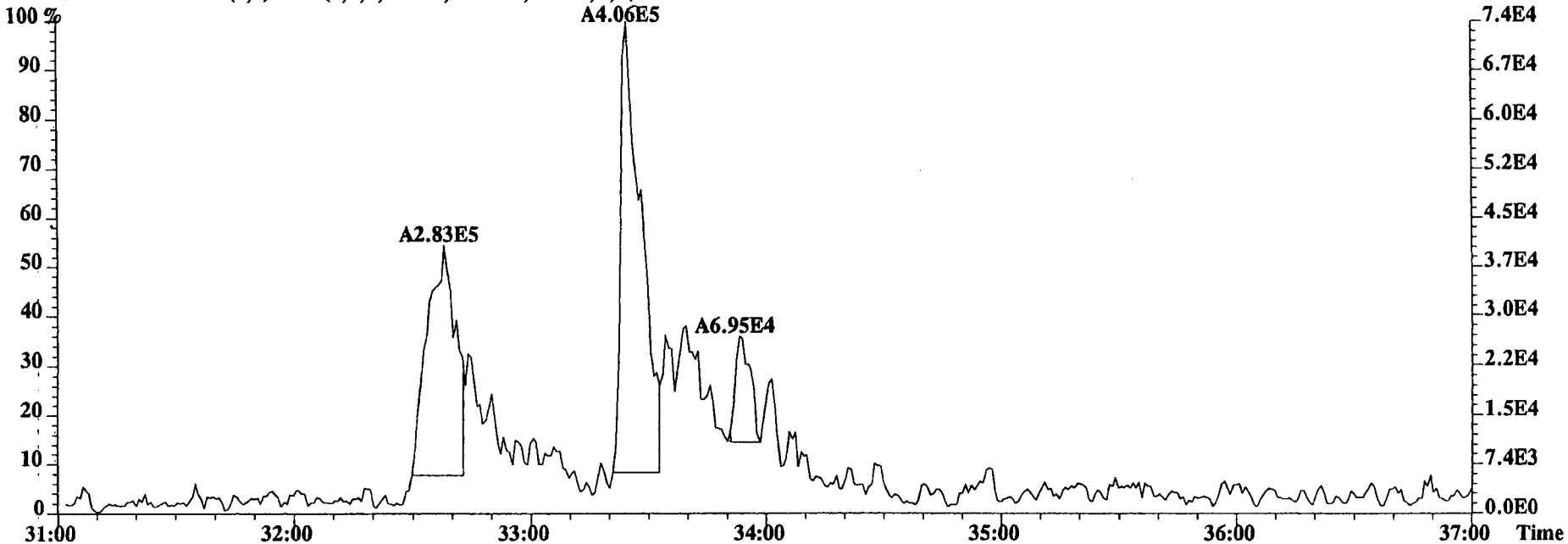


215

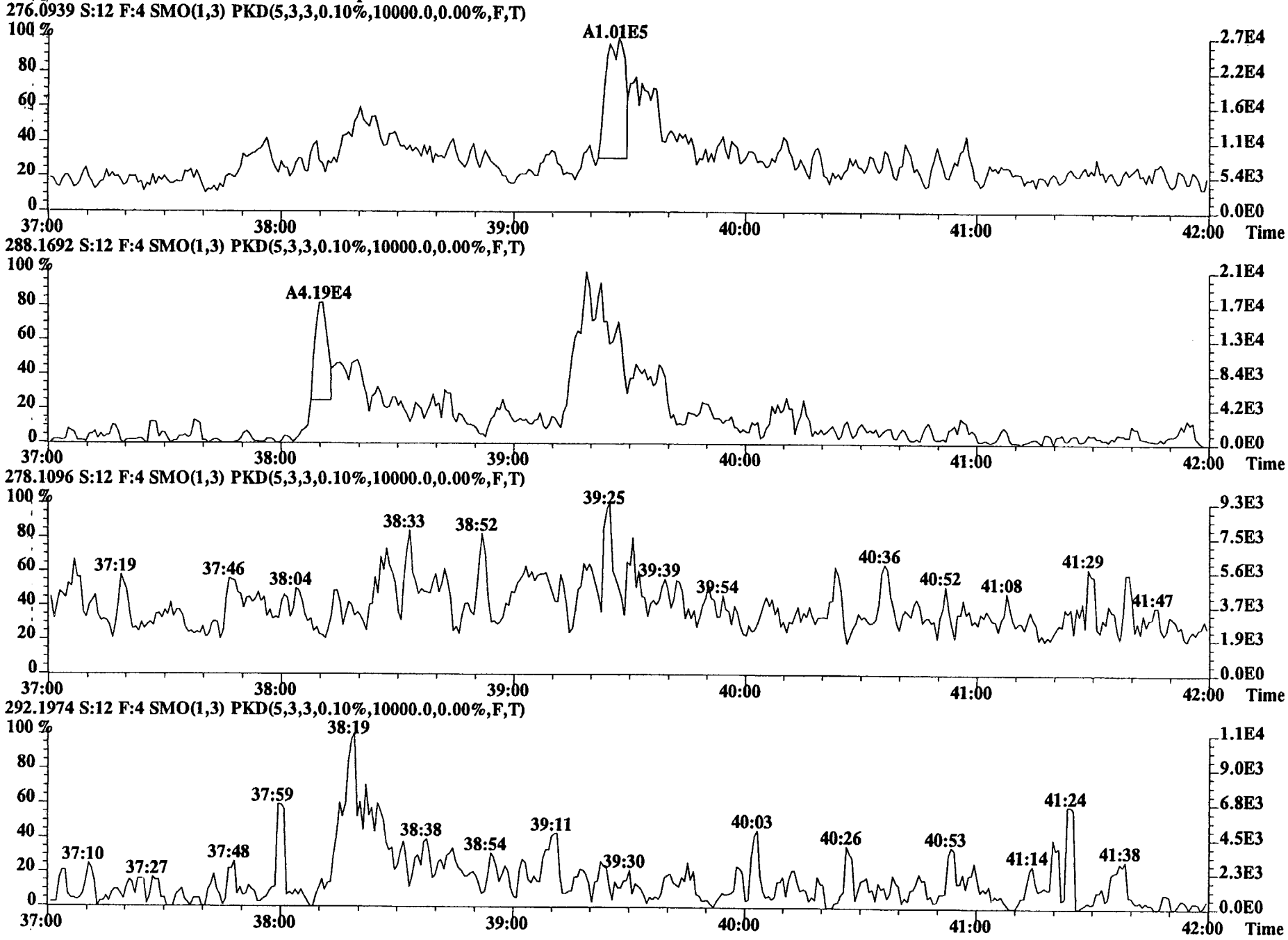
File:02NO98V4 #1-878 Acq: 2-NOV-1998 22:12:35 GC EI+ Voltage SIR 70SE
Sample#12 Text:301802-4 :100X DIL. : : : Exp:PAHAIR
252.0939 S:12 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



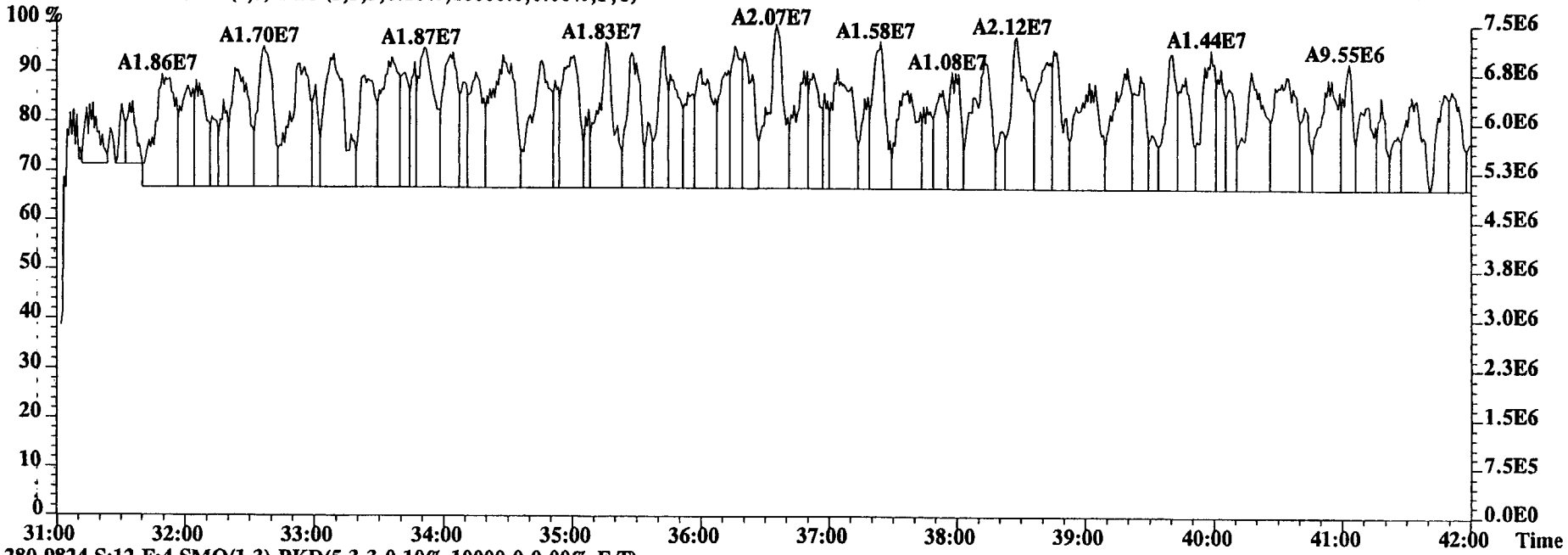
264.1692 S:12 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



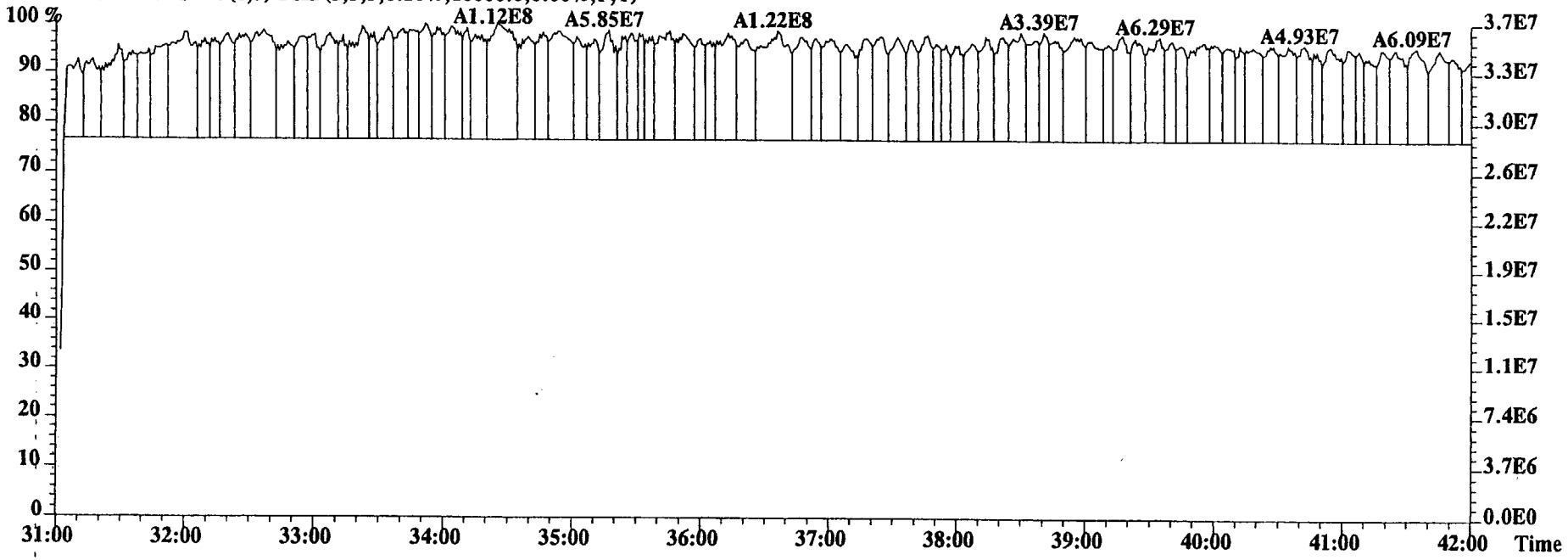
File:02NO98V4 #1-878 Acq: 2-NOV-1998 22:12:35 GC EI+ Voltage SIR 70SE
Sample#12 Text:301802-4 :100X DIL. : : : Exp:PAHAIR



File:02NO98V4 #1-878 Acq: 2-NOV-1998 22:12:35 GC EI+ Voltage SIR 70SE
Sample#12 Text:301802-4 :100X DIL. : : : Exp:PAHAIR
268.9824 S:12 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



280.9824 S:12 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



POLYNUCLEAR AROMATIC HYDROCARBONS
HIGH RESOLUTION GC/MS
Method HRGC/HRMS

Client Name: Pacific Environmental Services
Client ID: A-0-429-2
Lab ID: 301802-0005-SA
Matrix: AIRTRAIN Sampled: 22 SEP 98 Received: 29 SEP 98
Authorized: 29 SEP 98 Prepared: 03 OCT 98 Analyzed: 30 OCT 98
Dilution Factor: 1.0

Parameter	Result	Units	Reporting Limit	Data Qualifiers
Naphthalene	95000	ng/sample	--	B
2-Methylnaphthalene	24000	ng/sample	--	B
Acenaphthylene	22000	ng/sample	--	
Acenaphthene	2500	ng/sample	--	
Fluorene	7500	ng/sample	--	
Phenanthrene	45000	ng/sample	--	B
Anthracene	3300	ng/sample	--	
Fluoranthene	14000	ng/sample	--	
Pyrene	8100	ng/sample	--	
Benzo(a)anthracene	240	ng/sample	--	
Chrysene	640	ng/sample	--	
Benzo(b)fluoranthene	180	ng/sample	--	
Benzo(k)fluoranthene	160	ng/sample	--	
Benzo(e)pyrene	ND	ng/sample	100	
Benzo(a)pyrene	ND	ng/sample	100	
Perylene	ND	ng/sample	100	
Indeno(1,2,3-cd)pyrene	ND	ng/sample	100	
Dibenz(a,h)anthracene	ND	ng/sample	100	
Benzo(g,h,i)perylene	ND	ng/sample	100	

B = Compound is also detected in the blank.
ND = Not Detected

Reported By: Clark Pickell Approved By: Eric Redman

The cover letter is an integral part of this report.
Rev 230787

POLYNUCLEAR AROMATIC HYDROCARBONS
HIGH RESOLUTION GC/MS
Method HRGC/HRMS
(cont.)

Client Name: Pacific Environmental Services
Client ID: A-0-429-2
Lab ID: 301802-0005-SA
Matrix: AIRTRAIN Sampled: 22 SEP 98 Received: 29 SEP 98
Authorized: 29 SEP 98 Prepared: 03 OCT 98 Analyzed: 30 OCT 98
Dilution Factor: 1.0

Internal Standards	% Recovery	
Naphthalene-d8	46	m
Acenaphthylene-d8	75	
Acenaphthene-d10	72	
Fluorene-d10	75	
Phenanthrene-d10	88	
Fluoranthene-d10	58	
Pyrene-d10	56	
Benzo(a)anthracene-d12	75	
Perylene-d12	58	
Indeno(123-cd)pyrene-d12	73	
Chrysene-d12	80	
Benzo(b)fluoranthene-d12	94	
Benzo(k)fluoranthene-d12	88	
Benzo(a)pyrene-d12	76	
Dibenz(a,h)anthracene-d14	64	
Benzo(g,h,i)perylene-d12	76	

Field Surrogates	% Recovery
13C-Fluorene	112

m = Internal Standard recovery is outside method recovery goal.

Reported By: Clark Pickell Approved By: Eric Redman

The cover letter is an integral part of this report.
Rev 230787

04-NOV-1998 05:31:10 PM Dioxin Furan Unknown RESULTS

Mass Spec : VG-4 Results : 300C98V4081.RES : PAHAIR.TRG
GC Column : DB-5 Date analyzed : 30-OCT-98
Data file : 300C98V4 301802-5 :10X DIL. : : : Ex Cal : PAHAIR102998V4.R
Weight : 0.5

Name	Total Response	Isotope Ratio		R. T. mm:ss		RRF	pg/ SAMP	Rec/ MDL
d10-2-Methylnaphthalene	7316240	1.00	Y	12: 27	Y	1.00	50.00	
d8-Naphthalene	7460000	1.00	Y	10: 12	Y	2.24	22.75	46
Naphthalene	8681940000	1.00	Y	10: 16	Y	1.23	9.5e+04	B E
2-Methylnaphthalene	1024468000	1.00	Y	12: 34	Y	0.56	2.4e+04	B E
d8-Acenaphthylene	6663040	1.00	Y	15: 27	Y	1.21	37.52	75
Acenaphthylene	1401130000	1.00	Y	15: 30	Y	0.94	2.2e+04	E
d10-Acenaphthene	3898840	1.00	Y	16: 1	Y	0.74	35.78	72
Acenaphthene	121433800	1.00	Y	16: 8	Y	1.25	2499.50	
d10-Anthracene	4982580	1.00	Y	20: 54	Y	1.00	50.00	
d10-Fluorene	5320500	1.00	Y	17: 41	Y	1.42	37.58	75
Fluorene	465870000	1.00	Y	17: 46	Y	1.16	7545.02	E
d10-Phenanthrene	12360000	1.00	Y	20: 45	Y	2.81	44.18	88
Phenanthrene	4940660000	1.00	Y	20: 49	Y	0.89	4.5e+04	B E
Anthracene	324000000	1.00	Y	20: 58	Y	0.80	3275.05	
d14-Terphenyl	16072880	1.00	Y	26: 0	Y	1.00	50.00	
d10-Fluoranthene	13106960	1.00	Y	24: 35	Y	1.41	28.90	58
Fluoranthene	2079300000	1.00	Y	24: 39	Y	1.11	1.4e+04	E
d10-Pyrene	13659420	1.00	Y	25: 17	Y	1.52	27.99	56
Pyrene	1340422000	1.00	Y	25: 20	Y	1.21	8143.31	E
d12-Benzo(a)anthracene	10861060	1.00	Y	29: 9	Y	0.90	37.54	75
Benzo(a)anthracene	31010600	1.00	Y	29: 12	Y	1.20	237.04	
d12-Chrysene	16374560	1.00	Y	29: 15	Y	1.28	39.82	80
Chrysene	113356000	1.00	Y	29: 20	Y	1.08	638.64	
d12-Benzo(e)pyrene	25048600	1.00	Y	33: 22	Y	1.00	50.00	
d12-Benzo(b)fluoranthene	10713240	1.00	Y	32: 30	Y	0.45	47.12	94
Benzo(b)fluoranthene	22600000	1.00	Y	32: 35	Y	1.17	180.73	
d12-Benzo(k)fluoranthene	20931000	1.00	Y	32: 35	Y	0.95	44.07	88
Benzo(k)fluoranthene	38200000	1.00	Y	32: 38	Y	1.16	156.77	
d12-Benzo(a)pyrene	12894700	1.00	Y	33: 34	Y	0.68	38.04	76
Benzo(e)pyrene	20855800	1.00	Y	33: 28	Y	1.64	<RL=100.00	
Benzo(a)pyrene	6581120	1.00	Y	33: 39	Y	1.07	<RL=100.00	
d12-Perylene	9142680	1.00	Y	33: 51	Y	0.63	28.96	58
Perylene	* No Peak	0.00	N	33: 55	N	1.71	<RL=100.00	
d12-Indeno(123-cd)pyrene	8143820	1.00	Y	38: 4	Y	0.44	36.57	73
Indeno(123-cd)pyrene	4029580	1.00	Y	38: 11	Y	0.62	<RL=100.00	
d14-Dibenz(ah)anthracene	3945700	1.00	Y	38: 8	Y	0.25	32.04	64
Dibenz(ah)anthracene	889532	1.00	Y	38: 18	Y	1.40	<RL=100.00	
d12-Benzo(ghi)perylene	11051780	1.00	Y	39: 14	Y	0.58	38.05	76
Benzo(ghi)perylene	7159360	1.00	Y	39: 23	Y	1.02	<RL=100.00	
d10-Fluorene	5320500	1.00	Y	17: 41	Y	1.00	50.00	
13C-Fluorene	4818080	1.00	Y	17: 46	Y	0.81	55.90	112

11-4-98

04-NOV-1998 05:31:06 PM Dioxin Furan Unknown RESULTS

```
                0.5
98V4.RRF
 Rec/
  MDL

            3658120     3658120
     46     3730000     3730000
  B E    4340970000  4340970000
  B E     512234000   512234000

     75     3331520     3331520
   E       700565000   700565000

     72     1949420     1949420
           60716900    60716900

            2491290     2491290
     75     2660250     2660250
   E       232935000   232935000

     88     6180000     6180000
  B E    2470330000  2470330000
          162000000   162000000

            8036440     8036440
     58     6553480     6553480
   E      1039650000  1039650000

     56     6829710     6829710
   E       670211000   670211000

     75     5430530     5430530
           15505300    15505300

     80     8187280     8187280
           56678000    56678000

           12524300    12524300
     94     5356620     5356620
           11300000    11300000

     88    10465500    10465500
           19100000    19100000

     76     6447350     6447350
 100.00    10427900    10427900
 100.00     3290560     3290560

     58     4571340     4571340
 100.00           0           0

     73     4071910     4071910
 100.00     2014790     2014790

     64     1972850     1972850
 100.00     2014790      444766

     76     5525890     5525890
 100.00     3579680     3579680
```

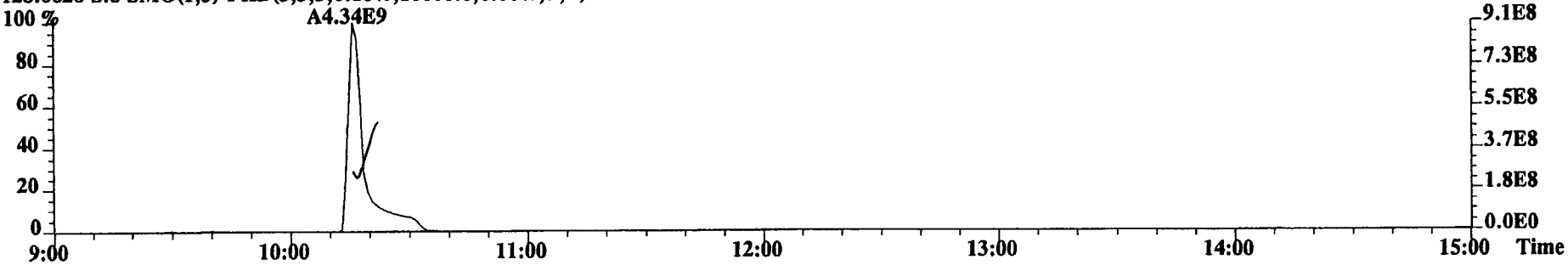
02-NOV-1998 08:48:47 AM Dioxin Furan Unknown RESULTS

Mass Spec : VG-4 Results : 30OC98V4081.RES : PAHAIR.TRG
GC Column : DB-5 Date analyzed : 30-OCT-98
Data file : 30OC98V4 301802-5 :10X DIL. : : : Ex Cal : PAHAIR102998V4.R
Weight : 0.5

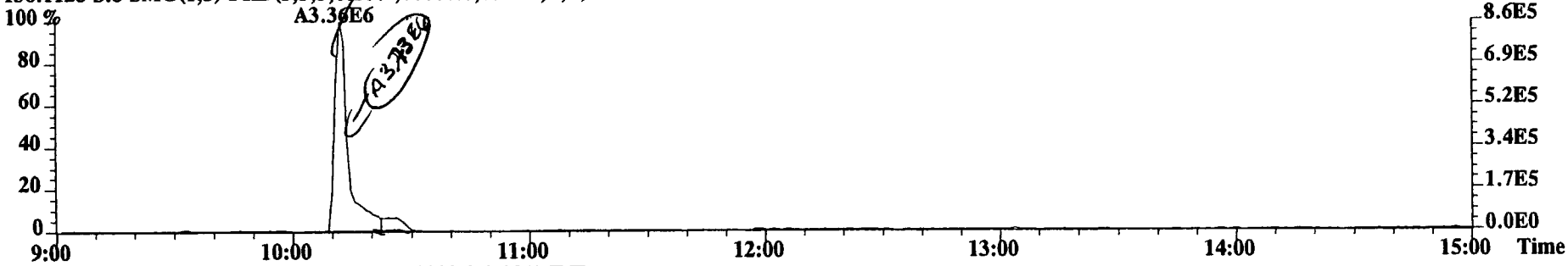
Name	Total Response	Isotope Ratio		R. T. mm:ss		Ex	Cal RRF	pg/ SAMP	Rec/ MDL
d10-2-Methylnaphthalene	7316240	1.00	Y	12: 27	Y		1.00	50.00	
d8-Naphthalene	6713680	1.00	Y	10: 12	Y		2.24	20.48	41
Naphthalene	8681940000	1.00	Y	10: 16	Y		1.23	1.1e+05	0.000
2-Methylnaphthalene	1024468000	1.00	Y	12: 34	Y		0.56	2.7e+04	0.000
d8-Acenaphthylene	6663040	1.00	Y	15: 27	Y		1.21	37.52	75
Acenaphthylene	1401130000	1.00	Y	15: 30	Y		0.94	2.2e+04	0.000
d10-Acenaphthene	3898840	1.00	Y	16: 1	Y		0.74	35.78	72
Acenaphthene	121433800	1.00	Y	16: 8	Y		1.25	2499.50	0.000
d10-Anthracene	4982580	1.00	Y	20: 54	Y		1.00	50.00	
d10-Fluorene	5320500	1.00	Y	17: 41	Y		1.42	37.58	75
Fluorene	465870000	1.00	Y	17: 46	Y		1.16	7545.02	0.000
d10-Phenanthrene	12661800	1.00	Y	20: 45	Y		2.81	45.26	91
Phenanthrene	4940660000	1.00	Y	20: 49	Y		0.89	4.4e+04	0.000
Anthracene	* No Peak	0.00	N	20: 58	N		0.80	0.00	0.000
d14-Terphenyl	16072880	1.00	Y	26: 0	Y		1.00	50.00	
d10-Fluoranthene	13106960	1.00	Y	24: 35	Y		1.41	28.90	58
Fluoranthene	2079300000	1.00	Y	24: 39	Y		1.11	1.4e+04	0.000
d10-Pyrene	13659420	1.00	Y	25: 17	Y		1.52	27.99	56
Pyrene	1340422000	1.00	Y	25: 20	Y		1.21	8143.31	0.000
d12-Benzo(a)anthracene	10861060	1.00	Y	29: 9	Y		0.90	37.54	75
Benzo(a)anthracene	31010600	1.00	Y	29: 12	Y		1.20	237.04	0.000
d12-Chrysene	16374560	1.00	Y	29: 15	Y		1.28	39.82	80
Chrysene	113356000	1.00	Y	29: 20	Y		1.08	638.64	0.000
d12-Benzo(e)pyrene	25048600	1.00	Y	33: 22	Y		1.00	50.00	
d12-Benzo(b)fluoranthene	10713240	1.00	Y	32: 30	Y		0.45	47.12	94
Benzo(b)fluoranthene	60963600	1.00	Y	32: 35	Y		1.17	487.51	0.000
d12-Benzo(k)fluoranthene	20931000	1.00	Y	32: 35	Y		0.95	44.07	88
Benzo(k)fluoranthene	60963600	1.00	Y	32: 35	Y		1.16	250.19	0.000
d12-Benzo(a)pyrene	12894700	1.00	Y	33: 34	Y		0.68	38.04	76
Benzo(e)pyrene	20855800	1.00	Y	33: 28	Y		1.64	98.57	0.000
Benzo(a)pyrene	6581120	1.00	Y	33: 39	Y		1.07	47.61	0.000
d12-Perylene	9142680	1.00	Y	33: 51	Y		0.63	28.96	58
Perylene	* No Peak	0.00	N	33: 55	N		1.71	0.00	0.000
d12-Indeno(123-cd)pyrene	8143820	1.00	Y	38: 4	Y		0.44	36.57	73
Indeno(123-cd)pyrene	4029580	1.00	Y	38: 11	Y		0.62	79.68	0.000
d14-Dibenz(ah)anthracene	3945700	1.00	Y	38: 8	Y		0.25	32.04	64
Dibenz(ah)anthracene	889532	1.00	Y	38: 18	Y		1.40	16.06	0.000
d12-Benzo(ghi)perylene	11051780	1.00	Y	39: 14	Y		0.58	38.05	76
Benzo(ghi)perylene	7159360	1.00	Y	39: 23	Y		1.02	63.76	0.000
d10-Fluorene	5320500	1.00	Y	17: 41	Y		1.42	7.47	15
13C-Fluorene	4818080	1.00	Y	17: 46	Y		1.00	90.56	0.000

File:30OC98V4 #1-510 Acq:30-OCT-1998 22:28:39 GC EI+ Voltage SIR 70SE
Sample#8 Text:301802-5 :10X DIL. : : : Exp:PAHAIR

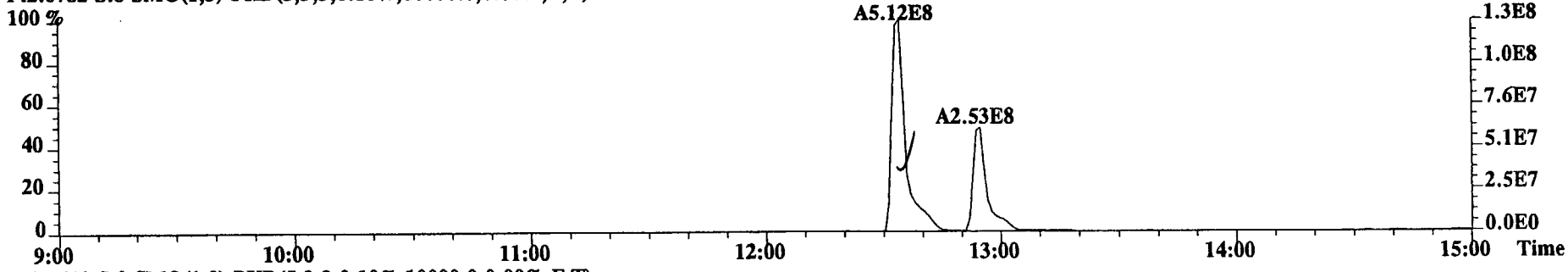
128.0626 S:8 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



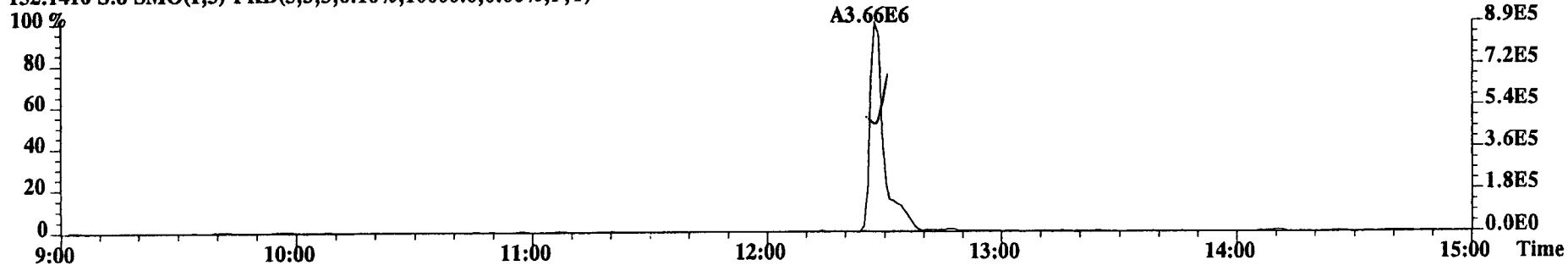
136.1128 S:8 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



142.0782 S:8 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

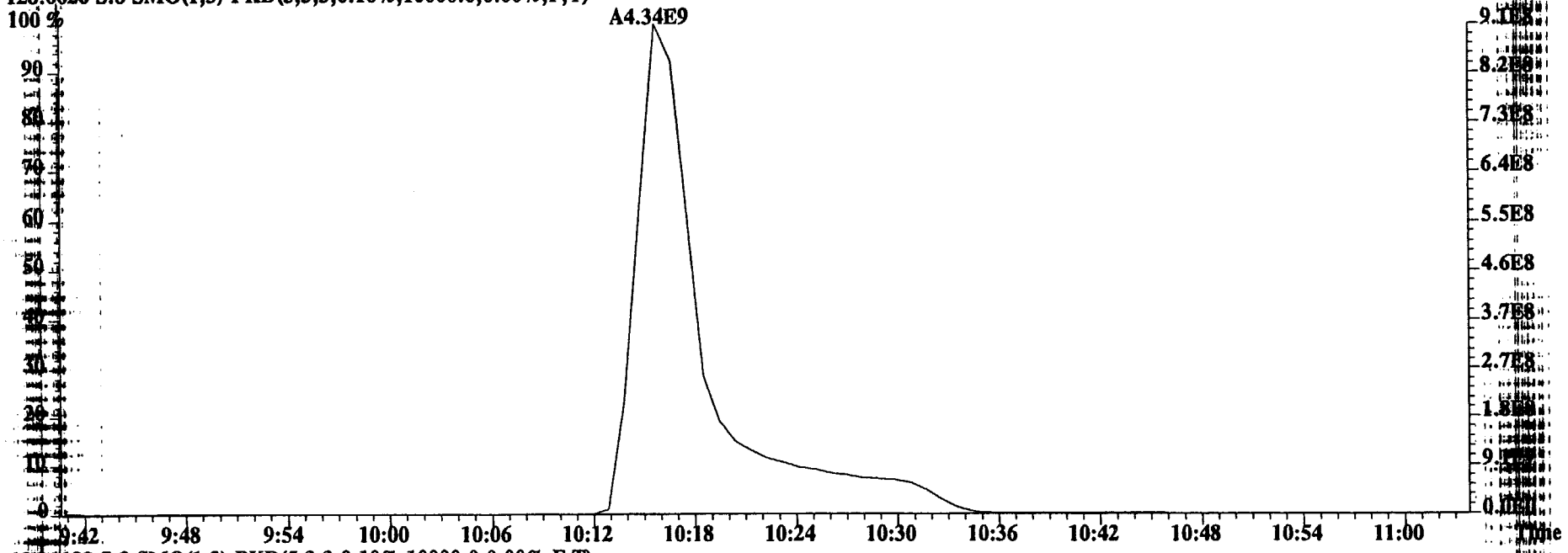


152.1410 S:8 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

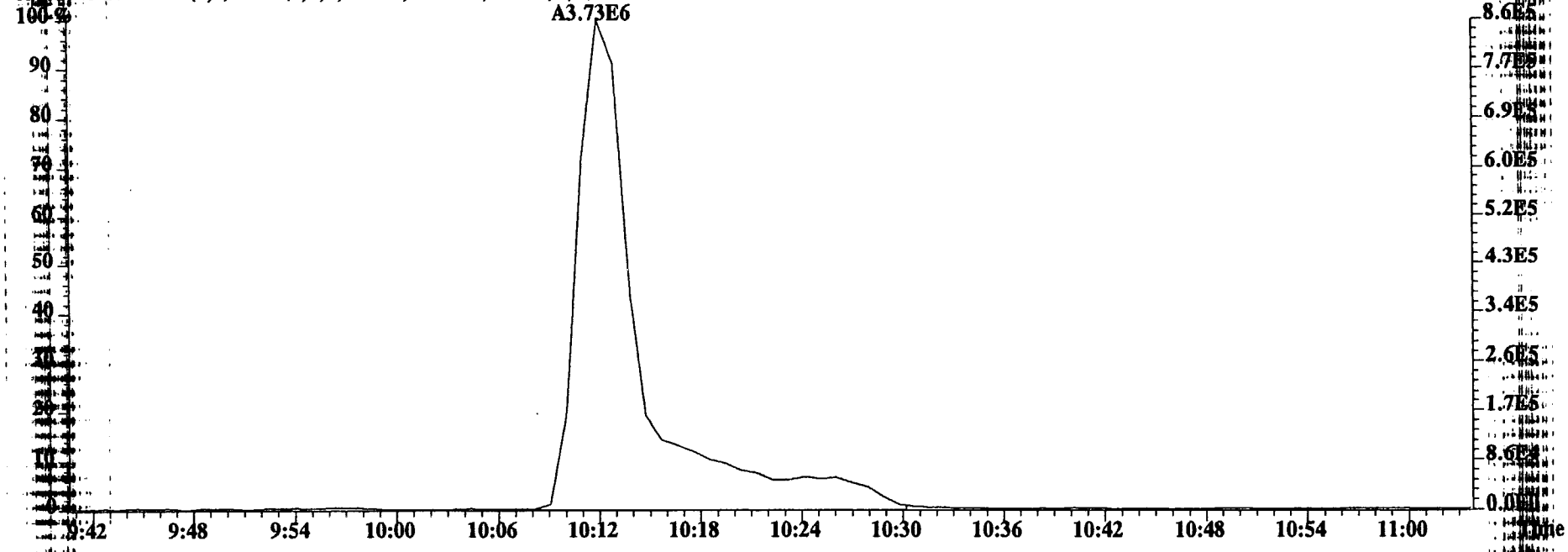


224

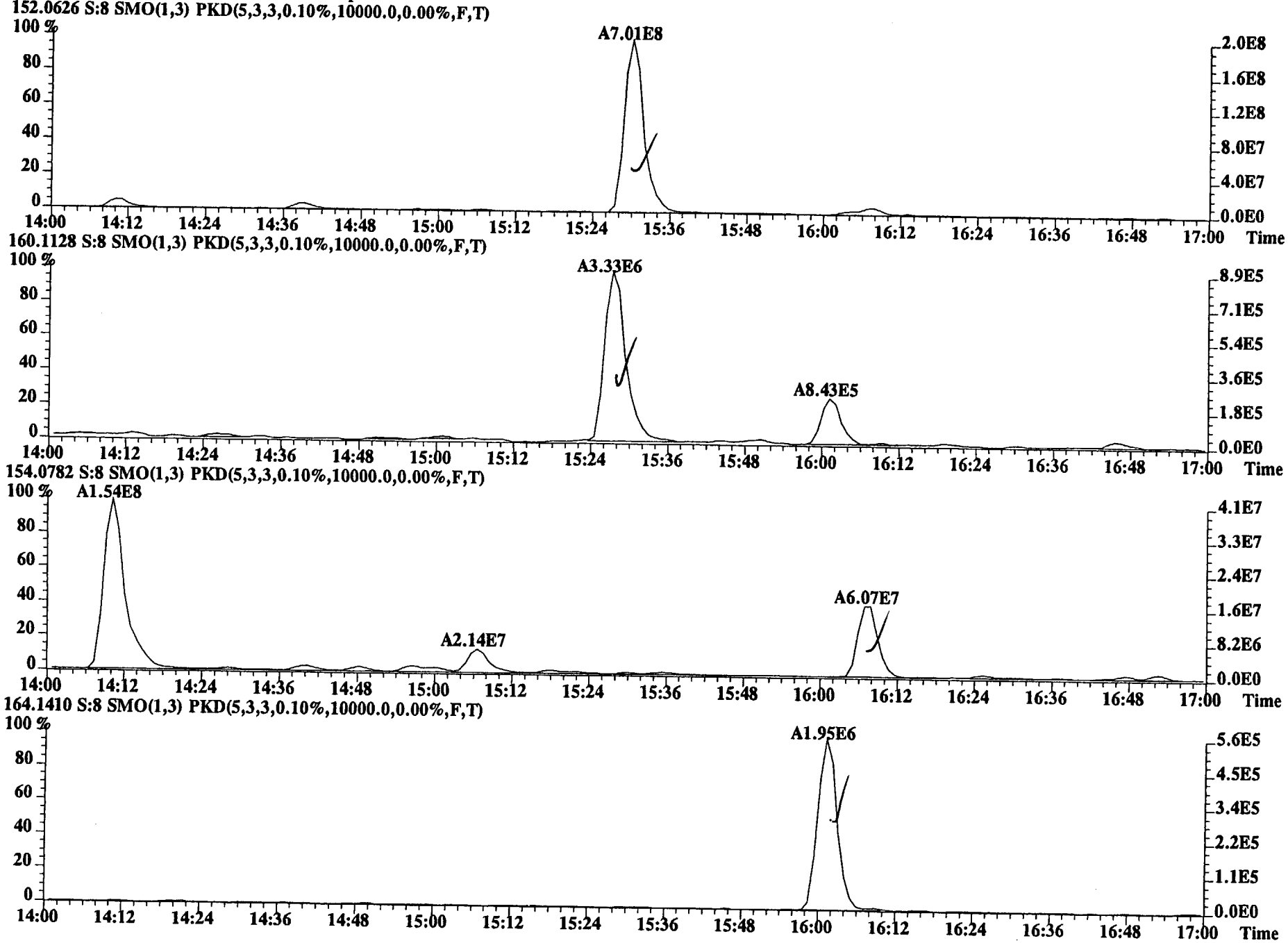
File:30OC98V4 #1-510 Acq:30-OCT-1998 22:28:39 GC EI+ Voltage SIR 70SE
Sample#8 Text:301802-5 :10X DIL. : : : Exp:PAHAIR
128.0626 S:8 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



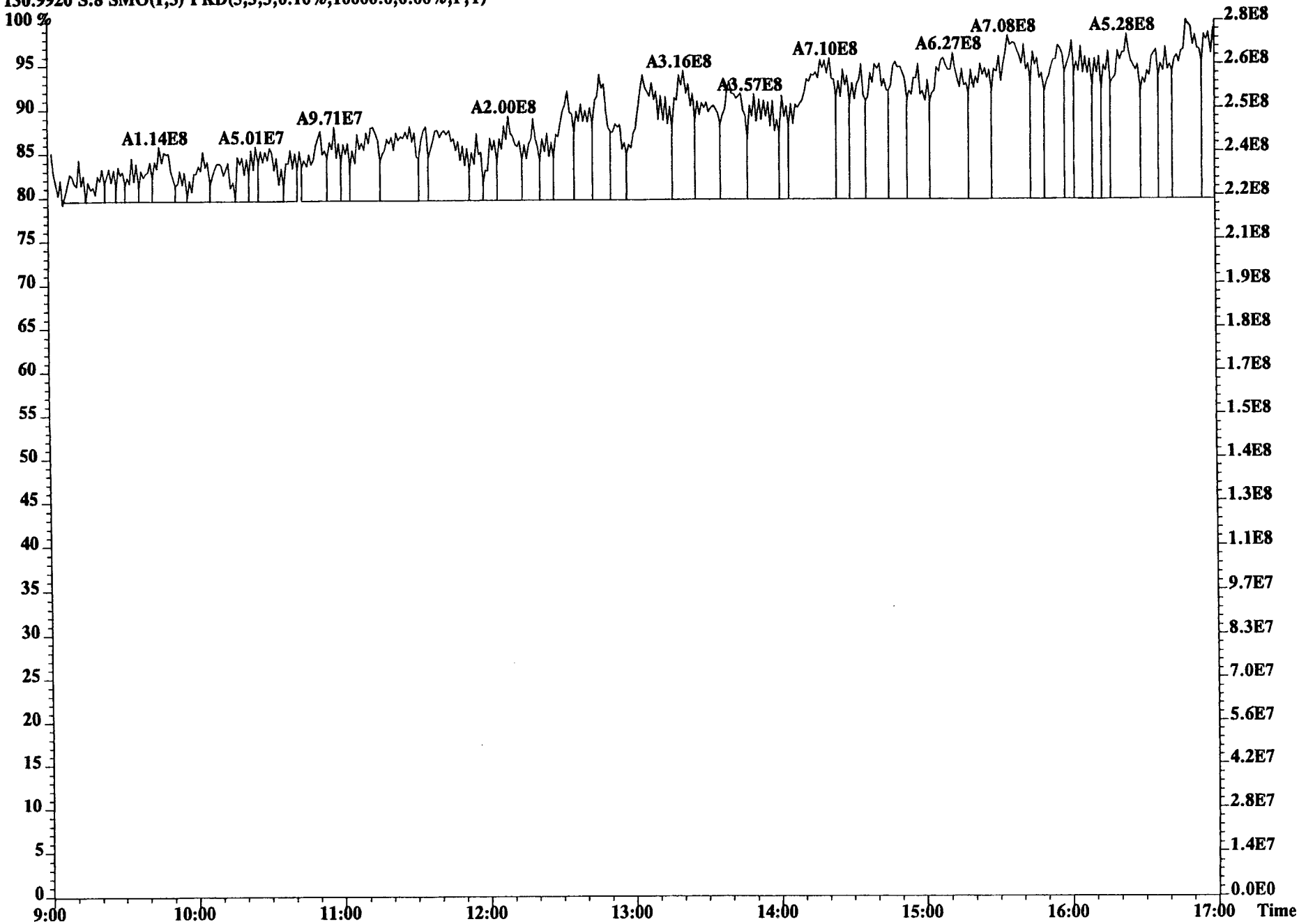
128.1128 S:8 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



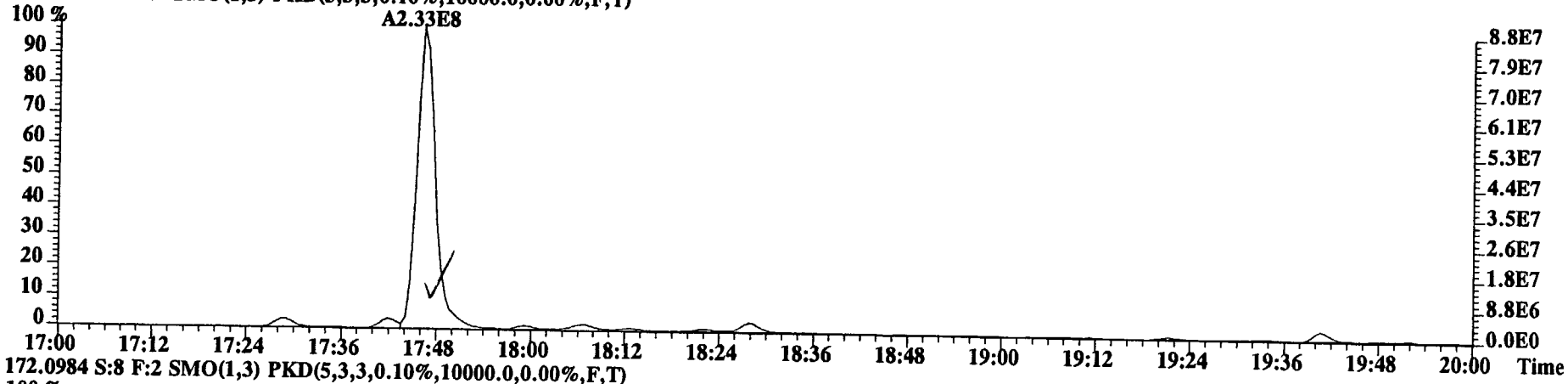
File:30OC98V4 #1-510 Acq:30-OCT-1998 22:28:39 GC EI+ Voltage SIR 70SE
Sample#8 Text:301802-5 :10X DIL. : : : Exp:PAHAIR



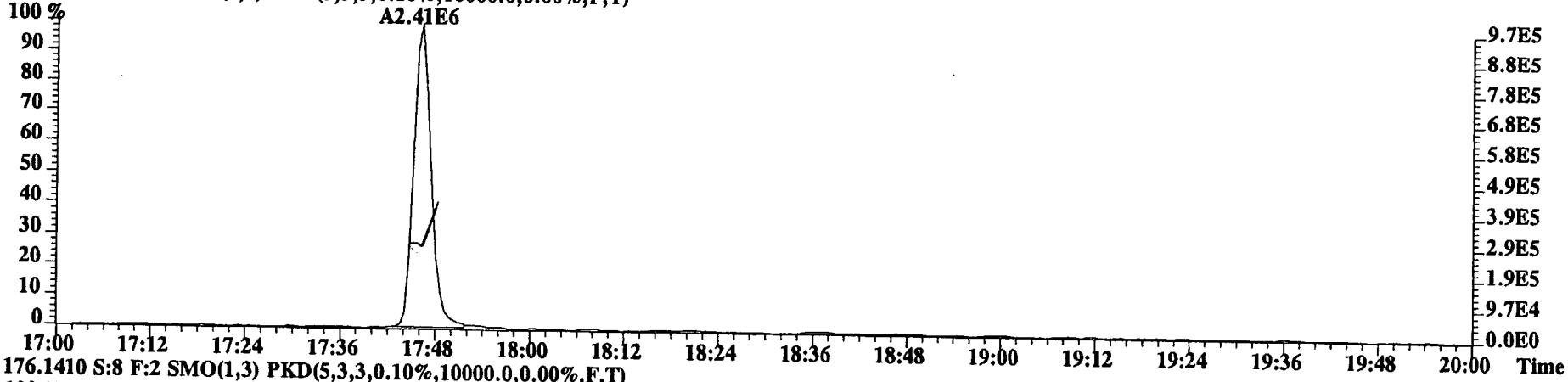
File:30OC98V4 #1-510 Acq:30-OCT-1998 22:28:39 GC EI+ Voltage SIR 70SE
Sample#8 Text:301802-5 :10X DIL. : : : Exp:PAHAIR
130.9920 S:8 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



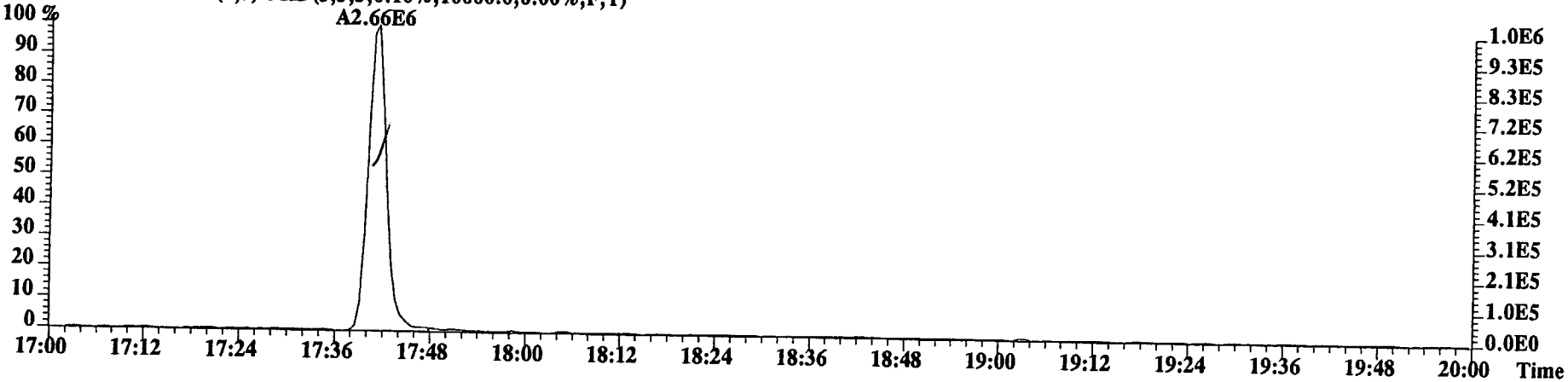
File:30OC98V4 #1-641 Acq:30-OCT-1998 22:28:39 GC EI+ Voltage SIR 70SE
Sample#8 Text:301802-5 :10X DIL. : : : Exp:PAHAIR
166.0798 S:8 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



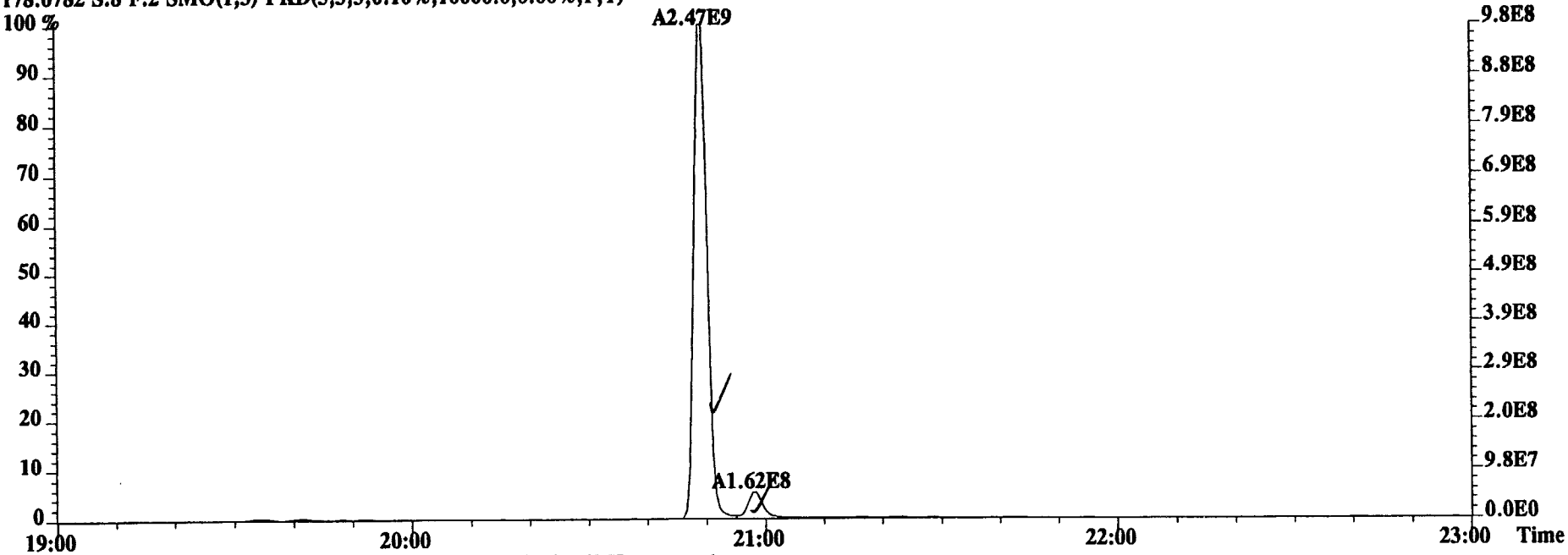
172.0984 S:8 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



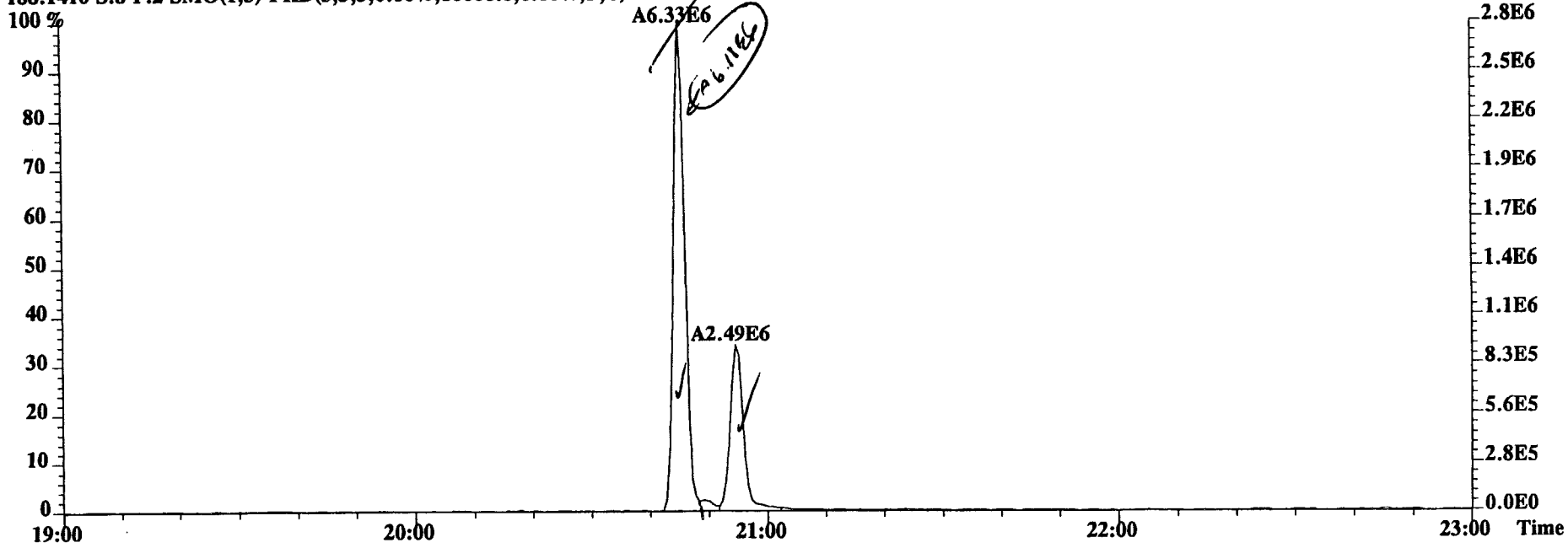
176.1410 S:8 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



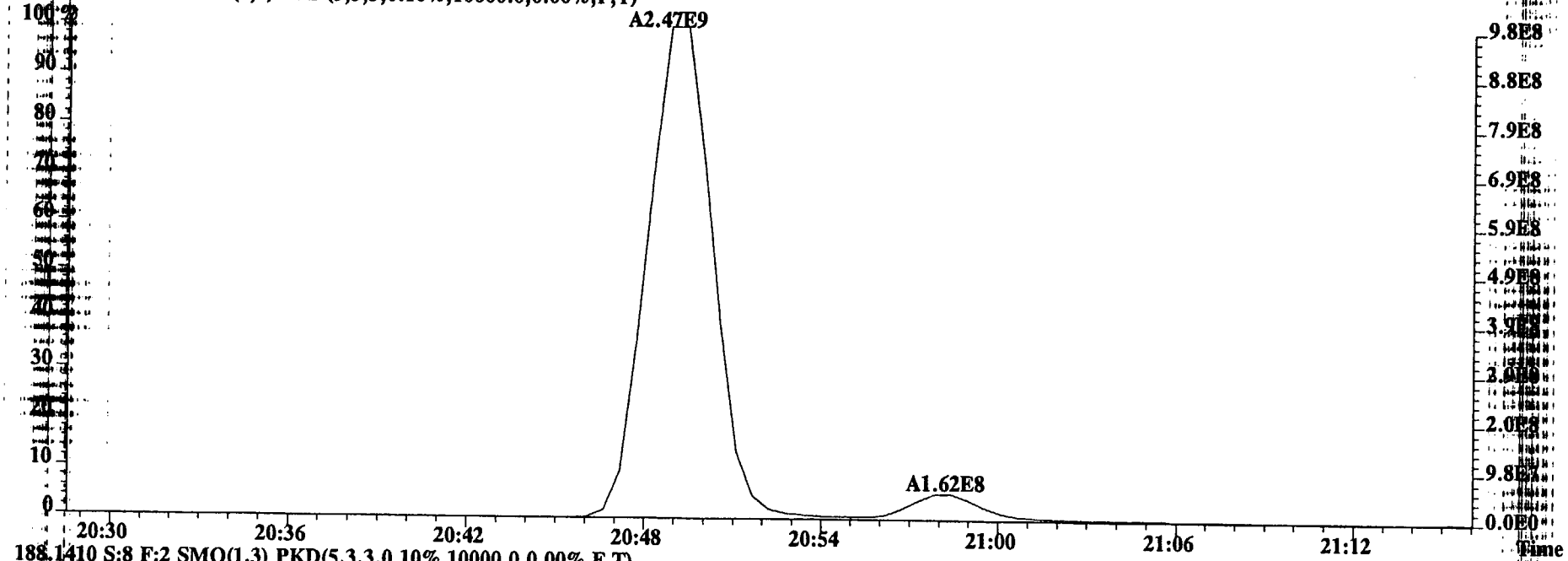
File:30OC98V4 #1-641 Acq:30-OCT-1998 22:28:39 GC EI+ Voltage SIR 70SE
Sample#8 Text:301802-5 :10X DIL. : : : Exp:PAHAIR
178.0782 S:8 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



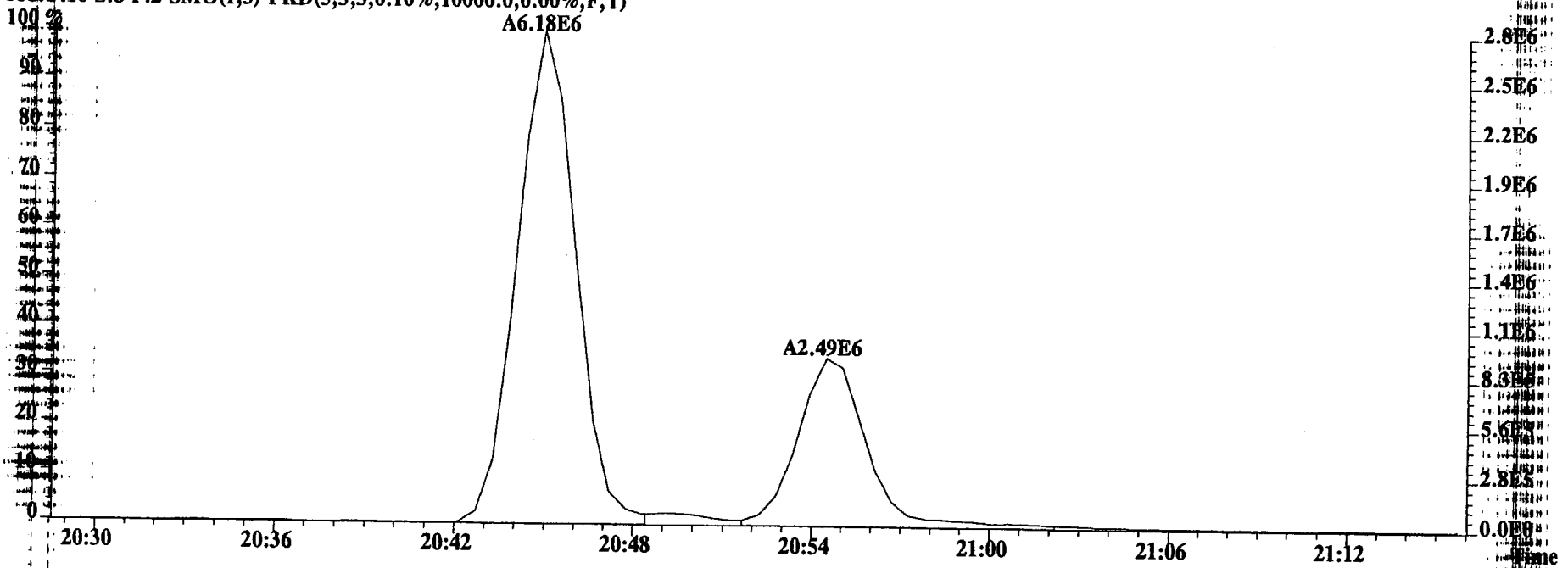
188.1410 S:8 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



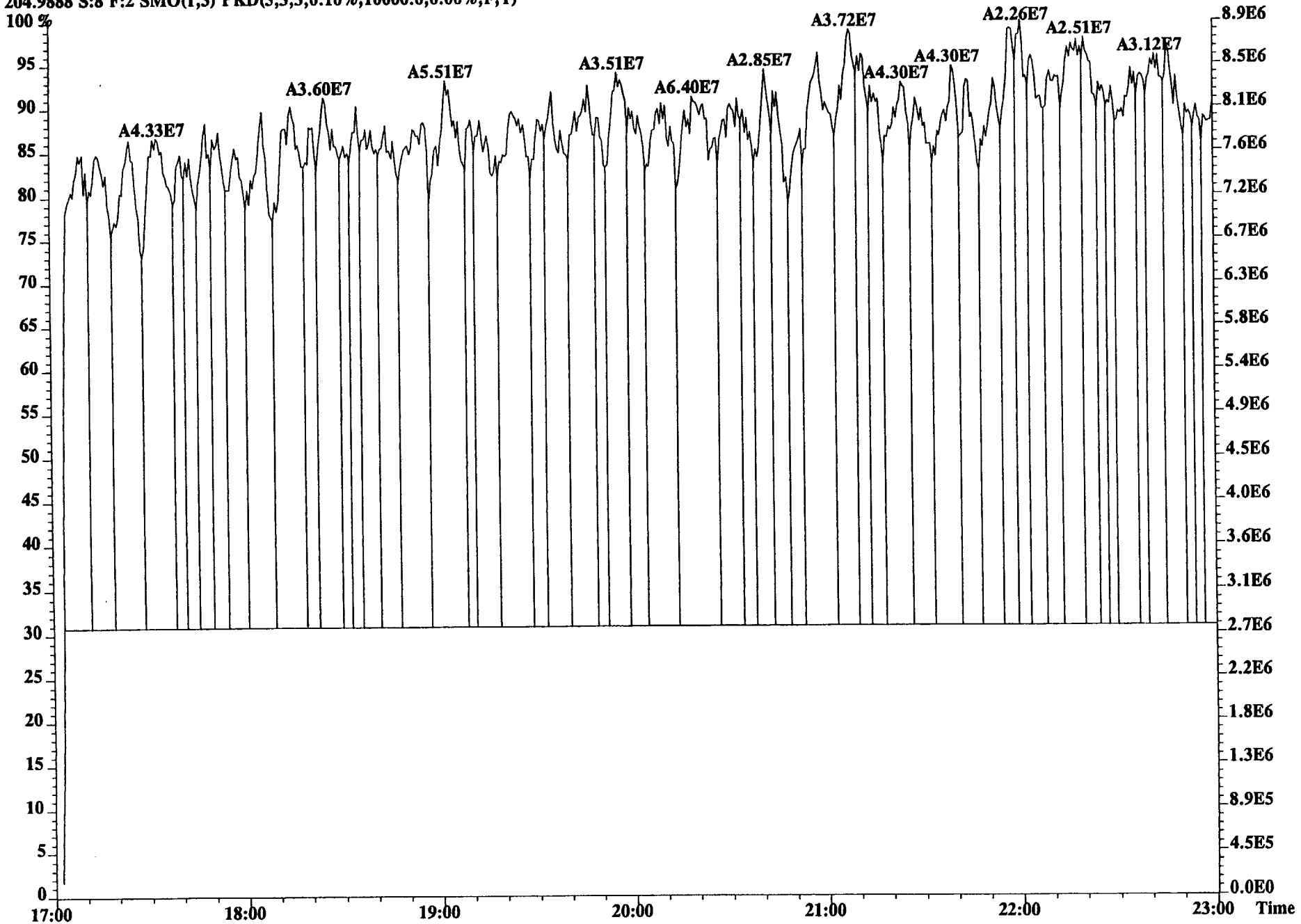
File:3DOC98V4 #1-641 Acq:30-OCT-1998 22:28:39 GC EI+ Voltage SIR 70SE
Sample#8 Text:301802-5 :10X DIL. : : : Exp:PAHAIR
178.0782 S:8 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



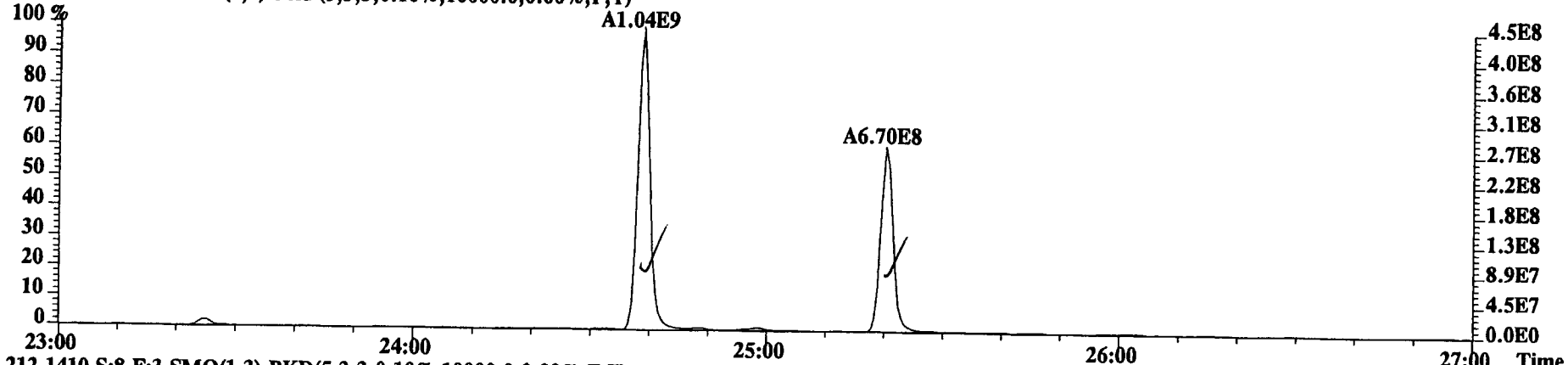
188.1410 S:8 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



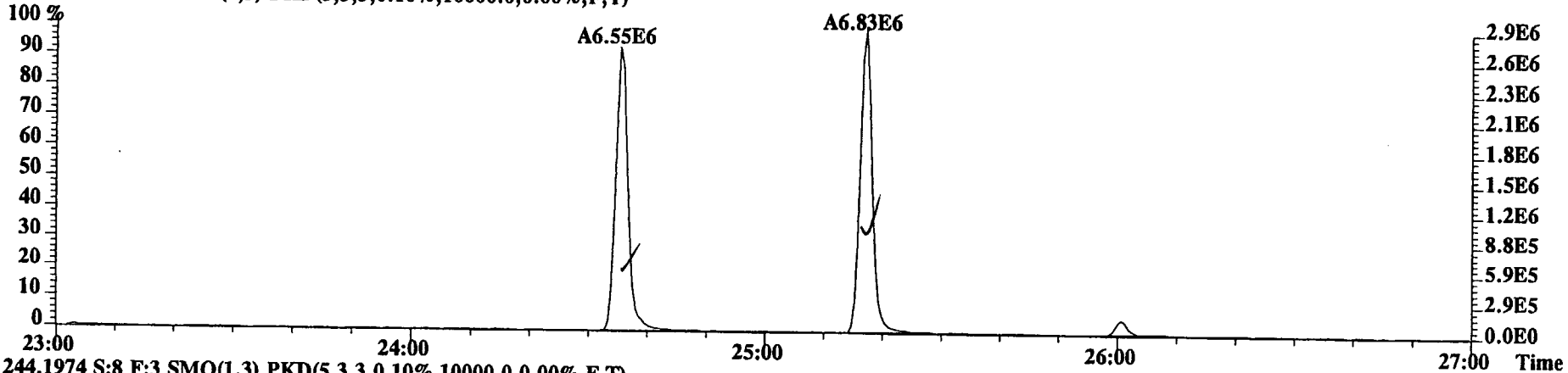
File:30OC98V4 #1-641 Acq:30-OCT-1998 22:28:39 GC EI+ Voltage SIR 70SE
Sample#8 Text:301802-5 :10X DIL. : : : Exp:PAHAIR
204.9888 S:8 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



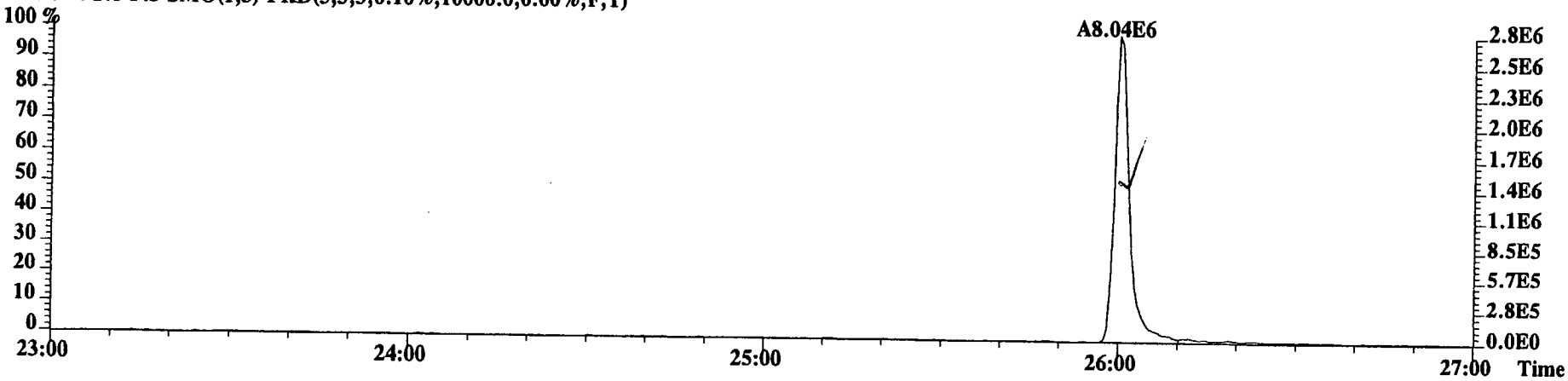
File:30OC98V4 #1-938 Acq:30-OCT-1998 22:28:39 GC EI+ Voltage SIR 70SE
Sample#8 Text:301802-5 :10X DIL. : : : Exp:PAHAIR
202.0782 S:8 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



212.1410 S:8 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

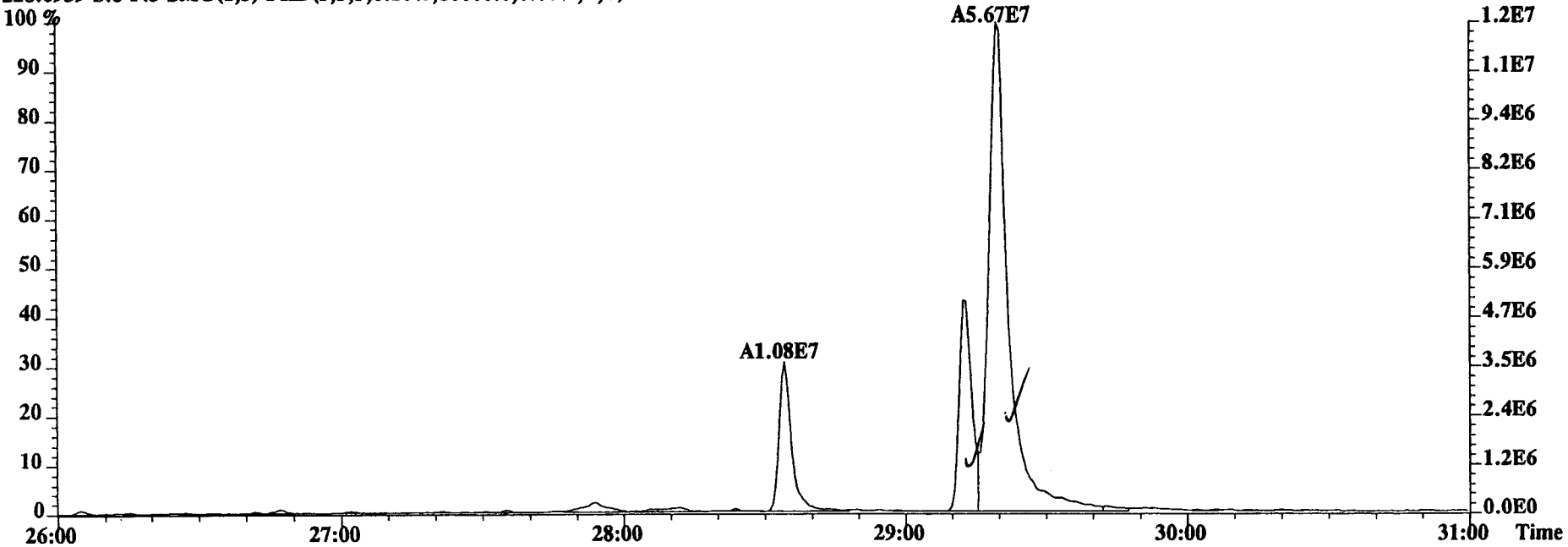


244.1974 S:8 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

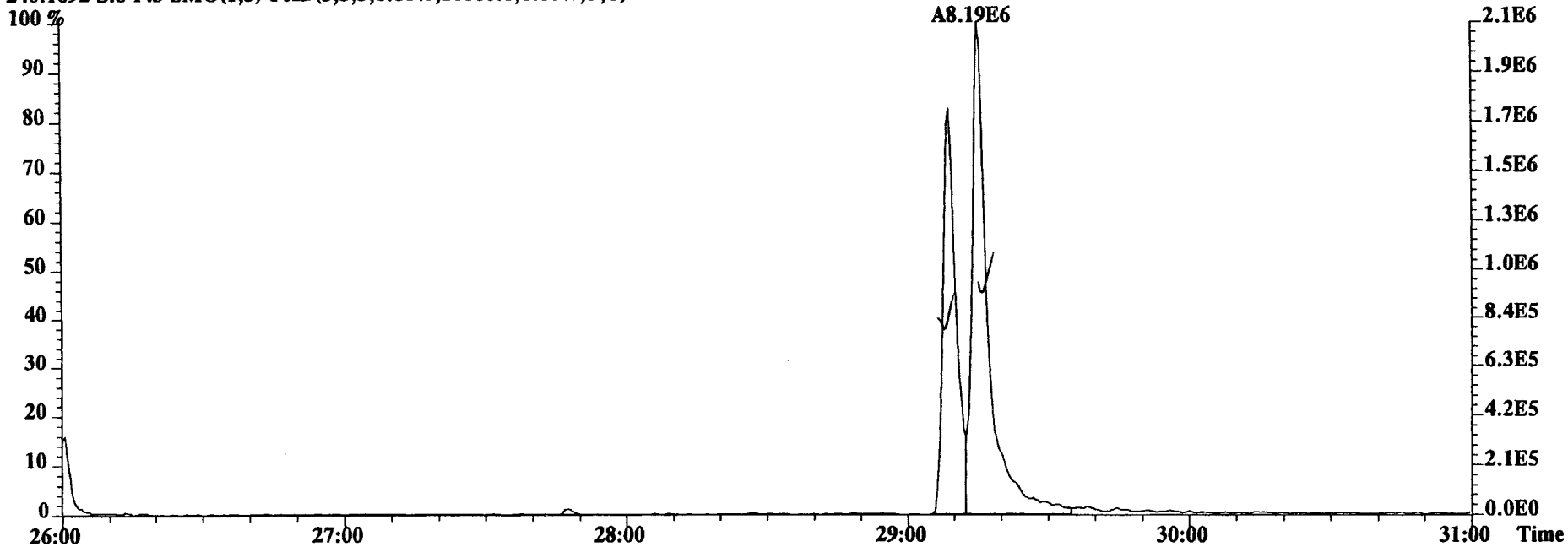


232

File:30OC98V4 #1-938 Acq:30-OCT-1998 22:28:39 GC EI+ Voltage SIR 70SE
Sample#8 Text:301802-5 :10X DIL. : : : Exp:PAHAIR
228.0939 S:8 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

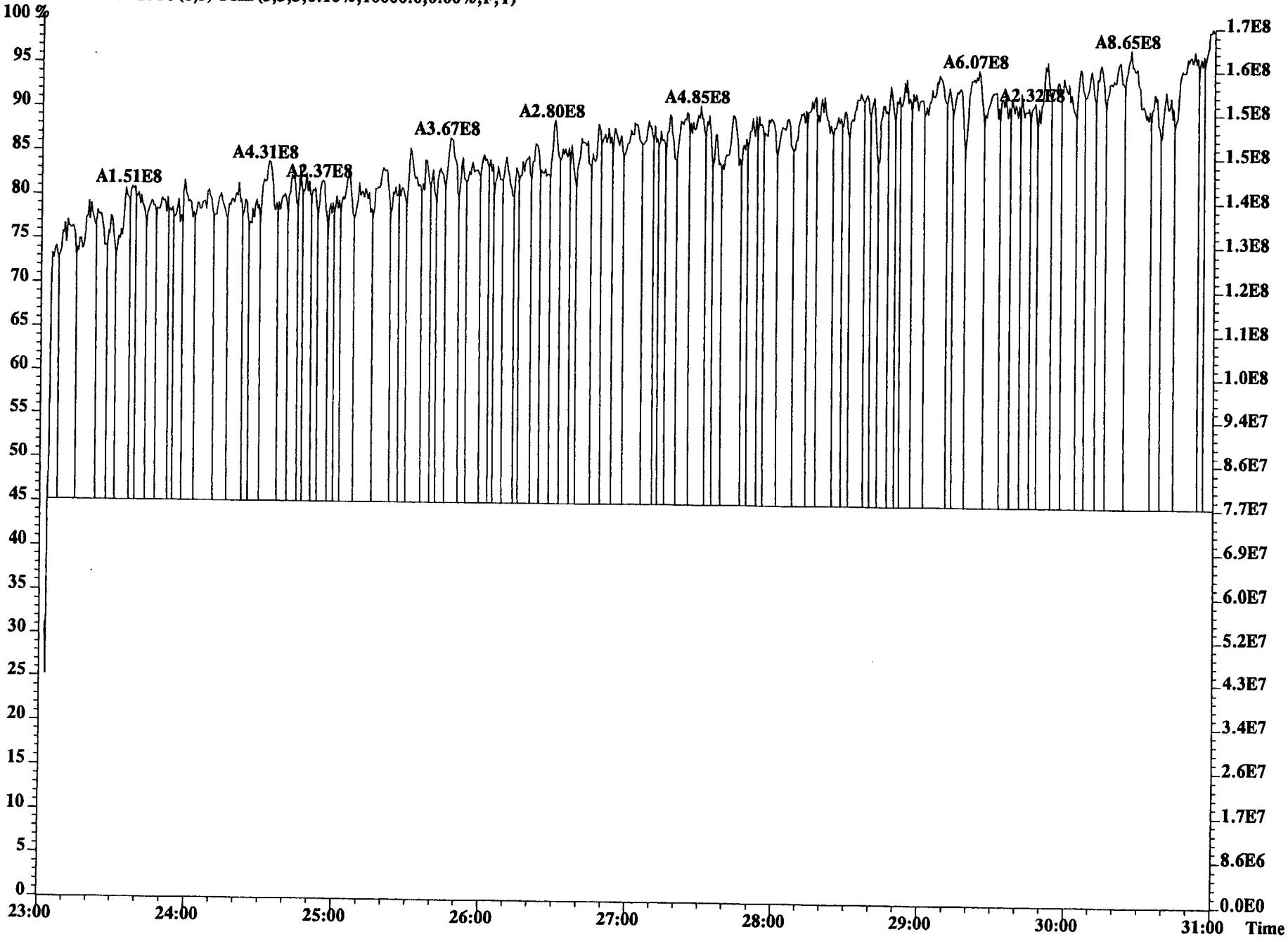


240.1692 S:8 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

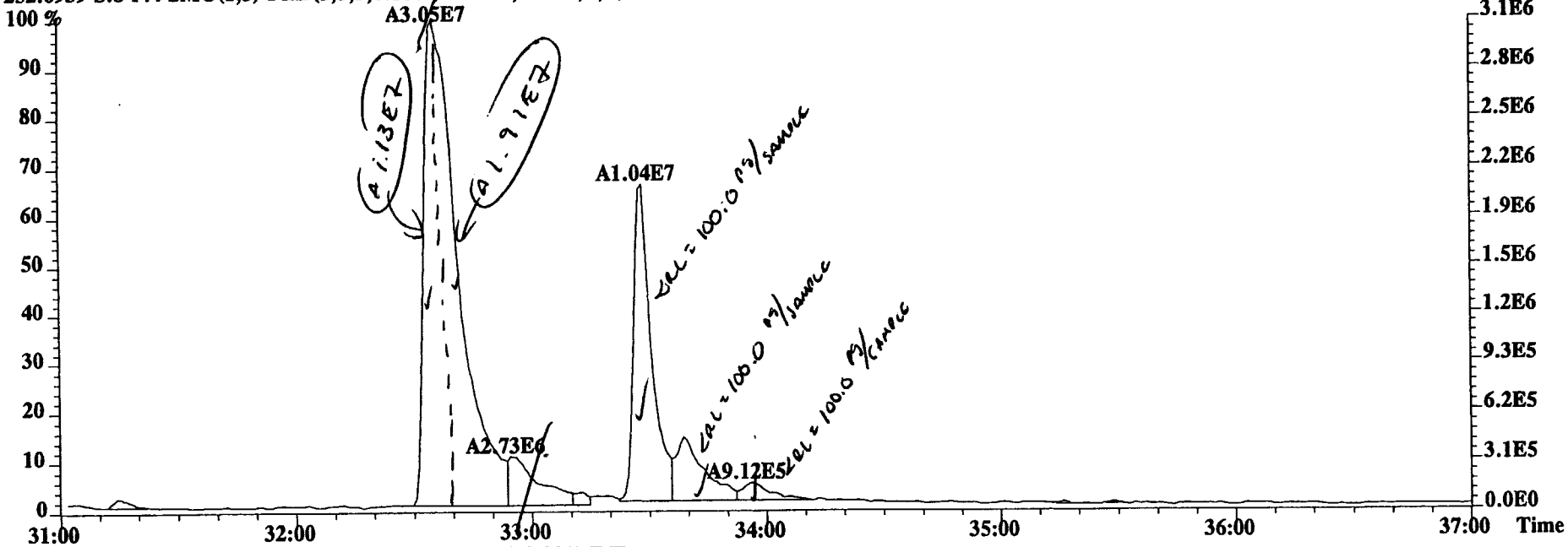


233

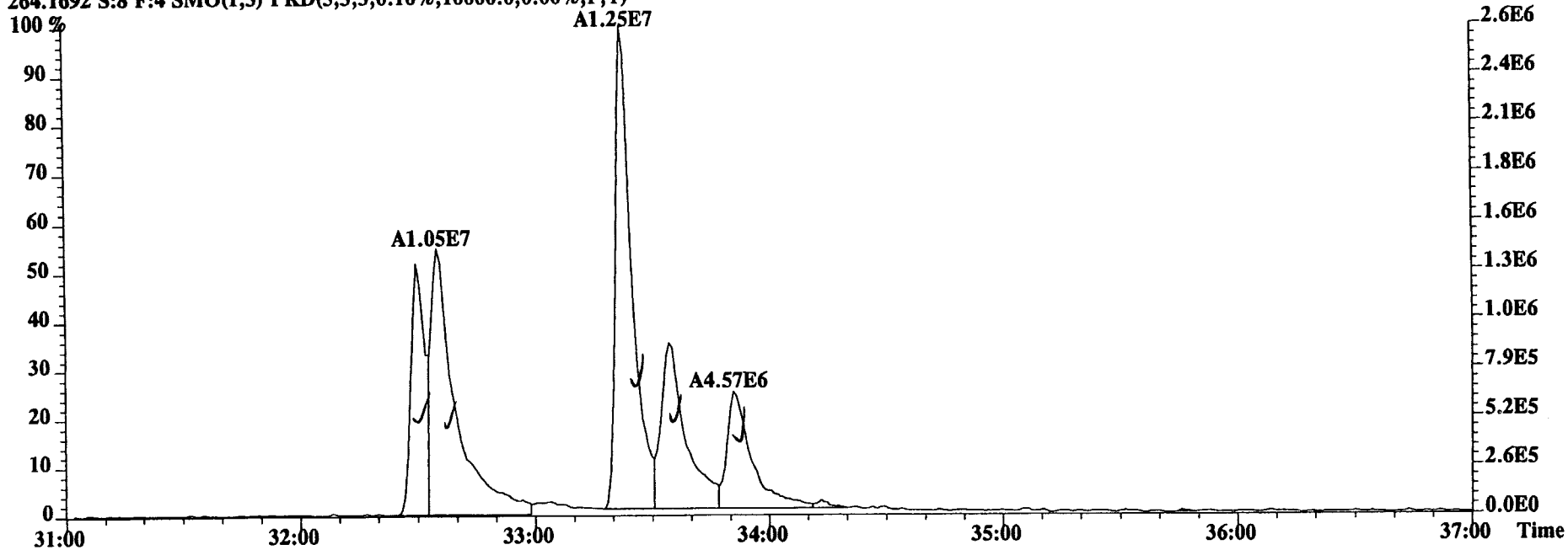
File:30OC98V4 #1-938 Acq:30-OCT-1998 22:28:39 GC EI+ Voltage SIR 70SE
Sample#8 Text:301802-5 :10X DIL. : : : Exp:PAHAIR
230.9856 S:8 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



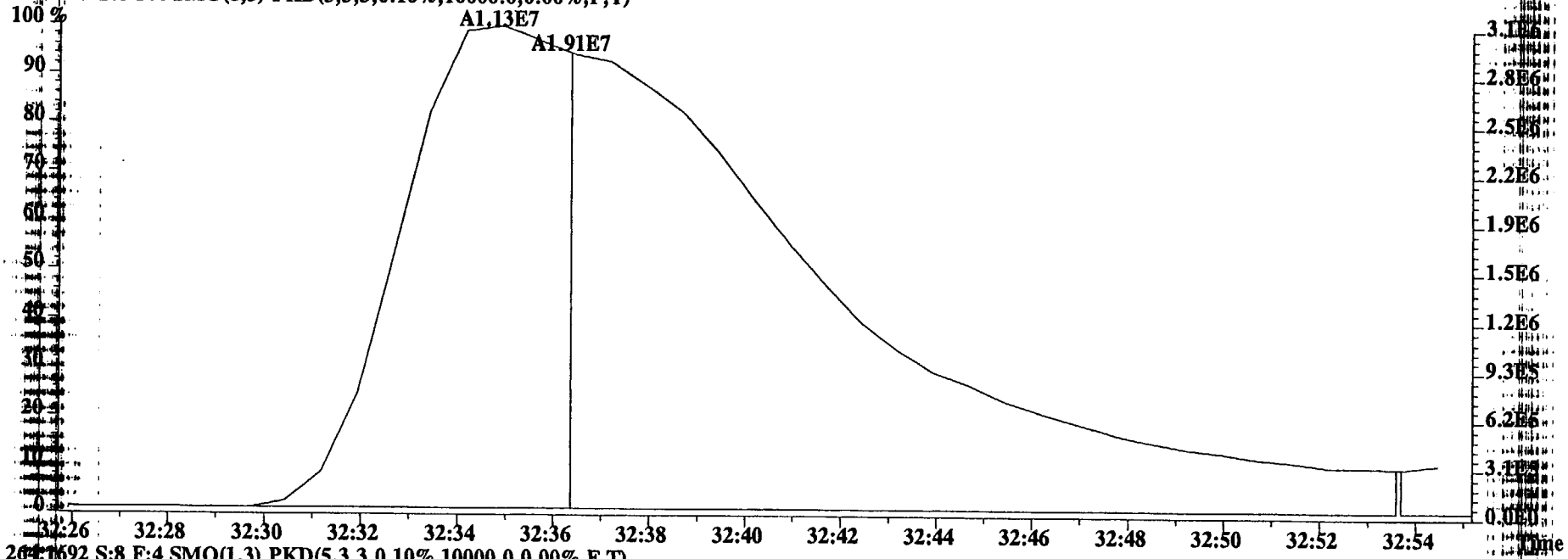
File:30OC98V4 #1-878 Acq:30-OCT-1998 22:28:39 GC EI+ Voltage SIR 70SE
Sample#8 Text:301802-5 :10X DIL. : : : Exp:PAHAIR
252.0939 S:8 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



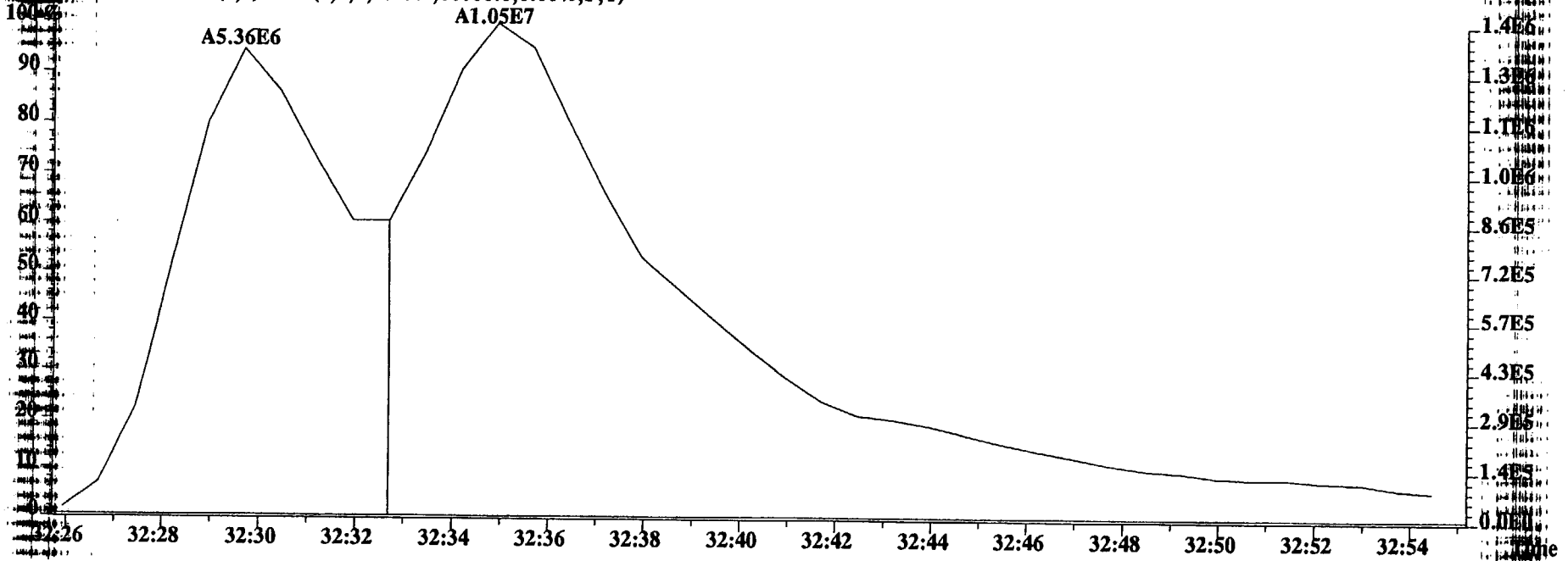
264.1692 S:8 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



FI[illegible]0OC98V4 #1-878 Acq:30-OCT-1998 22:28:39 GC EI+ Voltage SIR 70SE
Sample#8 Text:301802-5 :10X DIL. : : : Exp:PAHAIR
252.0939 S:8 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

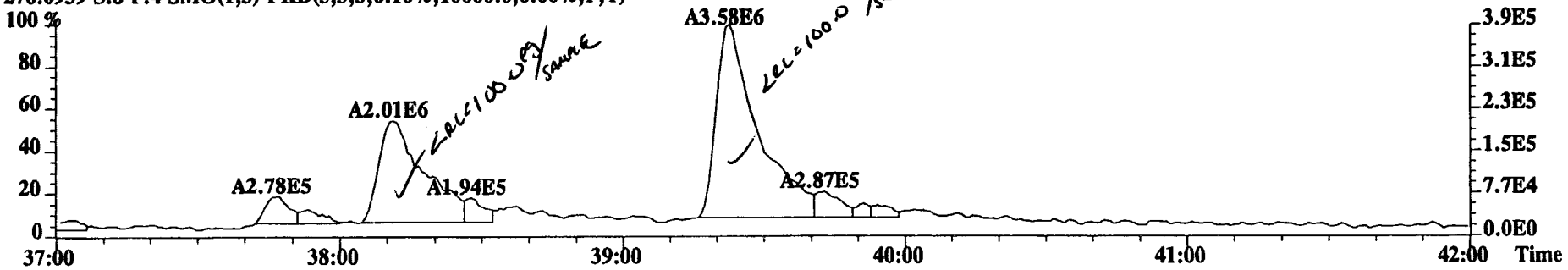


264.1592 S:8 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

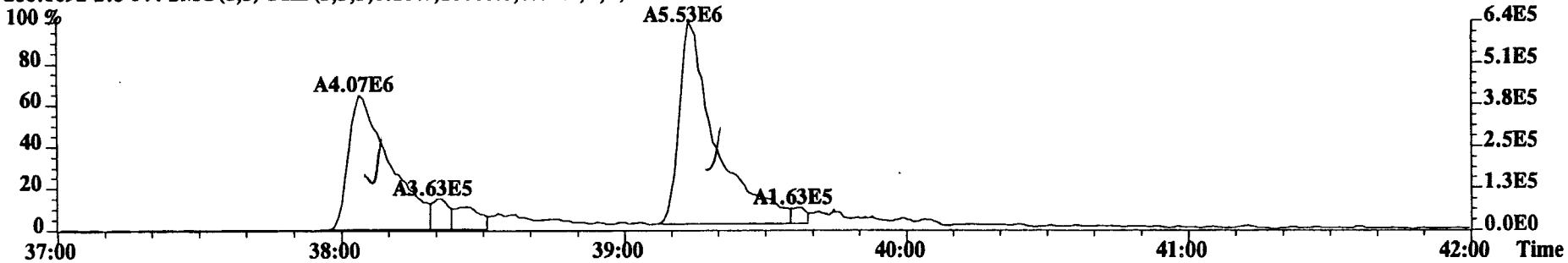


File:30OC98V4 #1-878 Acq:30-OCT-1998 22:28:39 GC EI+ Voltage SIR 70SE
Sample#8 Text:301802-5 :10X DIL. : : : Exp:PAHAIR

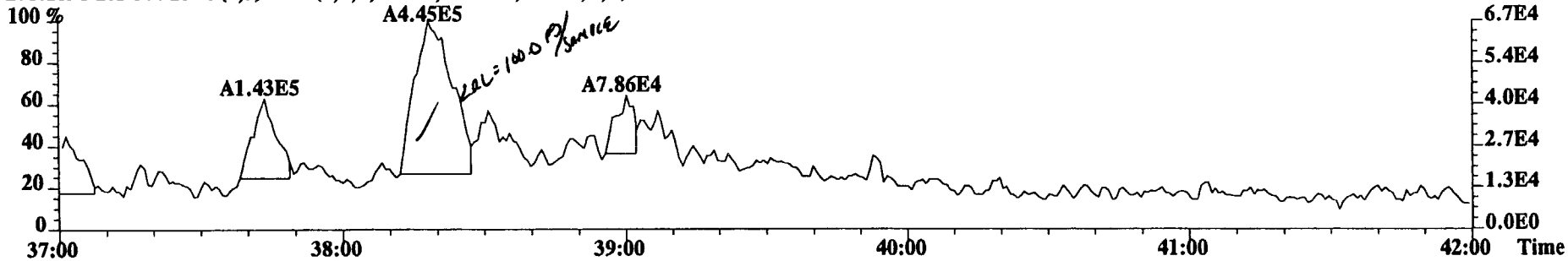
276.0939 S:8 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



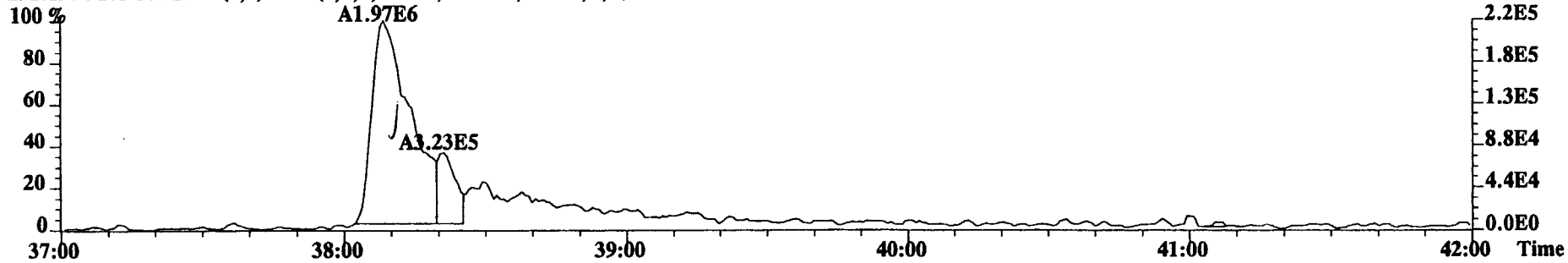
288.1692 S:8 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



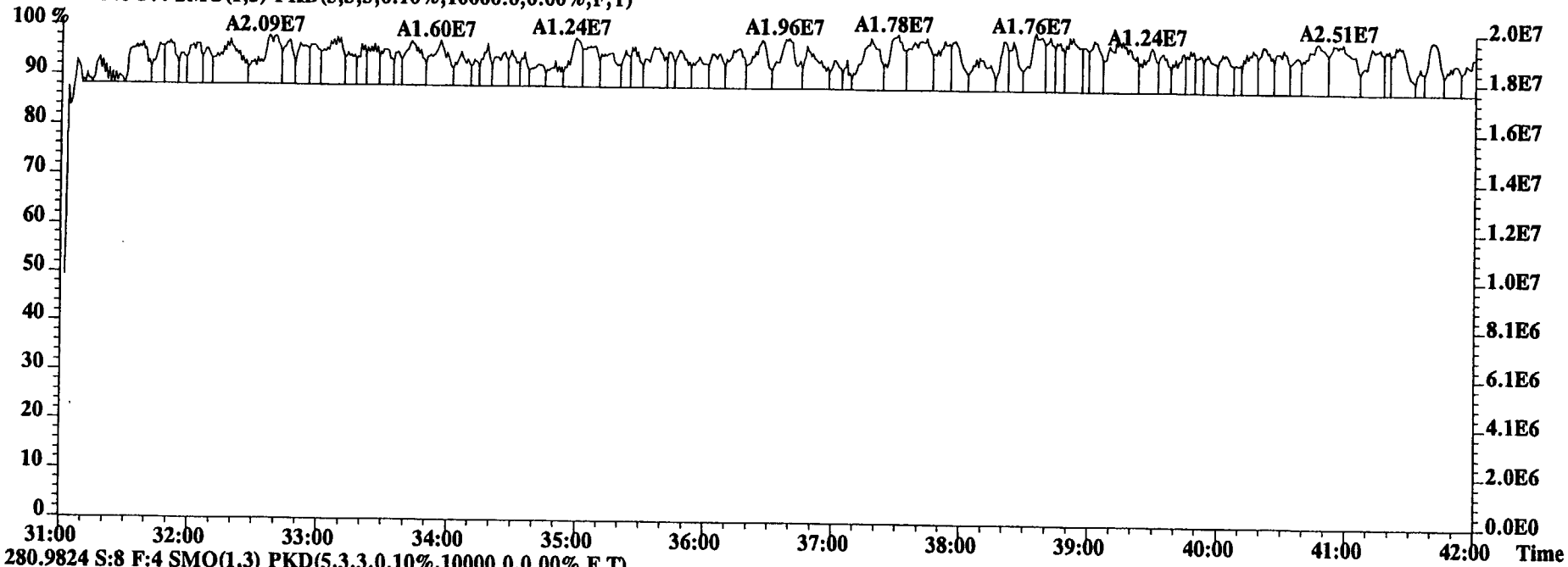
278.1096 S:8 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



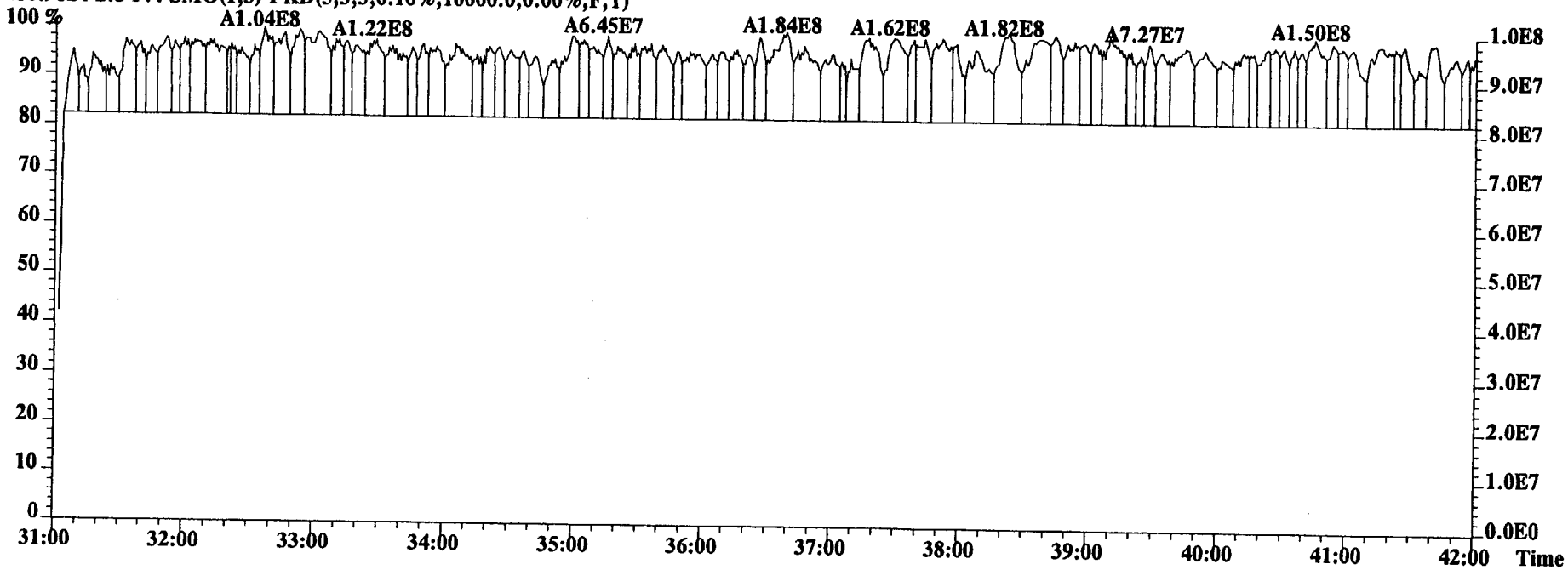
292.1974 S:8 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



File:30OC98V4 #1-878 Acq:30-OCT-1998 22:28:39 GC EI+ Voltage SIR 70SE
Sample#8 Text:301802-5 :10X DIL. : : : Exp:PAHAIR
268.9824 S:8 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



280.9824 S:8 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



POLYNUCLEAR AROMATIC HYDROCARBONS
HIGH RESOLUTION GC/MS
Method HRGC/HRMS

Client Name: Pacific Environmental Services
Client ID: A-O-429-3
Lab ID: 301802-0006-SA
Matrix: AIRTRAIN Sampled: 23 SEP 98 Received: 29 SEP 98
Authorized: 29 SEP 98 Prepared: 03 OCT 98 Analyzed: 30 OCT 98
Dilution Factor: 1.0

Parameter	Result	Units	Reporting Limit	Data Qualifiers
Naphthalene	110000	ng/sample	--	BD
2-Methylnaphthalene	36000	ng/sample	--	B
Acenaphthylene	17000	ng/sample	--	
Acenaphthene	3500	ng/sample	--	
Fluorene	8800	ng/sample	--	
Phenanthrene	27000	ng/sample	--	BD
Anthracene	5100	ng/sample	--	
Fluoranthene	12000	ng/sample	--	
Pyrene	6400	ng/sample	--	
Benzo(a)anthracene	240	ng/sample	--	
Chrysene	690	ng/sample	--	
Benzo(b)fluoranthene	210	ng/sample	--	
Benzo(k)fluoranthene	140	ng/sample	--	
Benzo(e)pyrene	110	ng/sample	--	
Benzo(a)pyrene	ND	ng/sample	100	
Perylene	ND	ng/sample	100	
Indeno(1,2,3-cd)pyrene	ND	ng/sample	100	
Dibenz(a,h)anthracene	ND	ng/sample	100	
Benzo(g,h,i)perylene	ND	ng/sample	100	

B = Compound is also detected in the blank.
D = Compound quantitated using a secondary dilution.
ND = Not Detected

Reported By: Clark Pickell Approved By: Eric Redman

The cover letter is an integral part of this report.
Rev 230787

POLYNUCLEAR AROMATIC HYDROCARBONS
HIGH RESOLUTION GC/MS
Method HRGC/HRMS
(cont.)

Client Name: Pacific Environmental Services
Client ID: A-0-429-3
Lab ID: 301802-0006-SA
Matrix: AIRTRAIN Sampled: 23 SEP 98 Received: 29 SEP 98
Authorized: 29 SEP 98 Prepared: 03 OCT 98 Analyzed: 30 OCT 98
Dilution Factor: 1.0

Internal Standards	% Recovery	
Naphthalene-d8	65	D
Acenaphthylene-d8	85	
Acenaphthene-d10	82	
Fluorene-d10	75	
Phenanthrene-d10	107	D
Fluoranthene-d10	69	
Pyrene-d10	63	
Benzo(a)anthracene-d12	80	
Perylene-d12	58	
Indeno(123-cd)pyrene-d12	80	
Chrysene-d12	85	
Benzo(b)fluoranthene-d12	88	
Benzo(k)fluoranthene-d12	87	
Benzo(a)pyrene-d12	73	
Dibenz(a,h)anthracene-d14	81	
Benzo(g,h,i)perylene-d12	66	

Field Surrogates	% Recovery
13C-Fluorene	117

D = Compound quantitated using a secondary dilution.

Reported By: Clark Pickell Approved By: Eric Redman

The cover letter is an integral part of this report.
Rev 230787

04-NOV-1998 05:35:54 PM Dioxin Furan Unknown RESULTS

Mass Spec : VG-4
GC Column : DB-5
Data file : 30OC98V4
Weight : 0.5

Results : 30OC98V4091.RES : PAHAIR.TRG
Date analyzed : 30-OCT-98
301802-6 :10X DIL. : : : Ex Cal : PAHAIR102998V4.R

Name	Total Response	Isotope Ratio		R. T. mm:ss		RRF	pg/ SAMP	Rec/ MDL
d10-2-Methylnaphthalene	6247200	1.00	Y	12: 28	Y	1.00	50.00	
d8-Naphthalene	5191140	1.00	Y	10: 12	Y	2.24	18.54	37
Naphthalene	8214020000	1.00	Y	10: 16	Y	1.23	-	SAT'D
2-Methylnaphthalene	1057434000	1.00	Y	12: 34	Y	0.56	3.6e+04	B E
d8-Acenaphthylene	6416360	1.00	Y	15: 28	Y	1.21	42.31	85
Acenaphthylene	1053276000	1.00	Y	15: 30	Y	0.94	1.7e+04	E
d10-Acenaphthene	3816800	1.00	Y	16: 1	Y	0.74	41.03	82
Acenaphthene	167765400	1.00	Y	16: 7	Y	1.25	3527.38	
d10-Anthracene	4361140	1.00	Y	20: 55	Y	1.00	50.00	
d10-Fluorene	4675320	1.00	Y	17: 41	Y	1.42	37.72	75
Fluorene	478978000	1.00	Y	17: 47	Y	1.16	8827.80	E
d10-Phenanthrene	11780000	1.00	Y	20: 45	Y	2.81	48.10	96
Phenanthrene	5372860000	1.00	Y	20: 49	Y	0.89	-	SAT'D
Anthracene	480000000	1.00	Y	20: 59	Y	0.80	5090.82	E
d14-Terphenyl	13510060	1.00	Y	26: 0	Y	1.00	50.00	
d10-Fluoranthene	13174340	1.00	Y	24: 35	Y	1.41	34.56	69
Fluoranthene	1730908000	1.00	Y	24: 39	Y	1.11	1.2e+04	E
d10-Pyrene	12865500	1.00	Y	25: 17	Y	1.52	31.36	63
Pyrene	984552000	1.00	Y	25: 20	Y	1.21	6350.44	E
d12-Benzo(a)anthracene	9716100	1.00	Y	29: 8	Y	0.90	39.95	80
Benzo(a)anthracene	28070400	1.00	Y	29: 13	Y	1.20	239.85	
d12-Chrysene	14713300	1.00	Y	29: 15	Y	1.28	42.57	85
Chrysene	109988000	1.00	Y	29: 20	Y	1.08	689.63	
d12-Benzo(e)pyrene	25220400	1.00	Y	33: 22	Y	1.00	50.00	
d12-Benzo(b)fluoranthene	10080440	1.00	Y	32: 30	Y	0.45	44.03	88
Benzo(b)fluoranthene	24200000	1.00	Y	32: 34	Y	1.17	205.67	
d12-Benzo(k)fluoranthene	20916200	1.00	Y	32: 35	Y	0.95	43.74	87
Benzo(k)fluoranthene	34800000	1.00	Y	32: 38	Y	1.16	142.92	
d12-Benzo(a)pyrene	12479520	1.00	Y	33: 34	Y	0.68	36.56	73
Benzo(e)pyrene	22107800	1.00	Y	33: 28	Y	1.64	107.97	
Benzo(a)pyrene	7248280	1.00	Y	33: 39	Y	1.07	<RL=100.00	
d12-Perylene	9256060	1.00	Y	33: 51	Y	0.63	29.12	58
Perylene	* No Peak	0.00	N	33: 55	N	1.71	<RL=100.00	
d12-Indeno(123-cd)pyrene	9019300	1.00	Y	38: 4	Y	0.44	40.22	80
Indeno(123-cd)pyrene	4096560	1.00	Y	38: 11	Y	0.62	<RL=100.00	
d14-Dibenz(ah)anthracene	5021960	1.00	Y	38: 9	Y	0.25	40.50	81
Dibenz(ah)anthracene	681544	1.00	Y	38: 16	Y	1.40	<RL=100.00	
d12-Benzo(ghi)perylene	9675900	1.00	Y	39: 14	Y	0.58	33.09	66
Benzo(ghi)perylene	7685780	1.00	Y	39: 23	Y	1.02	<RL=100.00	
d10-Fluorene	4675320	1.00	Y	17: 41	Y	1.00	50.00	
13C-Fluorene	4440900	1.00	Y	17: 46	Y	0.81	58.63	117

04-NOV-1998 05:35:50 PM Dioxin Furan Unknown RESULTS

```
                0.5
98V4.RRF
 Rec/
  MDL

            3123600    3123600
     37     2595570    2595570
 SAT'D 4107010000 4107010000
  B E    528717000  528717000

     85     3208180    3208180
    E     526638000  526638000

     82     1908400    1908400
           83882700   83882700

            2180570    2180570
     75     2337660    2337660
    E     239489000  239489000

     96     5890000    5890000
 SAT'D 2686430000 2686430000
    E     240000000  240000000

            6755030    6755030
     69     6587170    6587170
    E     865454000  865454000

     63     6432750    6432750
    E     492276000  492276000

     80     4858050    4858050
           14035200   14035200

     85     7356650    7356650
           54994000   54994000

           12610200   12610200
     88     5040220    5040220
           12100000   12100000

     87    10458100   10458100
           17400000   17400000

     73     6239760    6239760
           11053900   11053900
100.00      3624140    3624140

     58     4628030    4628030
100.00            0          0

     80     4509650    4509650
100.00      2048280    2048280

     81     2510980    2510980
100.00       340772     340772

     66     4837950    4837950
100.00      3842890    3842890
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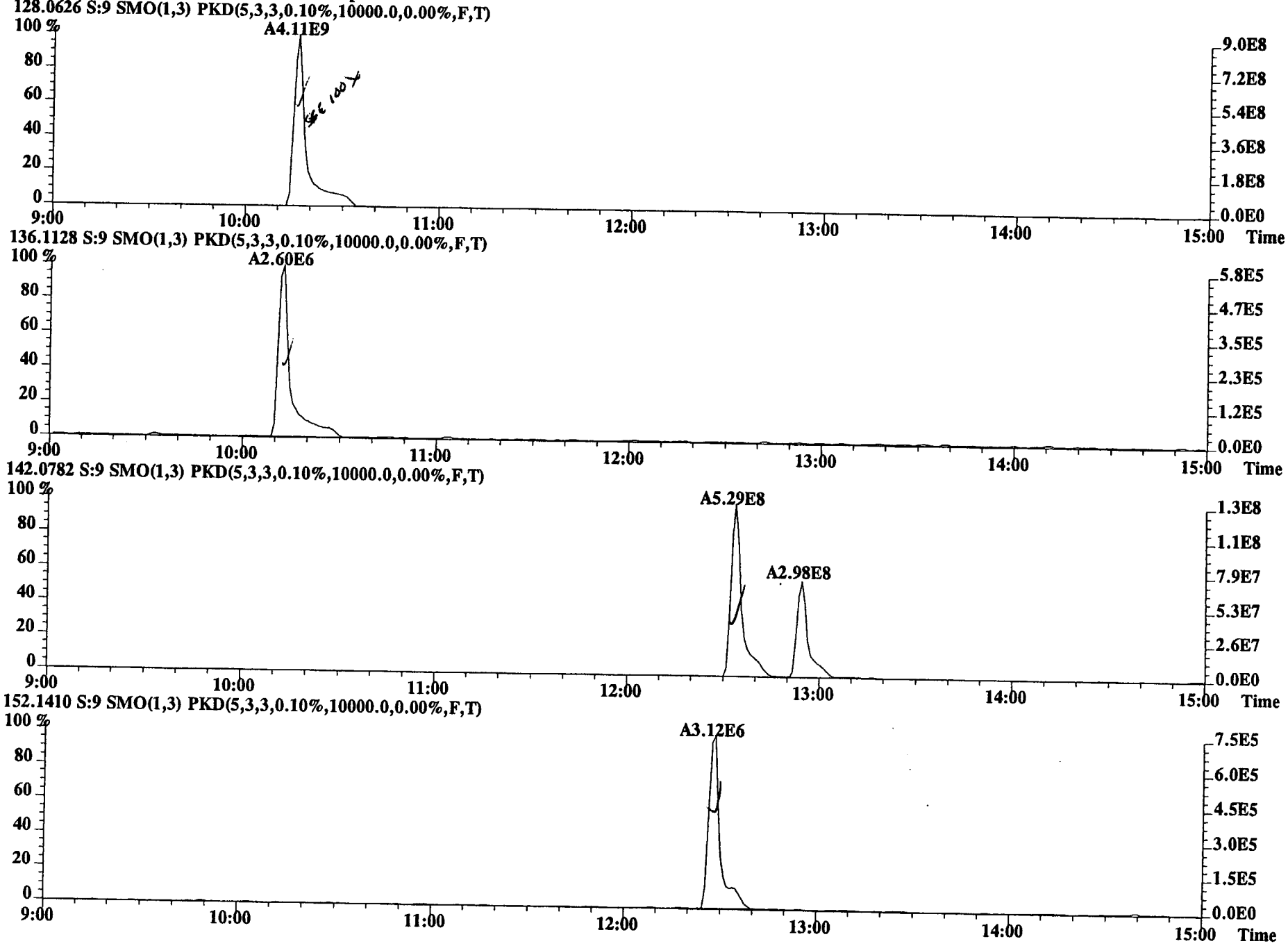
02-NOV-1998 08:52:06 AM Dioxin Furan Unknown RESULTS

Mass Spec : VG-4
GC Column : DB-5
Data file : 30OC98V4
Weight : 0.5

Results : 30OC98V4091.RES : PAHAIR.TRG
Date analyzed : 30-OCT-98
301802-6 :10X DIL. : : : Ex Cal : PAHAIR102998V4.R

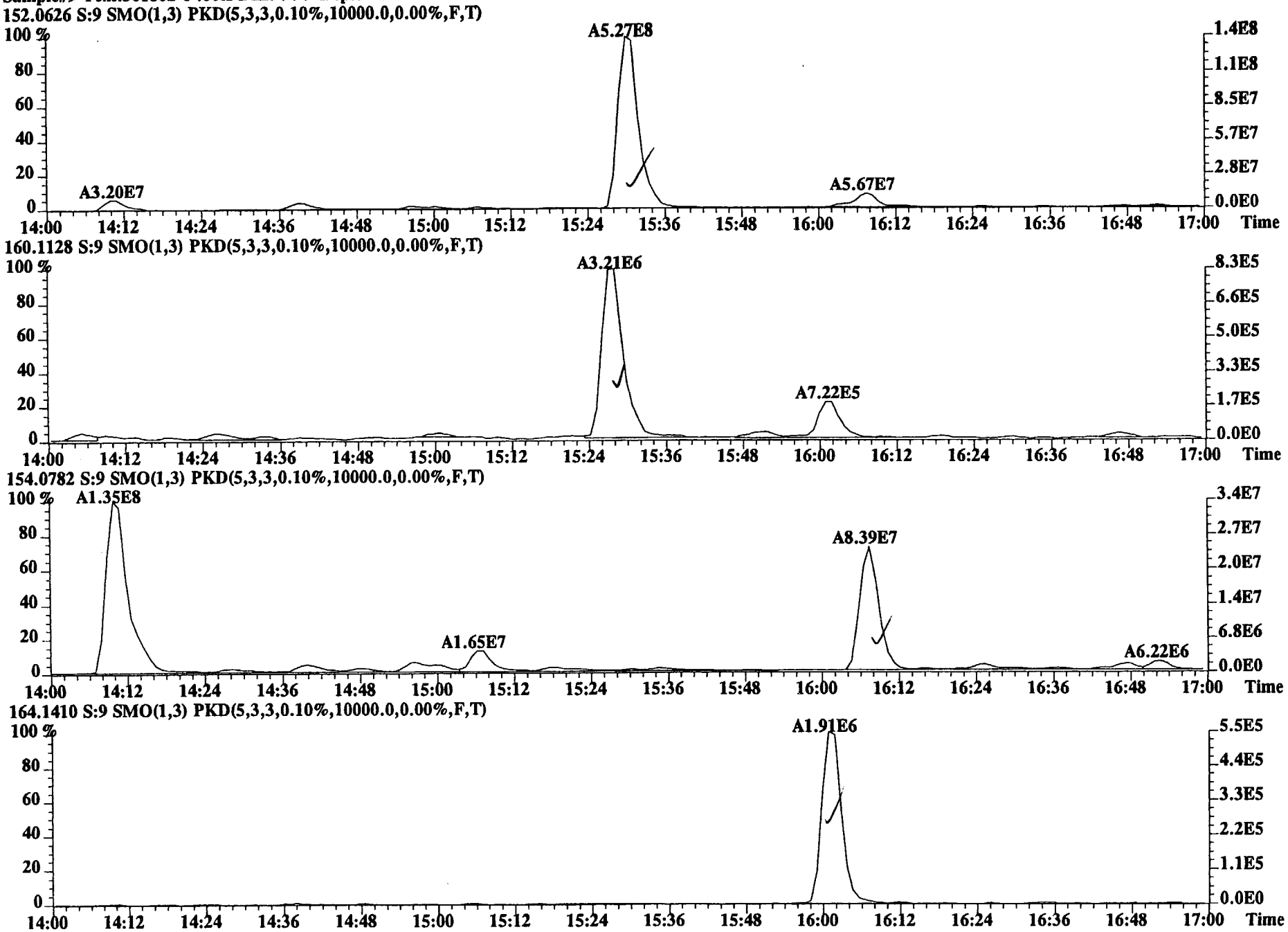
Name	Total Response	Isotope Ratio		R. T. mm:ss		RRF	pg/ SAMP	Rec/ MDL
d10-2-Methylnaphthalene	6247200	1.00	Y	12: 28	Y	1.00	50.00	
d8-Naphthalene	5191140	1.00	Y	10: 12	Y	2.24	18.54	37
Naphthalene	8214020000	1.00	Y	10: 16	Y	1.23	1.3e+05	0.000
2-Methylnaphthalene	1057434000	1.00	Y	12: 34	Y	0.56	3.6e+04	0.000
d8-Acenaphthylene	6416360	1.00	Y	15: 28	Y	1.21	42.31	85
Acenaphthylene	1053276000	1.00	Y	15: 30	Y	0.94	1.7e+04	0.000
d10-Acenaphthene	3816800	1.00	Y	16: 1	Y	0.74	41.03	82
Acenaphthene	167765400	1.00	Y	16: 7	Y	1.25	3527.38	0.000
d10-Anthracene	4361140	1.00	Y	20: 55	Y	1.00	50.00	
d10-Fluorene	4675320	1.00	Y	17: 41	Y	1.42	37.72	75
Fluorene	478978000	1.00	Y	17: 47	Y	1.16	8827.80	0.000
d10-Phenanthrene	11988160	1.00	Y	20: 45	Y	2.81	48.95	98
Phenanthrene	5372860000	1.00	Y	20: 49	Y	0.89	5.0e+04	0.000
Anthracene	* No Peak	0.00	N	20: 59	N	0.80	0.00	0.000
d14-Terphenyl	13510060	1.00	Y	26: 0	Y	1.00	50.00	
d10-Fluoranthene	13174340	1.00	Y	24: 35	Y	1.41	34.56	69
Fluoranthene	1730908000	1.00	Y	24: 39	Y	1.11	1.2e+04	0.000
d10-Pyrene	12865500	1.00	Y	25: 17	Y	1.52	31.36	63
Pyrene	984552000	1.00	Y	25: 20	Y	1.21	6350.44	0.000
d12-Benzo(a)anthracene	9716100	1.00	Y	29: 8	Y	0.90	39.95	80
Benzo(a)anthracene	28070400	1.00	Y	29: 13	Y	1.20	239.85	0.000
d12-Chrysene	14713300	1.00	Y	29: 15	Y	1.28	42.57	85
Chrysene	109988000	1.00	Y	29: 20	Y	1.08	689.63	0.000
d12-Benzo(e)pyrene	25220400	1.00	Y	33: 22	Y	1.00	50.00	
d12-Benzo(b)fluoranthene	10080440	1.00	Y	32: 30	Y	0.45	44.03	88
Benzo(b)fluoranthene	58691800	1.00	Y	32: 34	Y	1.17	498.81	0.000
d12-Benzo(k)fluoranthene	20916200	1.00	Y	32: 35	Y	0.95	43.74	87
Benzo(k)fluoranthene	58691800	1.00	Y	32: 34	Y	1.16	241.04	0.000
d12-Benzo(a)pyrene	12479520	1.00	Y	33: 34	Y	0.68	36.56	73
Benzo(e)pyrene	22107800	1.00	Y	33: 28	Y	1.64	107.97	0.000
Benzo(a)pyrene	7248280	1.00	Y	33: 39	Y	1.07	54.18	0.000
d12-Perylene	9256060	1.00	Y	33: 51	Y	0.63	29.12	58
Perylene	* No Peak	0.00	N	33: 55	N	1.71	0.00	0.000
d12-Indeno(123-cd)pyrene	9019300	1.00	Y	38: 4	Y	0.44	40.22	80
Indeno(123-cd)pyrene	4096560	1.00	Y	38: 11	Y	0.62	73.15	0.000
d14-Dibenz(ah)anthracene	5021960	1.00	Y	38: 9	Y	0.25	40.50	81
Dibenz(ah)anthracene	681544	1.00	Y	38: 16	Y	1.40	9.67	0.000
d12-Benzo(ghi)perylene	9675900	1.00	Y	39: 14	Y	0.58	33.09	66
Benzo(ghi)perylene	7685780	1.00	Y	39: 23	Y	1.02	78.18	0.000
d10-Fluorene	4675320	1.00	Y	17: 41	Y	1.42	6.52	13
13C-Fluorene	4440900	1.00	Y	17: 46	Y	1.00	94.99	0.000

File:30OC98V4 #1-510 Acq:30-OCT-1998 23:17:42 GC EI+ Voltage SIR 70SE
Sample#9 Text:301802-6 :10X DIL. : : : Exp:PAHAIR

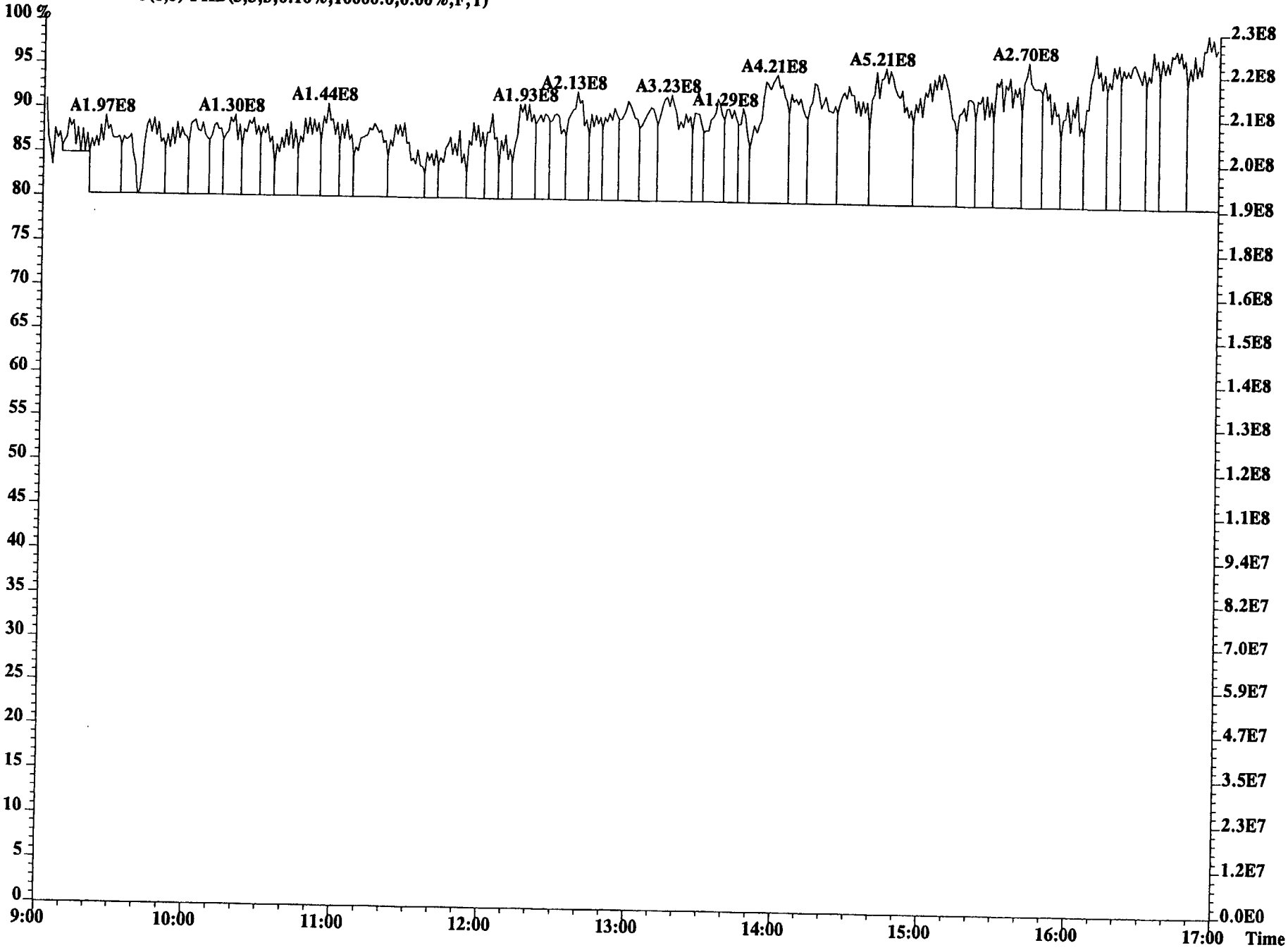


245

File:30OC98V4 #1-510 Acq:30-OCT-1998 23:17:42 GC EI+ Voltage SIR 70SE
Sample#9 Text:301802-6 :10X DIL. : : : Exp:PAHAIR

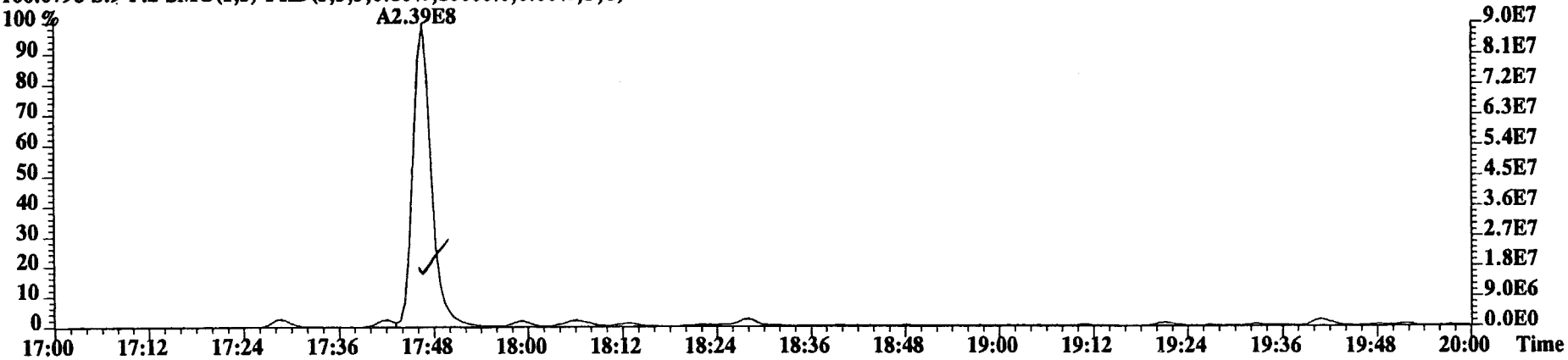


File:30OC98V4 #1-510 Acq:30-OCT-1998 23:17:42 GC EI+ Voltage SIR 70SE
Sample#9 Text:301802-6 :10X DIL. : : : Exp:PAHAIR
130.9920 S:9 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

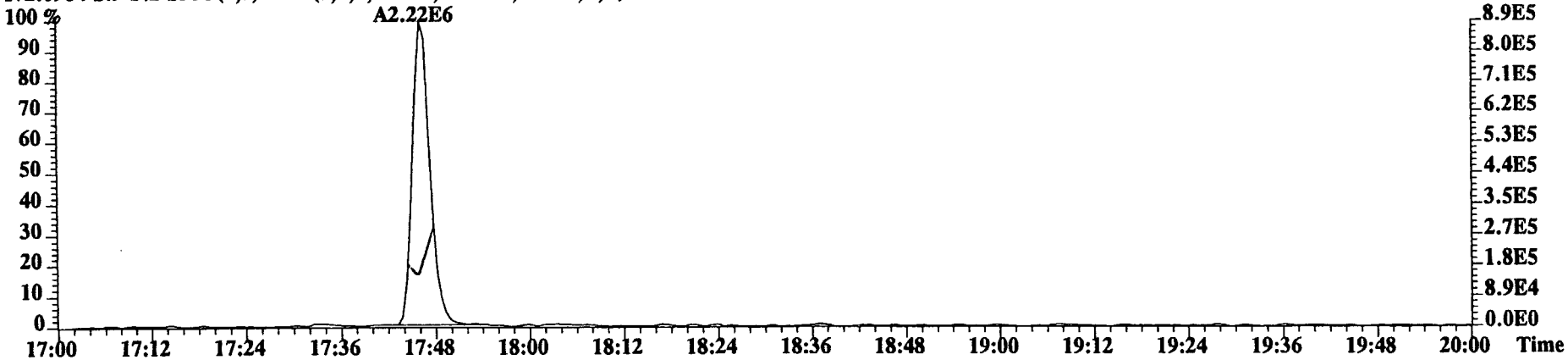


242

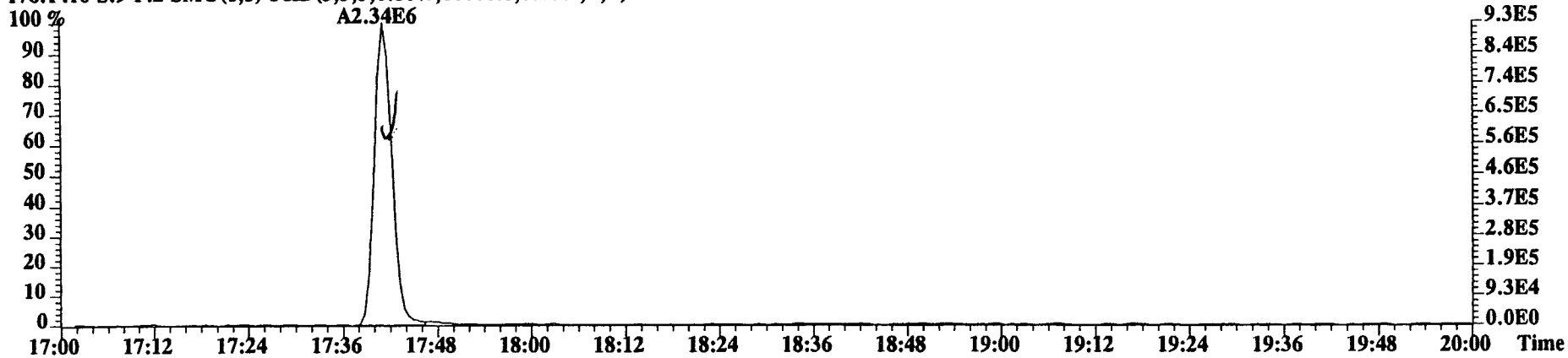
File:30OC98V4 #1-641 Acq:30-OCT-1998 23:17:42 GC EI+ Voltage SIR 70SE
Sample#9 Text:301802-6 :10X DIL. : : : Exp:PAHAIR
166.0798 S:9 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



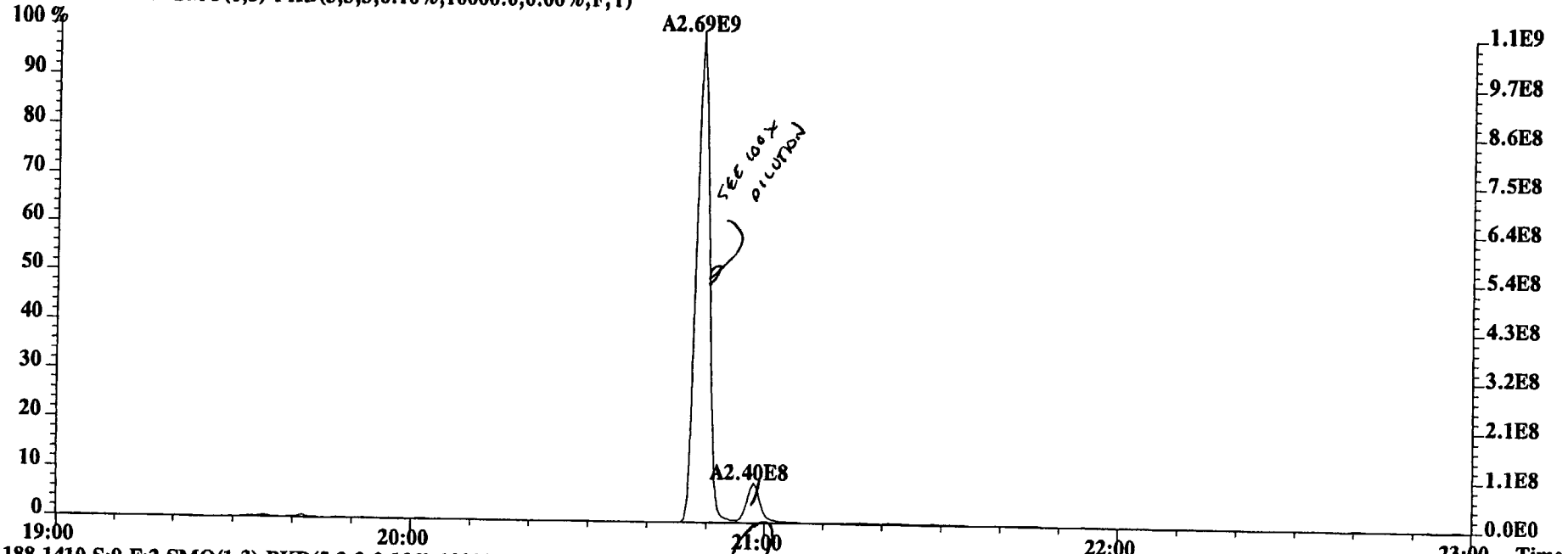
172.0984 S:9 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



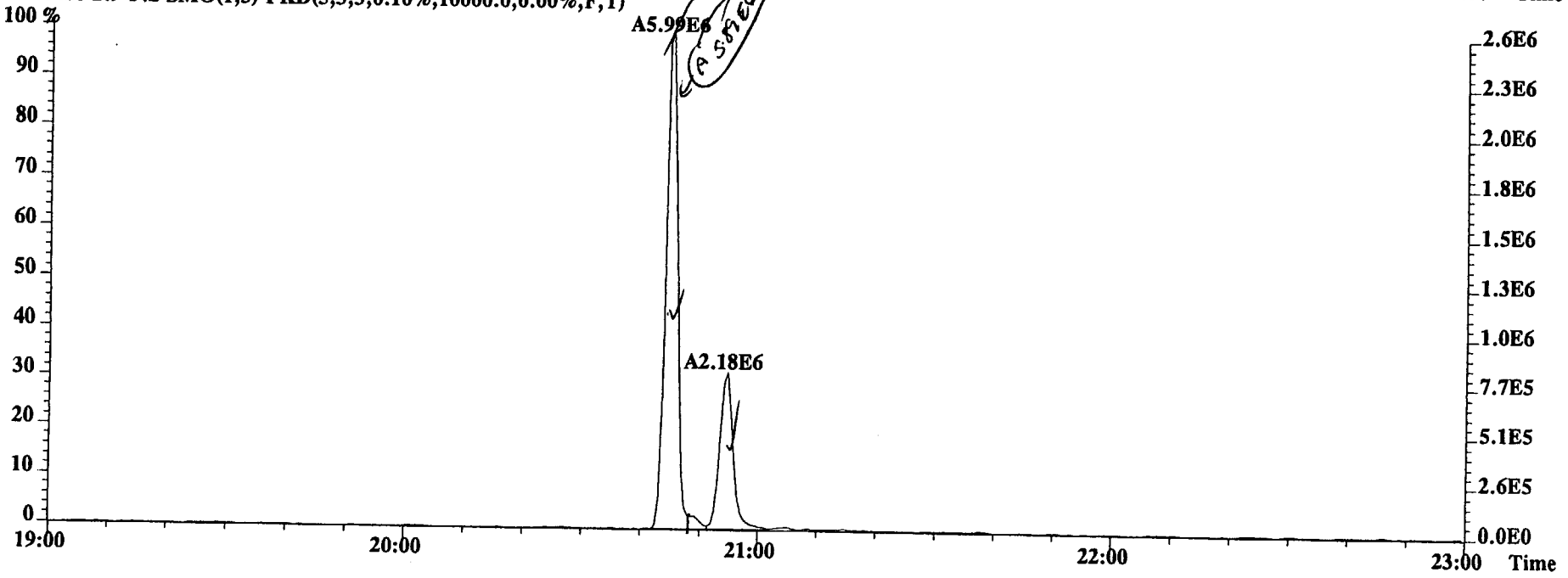
176.1410 S:9 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



File:30OC98V4 #1-641 Acq:30-OCT-1998 23:17:42 GC EI+ Voltage SIR 70SE
Sample#9 Text:301802-6 :10X DIL. : : : Exp:PAHAIR
178.0782 S:9 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

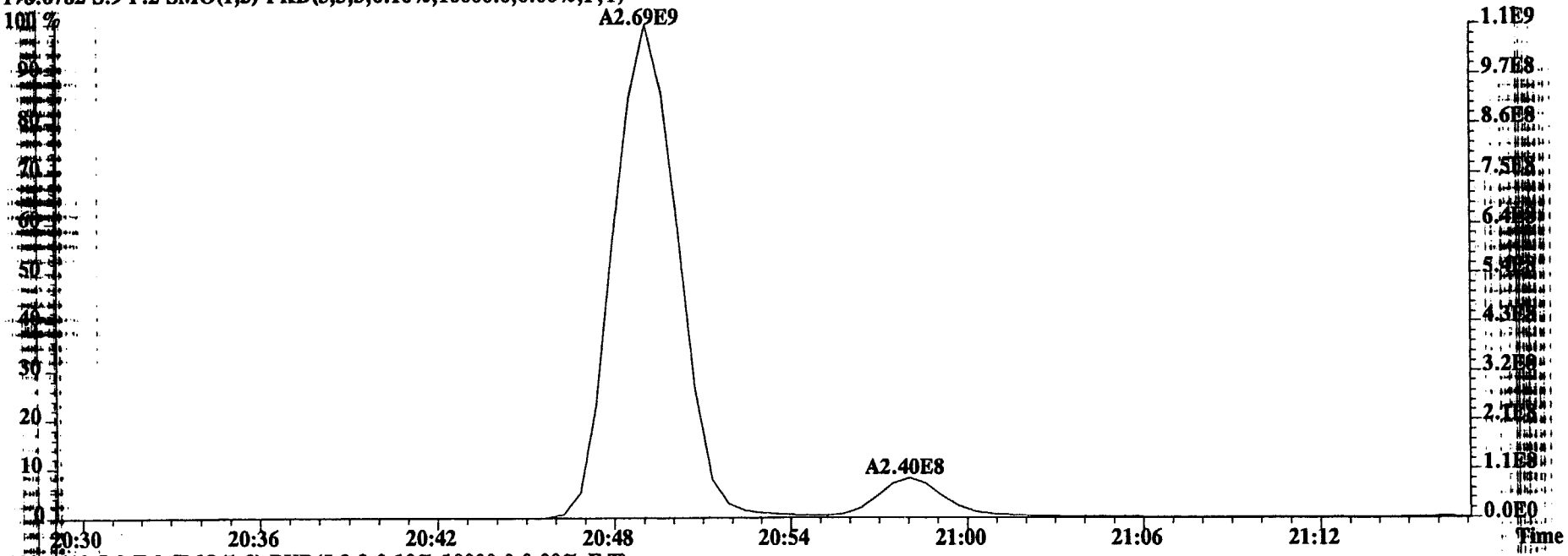


188.1410 S:9 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

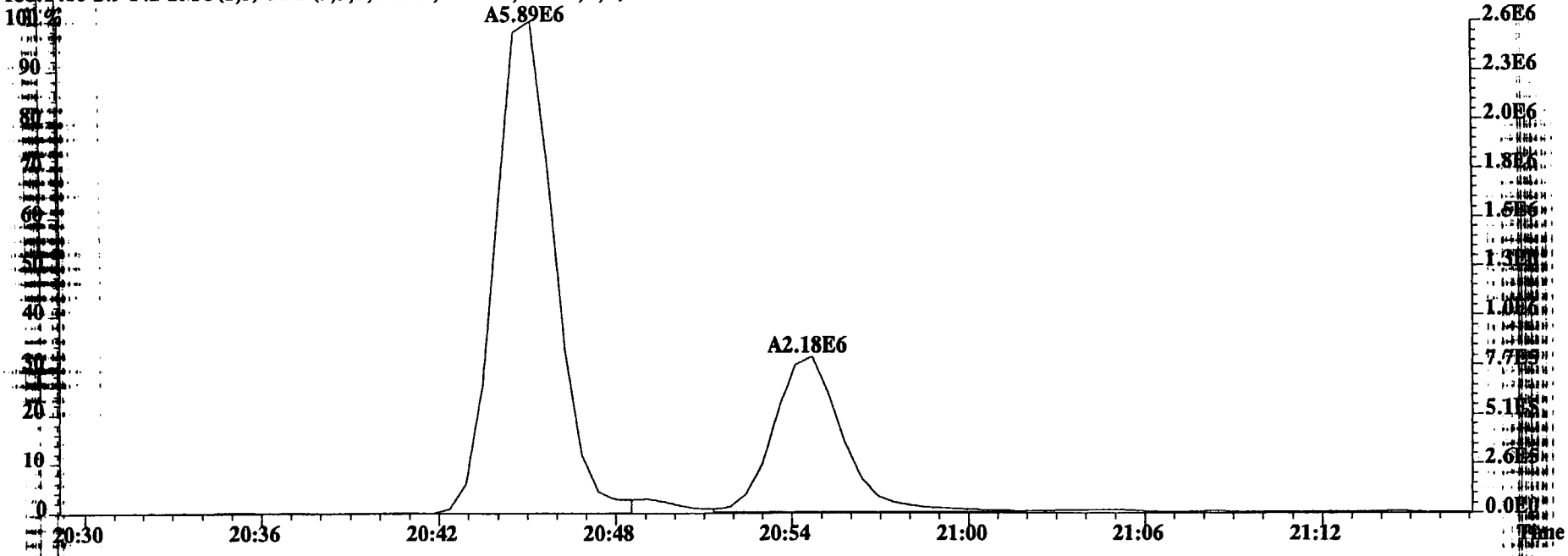


249

File:30OC98V4 #1-641 Acq:30-OCT-1998 23:17:42 GC EI+ Voltage SIR 70SE
Sample#9 Text:301802-6 :10X DIL. : : : Exp:PAHAIR
178.0782 S:9 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

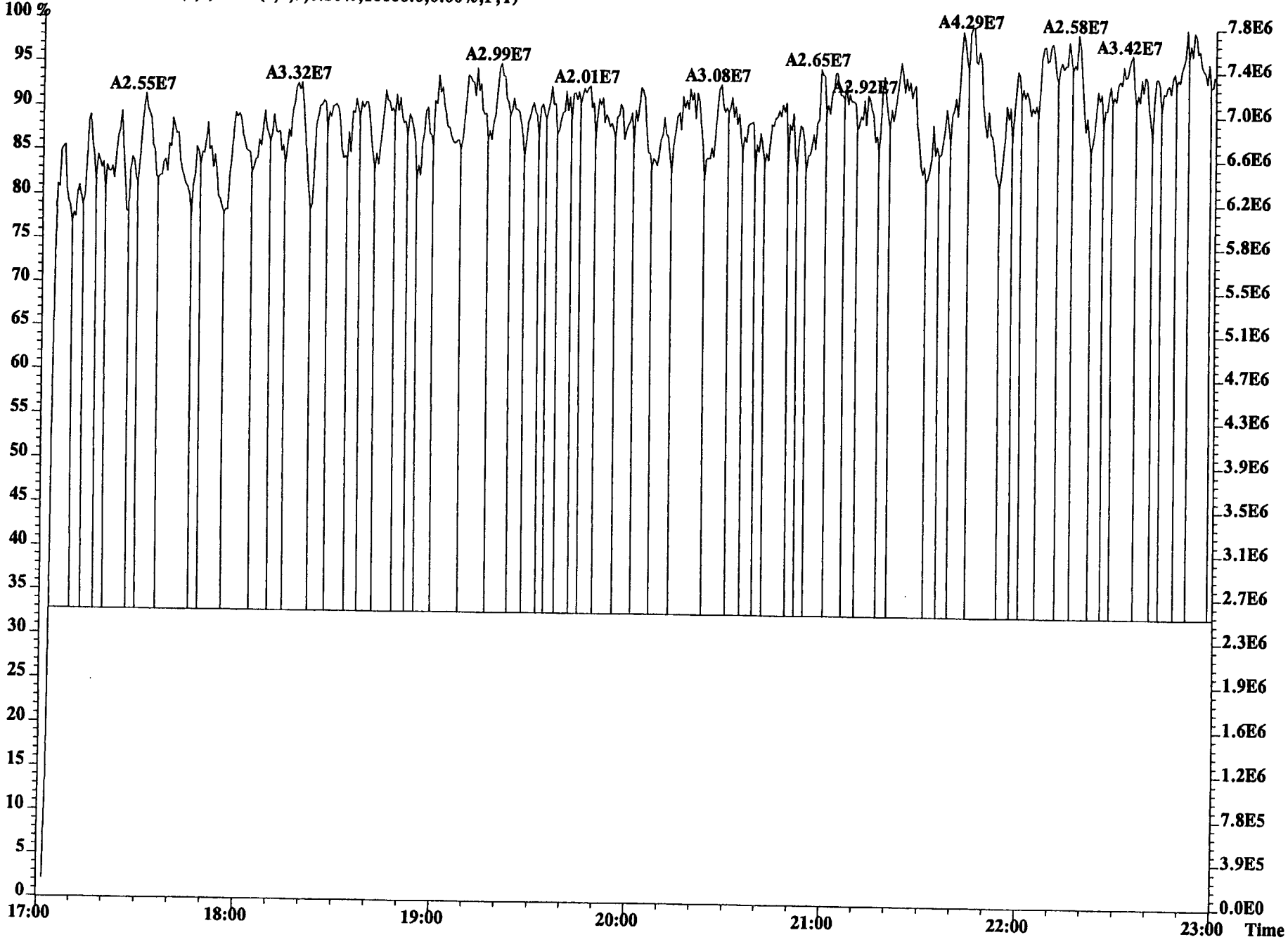


188.1410 S:9 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



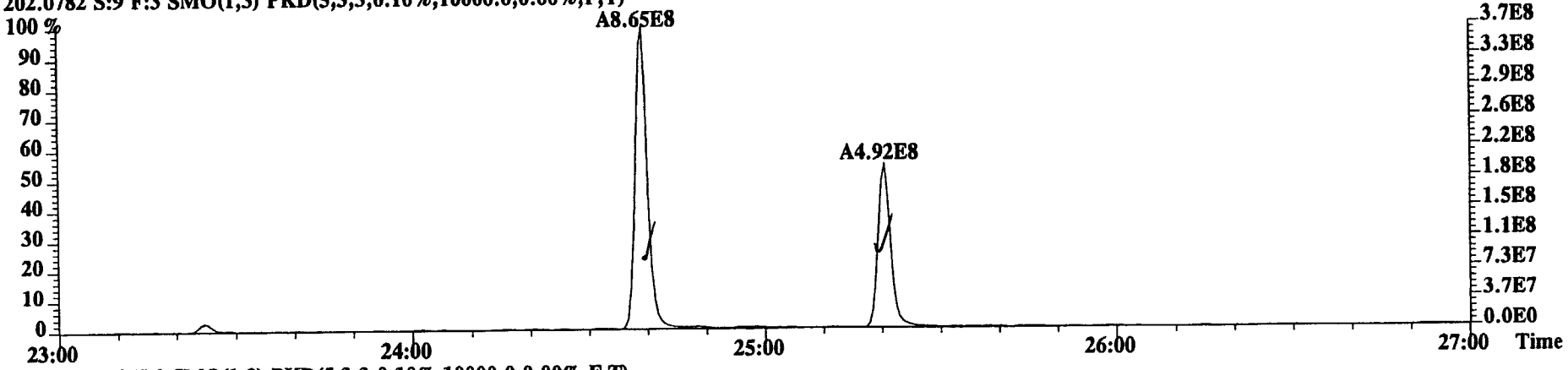
052 250

File:30OC98V4 #1-641 Acq:30-OCT-1998 23:17:42 GC EI+ Voltage SIR 70SE
Sample#9 Text:301802-6 :10X DIL. : : : Exp:PAHAIR
204.9888 S:9 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

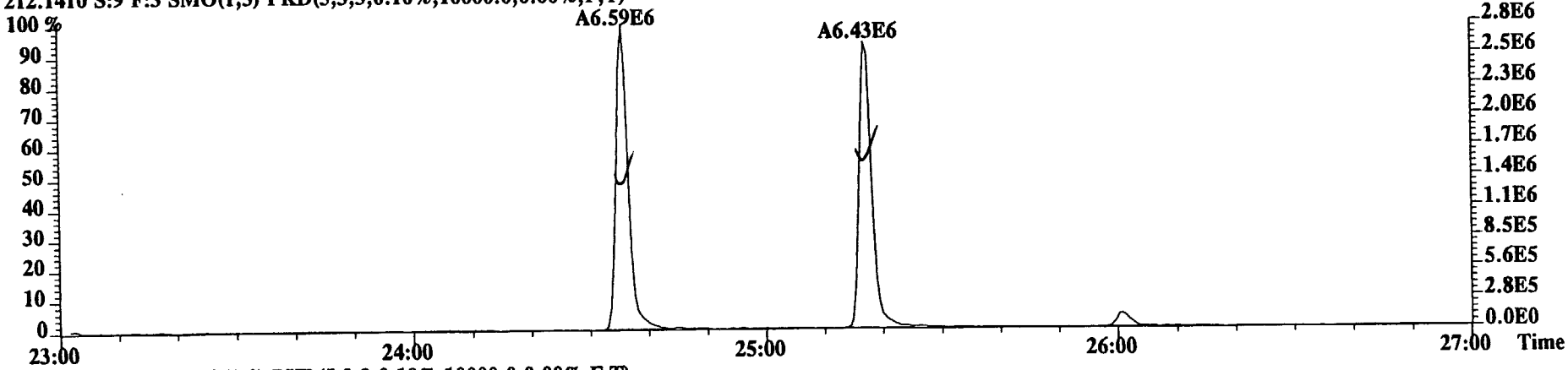


251

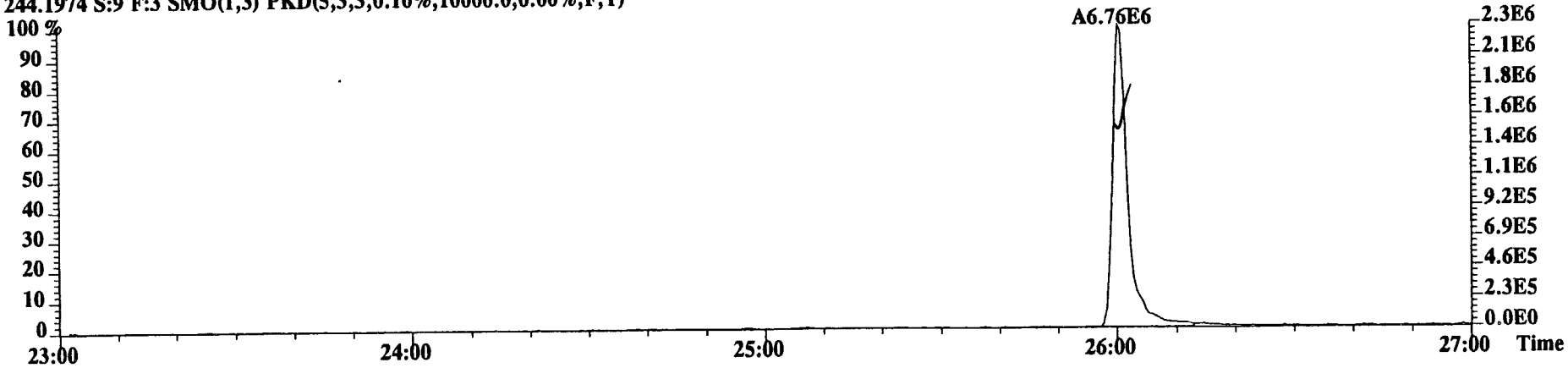
File:30OC98V4 #1-939 Acq:30-OCT-1998 23:17:42 GC EI+ Voltage SIR 70SE
Sample#9 Text:301802-6 :10X DIL. : : : Exp:PAHAIR
202.0782 S:9 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



212.1410 S:9 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

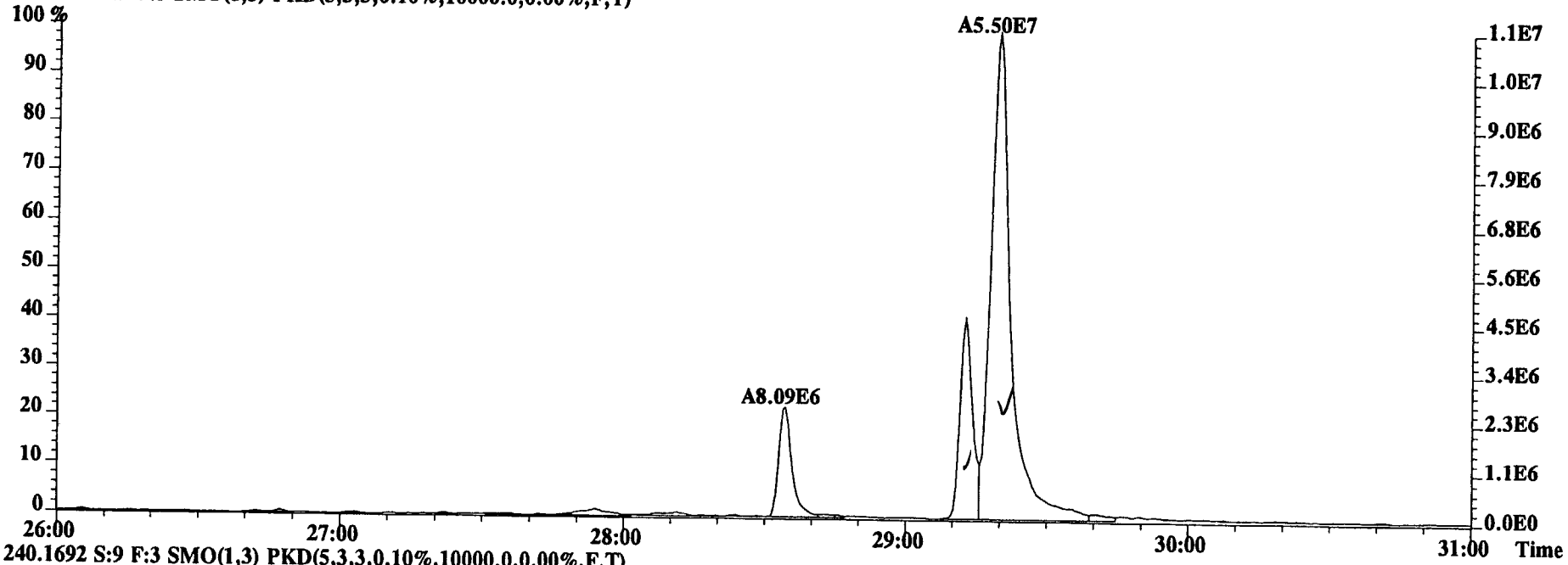


244.1974 S:9 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

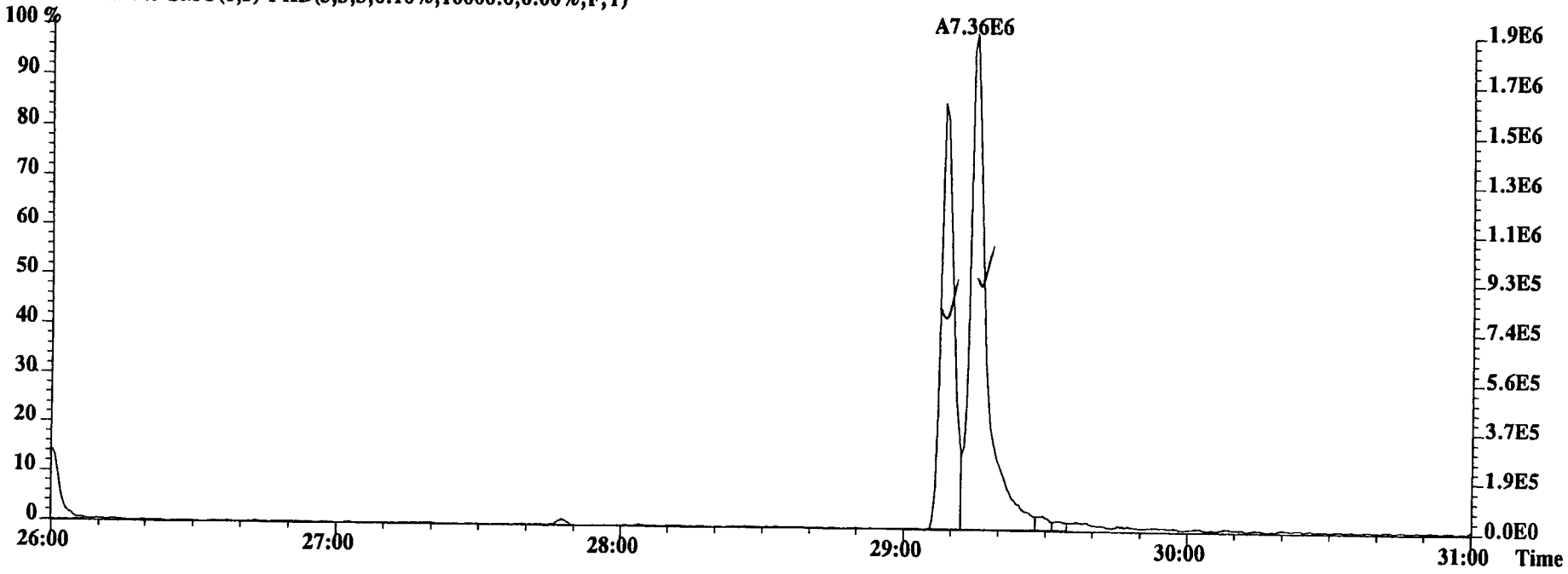


252

File:30OC98V4 #1-939 Acq:30-OCT-1998 23:17:42 GC EI+ Voltage SIR 70SE
Sample#9 Text:301802-6 :10X DIL. : : : Exp:PAHAIR
228.0939 S:9 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

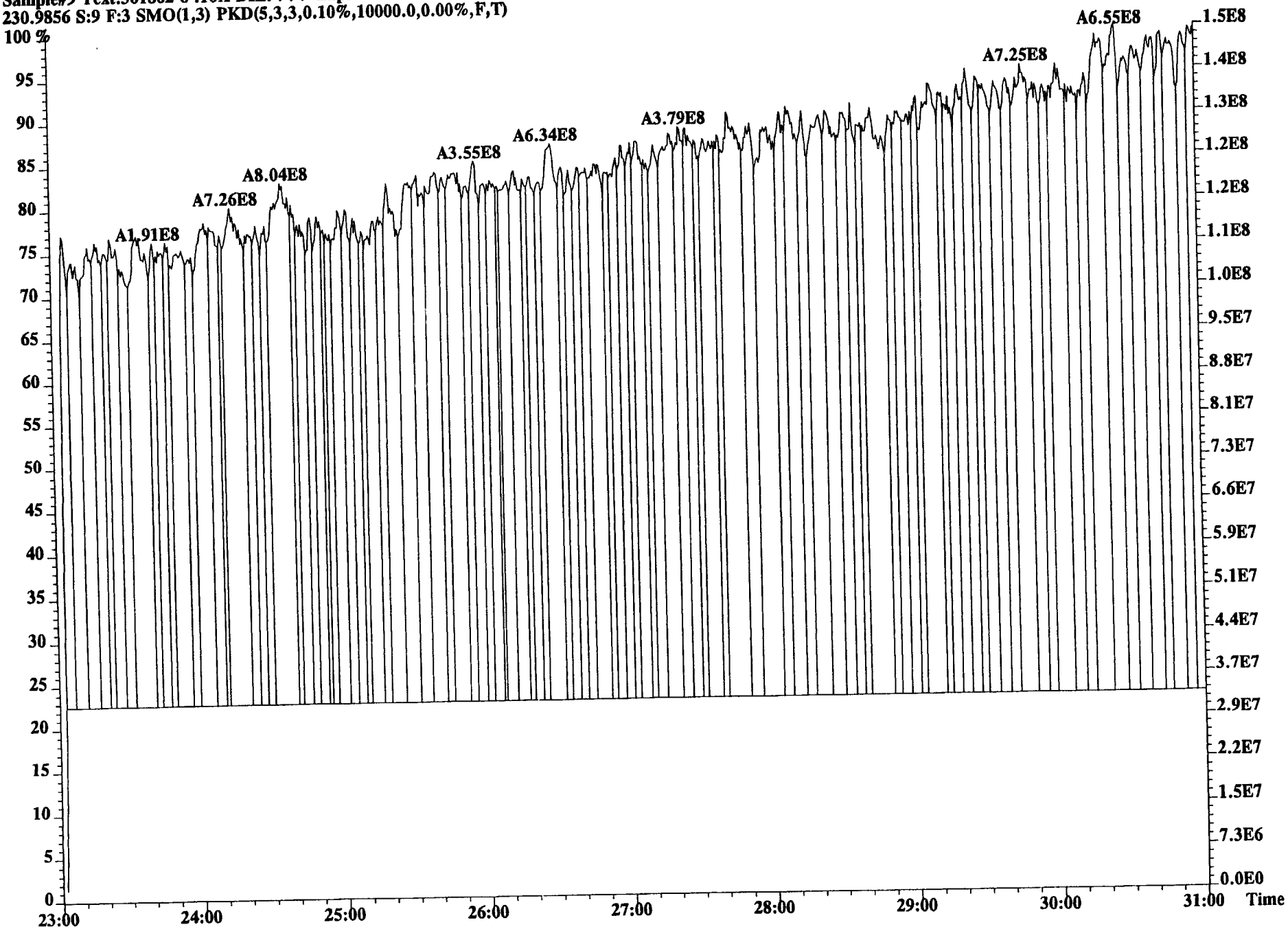


240.1692 S:9 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



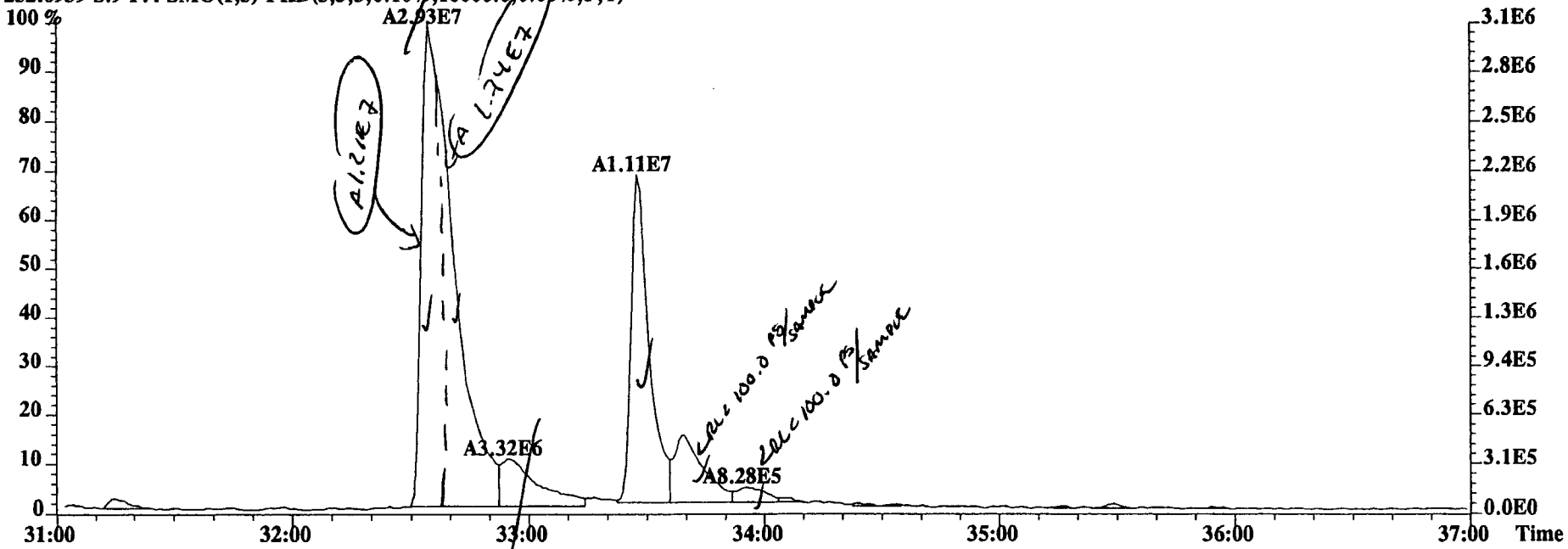
253

File:30OC98V4 #1-939 Acq:30-OCT-1998 23:17:42 GC EI+ Voltage SIR 70SE
Sample#9 Text:301802-6 :10X DIL. : : : Exp:PAHAIR
230.9856 S:9 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

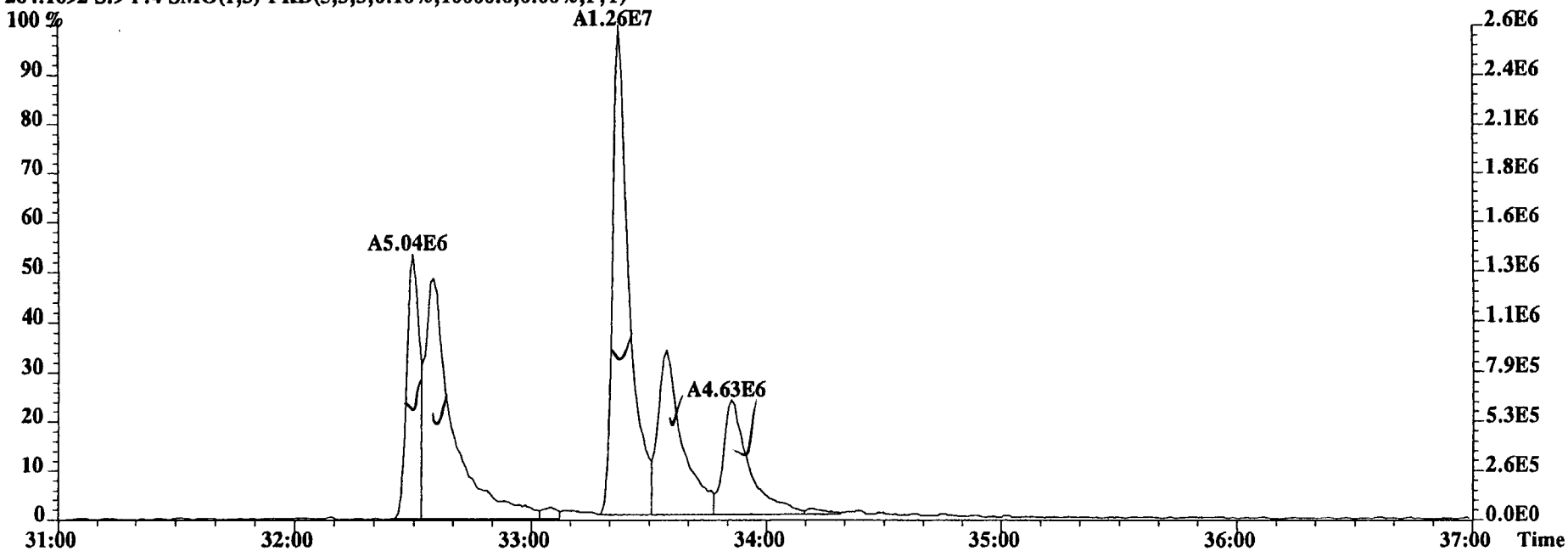


254

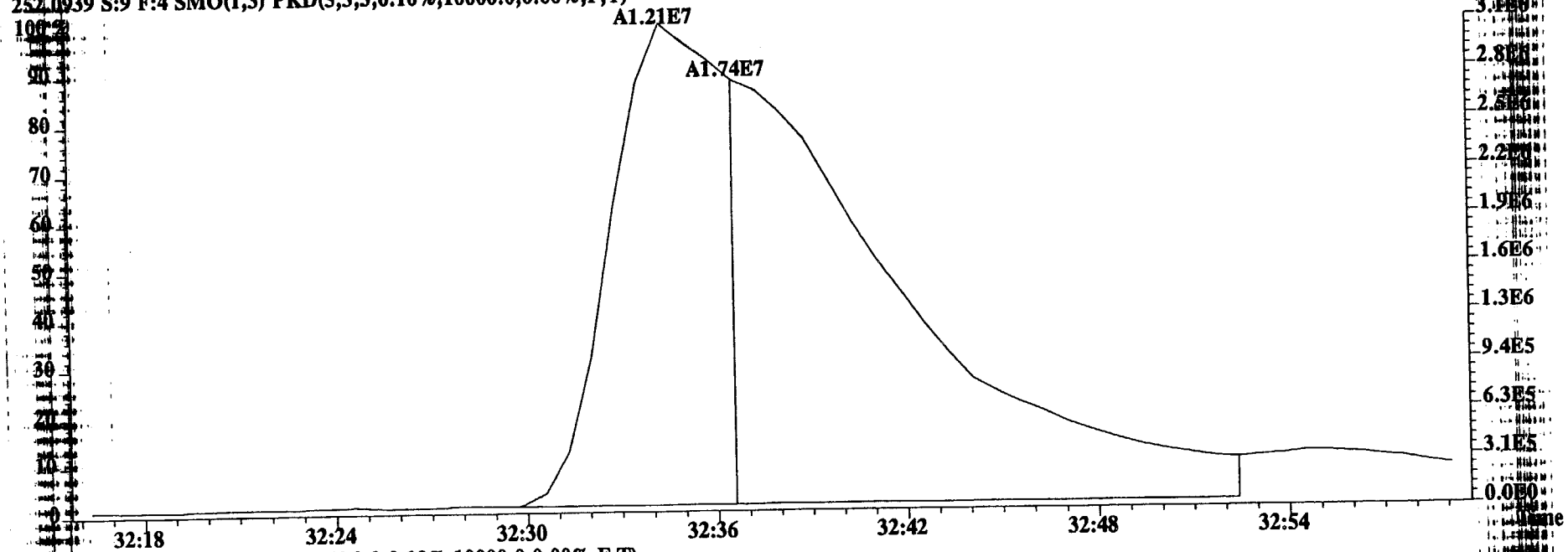
File:30OC98V4 #1-878 Acq:30-OCT-1998 23:17:42 GC EI+ Voltage SIR 70SE
Sample#9 Text:301802-6 :10X DIL. : : : Exp:PAHAIR
252.0939 S:9 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



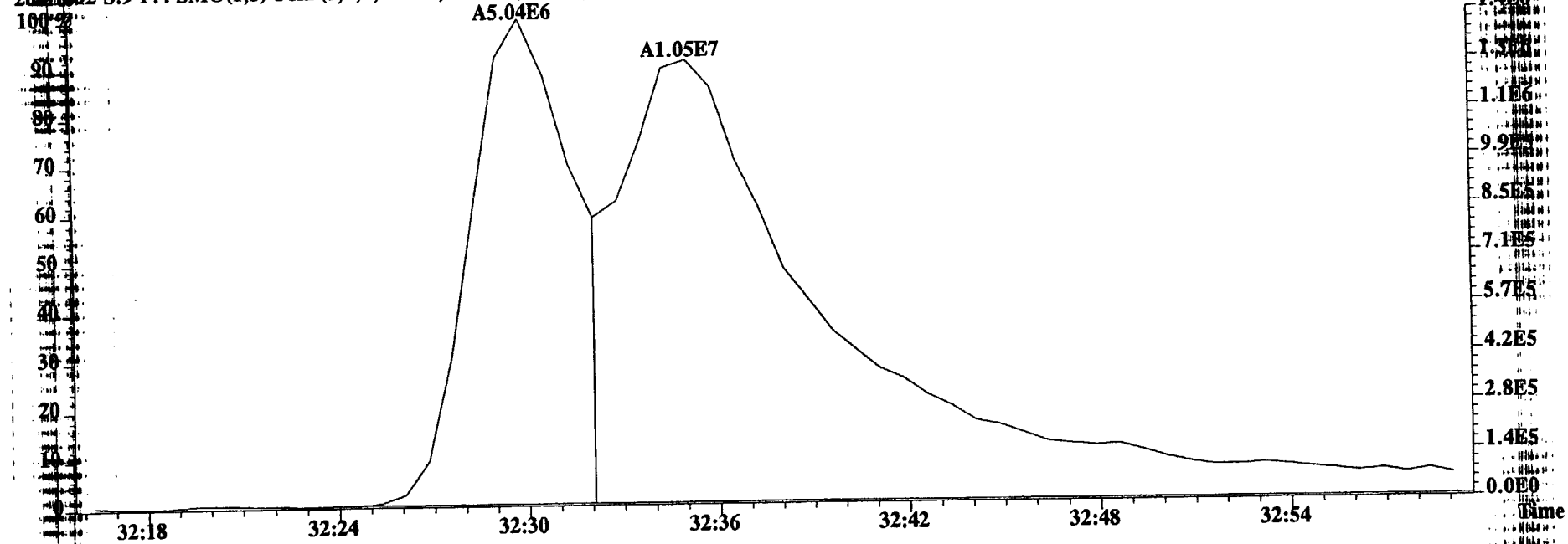
264.1692 S:9 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



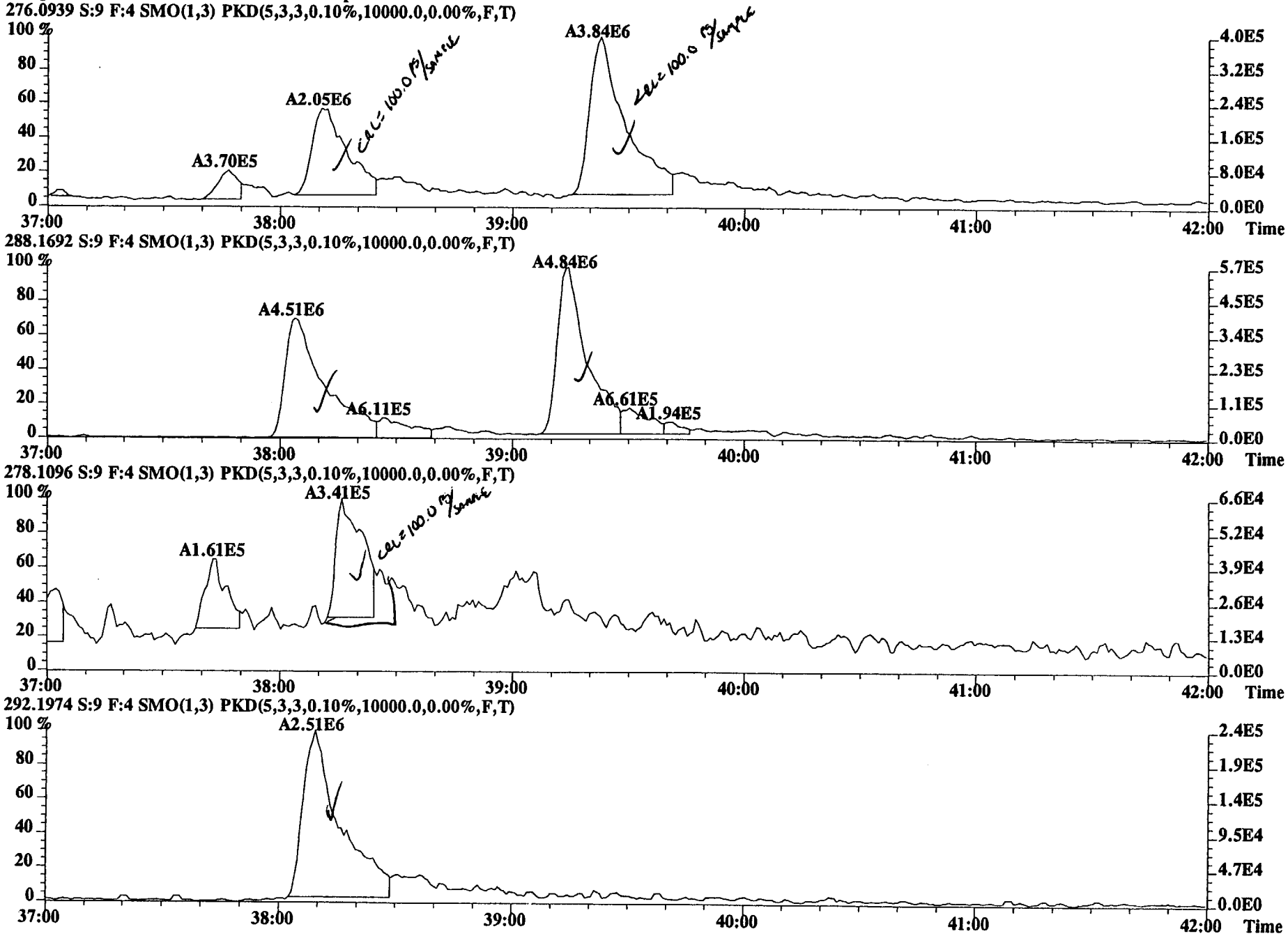
FIL:3IOC98V4 #1-878 Acq:30-OCT-1998 23:17:42 GC EI+ Voltage SIR 70SE
Sample#9 Text:301802-6 :10X DIL. : : : Exp:PAHAIR
252.0939 S:9 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



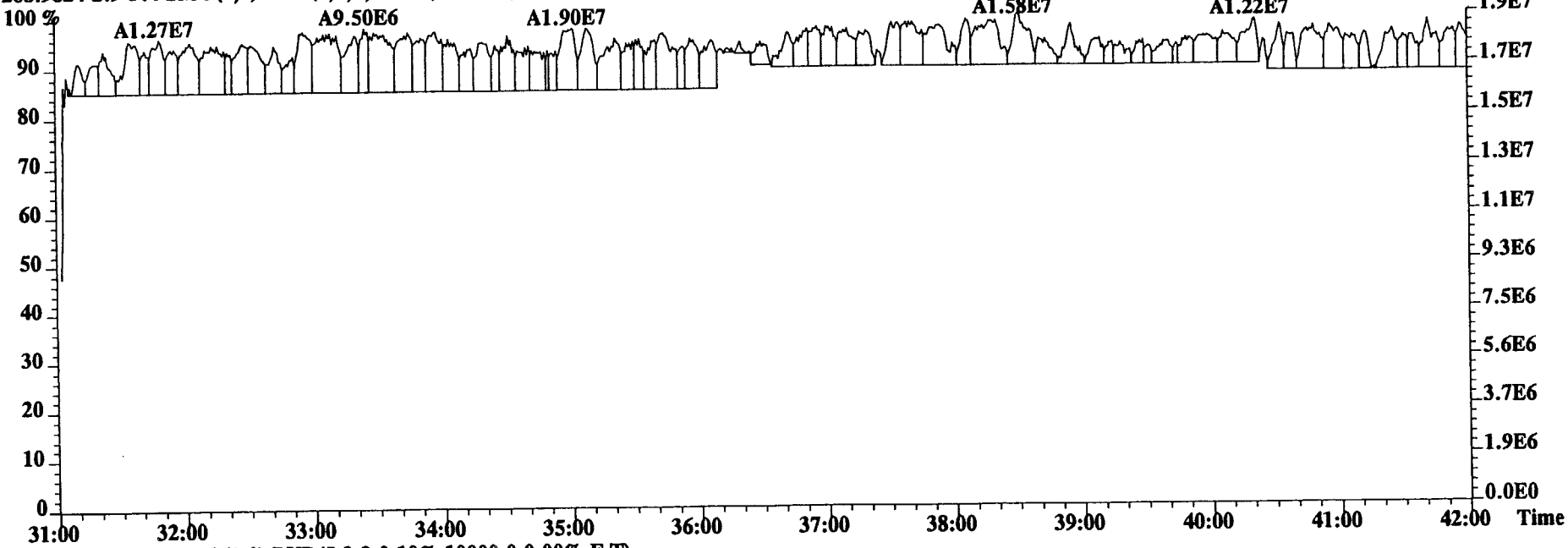
262.1692 S:9 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



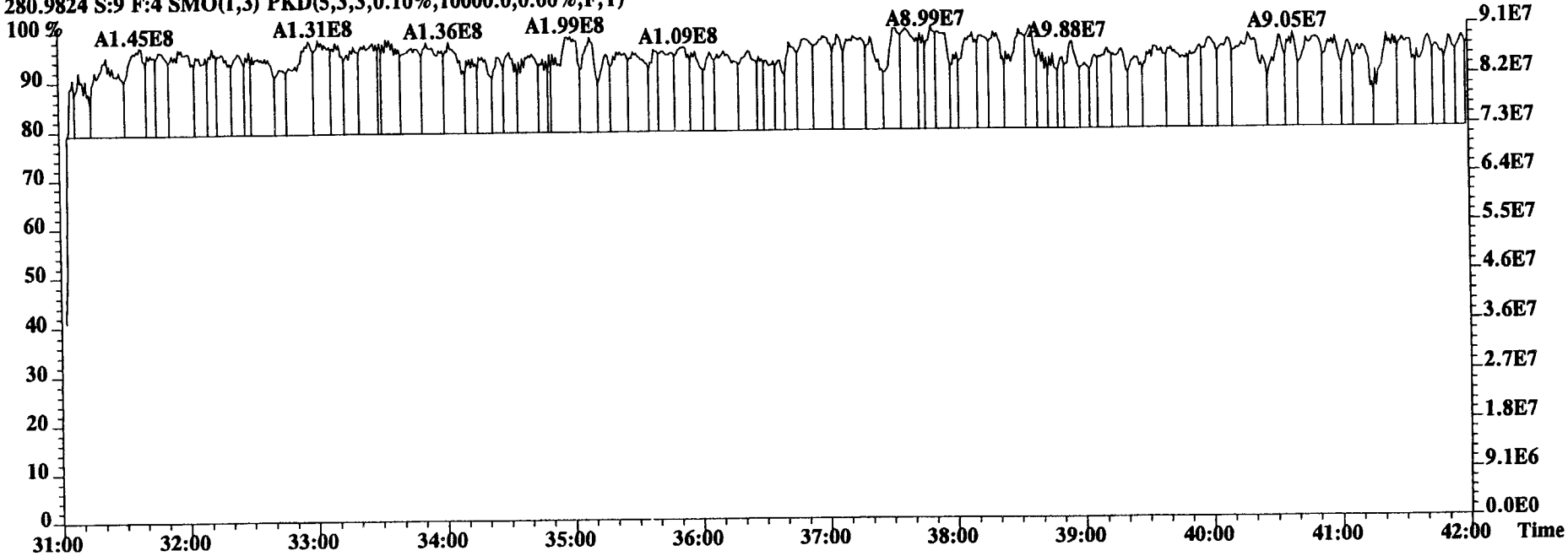
File:30OC98V4 #1-878 Acq:30-OCT-1998 23:17:42 GC EI+ Voltage SIR 70SE
Sample#9 Text:301802-6 :10X DIL. : : : Exp:PAHAIR



File:30OC98V4 #1-878 Acq:30-OCT-1998 23:17:42 GC EI+ Voltage SIR 70SE
Sample#9 Text:301802-6 :10X DIL. : : : Exp:PAHAIR
268.9824 S:9 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



280.9824 S:9 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



04-NOV-1998 05:38:56 PM Dioxin Furan Unknown RESULTS

Mass Spec : VG-4 Results : 02NO98V4131.RES : PAHAIR.TRG
GC Column : DB-5 Date analyzed : 02-NOV-98
Data file : 02NO98V4 301802-6 :100X DIL. : : : Ex Cal : PAHAIR102998V4.R
Weight : 0.5

Name	Total Response	Isotope Ratio	R. T. mm:ss	RRF	ng/ TRAIN	Rec/ MDL
d10-2-Methylnaphthalene	348000	1.00 Y	12: 29 Y	1.00	50.00	
d8-Naphthalene	510000	1.00 Y	10: 12 Y	2.24	32.70	65
Naphthalene	688320000	1.00 Y	10: 16 Y	1.23	1.1e+05	B ~~E~~
d10-Anthracene	208000	1.00 Y	20: 55 Y	1.00	50.00	
d10-Phenanthrene	622354	1.00 Y	20: 45 Y	2.81	53.29	107
Phenanthrene	153056200	1.00 Y	20: 49 Y	0.89	2.7e+04	B ~~E~~

11-4-98
CC

04-NOV-1998 05:38:52 PM Dioxin Furan Unknown RESULTS

0.5

98V4.RRF
Rec/
MDL

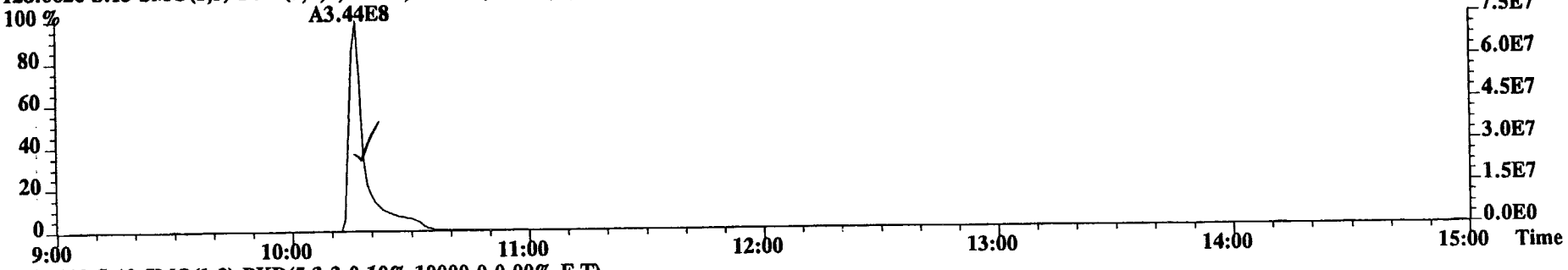
	174000	174000
65	255000	255000
B E	344160000	344160000
	104000	104000
107	311177	311177
B E	76528100	76528100

03-NOV-1998 08:43:44 AM 429AIR Unknown RESULTS

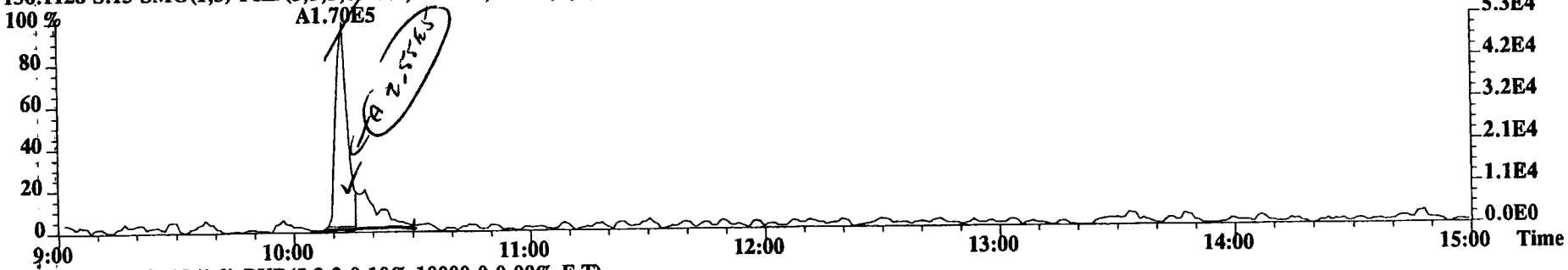
Mass Spec : VG-4 Results : 02NO98V4131.RES : PAHAIR.TRG
GC Column : DB-5 Date analyzed : 02-NOV-98
Data file : 02NO98V4 301802-6 :100X DIL. : : : Ex Cal : PAHAIR102998V4.R
Weight : 0.5

Name	Total Response	Isotope Ratio		R. T. mm:ss		RRF	ng/ TRAIN	Rec/ MDL
d10-2-Methylnaphthalene	313082	1.00	Y	12: 29	Y	1.00	50.00	
d8-Naphthalene	339338	1.00	Y	10: 12	Y	2.24	24.19	48
Naphthalene	688320000	1.00	Y	10: 16	Y	1.23	1.7e+05	0.000
2-Methylnaphthalene	84088400	1.00	Y	12: 33	Y	0.56	4.4e+04	0.000
d8-Acenaphthylene	250974	1.00	Y	15: 28	Y	1.21	33.02	66
Acenaphthylene	45451200	1.00	Y	15: 30	Y	0.94	1.9e+04	0.000
d10-Acenaphthene	163597	1.00	Y	16: 2	Y	0.74	35.09	70
Acenaphthene	9944880	1.00	Y	16: 7	Y	1.25	4878.37	0.000
d10-Anthracene	185990	1.00	Y	20: 55	Y	1.00	50.00	
d10-Fluorene	87891	1.00	Y	17: 41	Y	1.42	16.63	33
Fluorene	727086	1.00	Y	17: 47	Y	1.16	712.84	0.000
d10-Phenanthrene	622354	1.00	Y	20: 45	Y	2.81	59.59	119
Phenanthrene	153056200	1.00	Y	20: 49	Y	0.89	2.7e+04	0.000
Anthracene	* No Peak	0.00	N	20: 59	N	0.80	0.00	0.000
d14-Terphenyl	516988	1.00	Y	26: 2	Y	1.00	50.00	
d10-Fluoranthene	337802	1.00	Y	24: 36	Y	1.41	23.16	46
Fluoranthene	24047000	1.00	Y	24: 39	Y	1.11	6403.00	0.000
d10-Pyrene	392988	1.00	Y	25: 18	Y	1.52	25.03	50
Pyrene	13061900	1.00	Y	25: 21	Y	1.21	2758.16	0.000
d12-Benzo(a)anthracene	275340	1.00	Y	29: 12	Y	0.90	29.59	59
Benzo(a)anthracene	* No Peak	0.00	N	29: 14	N	1.20	0.00	0.000
d12-Chrysene	295068	1.00	Y	29: 18	Y	1.28	22.31	45
Chrysene	6311320	1.00	Y	29: 22	Y	1.08	1973.25	0.000
d12-Benzo(e)pyrene	842284	1.00	Y	33: 25	Y	1.00	50.00	
d12-Benzo(b)fluoranthene	135660	1.00	Y	32: 33	Y	0.45	17.74	35
Benzo(b)fluoranthene	289624	1.00	Y	32: 39	Y	1.17	182.90	0.000
d12-Benzo(k)fluoranthene	578002	1.00	Y	32: 40	Y	0.95	36.19	72
Benzo(k)fluoranthene	289624	1.00	Y	32: 39	Y	1.16	43.04	0.000
d12-Benzo(a)pyrene	122647	1.00	Y	33: 40	Y	0.68	10.76	22
Benzo(e)pyrene	264256	1.00	Y	33: 31	Y	1.64	131.31	0.000
Benzo(a)pyrene	* No Peak	0.00	N	33: 41	N	1.07	0.00	0.000
d12-Perylene	43231	1.00	Y	33: 55	Y	0.63	4.07	8
Perylene	* No Peak	0.00	N	33: 58	N	1.71	0.00	0.000
d12-Indeno(123-cd)pyrene	* No Peak	0.00	N	38: 4	N	0.44	0.00	0
Indeno(123-cd)pyrene	* No Peak	0.00	N	38: 11	N	0.62	*NoINoIs	
d14-Dibenz(ah)anthracene	* No Peak	0.00	N	38: 8	N	0.25	0.00	0
Dibenz(ah)anthracene	* No Peak	0.00	N	38: 18	N	1.40	*NoINoIs	
d12-Benzo(ghi)perylene	114185	1.00	Y	39: 17	Y	0.58	11.69	23
Benzo(ghi)perylene	126093	1.00	Y	39: 26	Y	1.02	108.69	0.000
d10-Fluorene	87891	1.00	Y	17: 41	Y	1.42	3.67	7
13C-Fluorene	* No Peak	0.00	N	17: 49	N	1.00	0.00	0.000

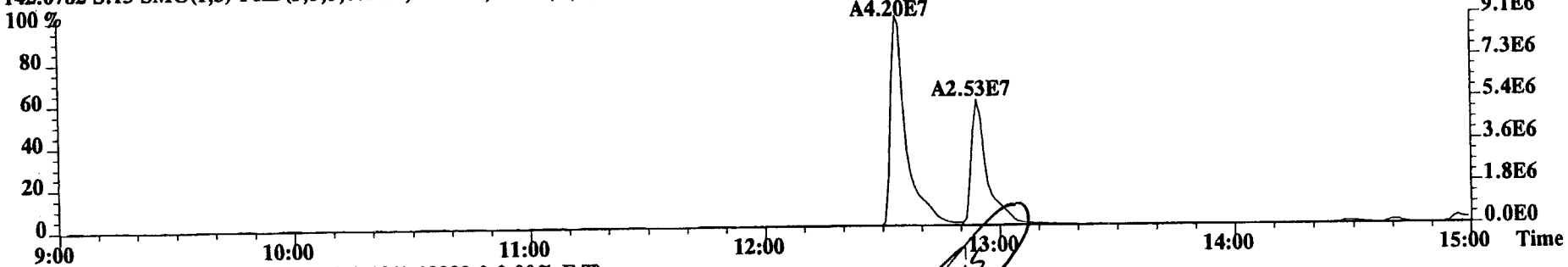
File:02NO98V4 #1-510 Acq: 2-NOV-1998 23:01:38 GC EI+ Voltage SIR 70SE
Sample#13 Text:301802-6 :100X DIL. : : : Exp:PAHAIR
128.0626 S:13 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



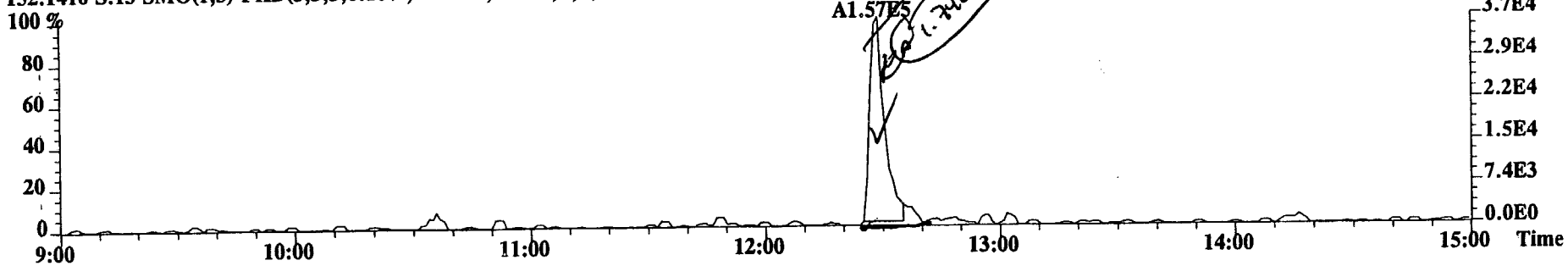
136.1128 S:13 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



142.0782 S:13 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

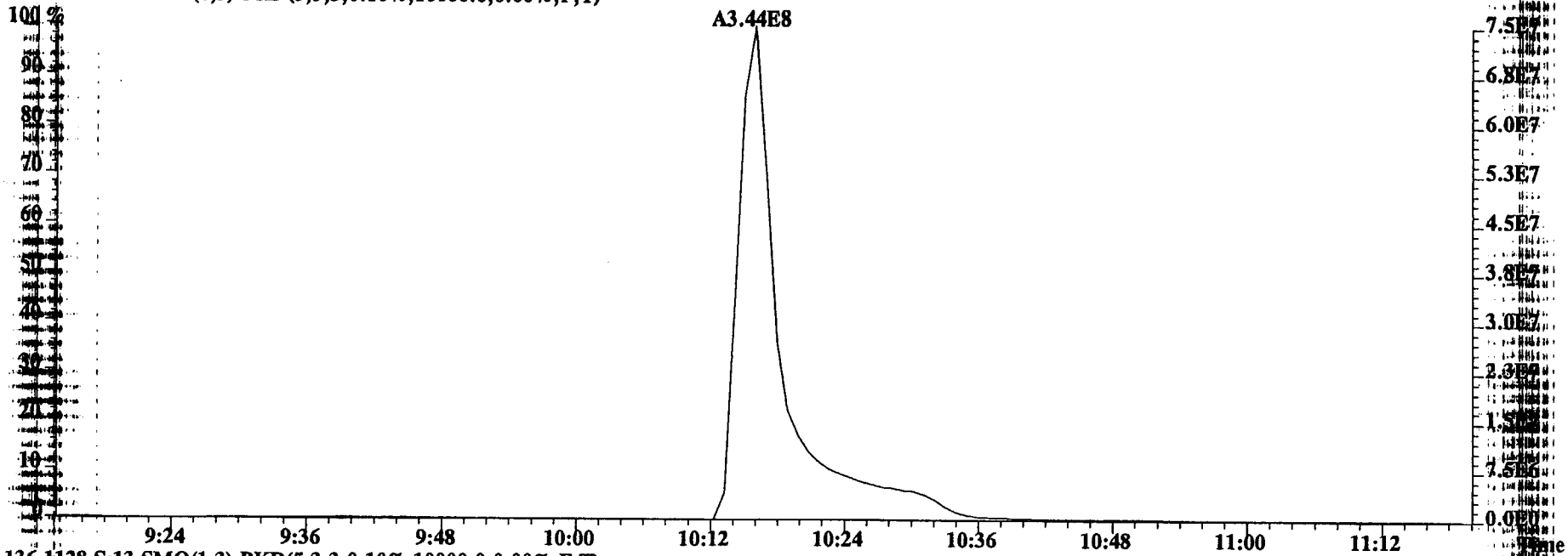


152.1410 S:13 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

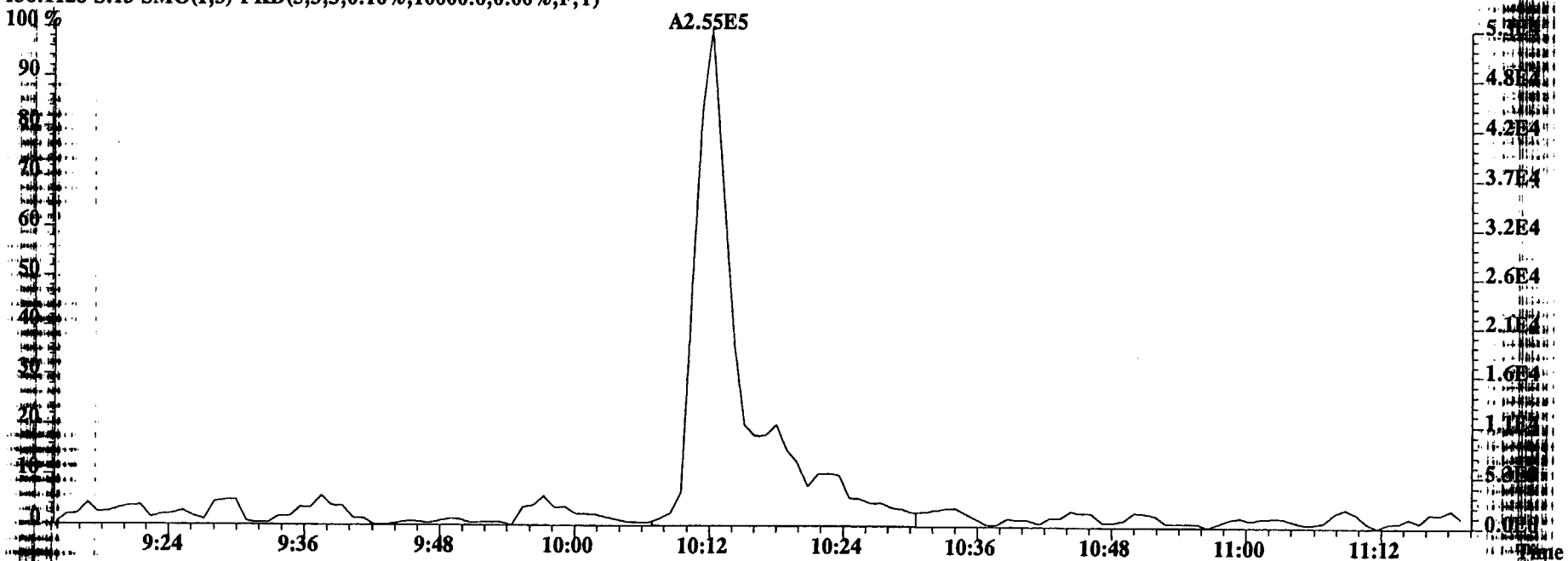


292

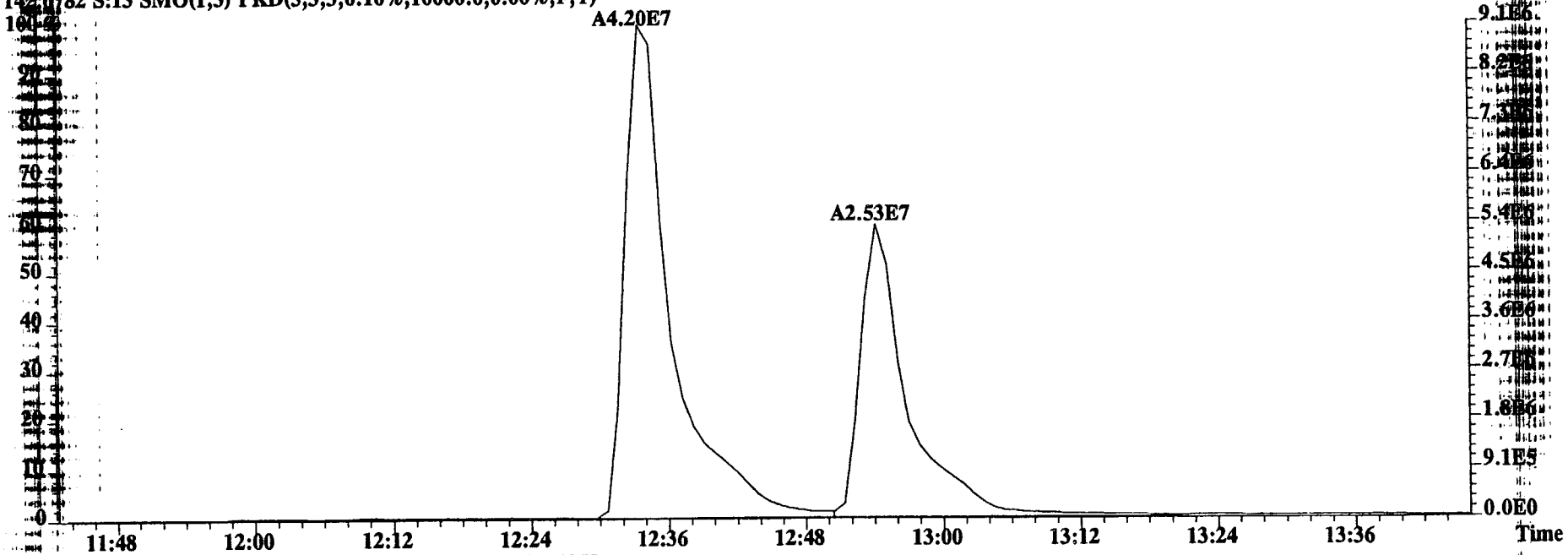
File:02NO98V4 #1-510 Acq: 2-NOV-1998 23:01:38 GC EI+ Voltage SIR 70SE
Sample#13 Text:301802-6 :100X DIL. : : : Exp:PAHAIR
128.0626 S:13 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



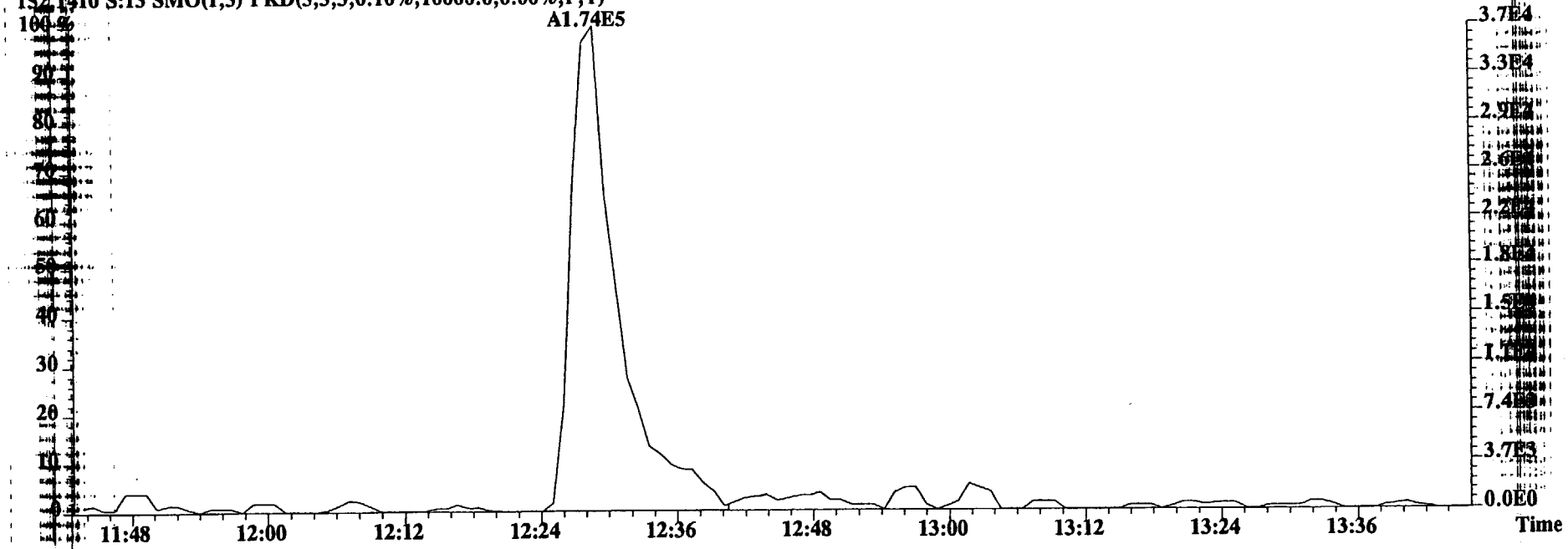
136.1128 S:13 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



File:02NO98V4 #1-510 Acq: 2-NOV-1998 23:01:38 GC EI+ Voltage SIR 70SE
Sample#13 Text:301802-6 :100X DIL. : : : Exp:PAHAIR
142.0782 S:13 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

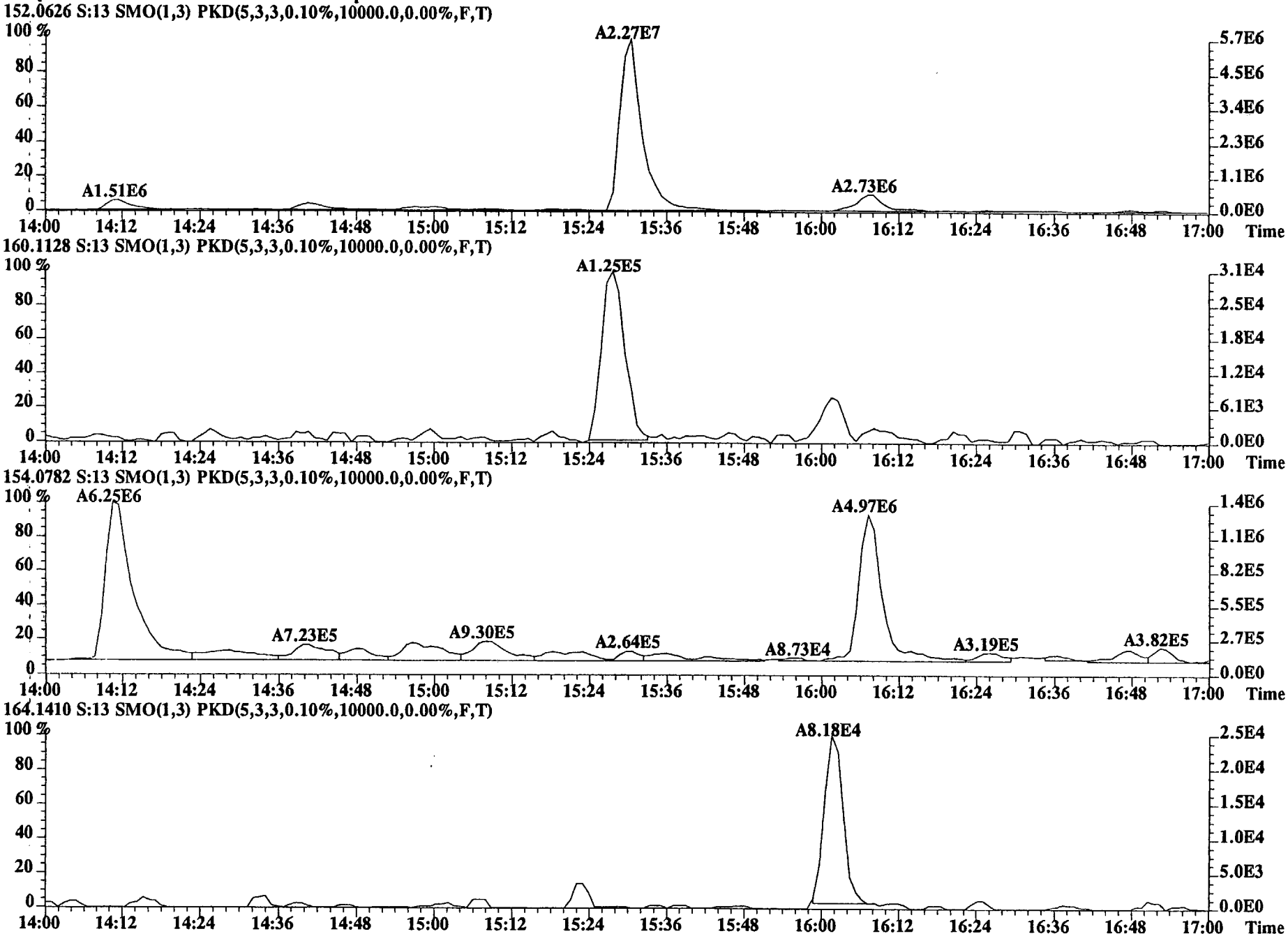


152.1410 S:13 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



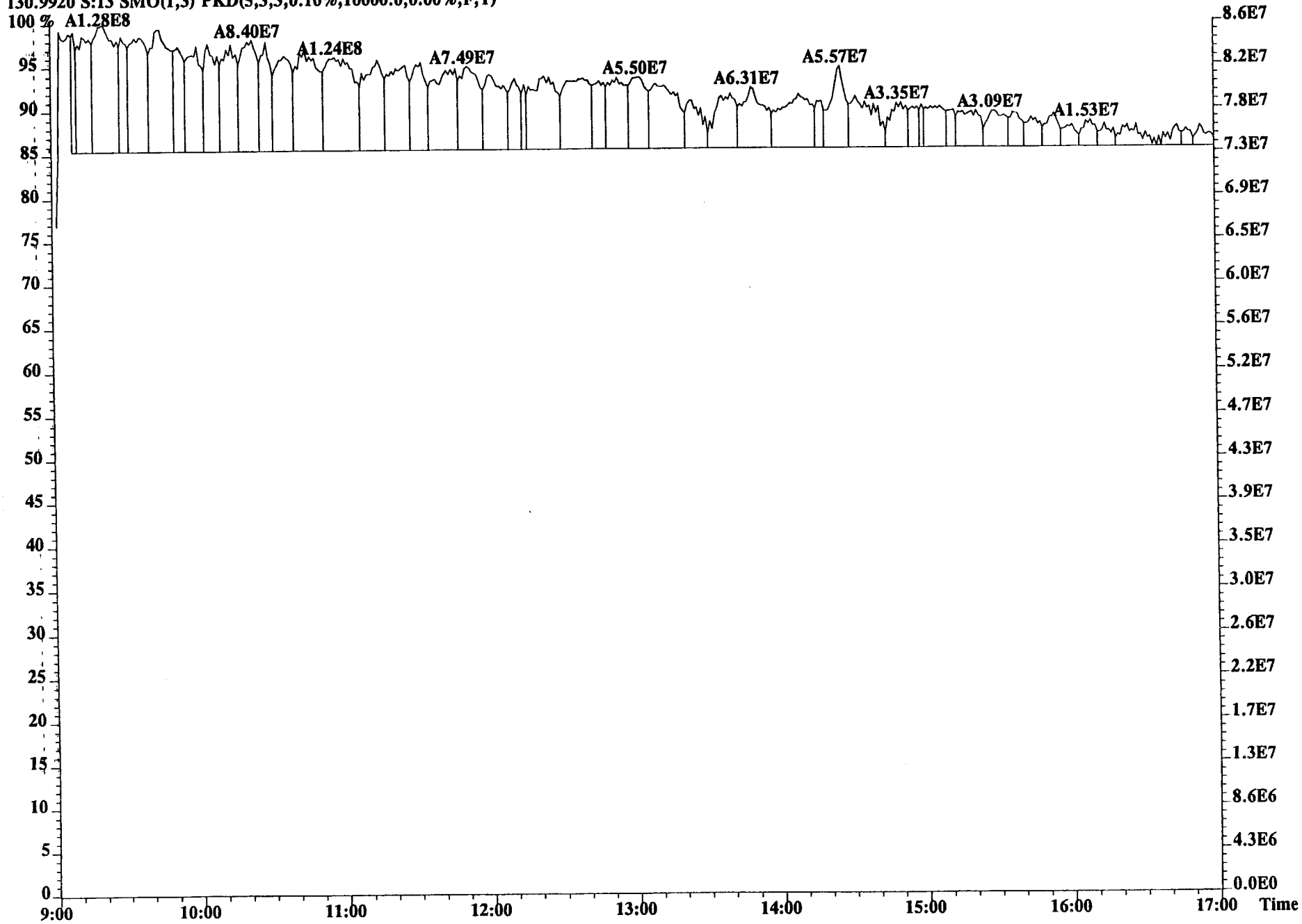
264

File:02NO98V4 #1-510 Acq: 2-NOV-1998 23:01:38 GC EI+ Voltage SIR 70SE
Sample#13 Text:301802-6 :100X DIL. : : : Exp:PAHAIR

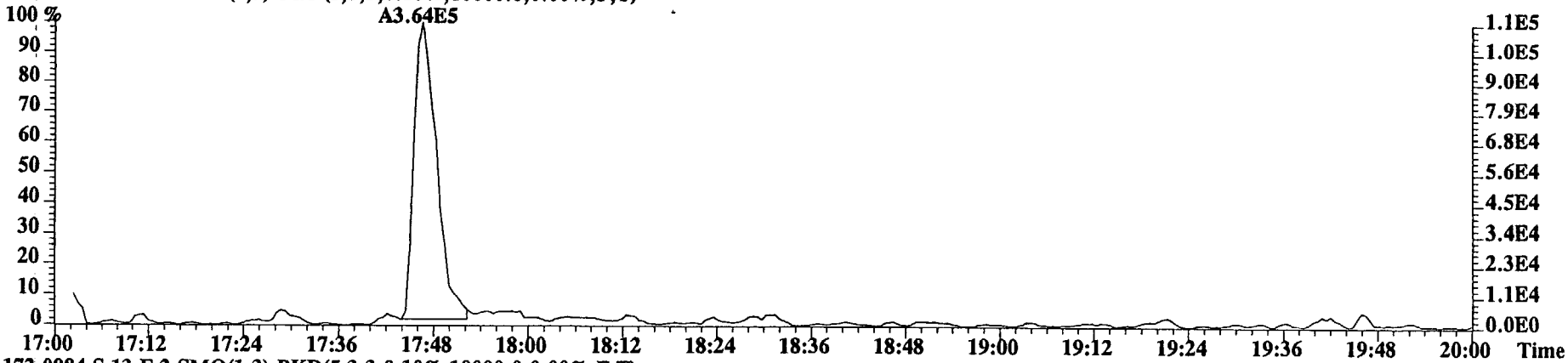


265

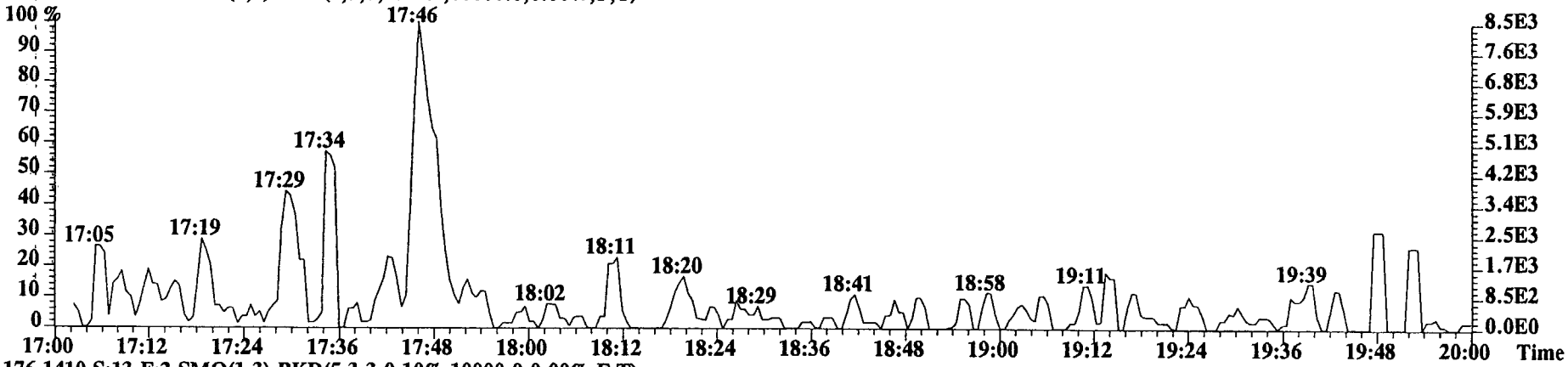
File:02NO98V4 #1-510 Acq: 2-NOV-1998 23:01:38 GC EI+ Voltage SIR 70SE
Sample#13 Text:301802-6 :100X DIL. : : : Exp:PAHAIR
130.9920 S:13 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



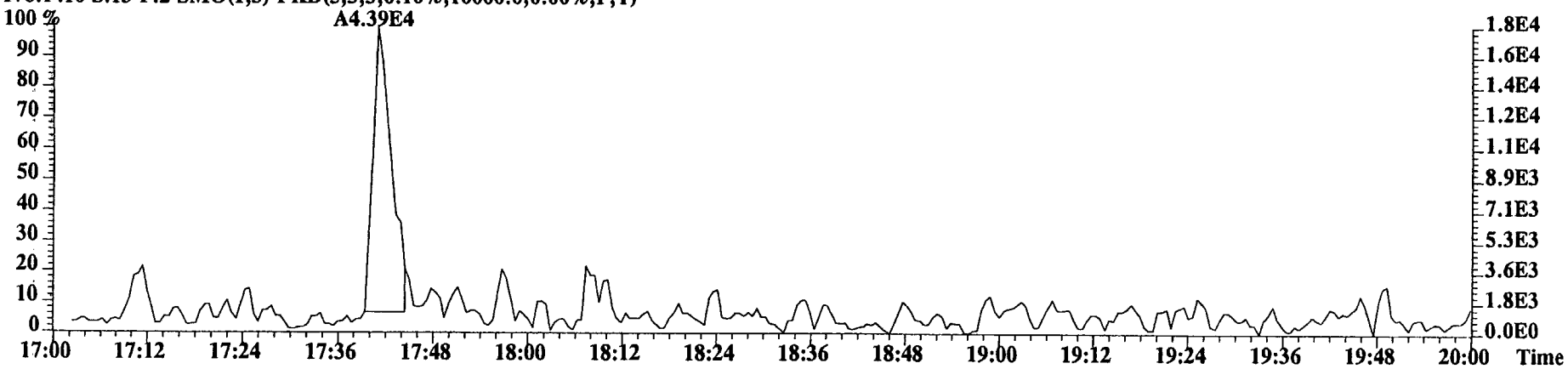
File:02NO98V4 #1-640 Acq: 2-NOV-1998 23:01:38 GC EI+ Voltage SIR 70SE
Sample#13 Text:301802-6 :100X DIL. : : : Exp:PAHAIR
166.0798 S:13 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



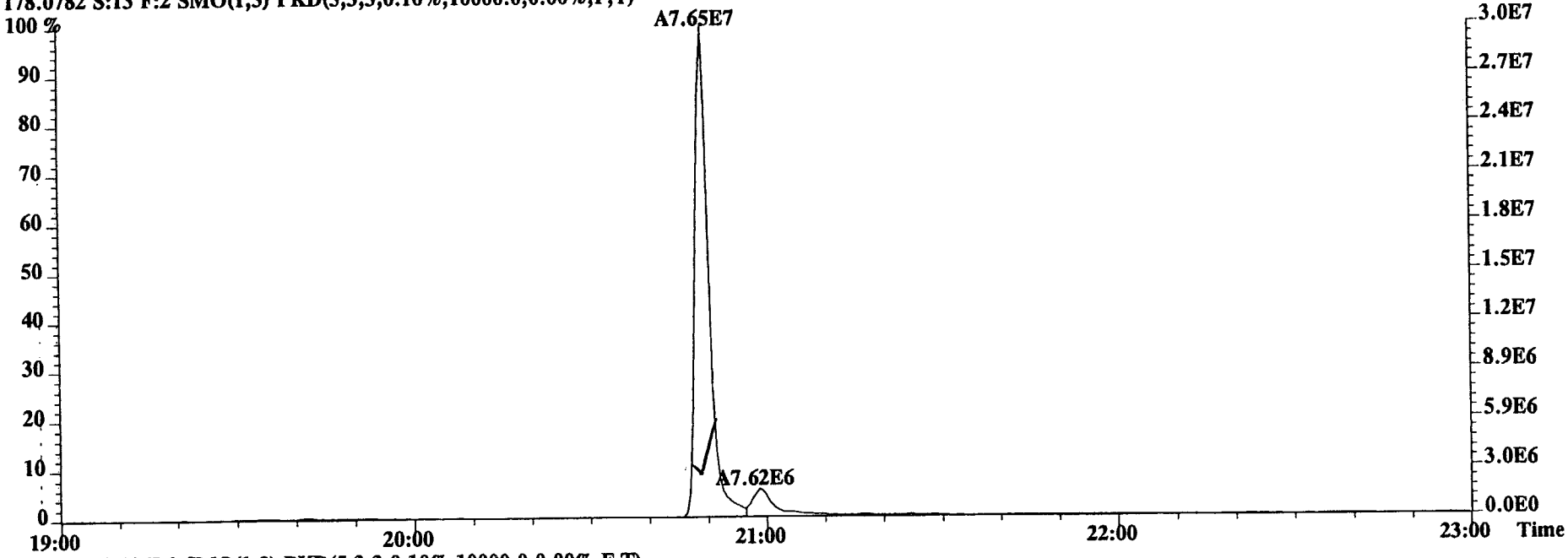
172.0984 S:13 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



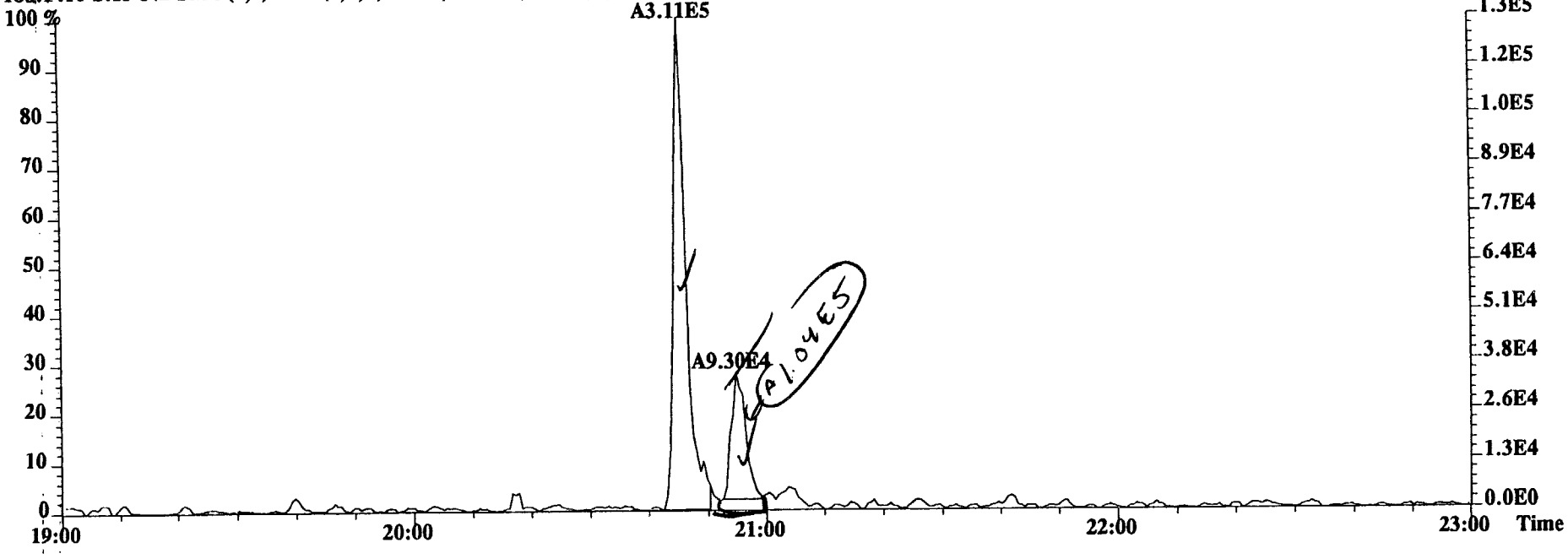
176.1410 S:13 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



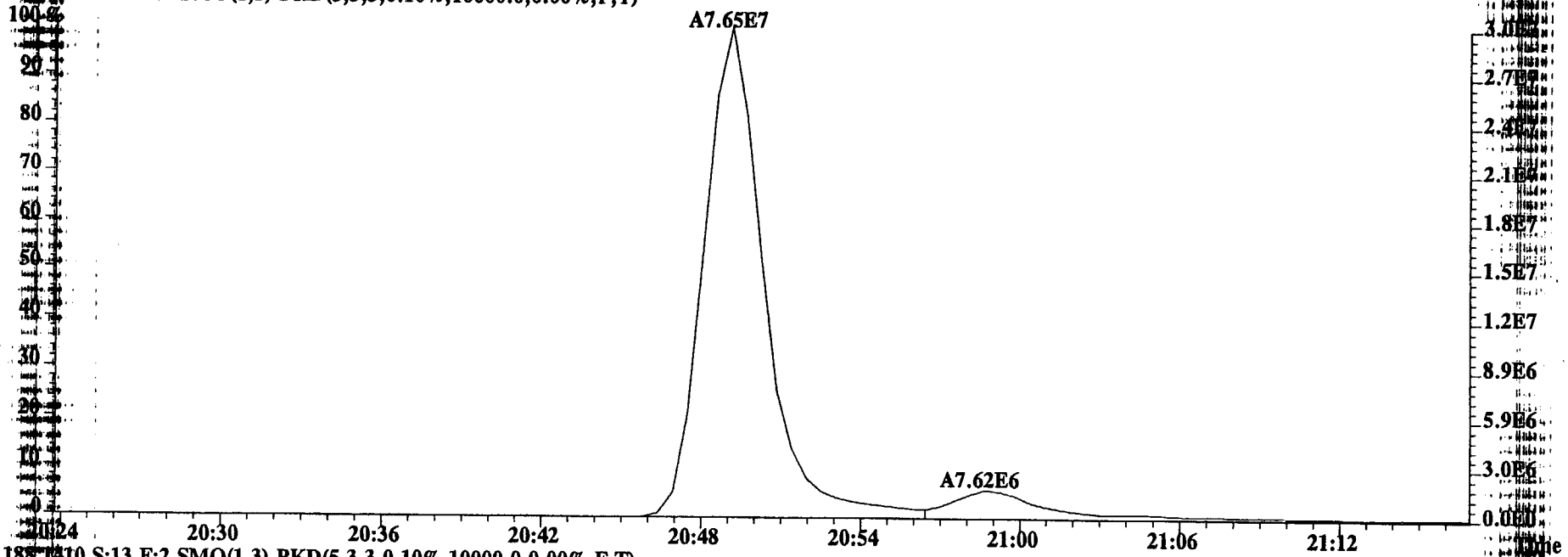
File:02NO98V4 #1-640 Acq: 2-NOV-1998 23:01:38 GC EI+ Voltage SIR 70SE
Sample#13 Text:301802-6 :100X DIL. : : : Exp:PAHAIR
178.0782 S:13 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



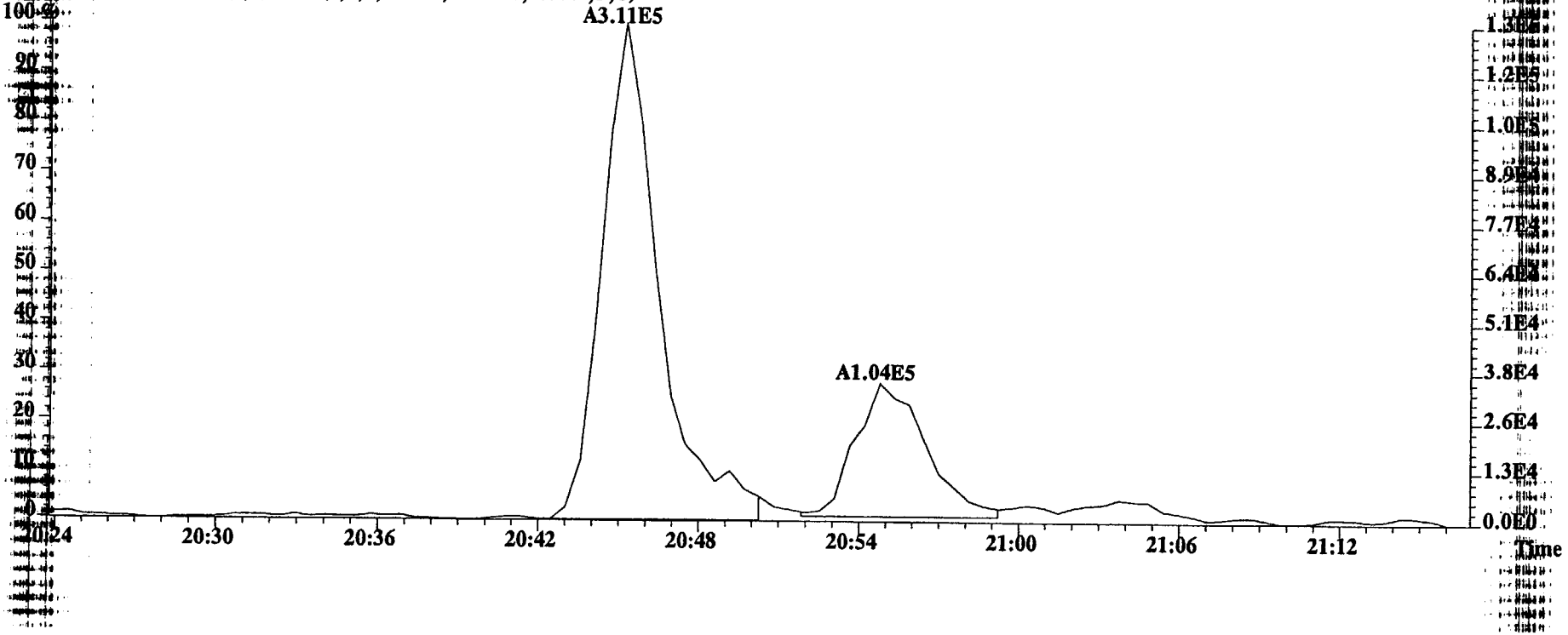
188.1410 S:13 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



File:02NO98V4 #1-640 Acq: 2-NOV-1998 23:01:38 GC EI+ Voltage SIR 70SE
Sample#13 Text:301802-6 :100X DIL. : : : Exp:PAHAIR
178:0782 S:13 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



188:0810 S:13 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



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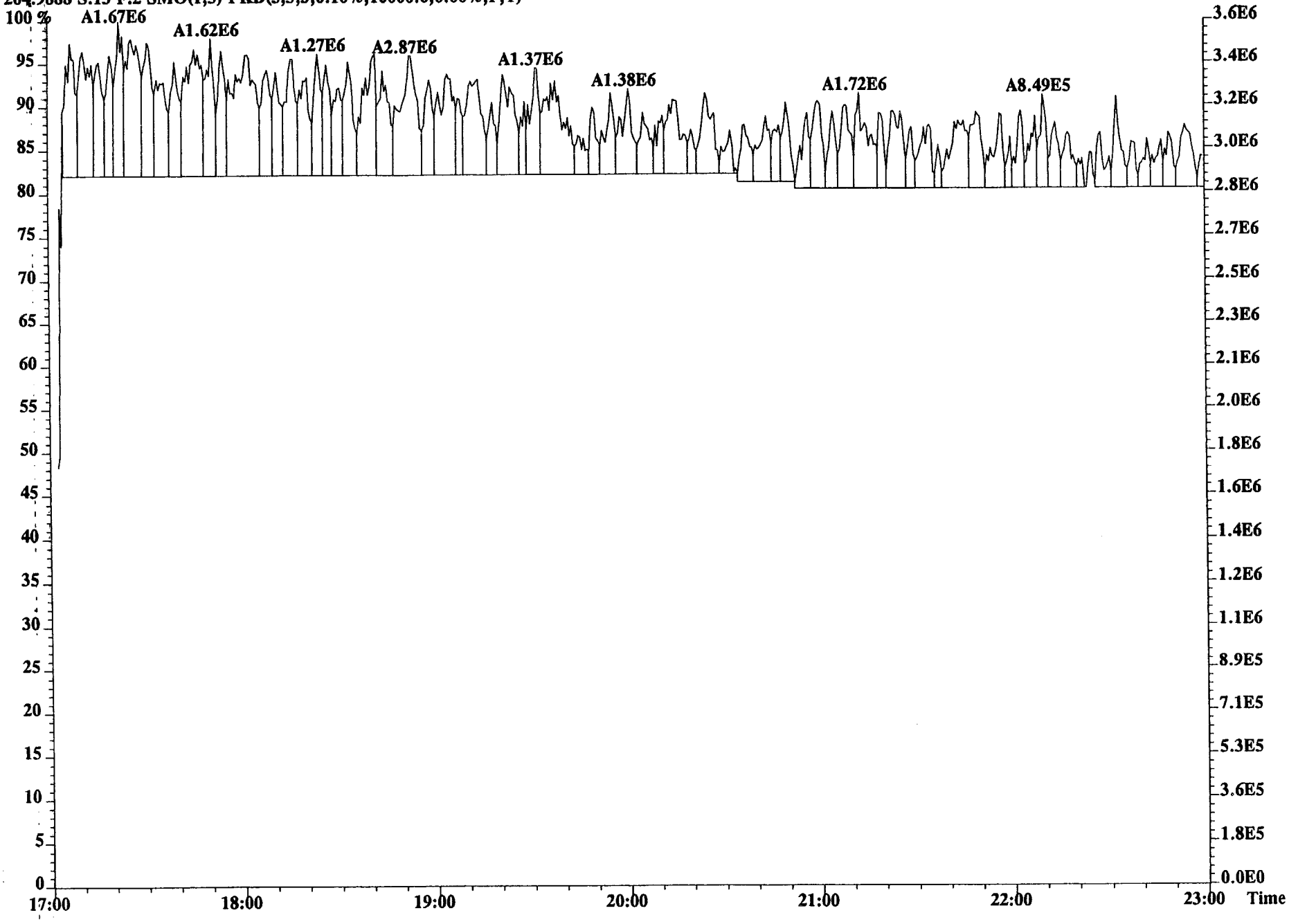
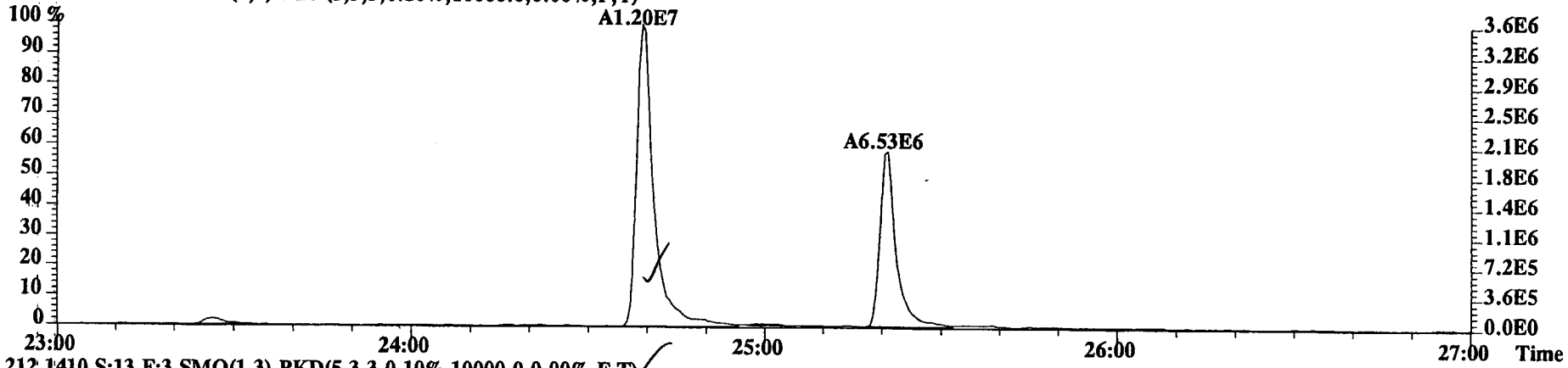
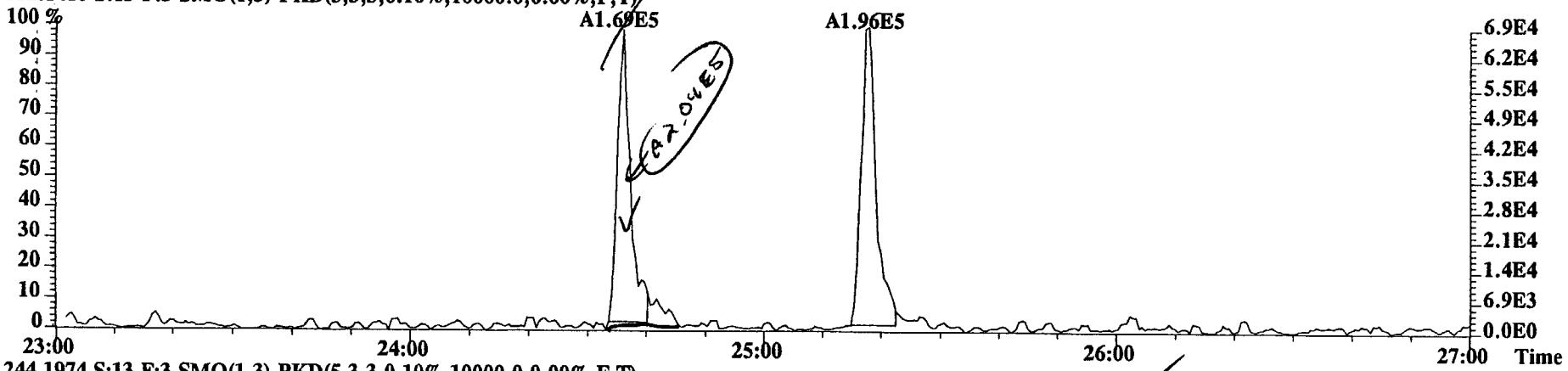
File:02NO98V4 #1-640 Acq: 2-NOV-1998 23:01:38 GC EI+ Voltage SIR 70SE
Sample#13 Text:301802-6 :100X DIL. : : : Exp:PAHAIR
204.9888 S:13 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



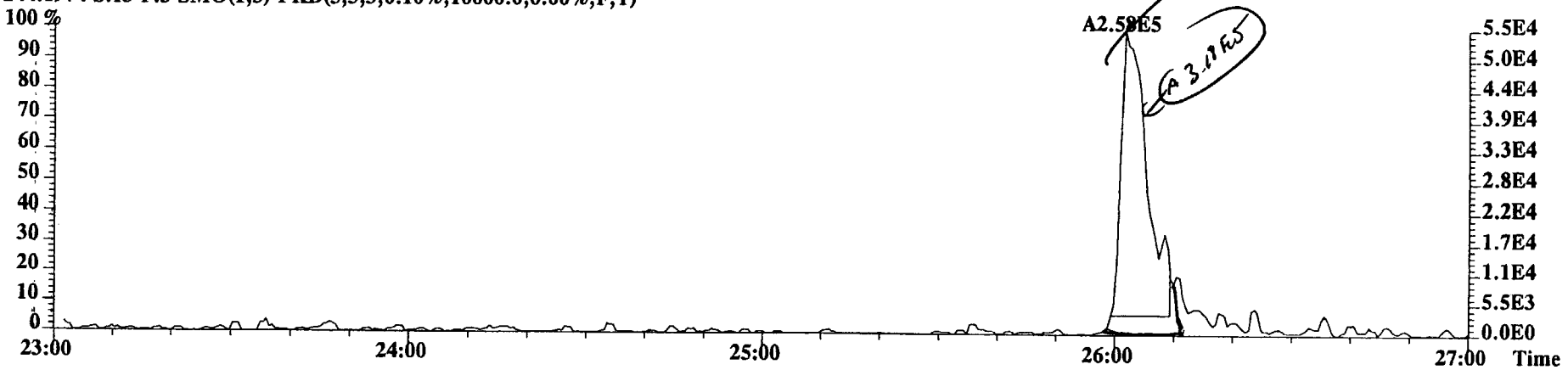
File:02NO98V4 #1-939 Acq: 2-NOV-1998 23:01:38 GC EI+ Voltage SIR 70SE
Sample#13 Text:301802-6 :100X DIL. : : : Exp:PAHAIR
202.0782 S:13 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



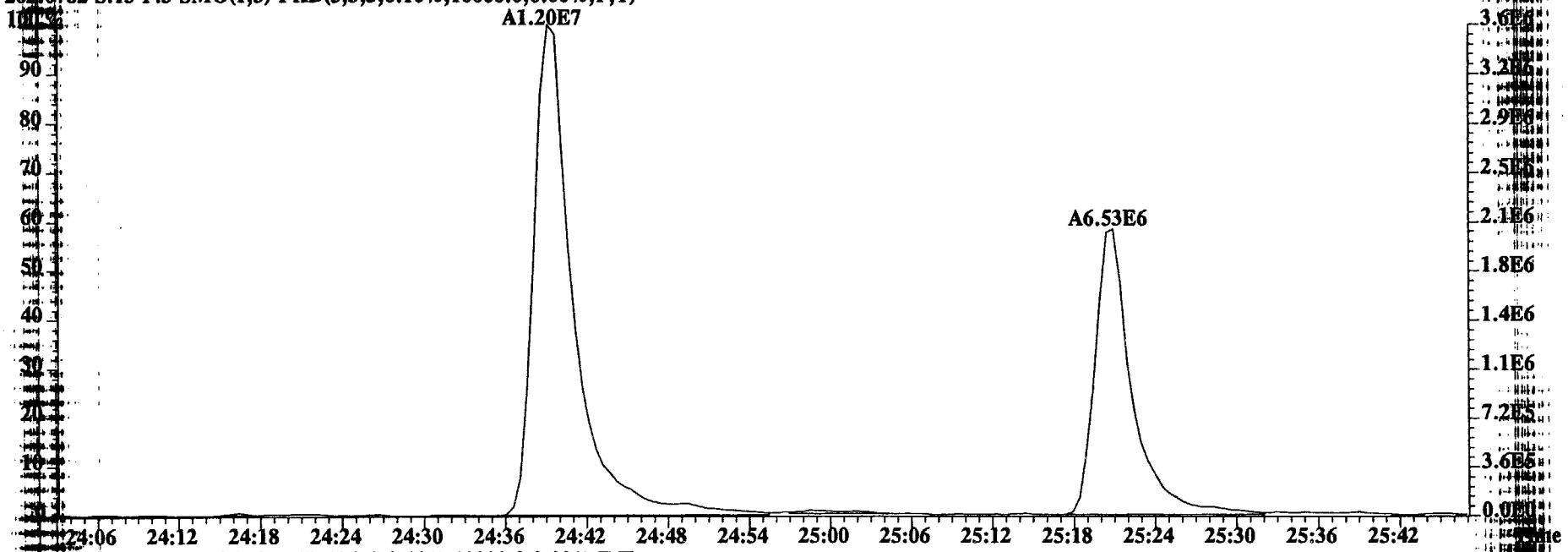
212.1410 S:13 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



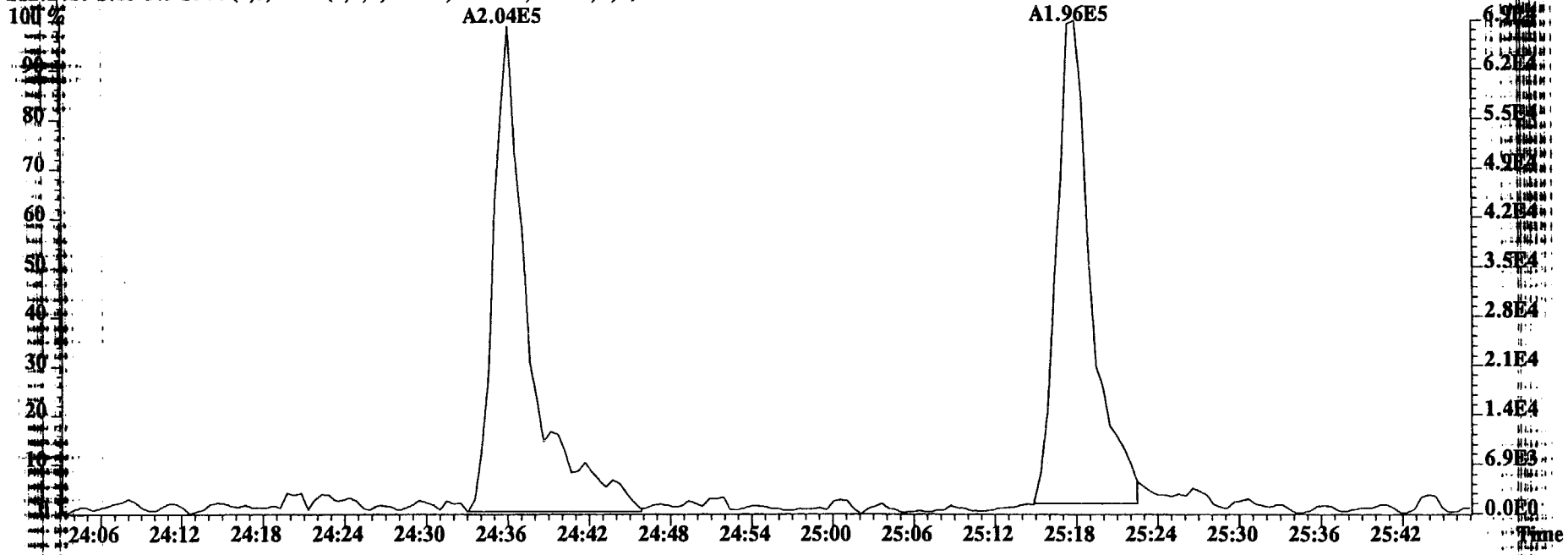
244.1974 S:13 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



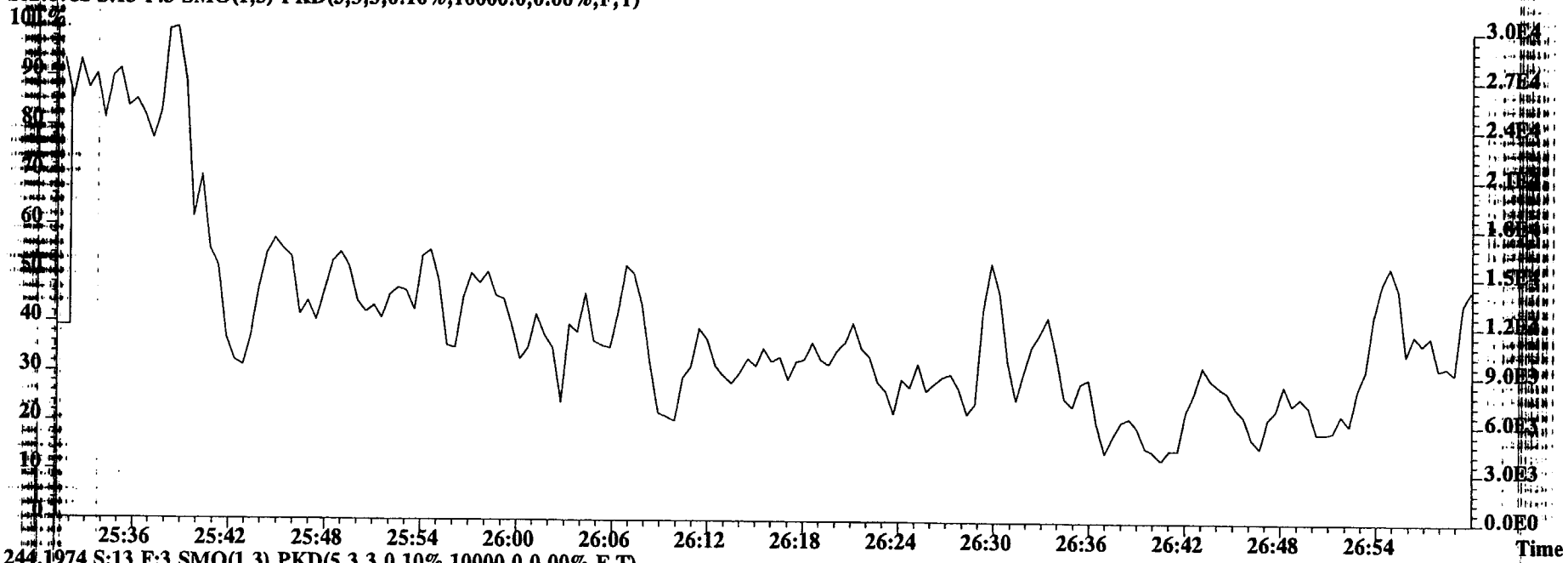
File:02NO98V4 #1-939 Acq: 2-NOV-1998 23:01:38 GC EI+ Voltage SIR 70SE
Sample#13 Text:301802-6 :100X DIL. : : : Exp:PAHAIR
202.0782 S:13 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



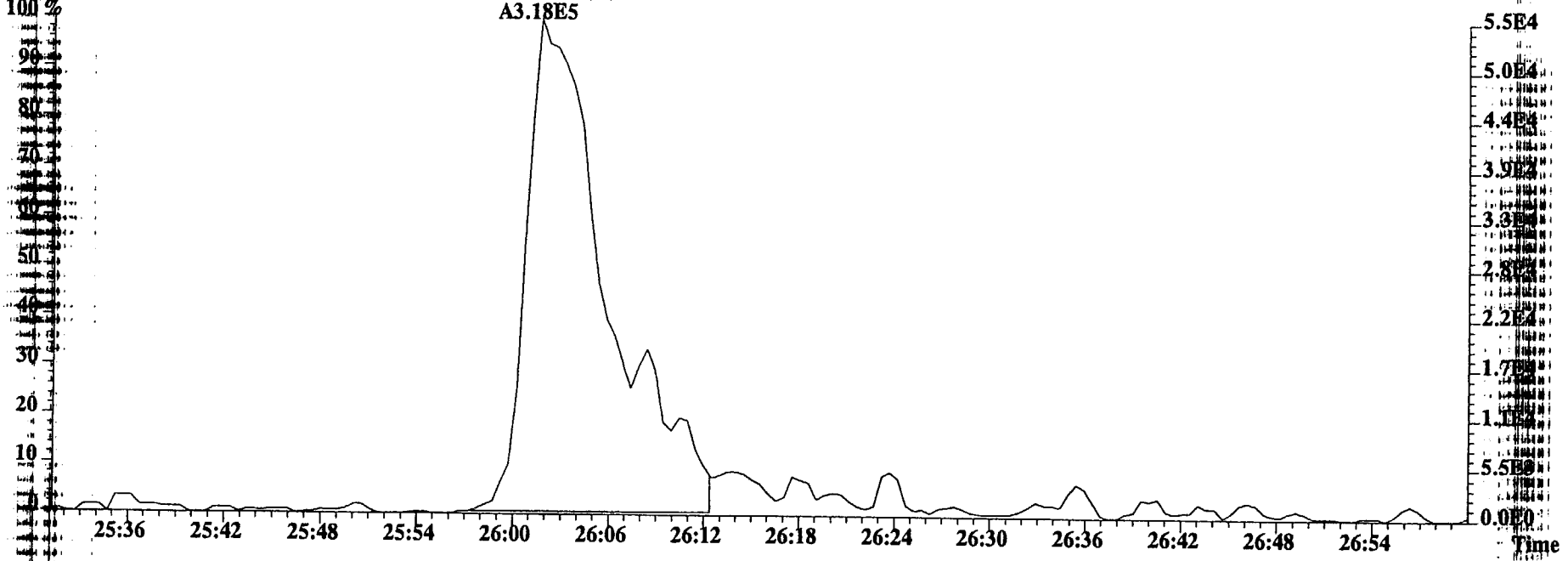
212.1410 S:13 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



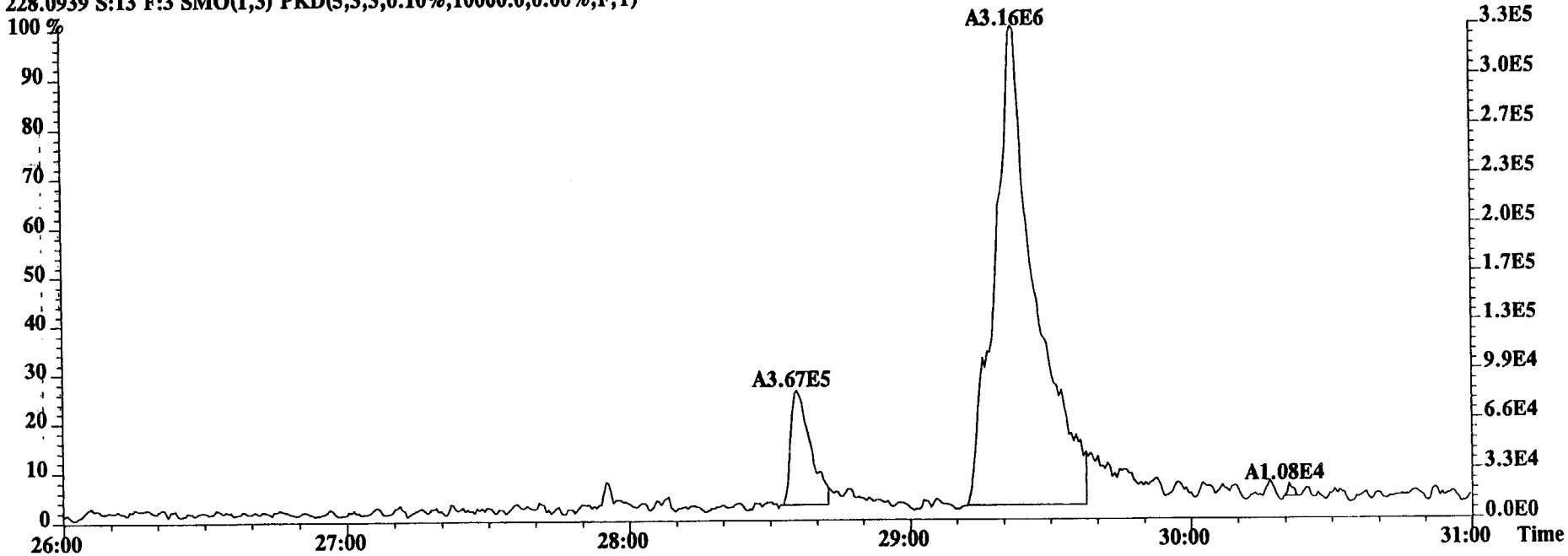
File:02NO98V4 #1-939 Acq: 2-NOV-1998 23:01:38 GC EI+ Voltage SIR 70SE
Sample#13 Text:301802-6 :100X DIL. : : : Exp:PAHAIR
202.0782 S:13 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



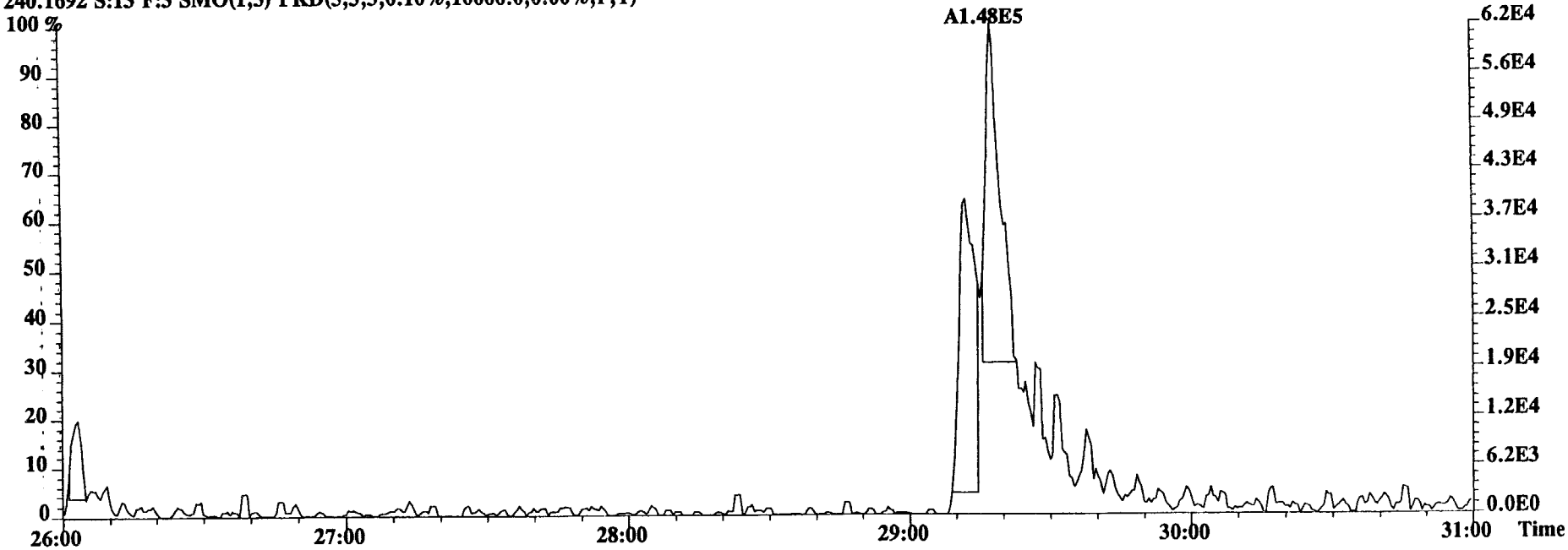
244.1974 S:13 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



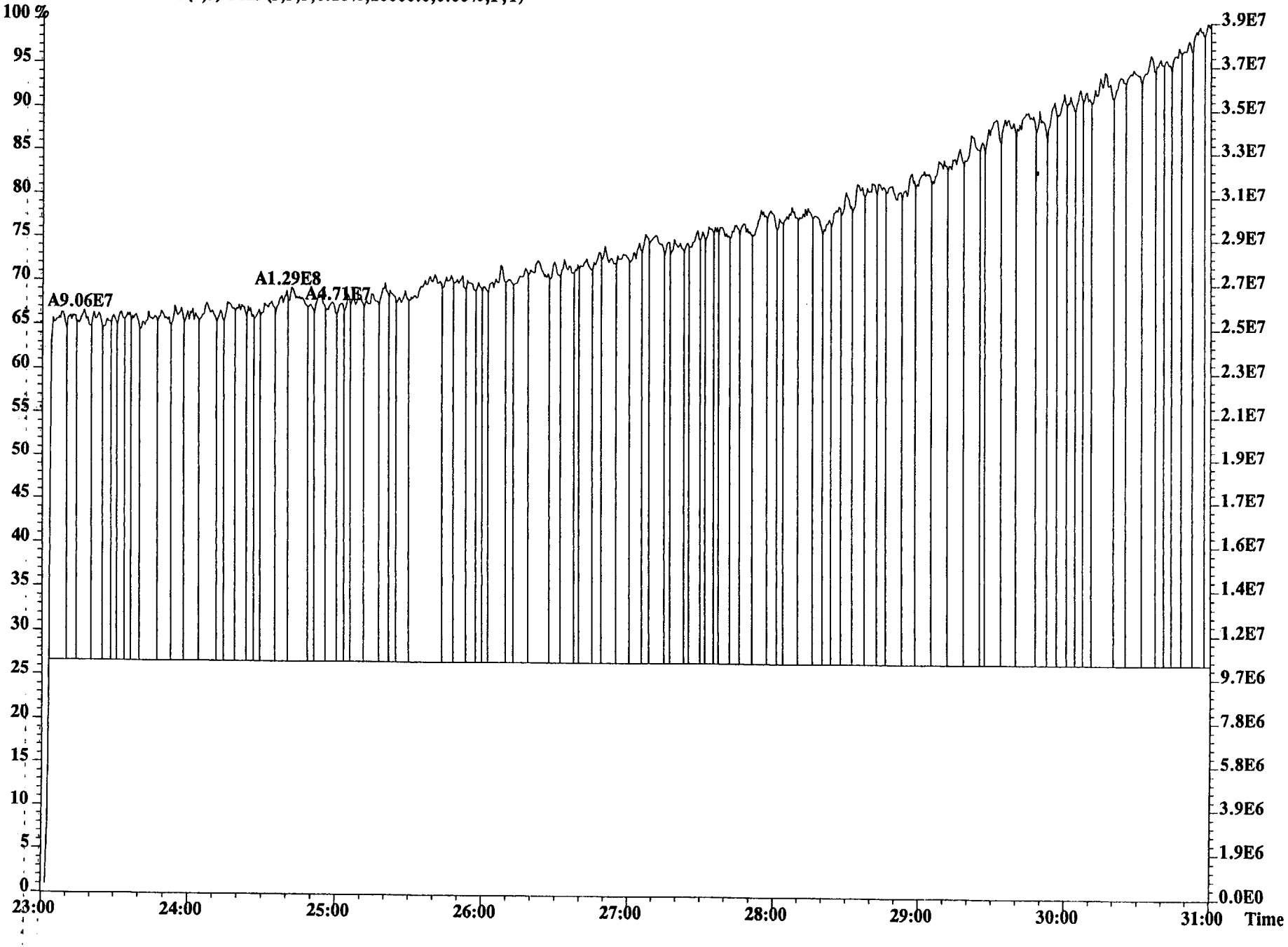
File:02NO98V4 #1-939 Acq: 2-NOV-1998 23:01:38 GC EI+ Voltage SIR 70SE
Sample#13 Text:301802-6 :100X DIL. : : : Exp:PAHAIR
228.0939 S:13 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



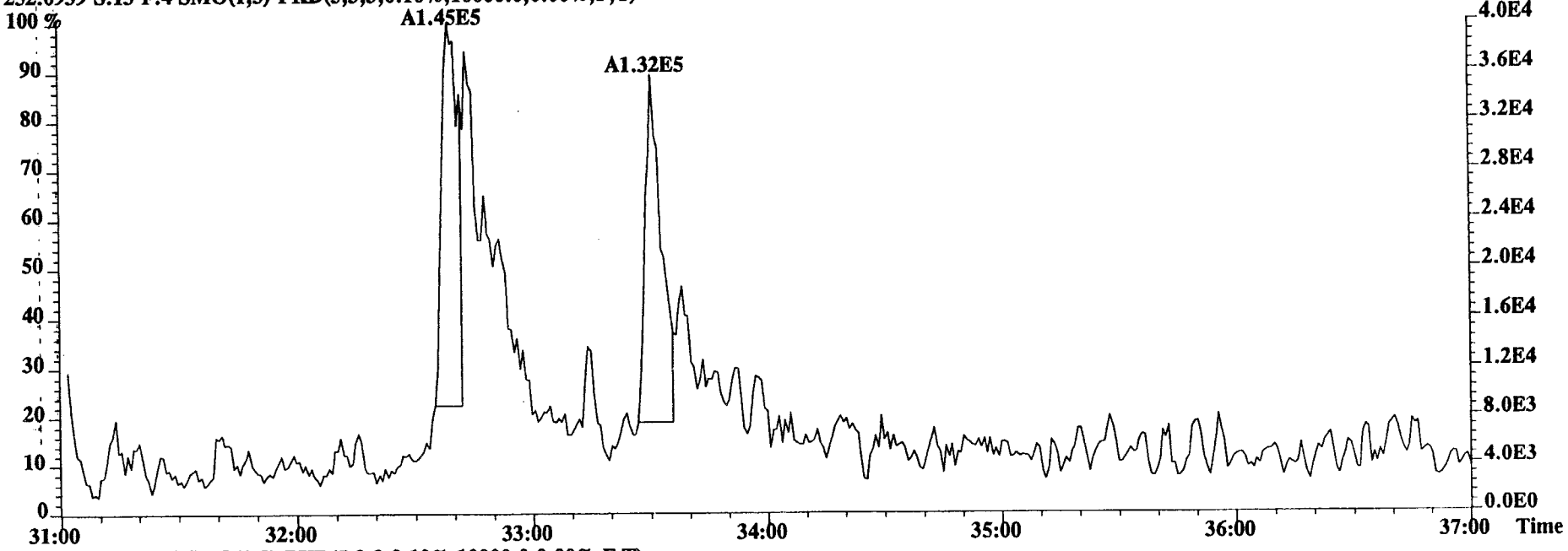
240.1692 S:13 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



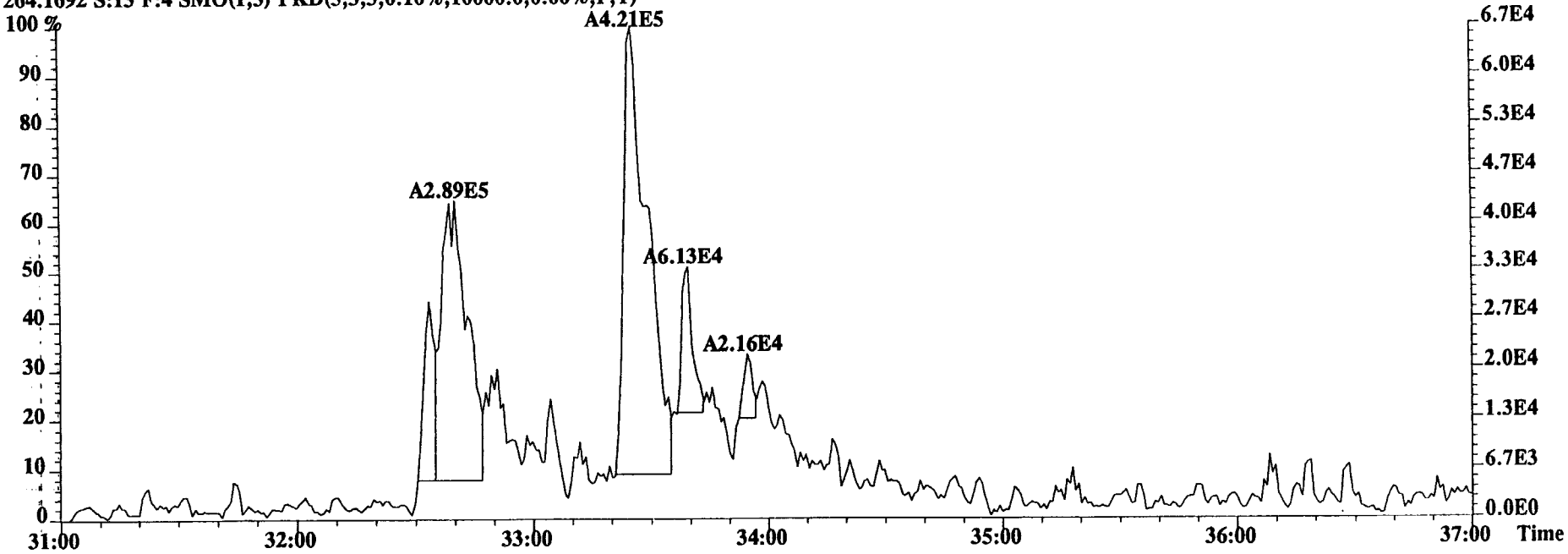
File:02NO98V4 #1-939 Acq: 2-NOV-1998 23:01:38 GC EI+ Voltage SIR 70SE
Sample#13 Text:301802-6 :100X DIL. : : : Exp:PAHAIR
230.9856 S:13 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



File:02NO98V4 #1-878 Acq: 2-NOV-1998 23:01:38 GC EI+ Voltage SIR 70SE
Sample#13 Text:301802-6 :100X DIL. : : : Exp:PAHAIR
252.0939 S:13 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

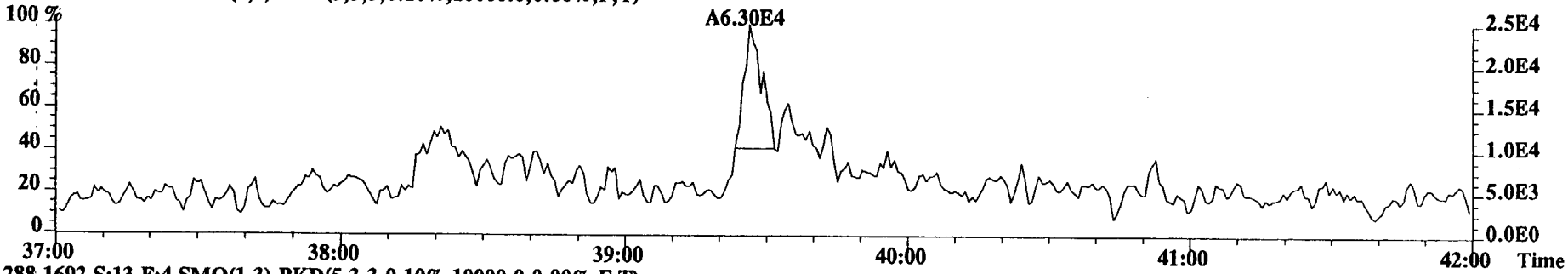


264.1692 S:13 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

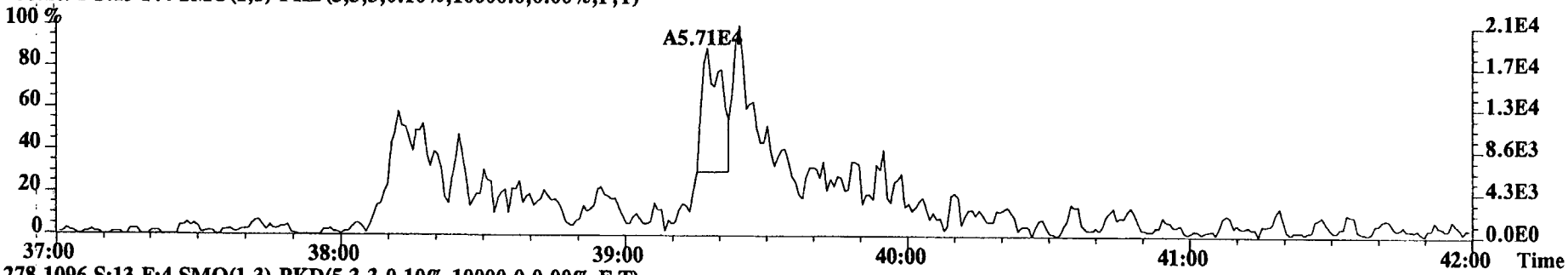


File:02NO98V4 #1-878 Acq: 2-NOV-1998 23:01:38 GC EI+ Voltage SIR 70SE
Sample#13 Text:301802-6 :100X DIL. : : : Exp:PAHAIR

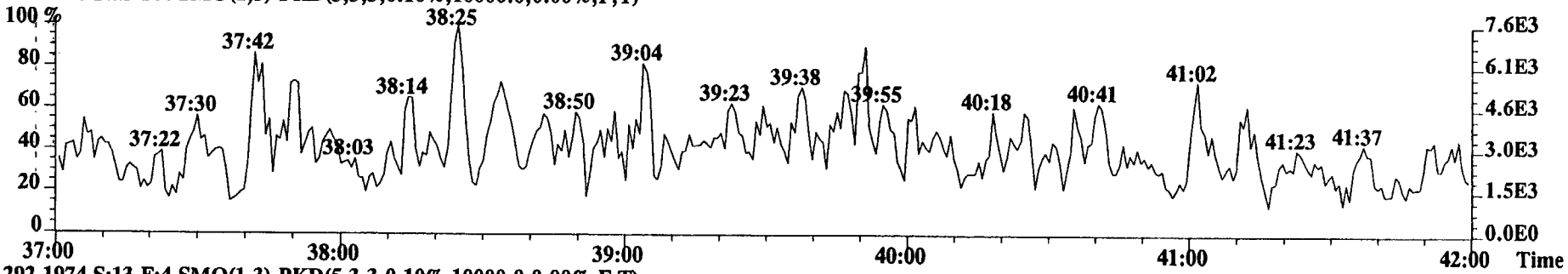
276.0939 S:13 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



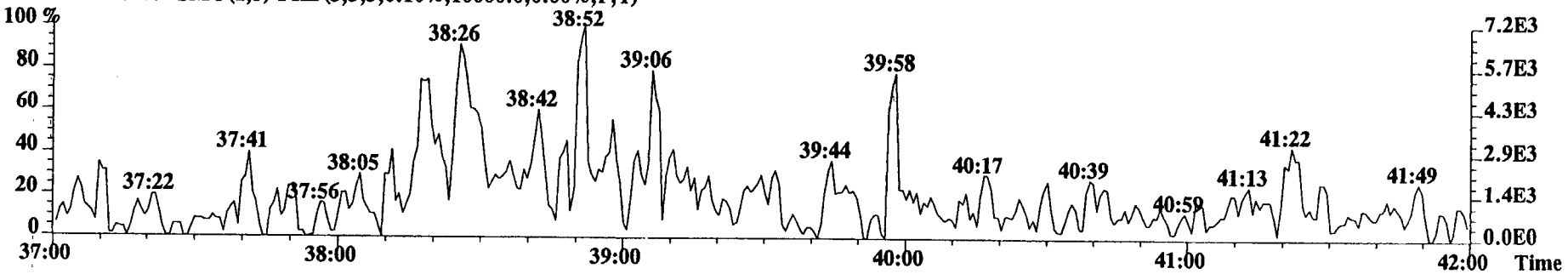
288.1692 S:13 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



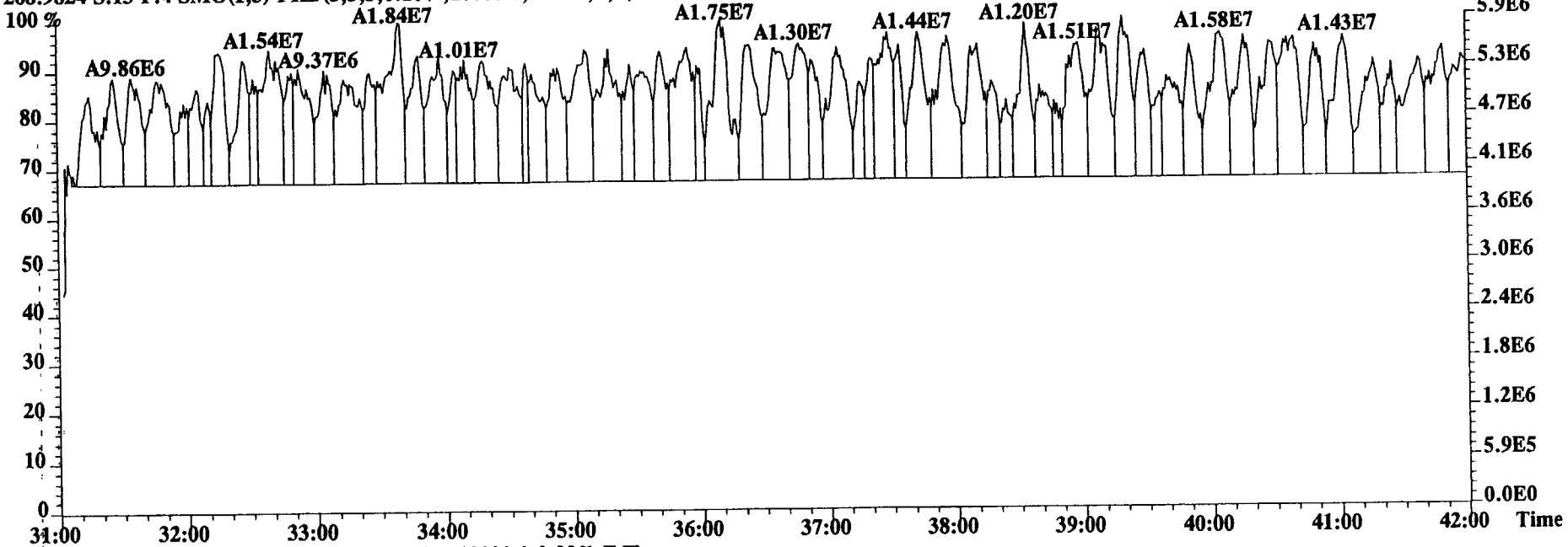
278.1096 S:13 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



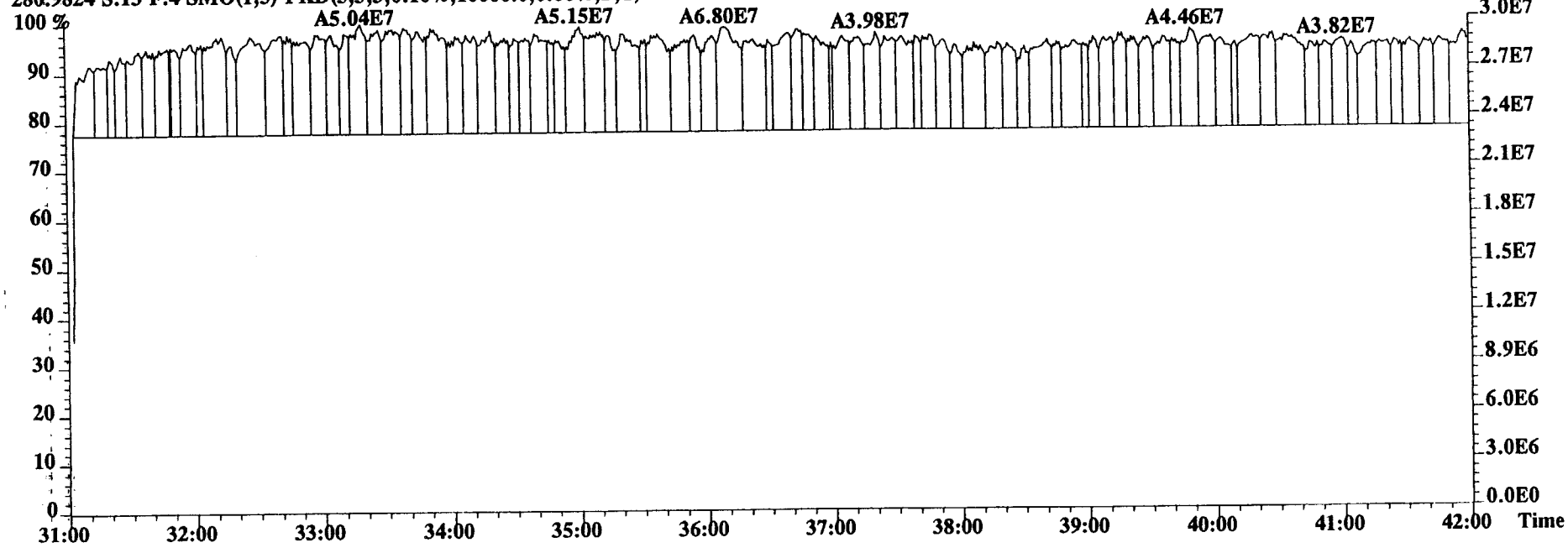
292.1974 S:13 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



File:02NO98V4 #1-878 Acq: 2-NOV-1998 23:01:38 GC EI+ Voltage SIR 70SE
Sample#13 Text:301802-6 :100X DIL. : : : Exp:PAHAIR
268.9824 S:13 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



280.9824 S:13 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



POLYNUCLEAR AROMATIC HYDROCARBONS
HIGH RESOLUTION GC/MS
Method HRGC/HRMS

Client Name: Pacific Environmental Services
Client ID: A-U-429-1
Lab ID: 301802-0007-SA
Matrix: AIRTRAIN Sampled: 24 SEP 98 Received: 29 SEP 98
Authorized: 29 SEP 98 Prepared: 03 OCT 98 Analyzed: 31 OCT 98
Dilution Factor: 1.0

Parameter	Result	Units	Reporting Limit	Data Qualifiers
Naphthalene	100000	ng/sample	--	B
2-Methylnaphthalene	2900	ng/sample	--	B
Acenaphthylene	16000	ng/sample	--	F
Acenaphthene	280	ng/sample	--	
Fluorene	930	ng/sample	--	
Phenanthrene	11000	ng/sample	--	B
Anthracene	310	ng/sample	--	
Fluoranthene	5400	ng/sample	--	
Pyrene	2700	ng/sample	--	
Benzo(a)anthracene	160	ng/sample	--	
Chrysene	380	ng/sample	--	
Benzo(b)fluoranthene	270	ng/sample	--	
Benzo(k)fluoranthene	ND	ng/sample	100	
Benzo(e)pyrene	290	ng/sample	--	F
Benzo(a)pyrene	230	ng/sample	--	F
Perylene	ND	ng/sample	100	
Indeno(1,2,3-cd)pyrene	ND	ng/sample	100	
Dibenz(a,h)anthracene	ND	ng/sample	100	
Benzo(g,h,i)perylene	ND	ng/sample	100	

B = Compound is also detected in the blank.
F = Reported value estimated due to an interference.
ND = Not Detected

Reported By: Clark Pickell Approved By: Eric Redman

The cover letter is an integral part of this report.
Rev 230787

POLYNUCLEAR AROMATIC HYDROCARBONS
HIGH RESOLUTION GC/MS
Method HRGC/HRMS
(cont.)

Client Name: Pacific Environmental Services
Client ID: A-U-429-1
Lab ID: 301802-0007-SA
Matrix: AIRTRAIN Sampled: 24 SEP 98 Received: 29 SEP 98
Authorized: 29 SEP 98 Prepared: 03 OCT 98 Analyzed: 31 OCT 98
Dilution Factor: 1.0

Internal Standards	% Recovery	
Naphthalene-d8	46	m
Acenaphthylene-d8	5.0	m
Acenaphthene-d10	50	
Fluorene-d10	81	
Phenanthrene-d10	94	
Fluoranthene-d10	70	
Pyrene-d10	57	
Benzo(a)anthracene-d12	52	
Perylene-d12	14	m
Indeno(123-cd)pyrene-d12	70	
Chrysene-d12	80	
Benzo(b)fluoranthene-d12	79	
Benzo(k)fluoranthene-d12	80	
Benzo(a)pyrene-d12	18	m
Dibenz(a,h)anthracene-d14	77	
Benzo(g,h,i)perylene-d12	58	

Field Surrogates	% Recovery
13C-Fluorene	119

m = Internal Standard recovery is outside method recovery goal.

Reported By: Clark Pickell Approved By: Eric Redman

The cover letter is an integral part of this report.
Rev 230787

04-NOV-1998 06:44:19 PM Dioxin Furan Unknown RESULTS

Mass Spec : VG-4 Results : 30OC98V4101.RES : PAHAIR.TRG
GC Column : DB-5 Date analyzed : 30-OCT-98
Data file : 30OC98V4 301802-7 :10X DIL. : : : Ex Cal : PAHAIR102998V4.R
Weight : 0.5

Name	Total Response	Isotope Ratio		R. T. mm:ss		RRF	pg/ SAMP	Rec/ MDL	
d10-2-Methylnaphthalene	4546720	1.00	Y	12: 28	Y	1.00	50.00		
d8-Naphthalene	4660000	1.00	Y	10: 12	Y	2.24	22.87	46	m
Naphthalene	5827860000	1.00	Y	10: 16	Y	1.23	1.0e+05	B E	
2-Methylnaphthalene	75979200	1.00	Y	12: 34	Y	0.56	2908.66	B	
d8-Acenaphthylene	302000	1.00	Y	15: 37	Y	1.21	2.74	5	m
Acenaphthylene	46600000	1.00	Y	15: 44	Y	0.94	1.6e+04	E F	
d10-Acenaphthene	1682194	1.00	Y	16: 2	Y	0.74	24.84	50	
Acenaphthene	5780000	1.00	Y	16: 8	Y	1.25	275.74		
d10-Anthracene	2875560	1.00	Y	20: 55	Y	1.00	50.00		
d10-Fluorene	3313300	1.00	Y	17: 41	Y	1.42	40.55	81	
Fluorene	35925800	1.00	Y	17: 46	Y	1.16	934.32		
d10-Phenanthrene	7550260	1.00	Y	20: 45	Y	2.81	46.76	94	
Phenanthrene	754314000	1.00	Y	20: 50	Y	0.89	1.1e+04	B E	
Anthracene	18660000	1.00	Y	20: 59	Y	0.80	308.77		
d14-Terphenyl	9995400	1.00	Y	26: 1	Y	1.00	50.00		
d10-Fluoranthene	9883440	1.00	Y	24: 35	Y	1.41	35.05	70	
Fluoranthene	591552000	1.00	Y	24: 39	Y	1.11	5383.56	E	
d10-Pyrene	8622380	1.00	Y	25: 17	Y	1.52	28.41	57	
Pyrene	278108000	1.00	Y	25: 20	Y	1.21	2676.57		
d12-Benzo(a)anthracene	4643320	1.00	Y	29: 9	Y	0.90	25.81	52	
Benzo(a)anthracene	8743480	1.00	Y	29: 15	Y	1.20	156.33		
d12-Chrysene	10185540	1.00	Y	29: 16	Y	1.28	39.83	80	
Chrysene	31389200	1.00	Y	29: 20	Y	1.08	284.30		
d12-Benzo(e)pyrene	17720000	1.00	Y	33: 23	Y	1.00	50.00		
d12-Benzo(b)fluoranthene	6376500	1.00	Y	32: 30	Y	0.45	39.64	79	
Benzo(b)fluoranthene	19920000	1.00	Y	32: 35	Y	1.17	267.63		
d12-Benzo(k)fluoranthene	13367320	1.00	Y	32: 36	Y	0.95	39.78	80	
Benzo(k)fluoranthene	13920000	1.00	Y	32: 38	Y	1.16	<RL=100.00		
d12-Benzo(a)pyrene	2160000	1.00	Y	33: 33	Y	0.68	9.01	18	r
Benzo(e)pyrene	10177060	1.00	Y	33: 28	Y	1.64	287.15	~~E~~ F	
Benzo(a)pyrene	5220300	1.00	Y	33: 35	Y	1.07	225.45	~~E~~ F	
d12-Perylene	1562000	1.00	Y	33: 50	Y	0.63	6.99	14	r
Perylene	1180000	1.00	Y	33: 56	N	1.71	<RL=100.00		
d12-Indeno(123-cd)pyrene	5480000	1.00	Y	38: 5	Y	0.44	34.78	70	
Indeno(123-cd)pyrene	1662000	1.00	Y	38: 12	Y	0.62	<RL=100.00		
d14-Dibenz(ah)anthracene	3340000	1.00	Y	38: 9	Y	0.25	38.34	77	
Dibenz(ah)anthracene	* No Peak	0.00	N	38: 16	N	1.40	<RL=100.00		
d12-Benzo(ghi)perylene	5940000	1.00	Y	39: 14	Y	0.58	28.91	58	
Benzo(ghi)perylene	3300000	1.00	Y	39: 24	Y	1.02	<RL=100.00		
d10-Fluorene	3313300	1.00	Y	17: 41	Y	1.00	50.00		
13C-Fluorene	3194800	1.00	Y	17: 46	Y	0.81	59.52	119	

281 11-4-98
CP

0.5
98V4.RRF
Rec/
MDL

	2273360	2273360
46	2330000	2330000
B E	2913930000	2913930000
B	37989600	37989600
5	151000	151000
E	23300000	23300000
50	841097	841097
	2890000	2890000
	1437780	1437780
81	1656650	1656650
	17962900	17962900
94	3775130	3775130
B E	377157000	377157000
	9330000	9330000
	4997700	4997700
70	4941720	4941720
E	295776000	295776000
57	4311190	4311190
	139054000	139054000
52	2321660	2321660
	4371740	4371740
80	5092770	5092770
	15694600	15694600
	8860000	8860000
79	3188250	3188250
	9960000	9960000
80	6683660	6683660
100.00	6960000	6960000
18	1080000	1080000
	5088530	5088530
	2610150	2610150
14	781000	781000
100.00	590000	590000
70	2740000	2740000
100.00	831000	831000
77	1670000	1670000
100.00	0	0
58	2970000	2970000
100.00	1650000	1650000

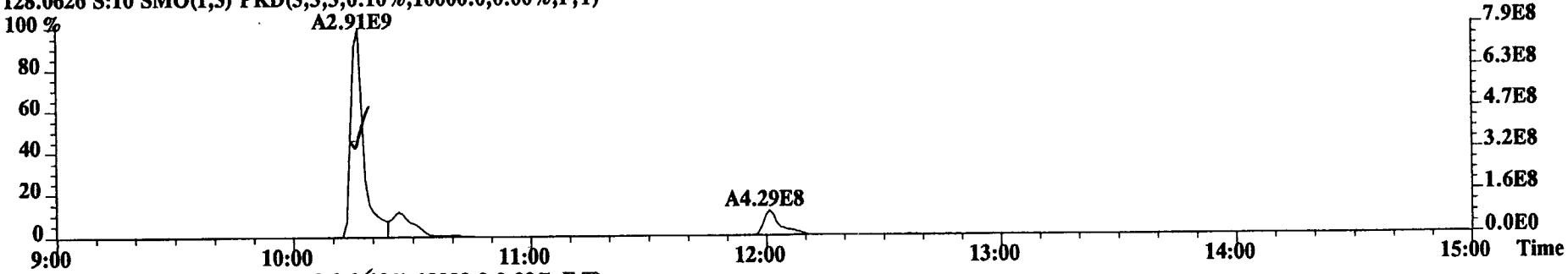
02-NOV-1998 08:55:42 AM Dioxin Furan Unknown RESULTS

Mass Spec : VG-4 Results : 30OC98V4101.RES : PAHAIR.TRG
GC Column : DB-5 Date analyzed : 30-OCT-98
Data file : 30OC98V4 301802-7 :10X DIL. : : : Ex Cal : PAHAIR102998V4.R
Weight : 0.5

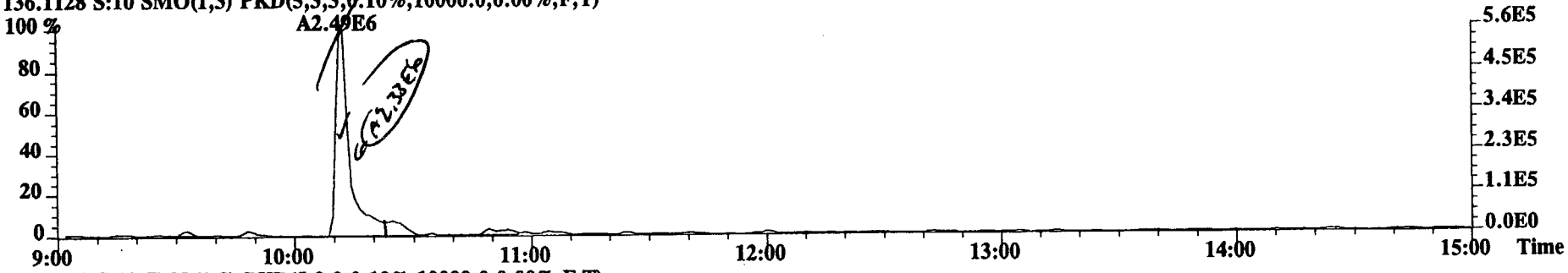
Name	Total Response	Isotope Ratio		R. T. mm:ss		Ex	RRF	pg/ SAMP	Rec/ MDL
d10-2-Methylnaphthalene	4546720	1.00	Y	12:	28	Y	1.00	50.00	
d8-Naphthalene	4981700	1.00	Y	10:	12	Y	2.24	24.45	49
Naphthalene	5827860000	1.00	Y	10:	16	Y	1.23	9.5e+04	0.000
2-Methylnaphthalene	75979200	1.00	Y	12:	34	Y	0.56	2720.83	0.000
d8-Acenaphthylene	* No Peak	0.00	N	15:	28	N	1.21	0.00	0
Acenaphthylene	46691600	1.00	Y	15:	31	Y	0.94	*NoINoIs	
d10-Acenaphthene	1682194	1.00	Y	16:	2	Y	0.74	24.84	50
Acenaphthene	* No Peak	0.00	N	16:	8	N	1.25	0.00	0.000
d10-Anthracene	2875560	1.00	Y	20:	55	Y	1.00	50.00	
d10-Fluorene	3313300	1.00	Y	17:	41	Y	1.42	40.55	81
Fluorene	35925800	1.00	Y	17:	46	Y	1.16	934.32	0.000
d10-Phenanthrene	7550260	1.00	Y	20:	45	Y	2.81	46.76	94
Phenanthrene	754314000	1.00	Y	20:	50	Y	0.89	1.1e+04	0.000
Anthracene	* No Peak	0.00	N	20:	59	N	0.80	0.00	0.000
d14-Terphenyl	9995400	1.00	Y	26:	1	Y	1.00	50.00	
d10-Fluoranthene	9883440	1.00	Y	24:	35	Y	1.41	35.05	70
Fluoranthene	591552000	1.00	Y	24:	39	Y	1.11	5383.56	0.000
d10-Pyrene	8622380	1.00	Y	25:	17	Y	1.52	28.41	57
Pyrene	278108000	1.00	Y	25:	20	Y	1.21	2676.57	0.000
d12-Benzo(a)anthracene	4643320	1.00	Y	29:	9	Y	0.90	25.81	52
Benzo(a)anthracene	8743480	1.00	Y	29:	15	Y	1.20	156.33	0.000
d12-Chrysene	10185540	1.00	Y	29:	16	Y	1.28	39.83	80
Chrysene	31389200	1.00	Y	29:	20	Y	1.08	284.30	0.000
d12-Benzo(e)pyrene	19667360	1.00	Y	33:	23	Y	1.00	50.00	
d12-Benzo(b)fluoranthene	6376500	1.00	Y	32:	30	Y	0.45	35.72	71
Benzo(b)fluoranthene	34053400	1.00	Y	32:	35	Y	1.17	457.52	0.000
d12-Benzo(k)fluoranthene	13367320	1.00	Y	32:	36	Y	0.95	35.85	72
Benzo(k)fluoranthene	34053400	1.00	Y	32:	35	Y	1.16	218.83	0.000
d12-Benzo(a)pyrene	* No Peak	0.00	N	33:	33	N	0.68	0.00	0
Benzo(e)pyrene	10177060	1.00	Y	33:	28	Y	1.64	*NoINoIs	
Benzo(a)pyrene	5220300	1.00	Y	33:	35	Y	1.07	*NoINoIs	
d12-Perylene	* No Peak	0.00	N	33:	50	N	0.63	0.00	0
Perylene	* No Peak	0.00	N	33:	56	N	1.71	*NoINoIs	
d12-Indeno(123-cd)pyrene	3641700	1.00	Y	38:	5	Y	0.44	20.83	42
Indeno(123-cd)pyrene	1622574	1.00	Y	38:	12	Y	0.62	71.75	0.000
d14-Dibenz(ah)anthracene	1901412	1.00	Y	38:	9	Y	0.25	19.66	39
Dibenz(ah)anthracene	* No Peak	0.00	N	38:	16	N	1.40	0.00	0.000
d12-Benzo(ghi)perylene	3873040	1.00	Y	39:	14	Y	0.58	16.98	34
Benzo(ghi)perylene	2971060	1.00	Y	39:	24	Y	1.02	75.50	0.000
d10-Fluorene	3313300	1.00	Y	17:	41	Y	1.42	5.93	12
13C-Fluorene	3194800	1.00	Y	17:	46	Y	1.00	96.42	0.000

File:30OC98V4 #1-509 Acq:31-OCT-1998 00:06:44 GC EI+ Voltage SIR 70SE
Sample#10 Text:301802-7 :10X DIL. : : : Exp:PAHAIR

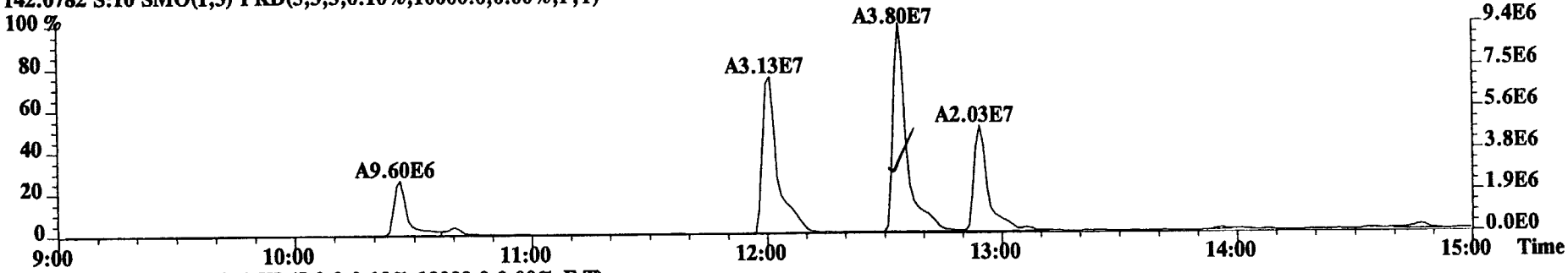
128.0626 S:10 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



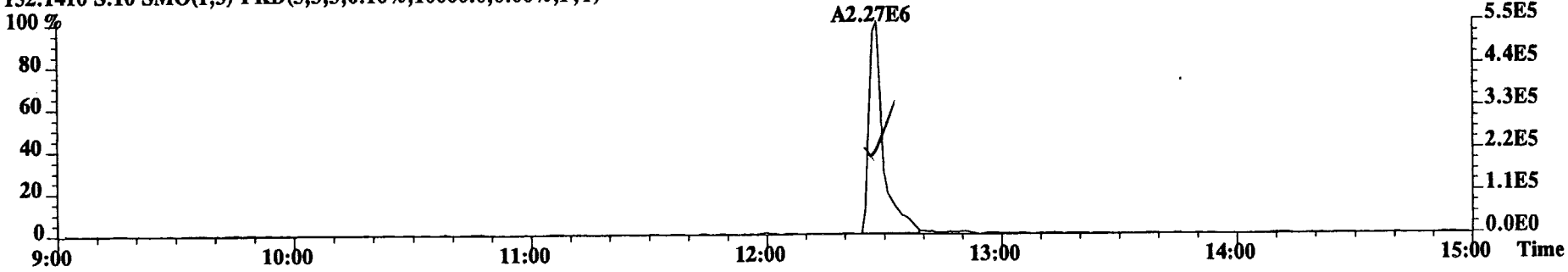
136.1128 S:10 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

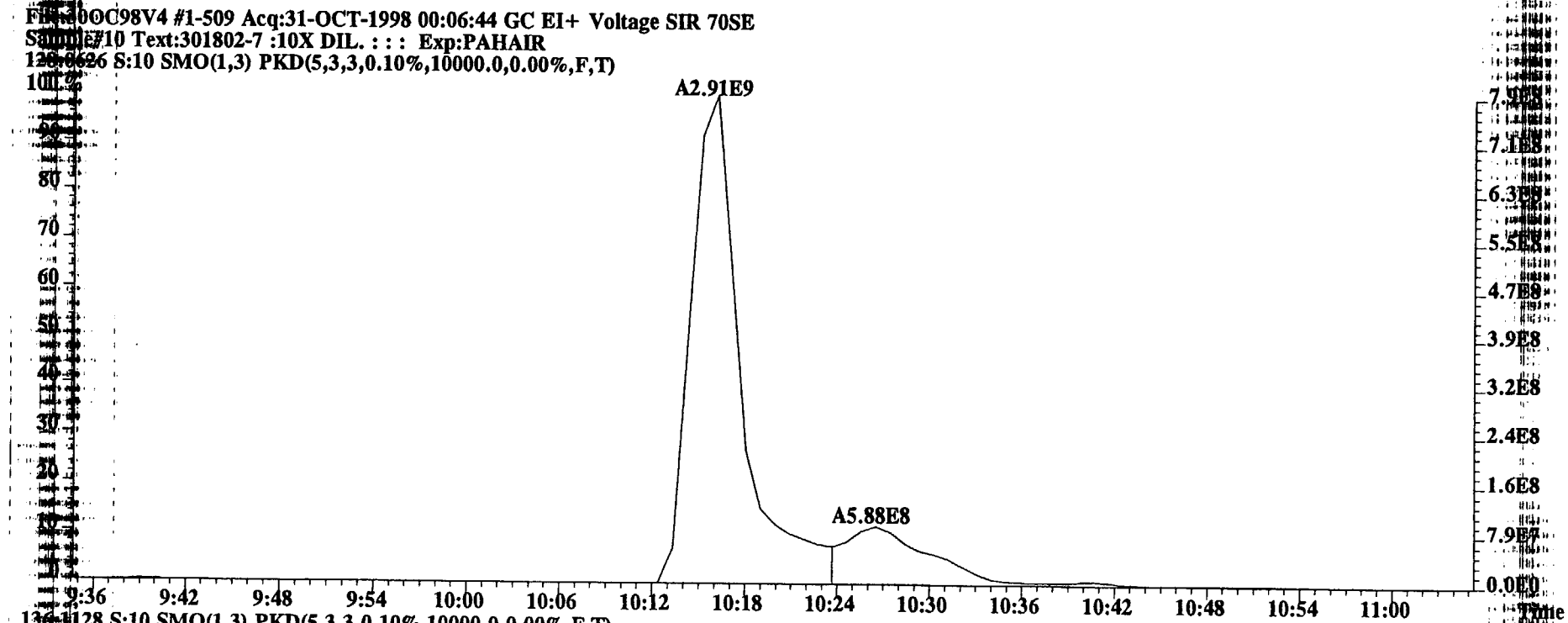


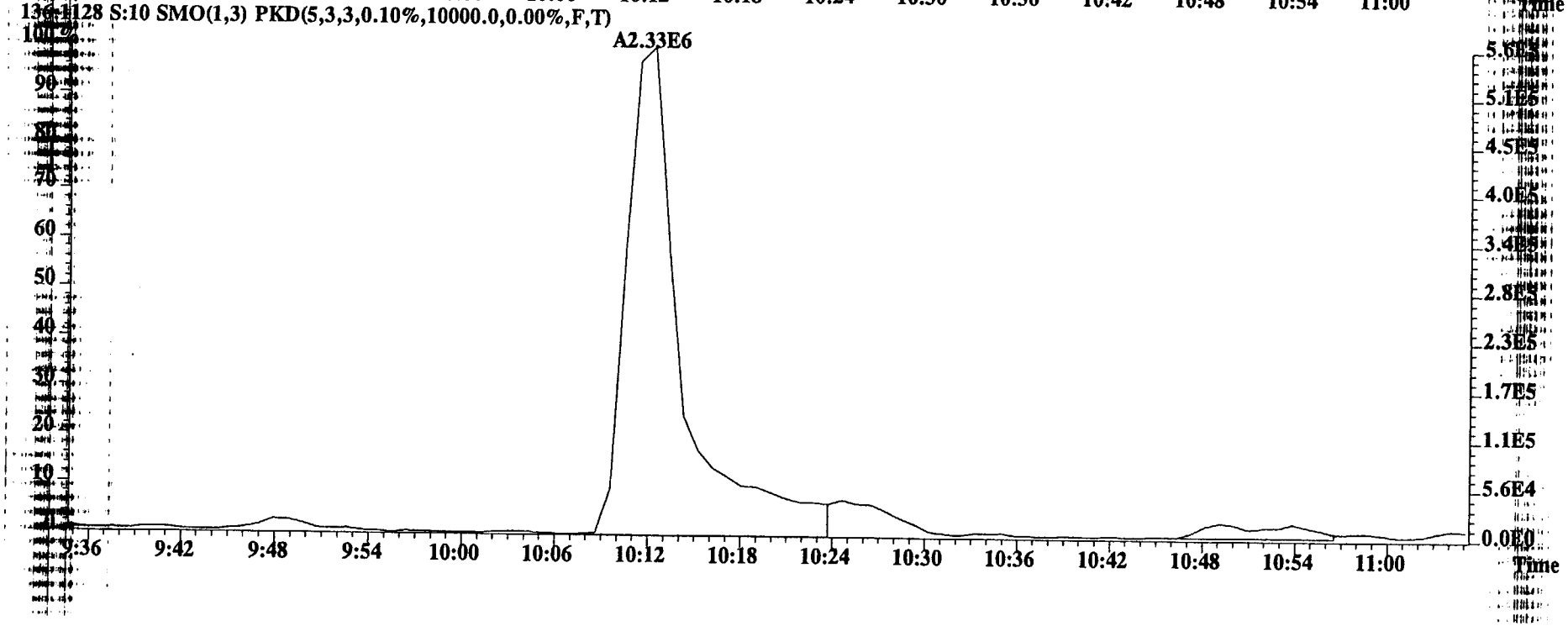
142.0782 S:10 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



152.1410 S:10 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

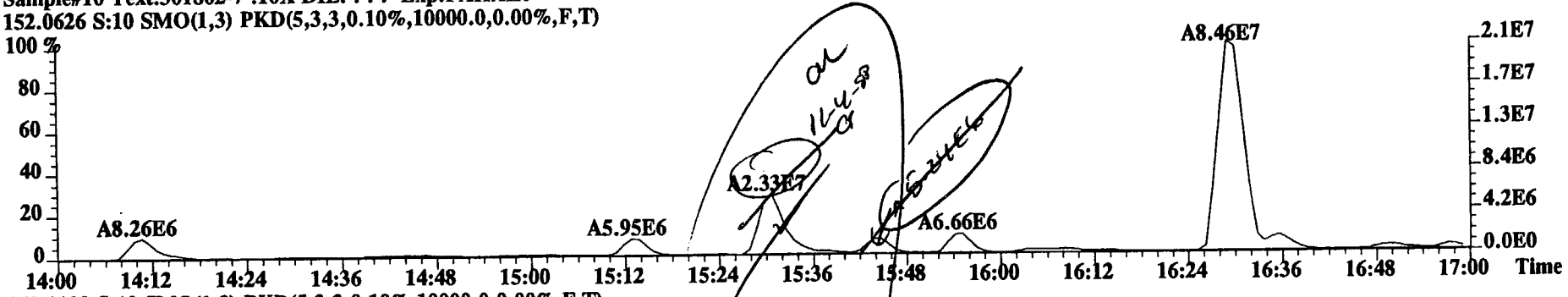



FI 30OC98V4 #1-509 Acq:31-OCT-1998 00:06:44 GC EI+ Voltage SIR 70SE
Sample#10 Text:301802-7 :10X DIL. : : : Exp:PAHAIR
126.6626 S:10 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)
A2.91E9
A5.88E8
9:36
9:42
9:48
9:54
10:00
10:06
10:12
10:18
10:24
10:30
10:36
10:42
10:48
10:54
11:00
Time

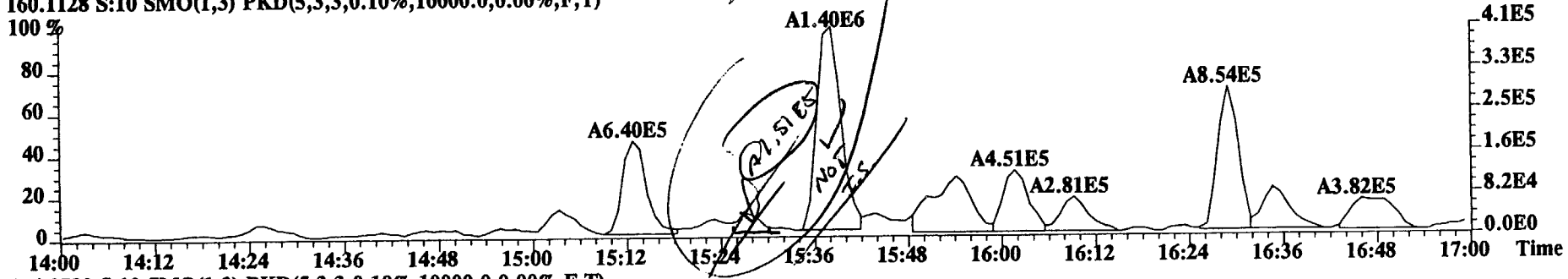

136.1128 S:10 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)
A2.33E6
9:36
9:42
9:48
9:54
10:00
10:06
10:12
10:18
10:24
10:30
10:36
10:42
10:48
10:54
11:00
Time

File:30OC98V4 #1-509 Acq:31-OCT-1998 00:06:44 GC EI+ Voltage SIR 70SE
Sample#10 Text:301802-7 :10X DIL. : : : Exp:PAHAIR

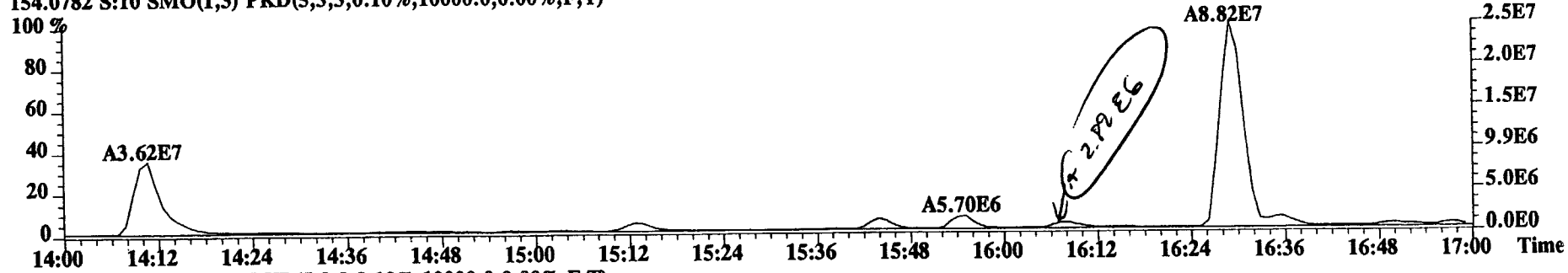
152.0626 S:10 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



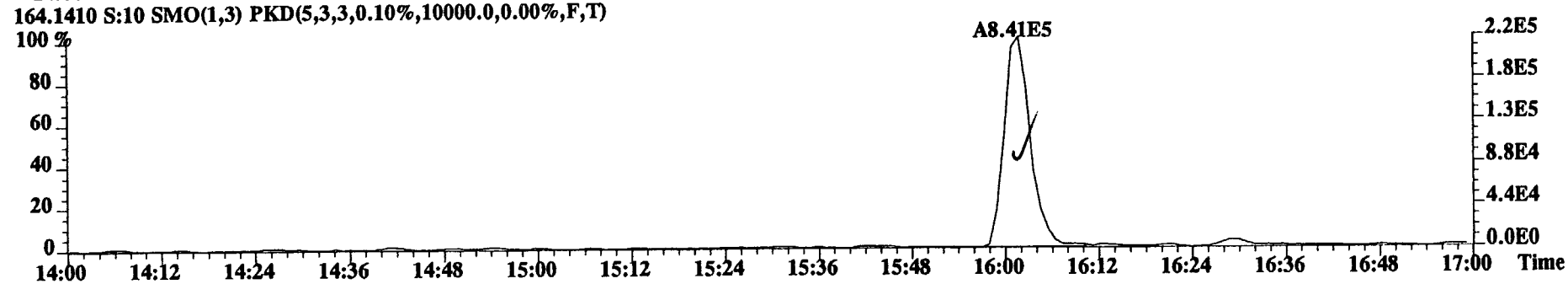
160.1128 S:10 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



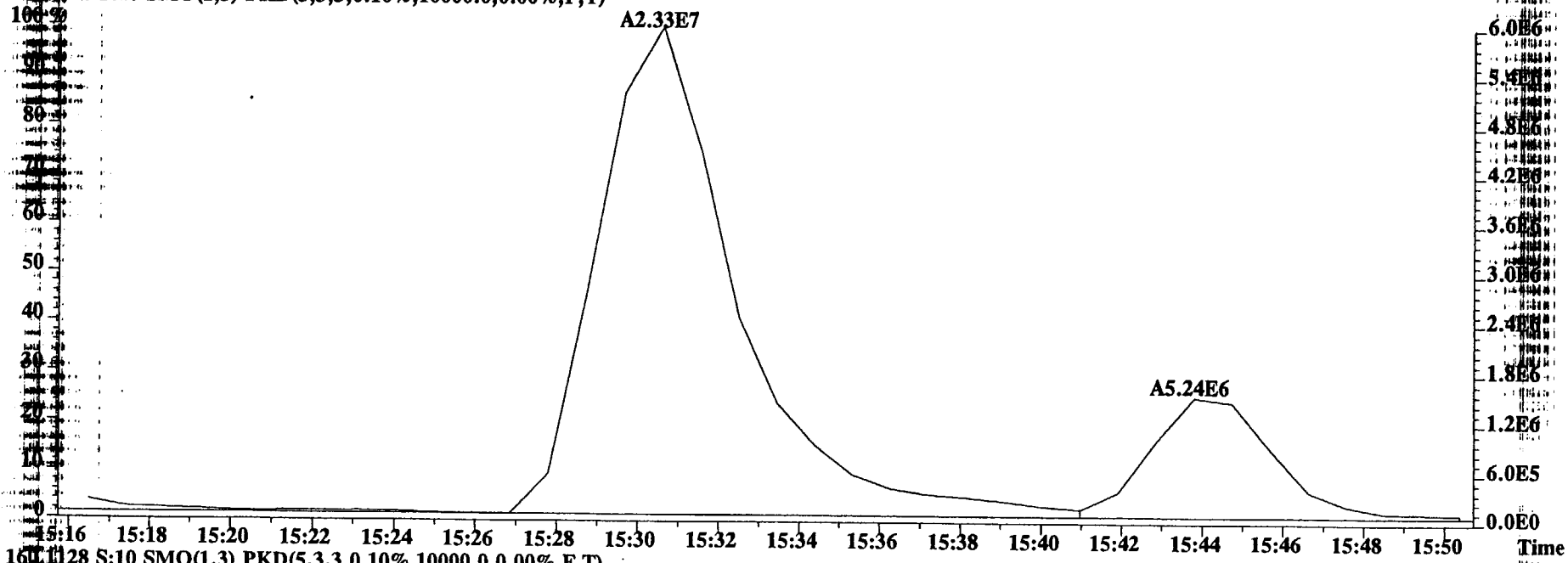
154.0782 S:10 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



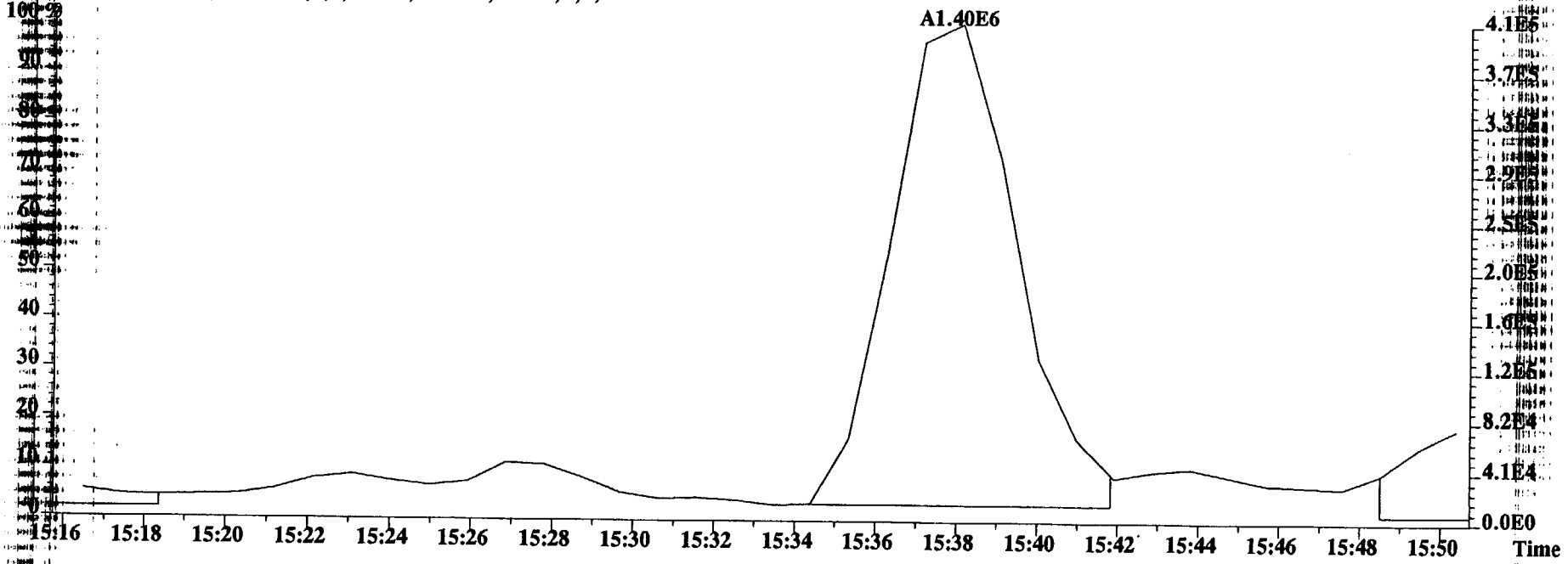
164.1410 S:10 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



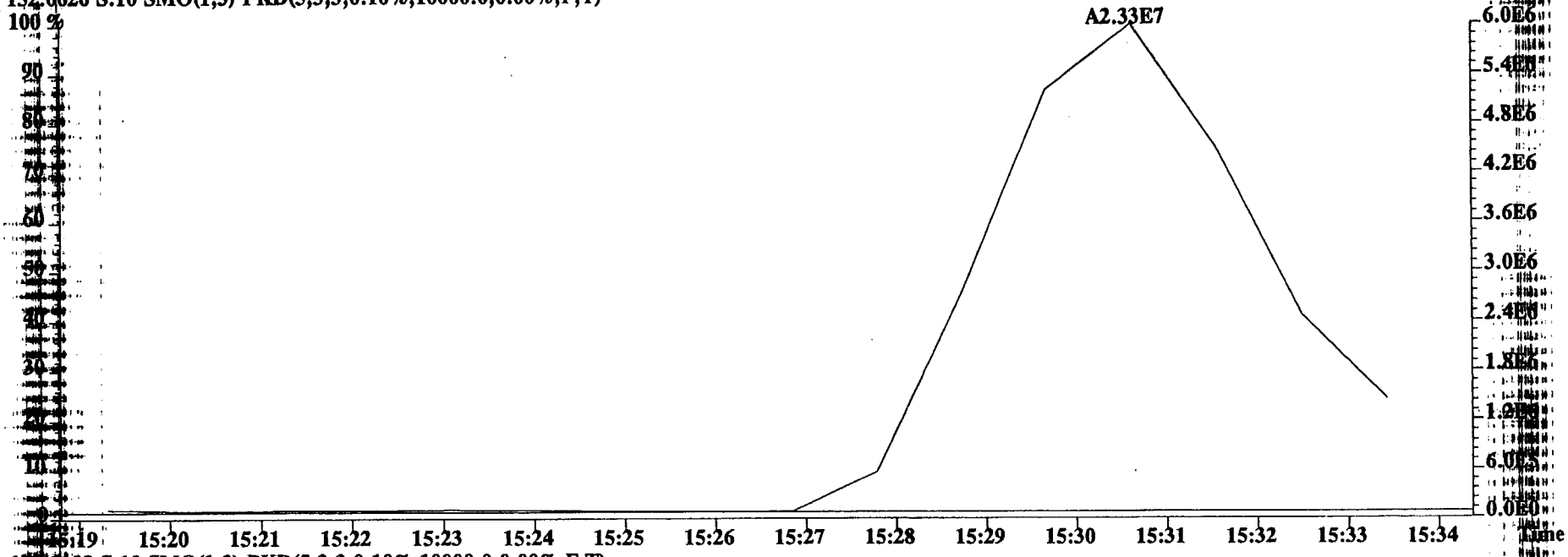
File:3DOC98V4 #1-509 Acq:31-OCT-1998 00:06:44 GC EI+ Voltage SIR 70SE
Sample#10 Text:301802-7 :10X DIL. : : : Exp:PAHAIR
152.0626 S:10 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



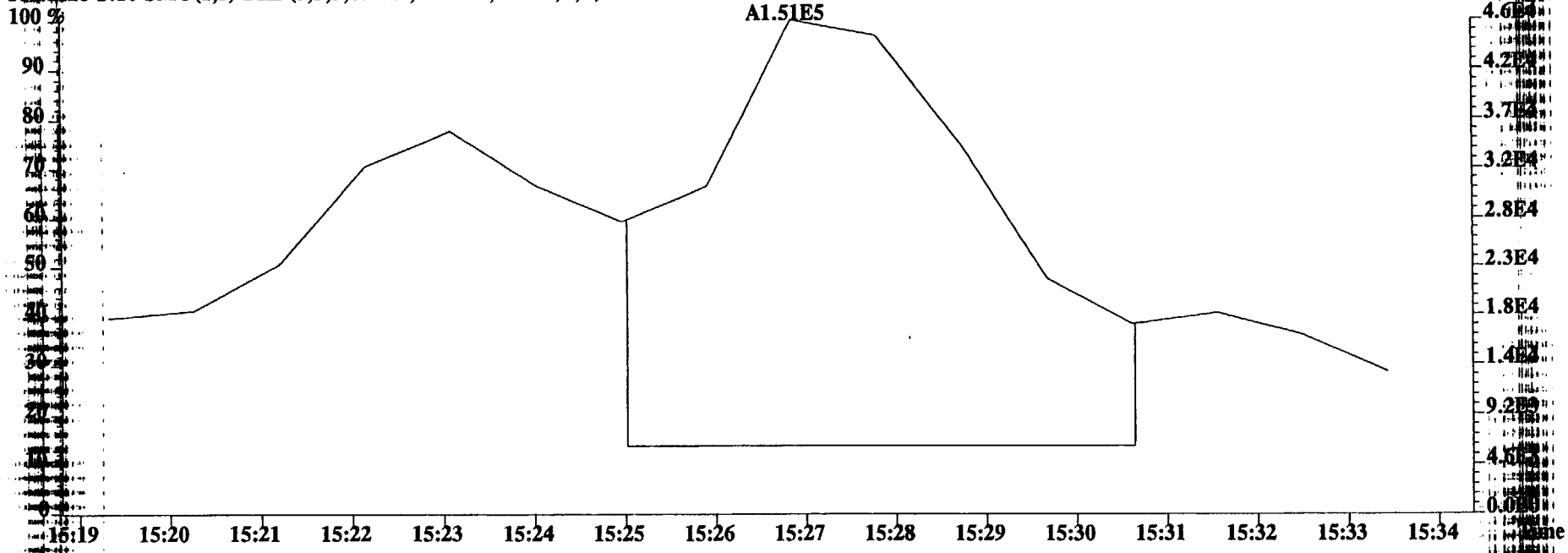
166.1128 S:10 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



File:30OC98V4 #1-509 Acq:31-OCT-1998 00:06:44 GC EI+ Voltage SIR 70SE
Sample#10 Text:301802-7 :10X DIL. : : : Exp:PAHAIR
152.0626 S:10 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

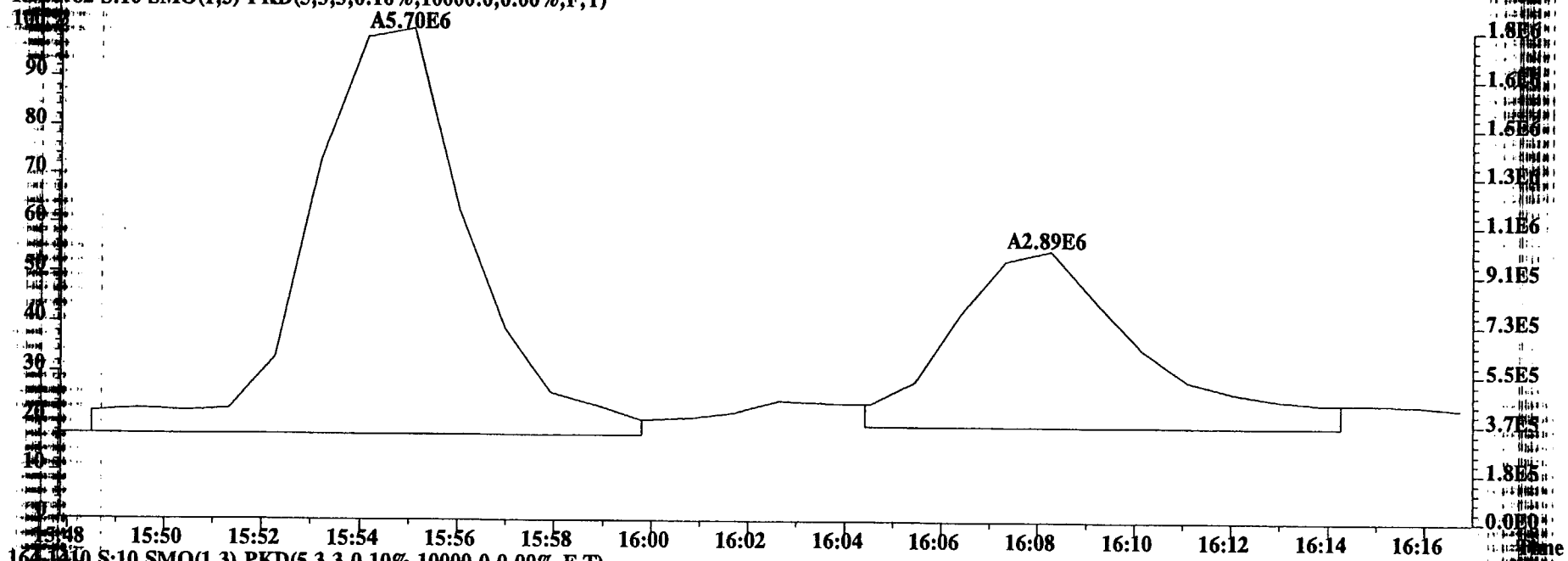


160.1128 S:10 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

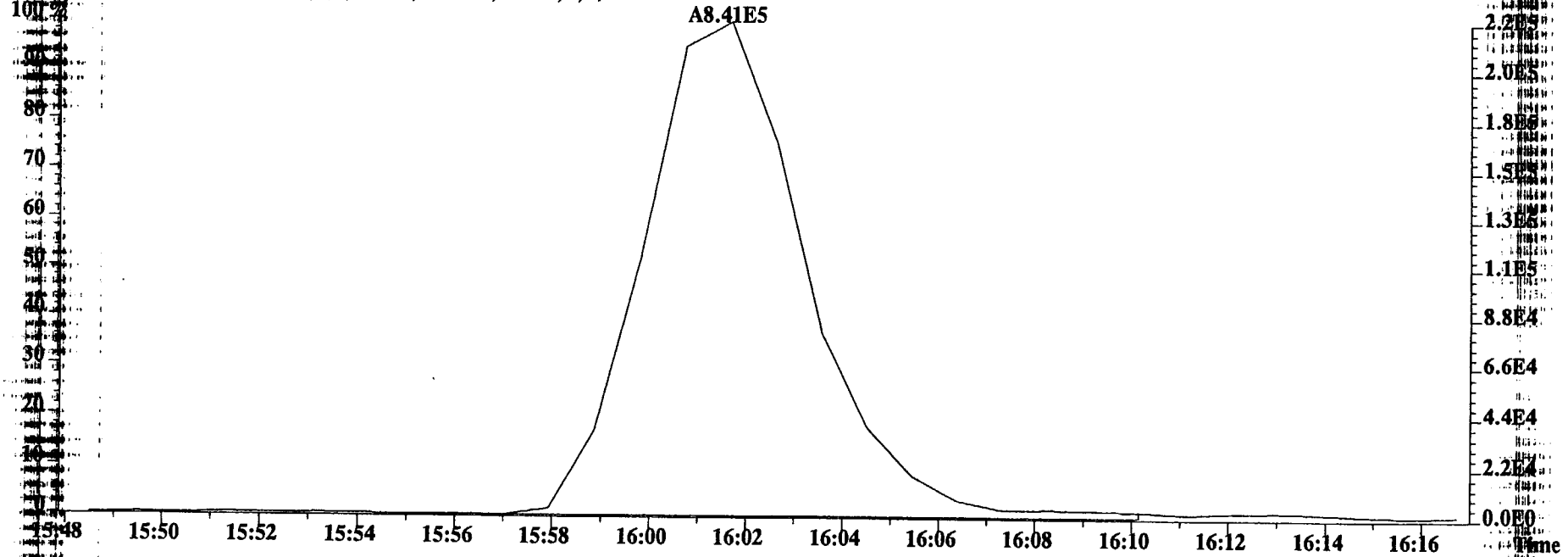


282

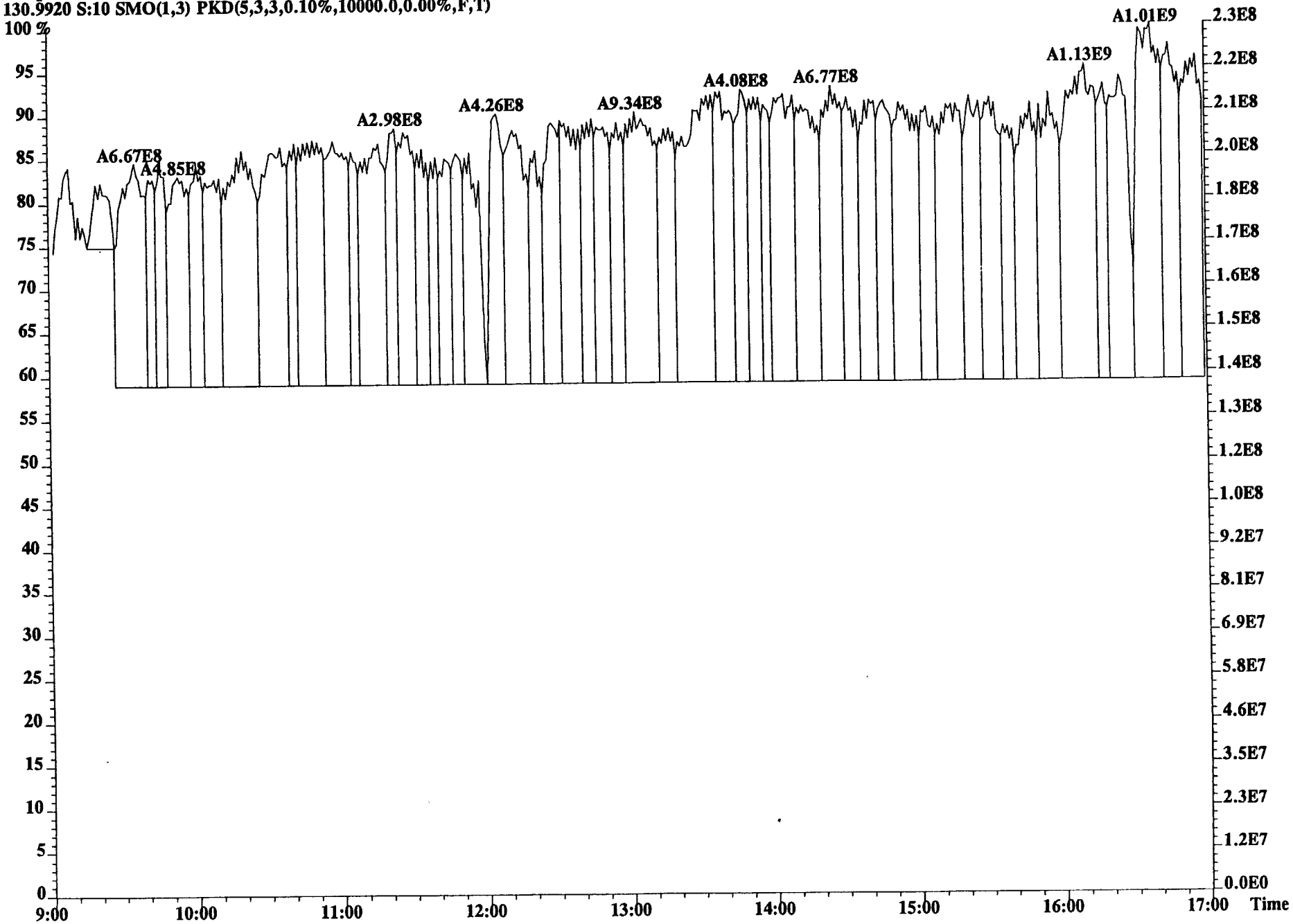
File:3UOC98V4 #1-509 Acq:31-OCT-1998 00:06:44 GC EI+ Voltage SIR 70SE
Sample#10 Text:301802-7 :10X DIL. : : : Exp:PAHAIR
154.0782 S:10 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



164.1410 S:10 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

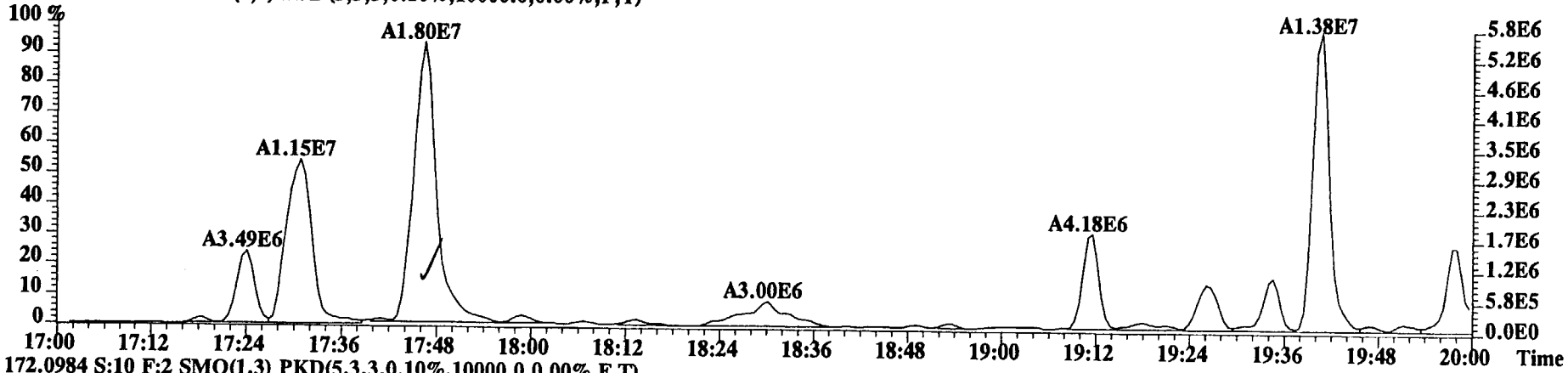


File:30OC98V4 #1-509 Acq:31-OCT-1998 00:06:44 GC EI+ Voltage SIR 70SE
Sample#10 Text:301802-7 :10X DIL. : : : Exp:PAHAIR
130.9920 S:10 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

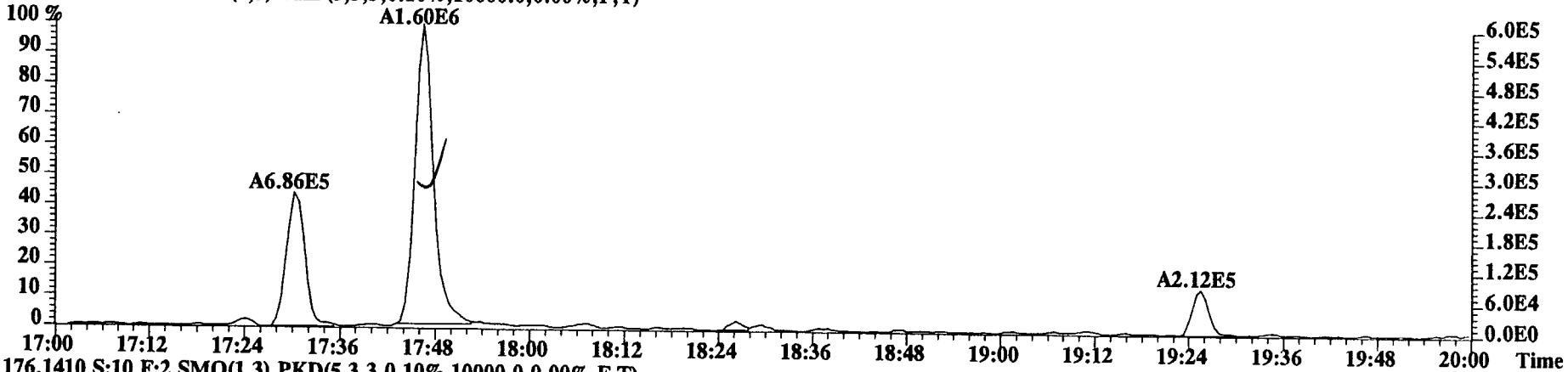


290

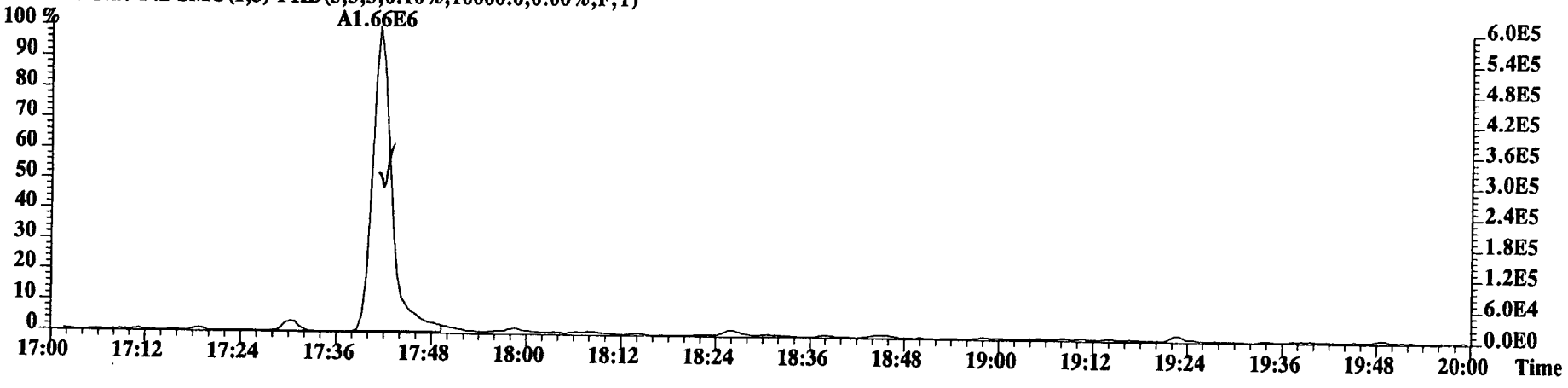
File:30OC98V4 #1-642 Acq:31-OCT-1998 00:06:44 GC EI+ Voltage SIR 70SE
Sample#10 Text:301802-7 :10X DIL. : : : Exp:PAHAIR
166.0798 S:10 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



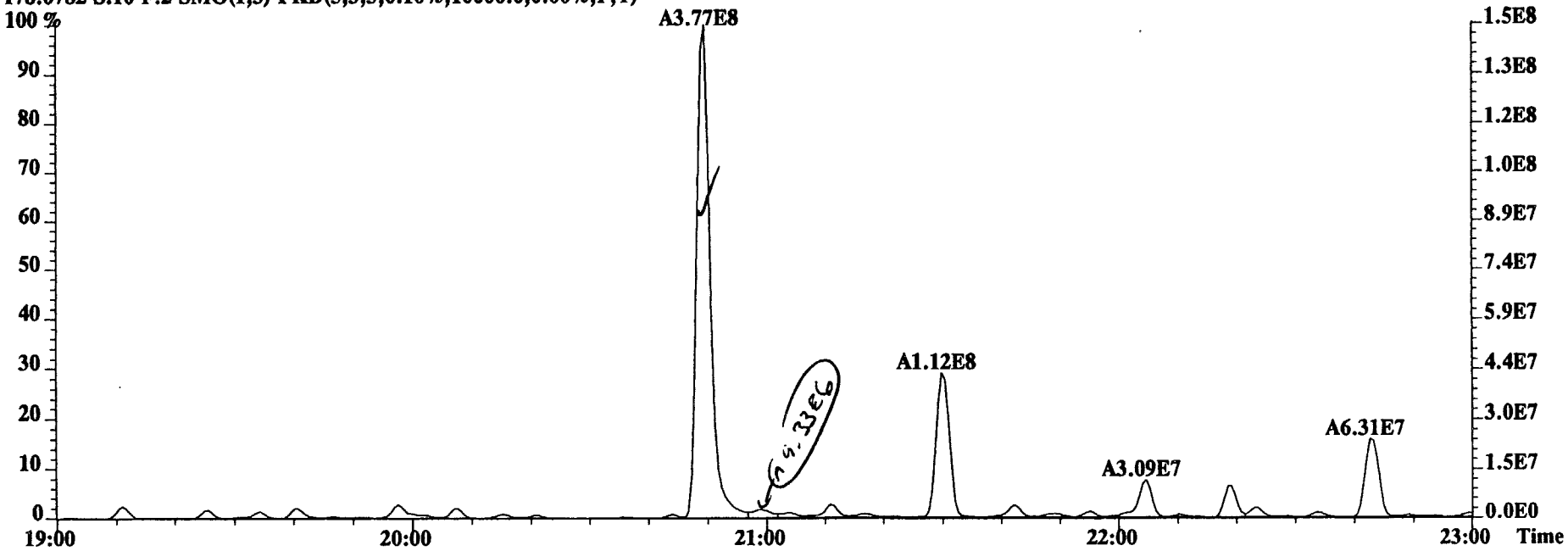
172.0984 S:10 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



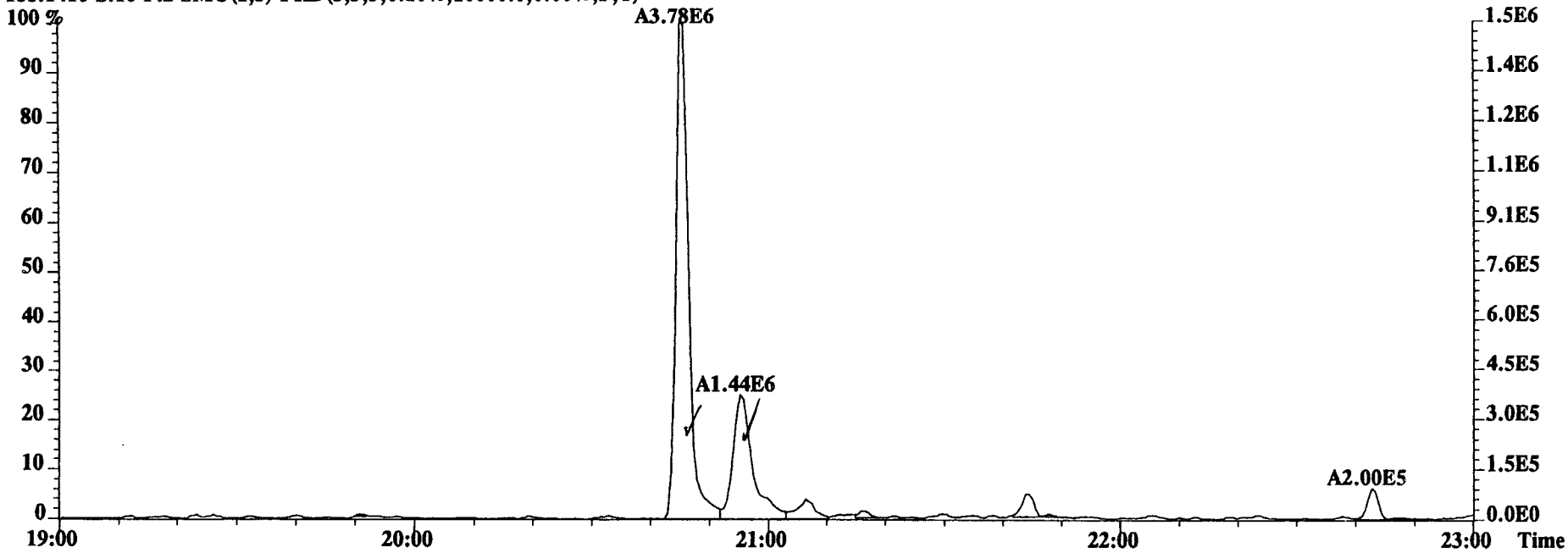
176.1410 S:10 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



File:30OC98V4 #1-642 Acq:31-OCT-1998 00:06:44 GC EI+ Voltage SIR 70SE
Sample#10 Text:301802-7 :10X DIL. : : : Exp:PAHAIR
178.0782 S:10 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

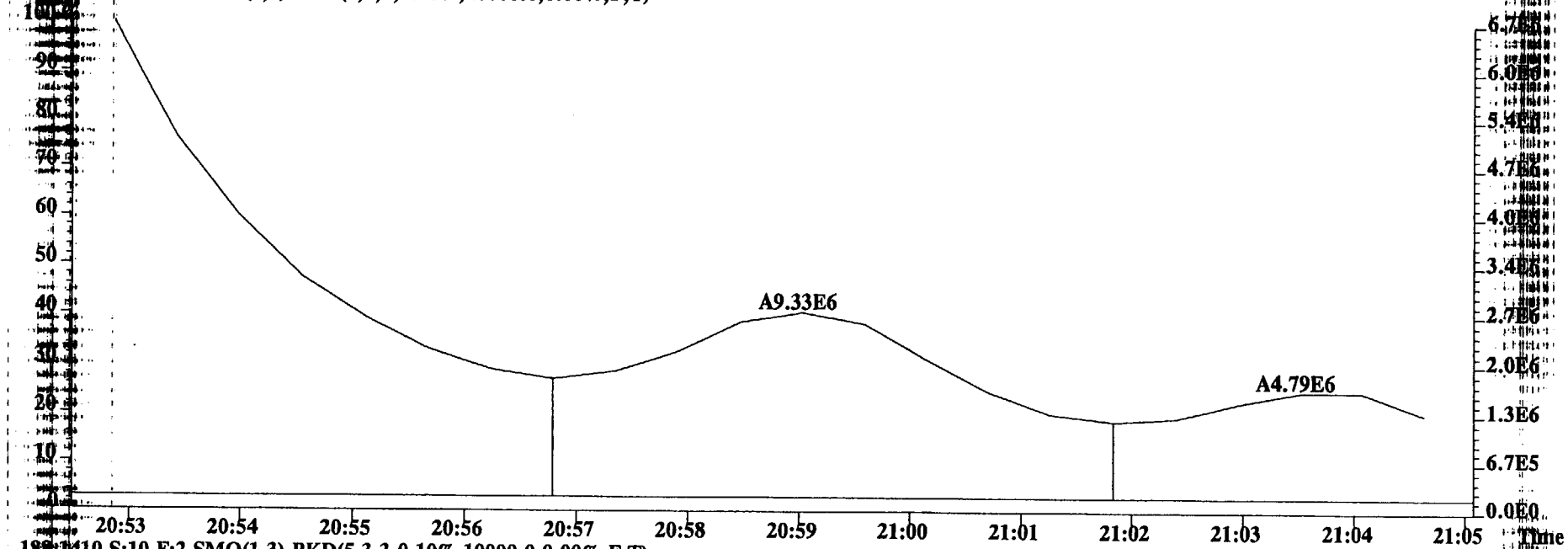


188.1410 S:10 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

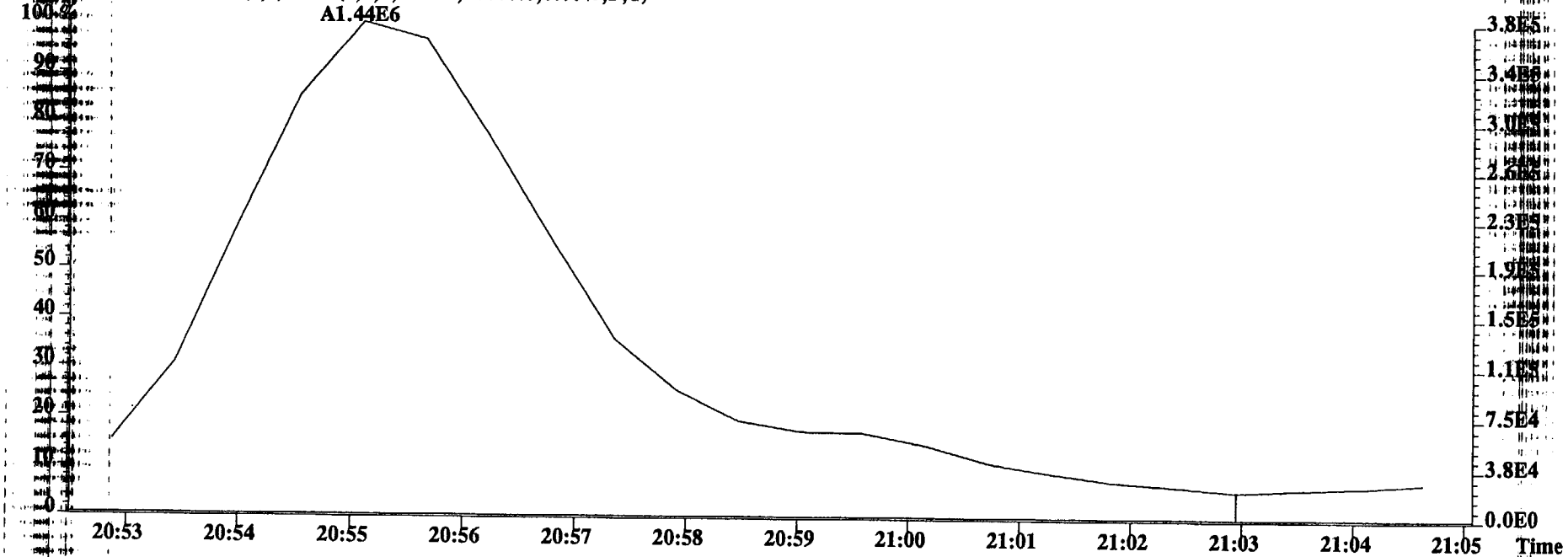


292

File:30OC98V4 #1-642 Acq:31-OCT-1998 00:06:44 GC EI+ Voltage SIR 70SE
Sample#10 Text:301802-7 :10X DIL. : : : Exp:PAHAIR
178:6782 S:10 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

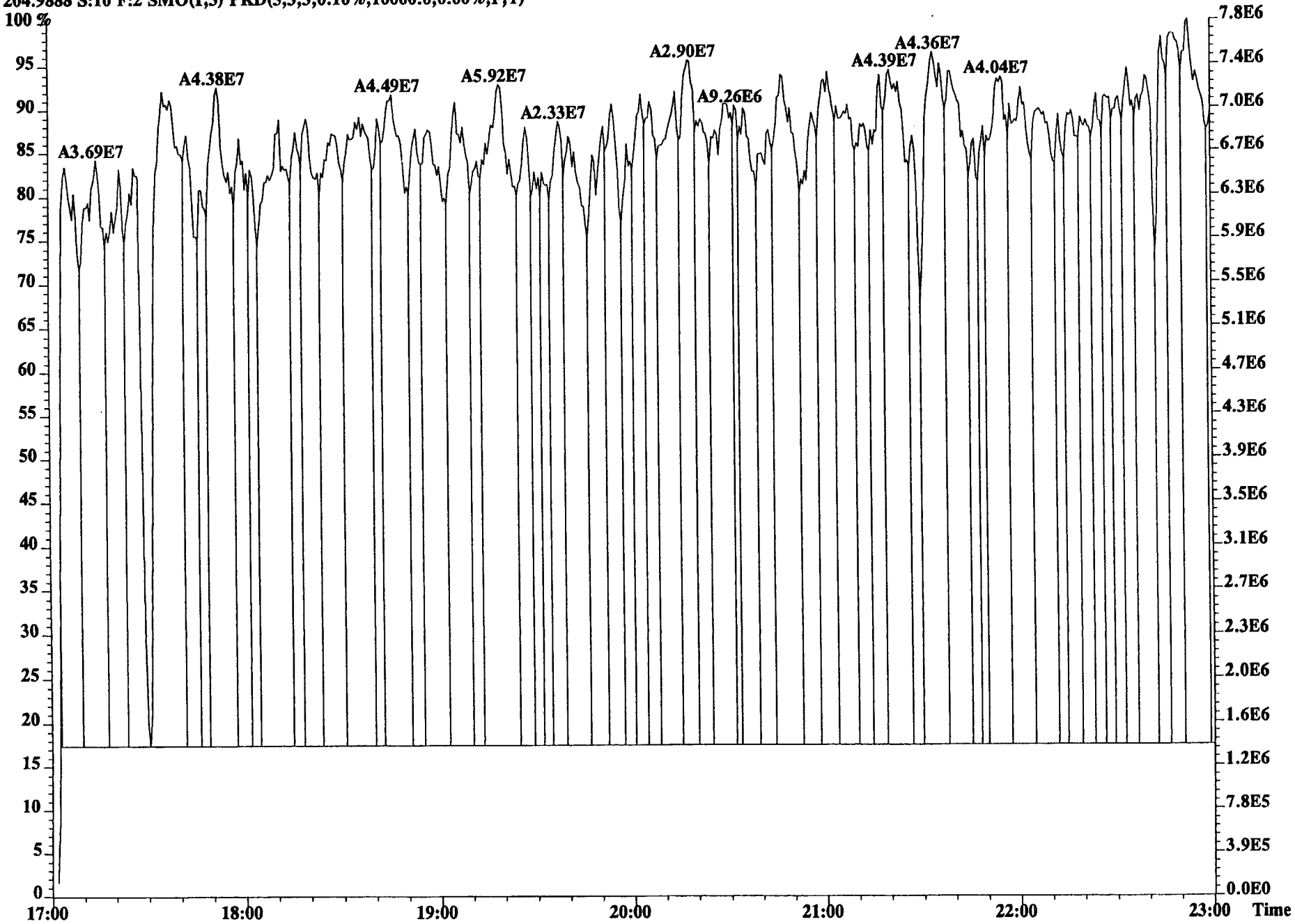


188:1410 S:10 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

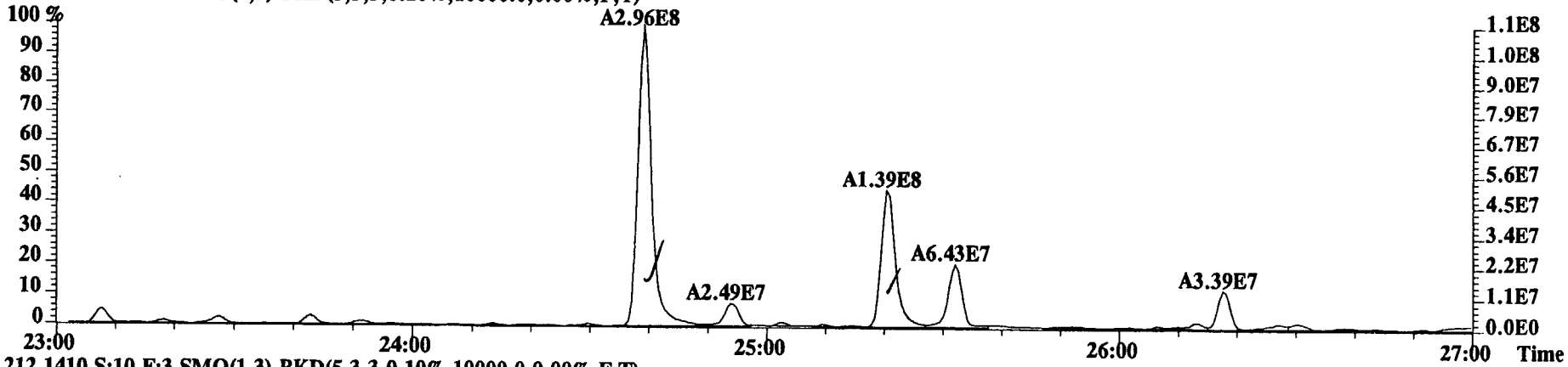


293

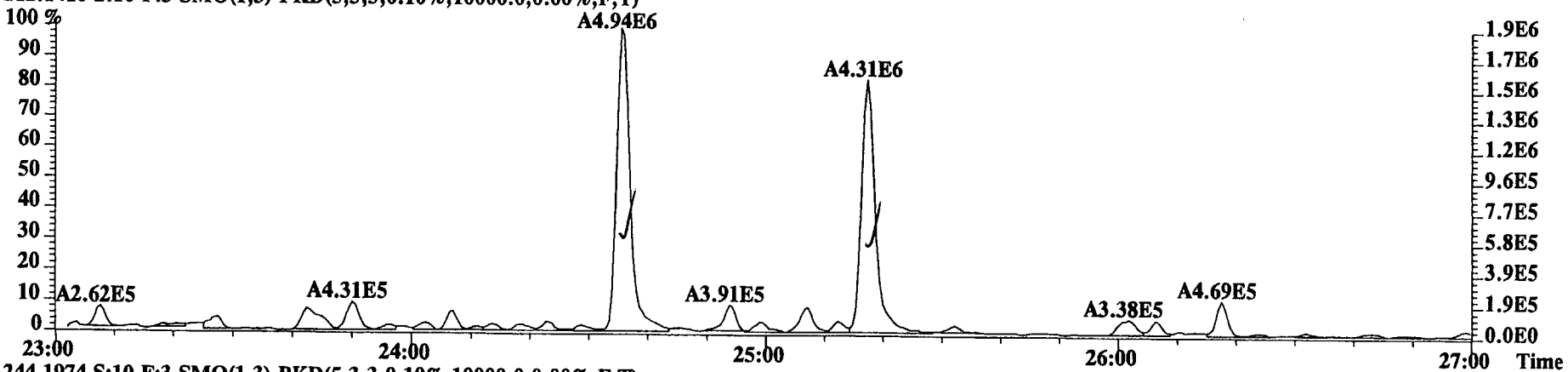
File:30OC98V4 #1-642 Acq:31-OCT-1998 00:06:44 GC EI+ Voltage SIR 70SE
Sample#10 Text:301802-7 :10X DIL. : : : Exp:PAHAIR
204.9888 S:10 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



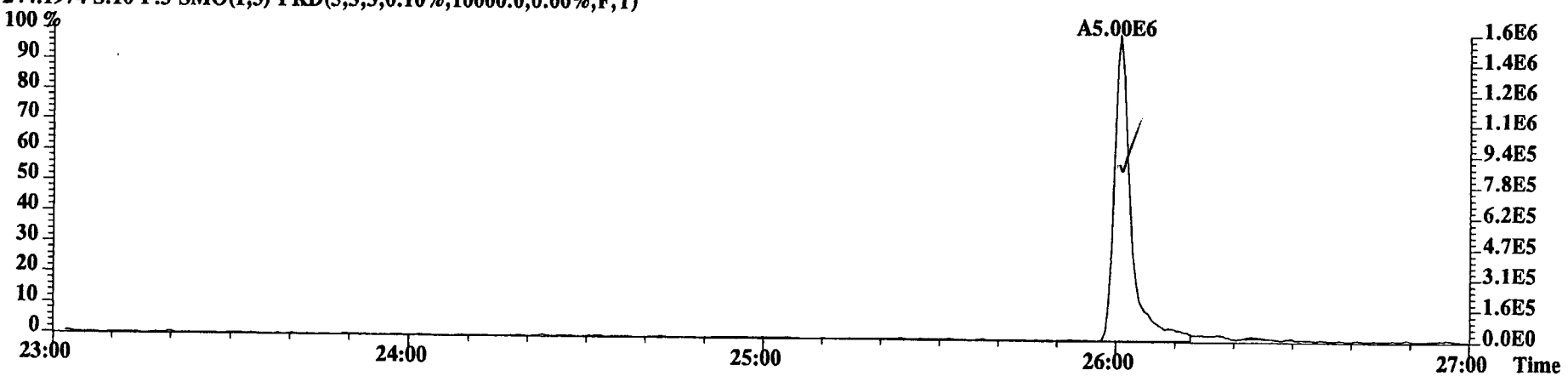
File:30OC98V4 #1-938 Acq:31-OCT-1998 00:06:44 GC EI+ Voltage SIR 70SE
Sample#10 Text:301802-7 :10X DIL. : : : Exp:PAHAIR
202.0782 S:10 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



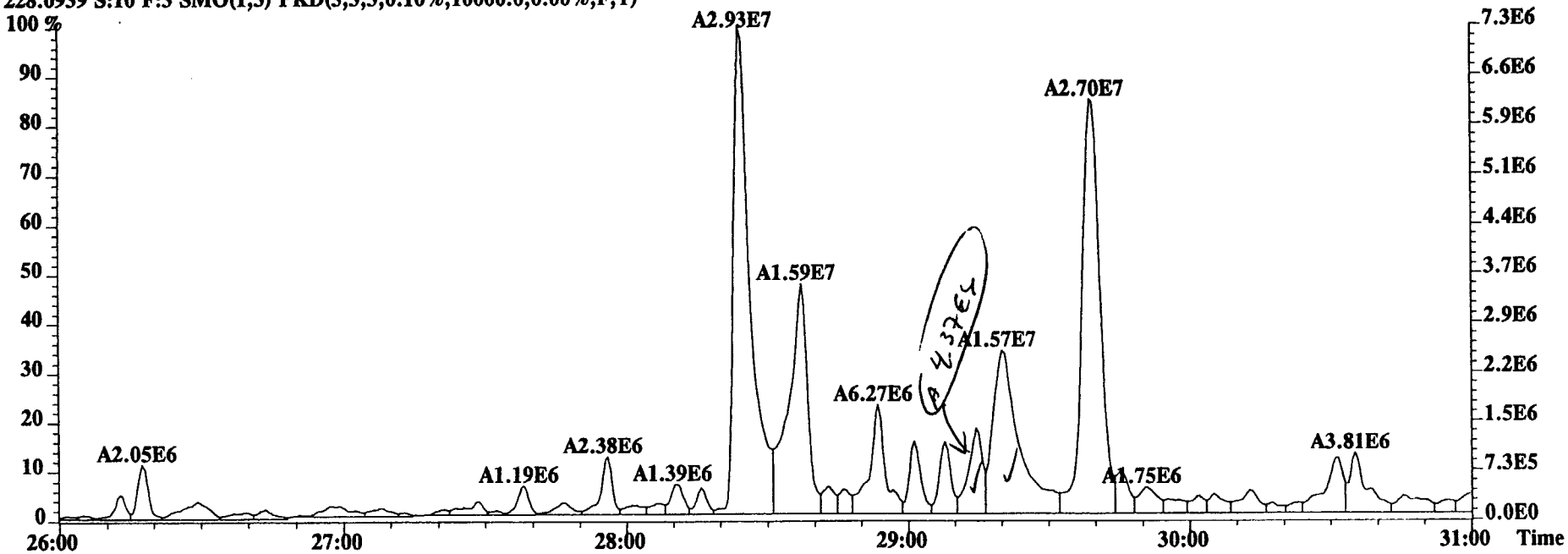
212.1410 S:10 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



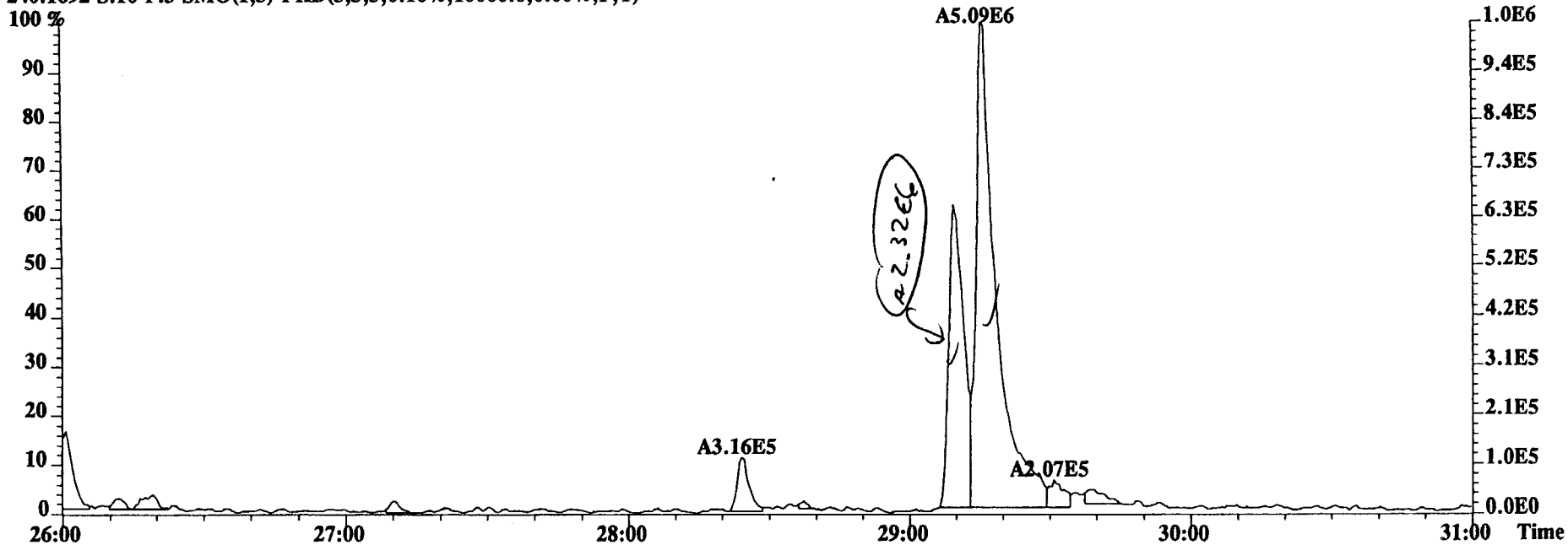
244.1974 S:10 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



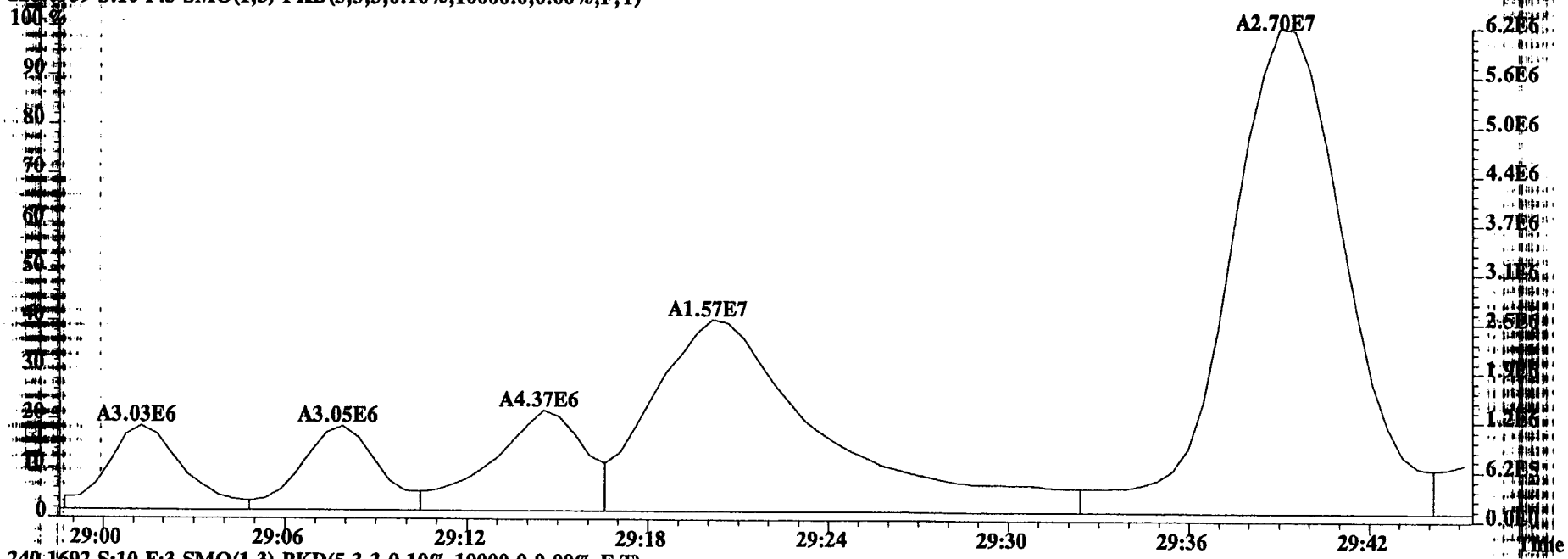
File:30OC98V4 #1-938 Acq:31-OCT-1998 00:06:44 GC EI+ Voltage SIR 70SE
Sample#10 Text:301802-7 :10X DIL. : : : Exp:PAHAIR
228.0939 S:10 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



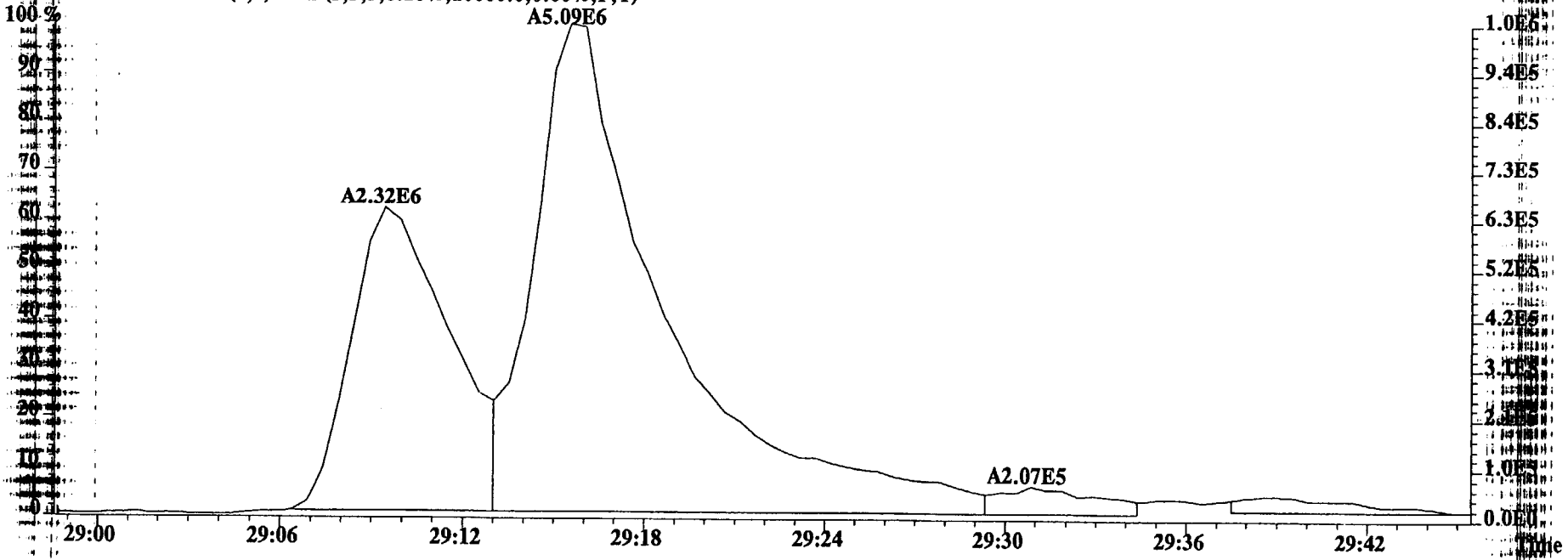
240.1692 S:10 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



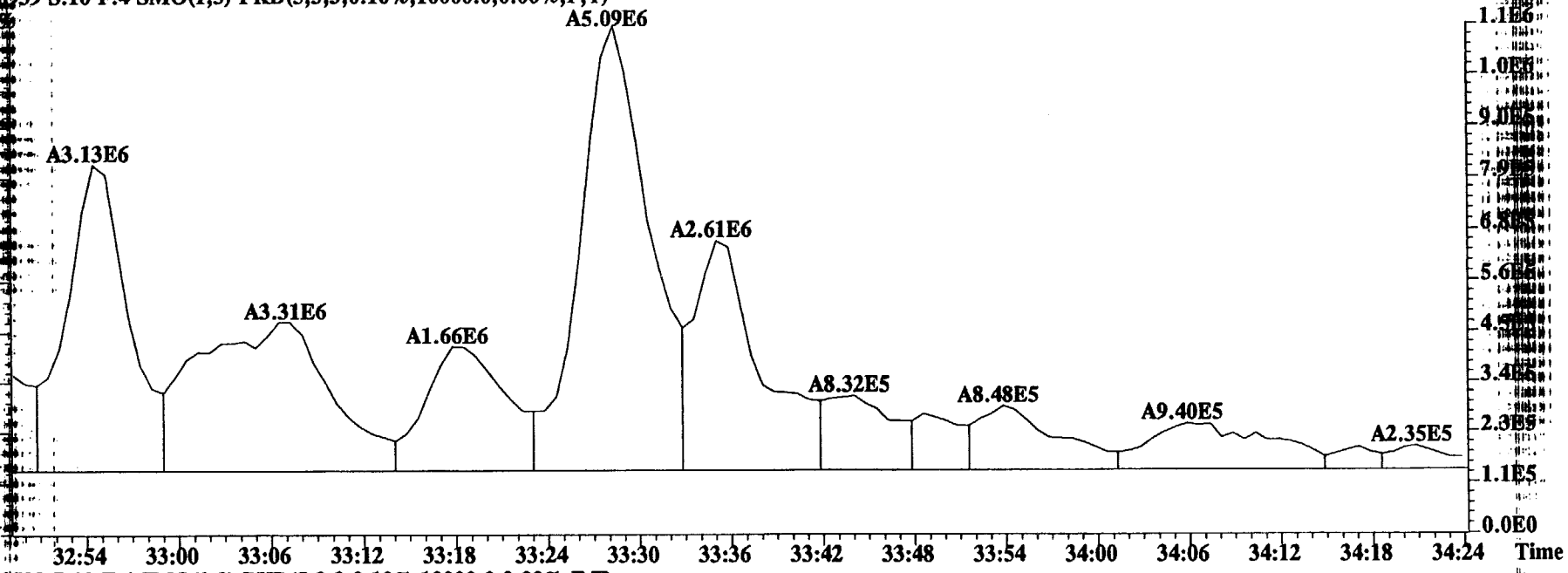
File:30OC98V4 #1-938 Acq:31-OCT-1998 00:06:44 GC EI+ Voltage SIR 70SE
Sample#10 Text:301802-7 :10X DIL. : : : Exp:PAHAIR
228.0939 S:10 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



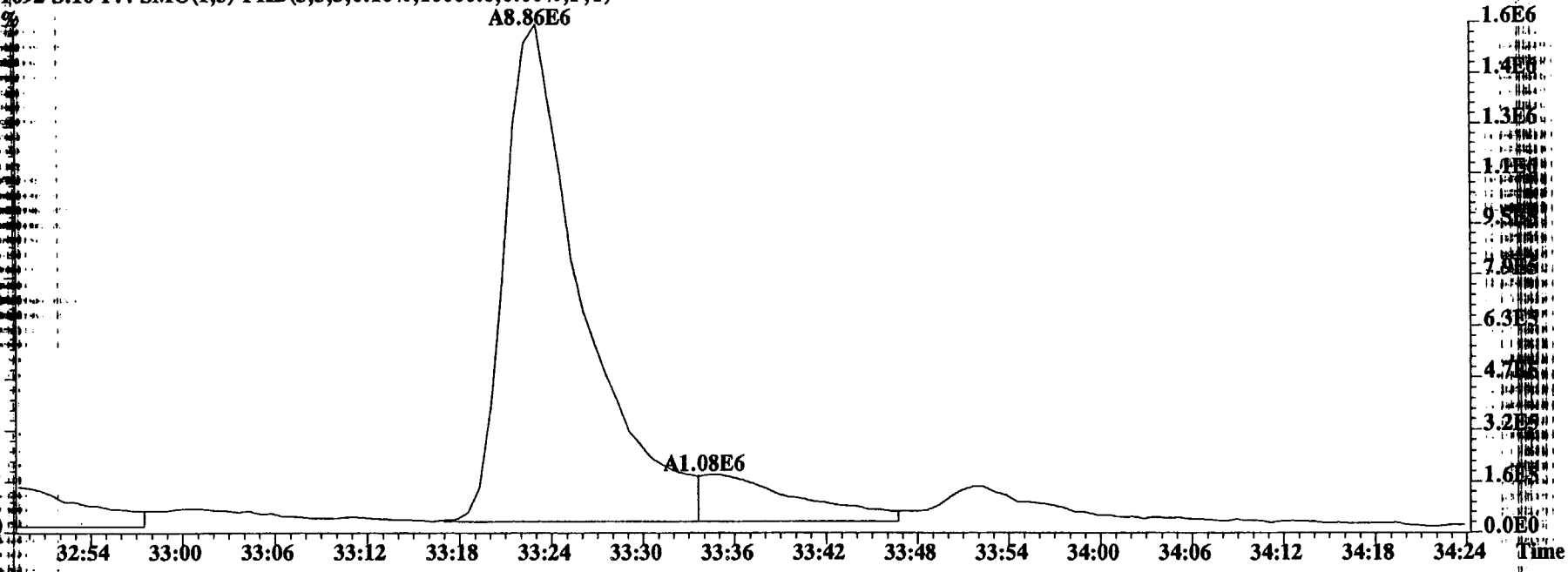
240.1692 S:10 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



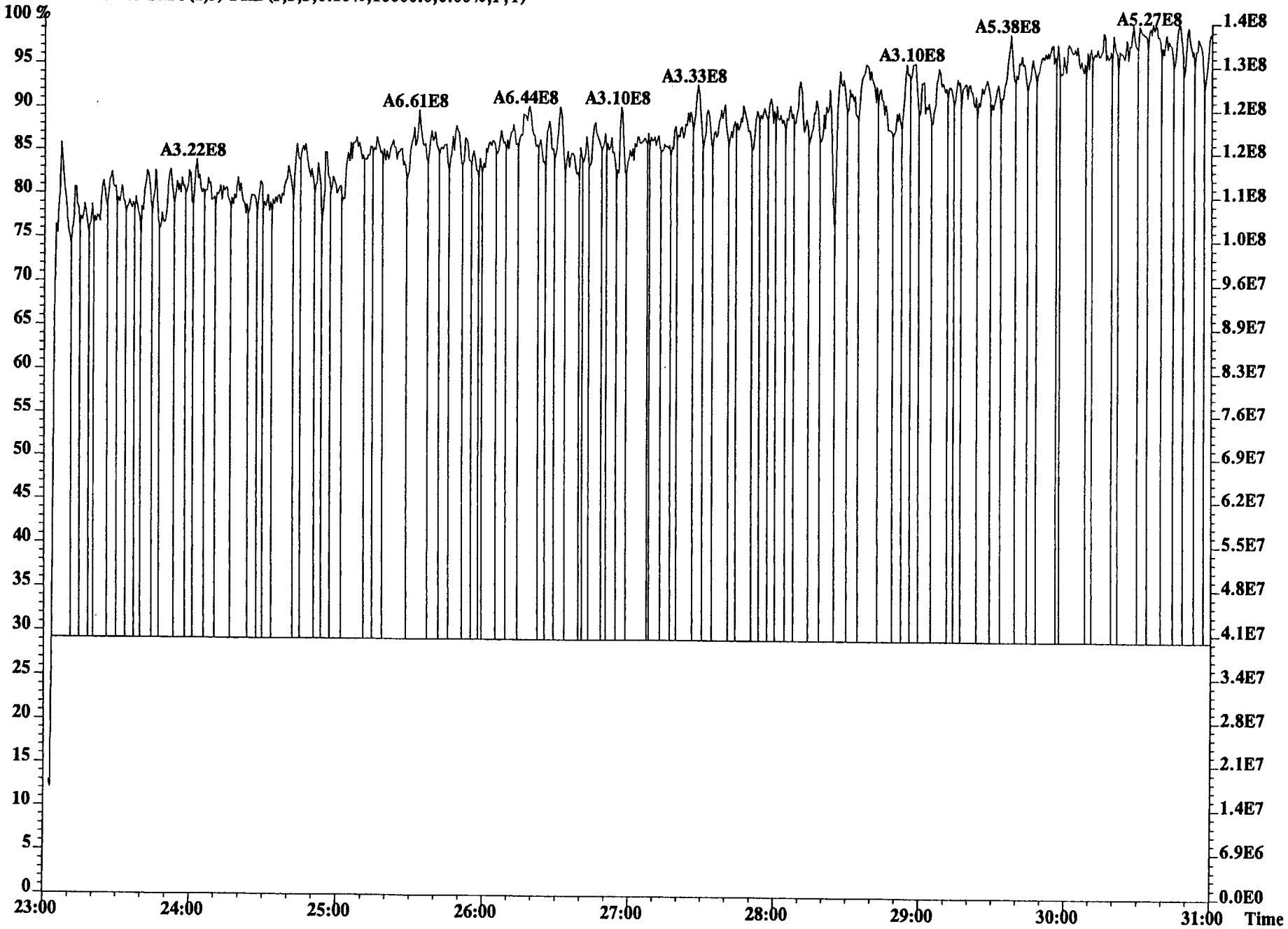
File:30OC98V4 #1-878 Acq:31-OCT-1998 00:06:44 GC EI+ Voltage SIR 70SE
Sample#10 Text:301802-7 :10X DIL. : : : Exp:PAHAIR
252.0939 S:10 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



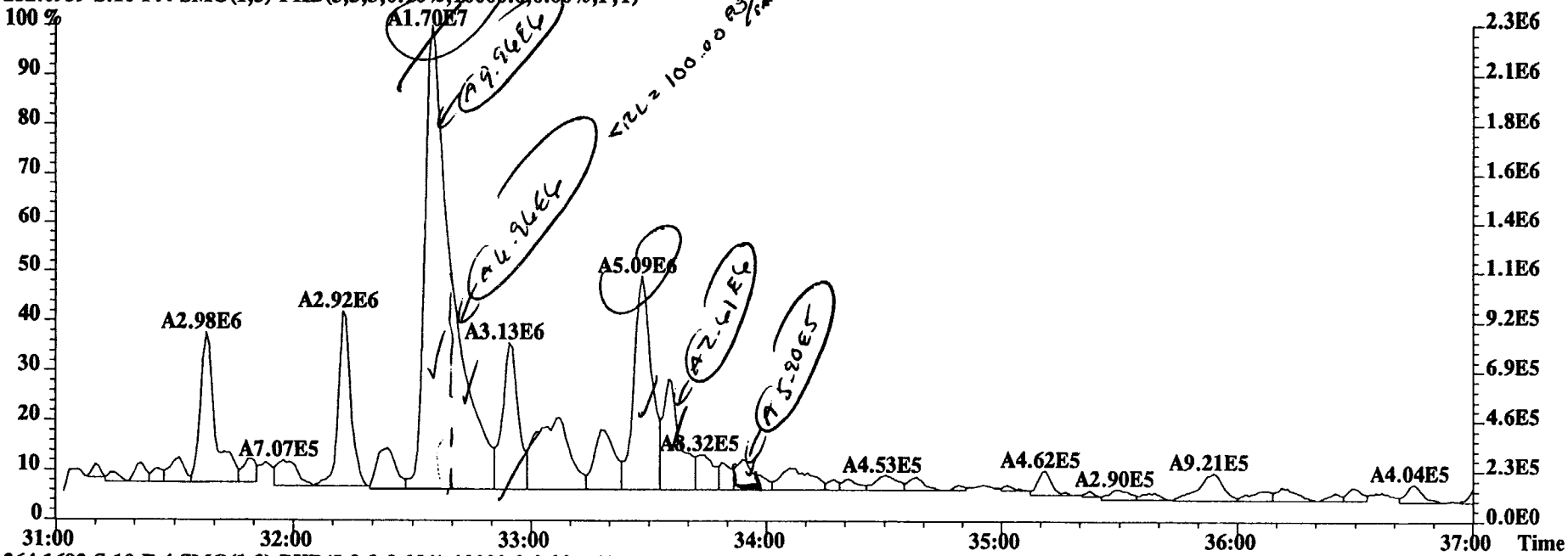
252.1692 S:10 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



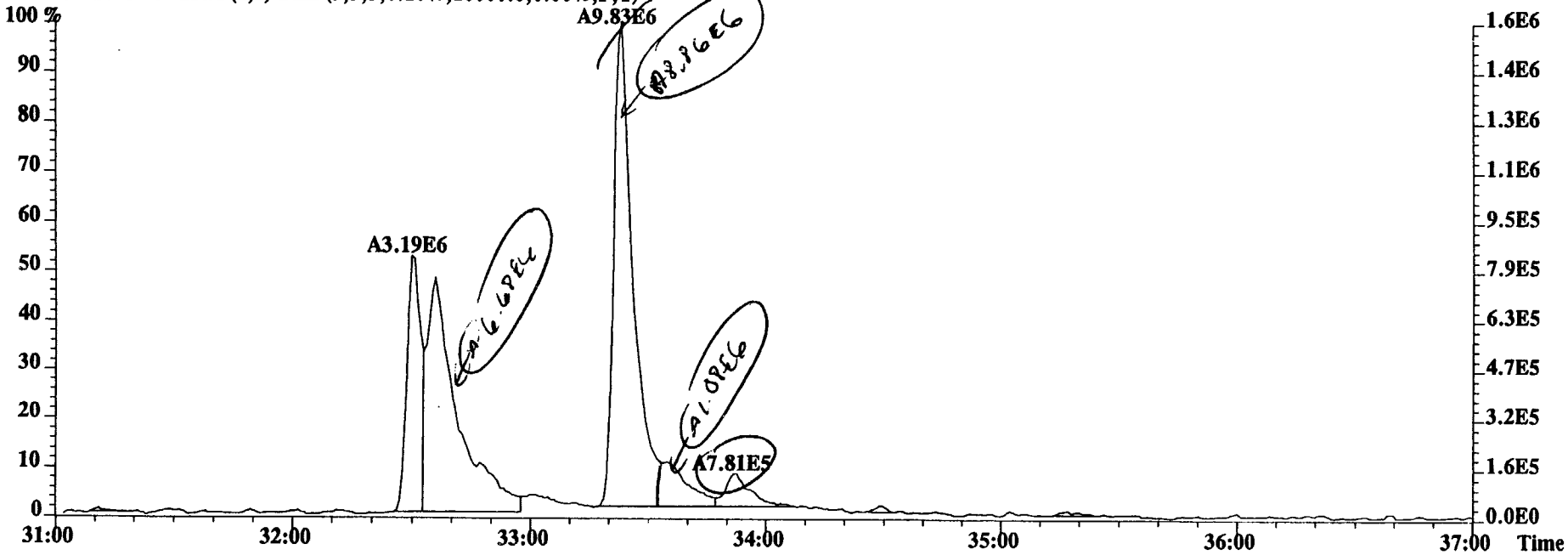
File:30OC98V4 #1-938 Acq:31-OCT-1998 00:06:44 GC EI+ Voltage SIR 70SE
Sample#10 Text:301802-7 :10X DIL. : : : Exp:PAHAIR
230.9856 S:10 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



File:30OC98V4 #1-878 Acq:31-OCT-1998 00:06:44 GC EI+ Voltage SIR 70SE
Sample#10 Text:301802-7 :10X DIL. : : : Exp:PAHAIR
252.0939 S:10 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

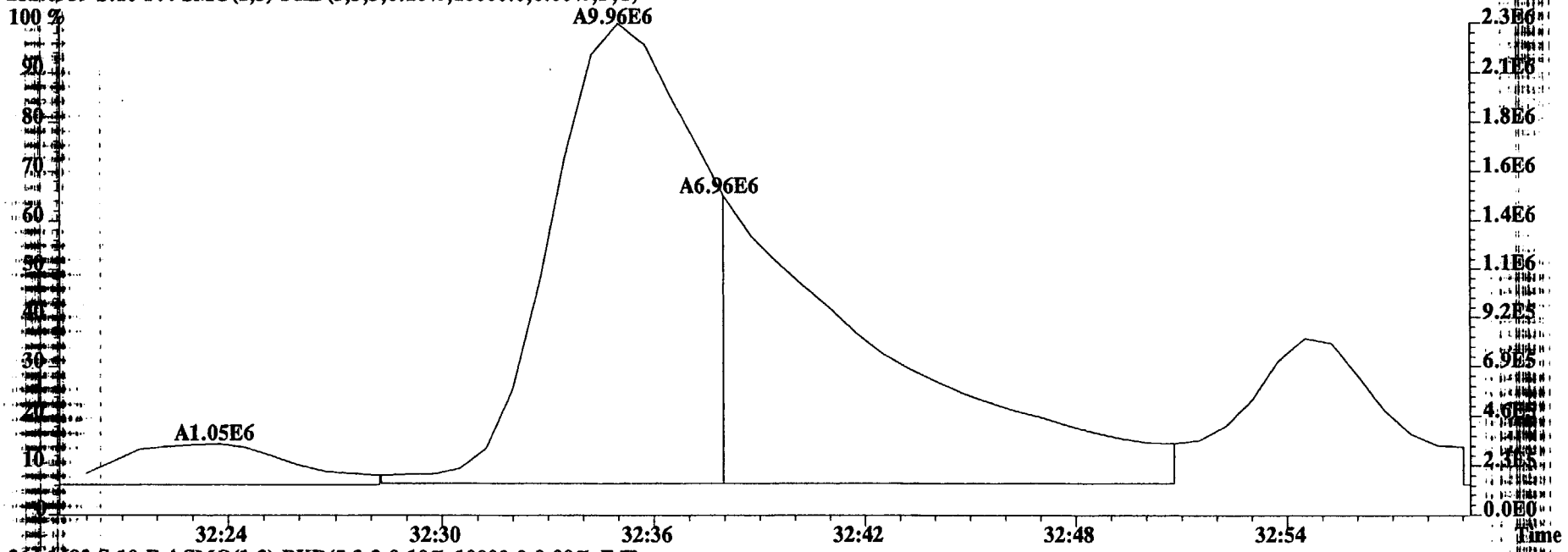


264.1692 S:10 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

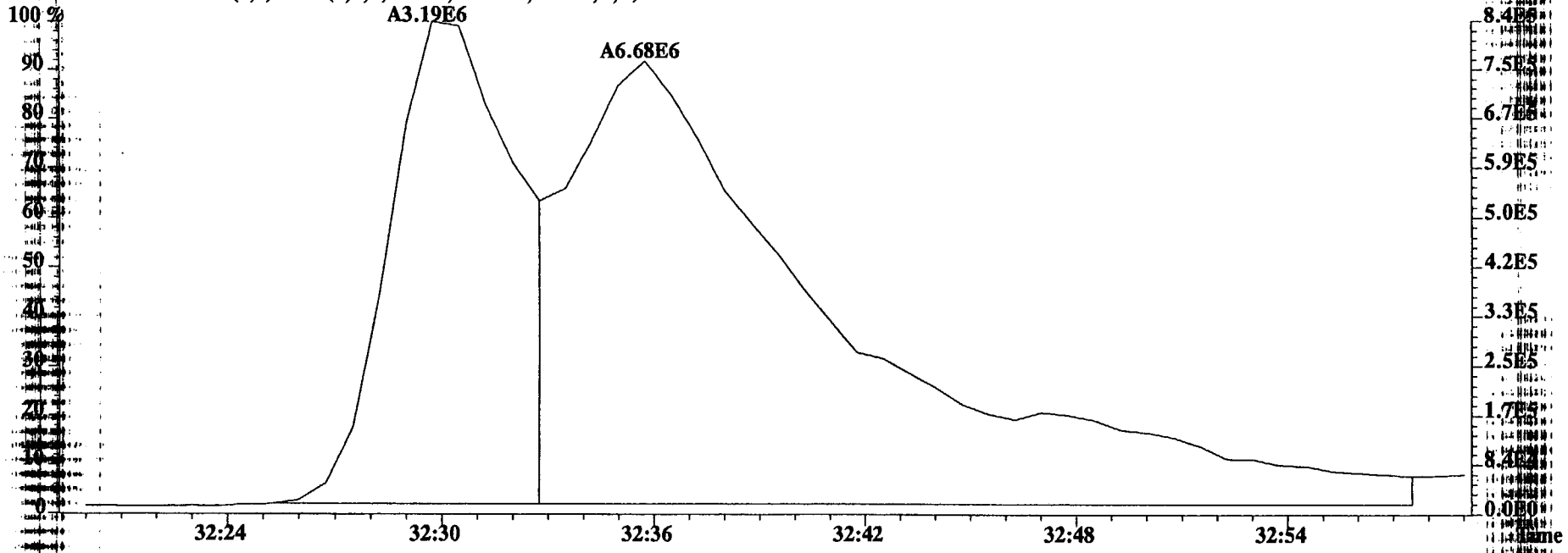


300

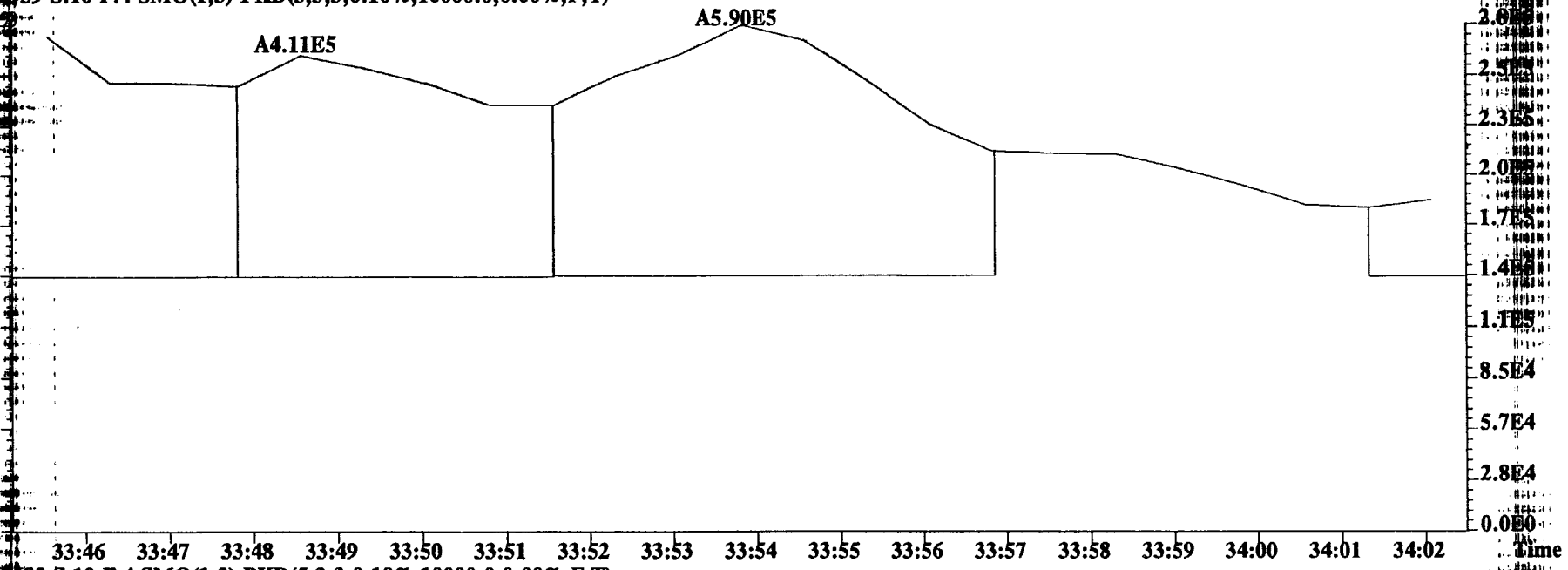
File:30OC98V4 #1-878 Acq:31-OCT-1998 00:06:44 GC EI+ Voltage SIR 70SE
Sample#10 Text:301802-7 :10X DIL. : : : Exp:PAHAIR
252.0939 S:10 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



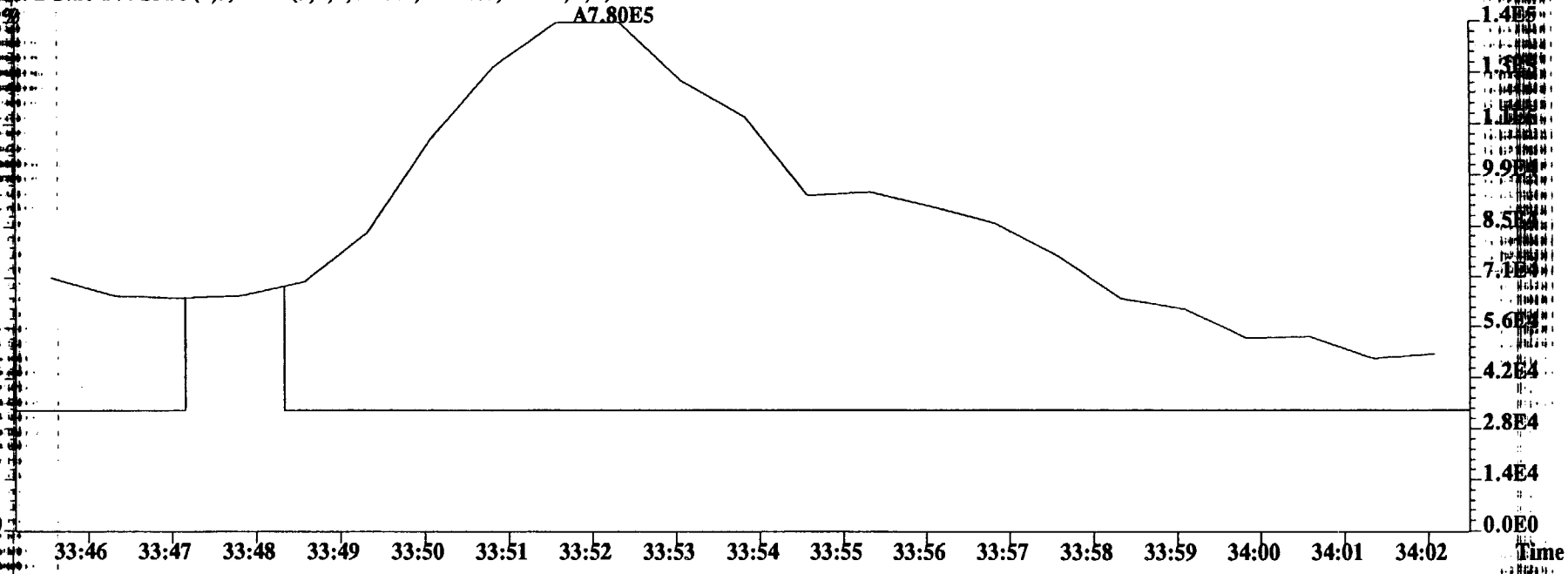
264.1692 S:10 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



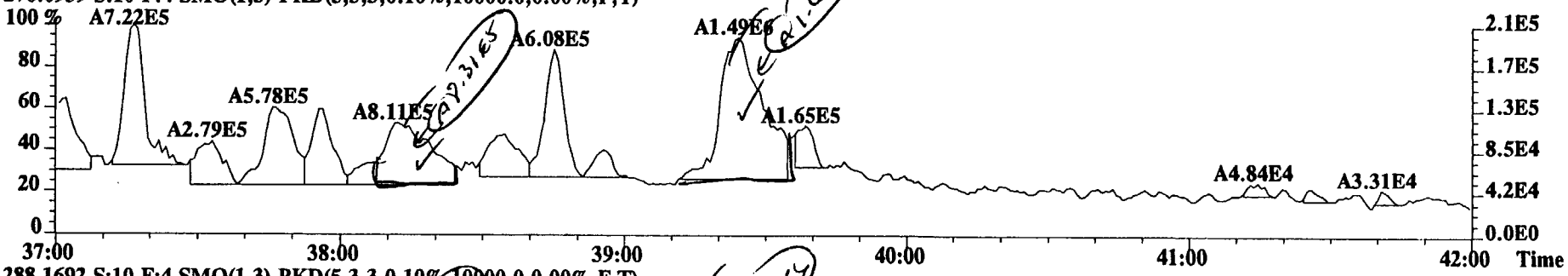
FILE:3DOC98V4 #1-878 Acq:31-OCT-1998 00:06:44 GC EI+ Voltage SIR 70SE
Sample#10 Text:301802-7 :10X DIL. : : : Exp:PAHAIR
252.0939 S:10 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



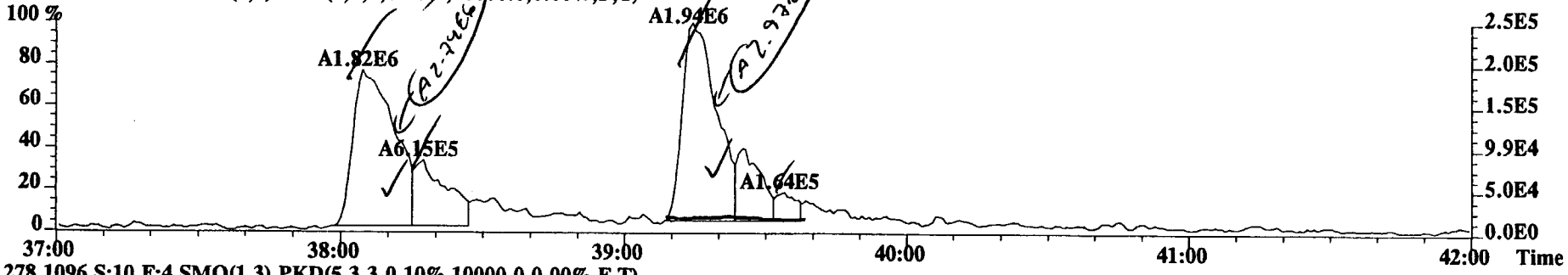
264.1692 S:10 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



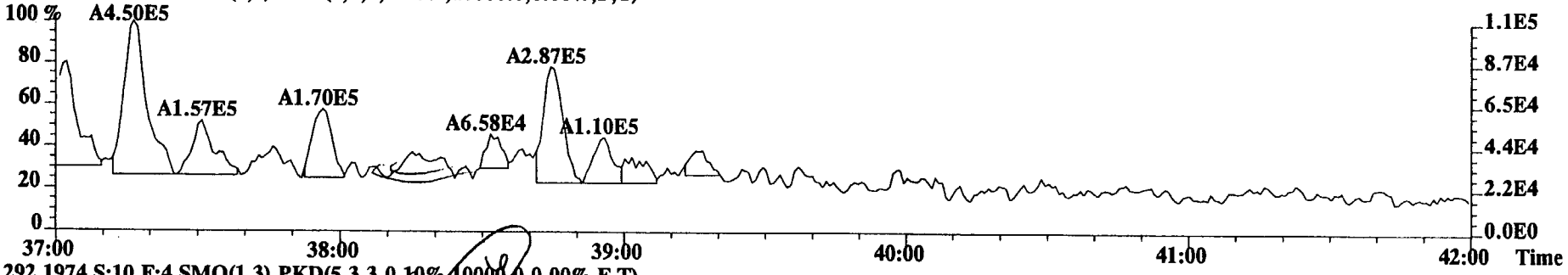
File:30OC98V4 #1-878 Acq:31-OCT-1998 00:06:44 GC EI+ Voltage SIR 70SE
Sample#10 Text:301802-7 :10X DIL. : : : Exp:PAHAIR
276.0939 S:10 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



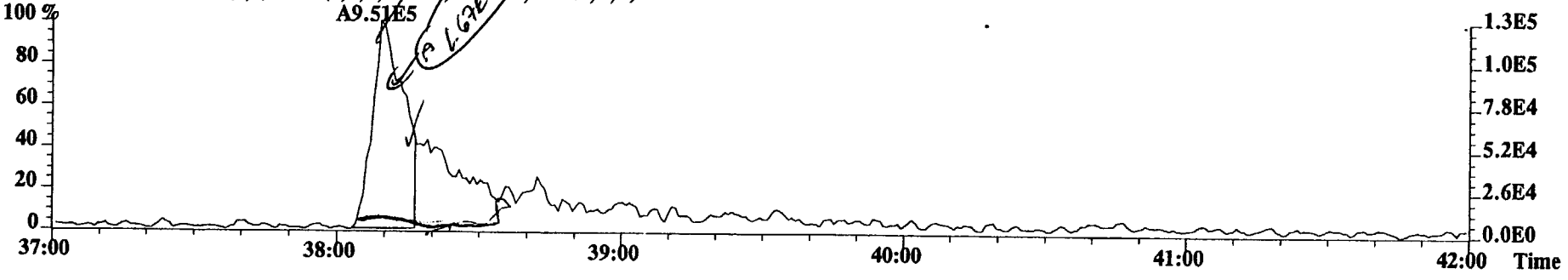
288.1692 S:10 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



278.1096 S:10 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

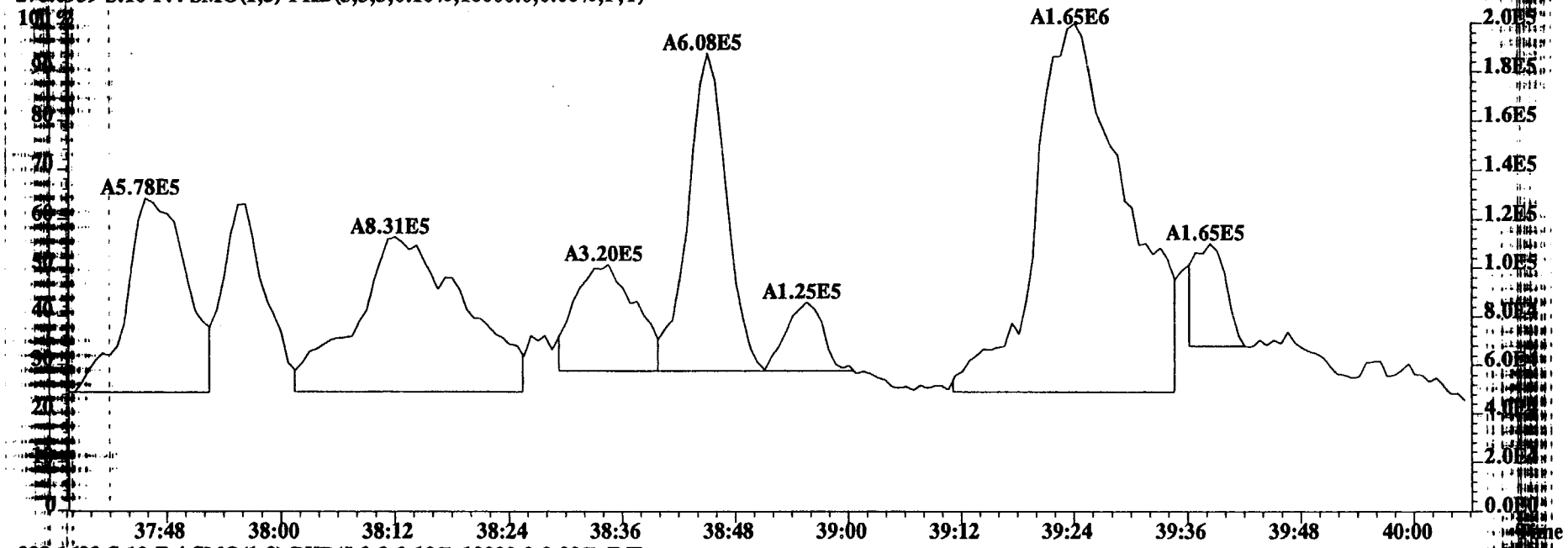


292.1974 S:10 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

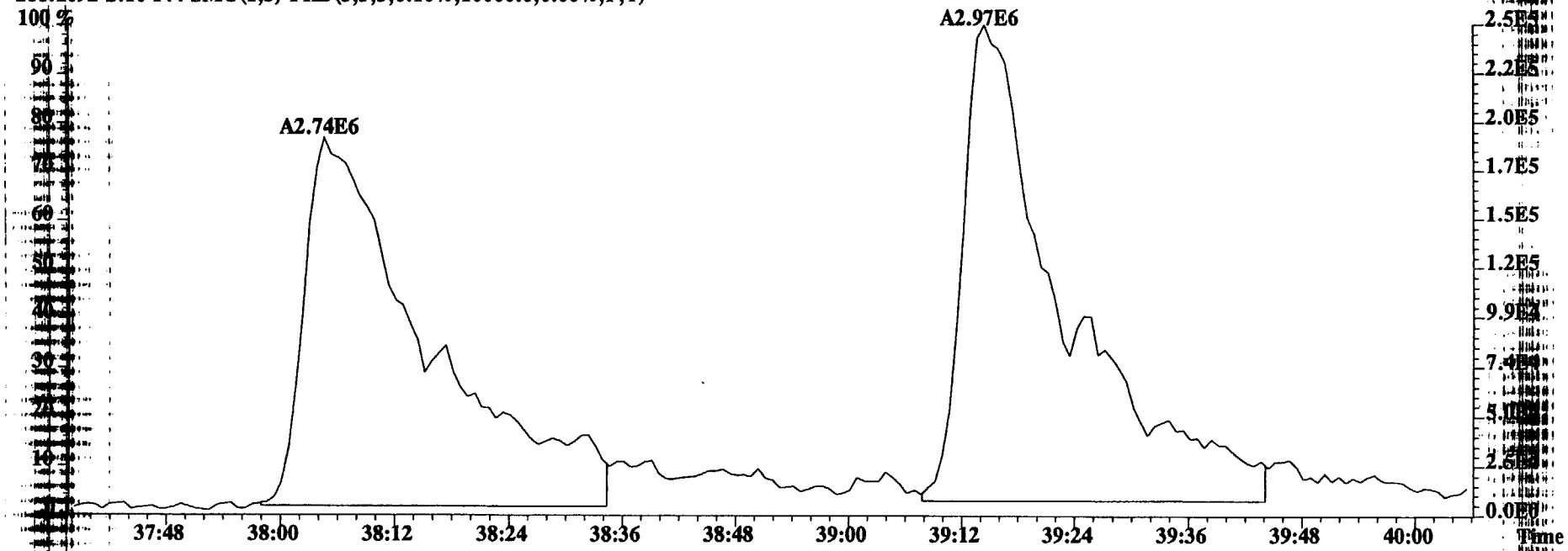


C 303

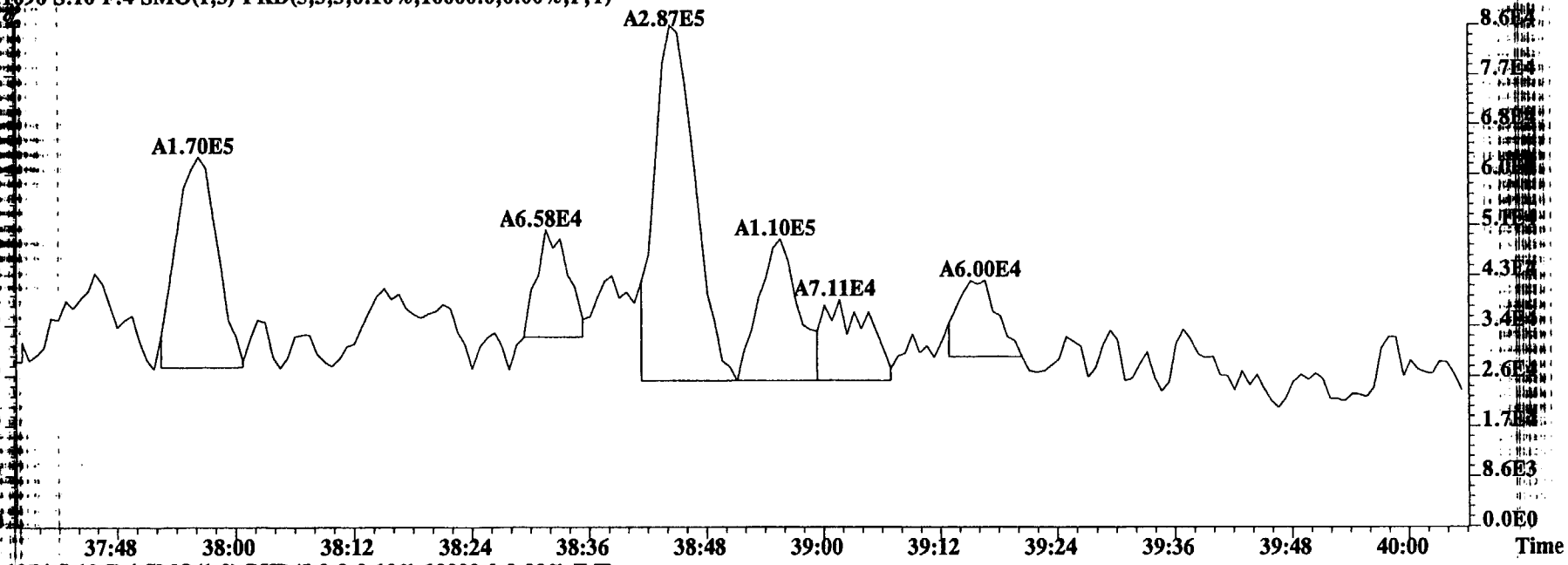
File:30OC98V4 #1-878 Acq:31-OCT-1998 00:06:44 GC EI+ Voltage SIR 70SE
Sample#10 Text:301802-7 :10X DIL. : : : Exp:PAHAIR
276.0939 S:10 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



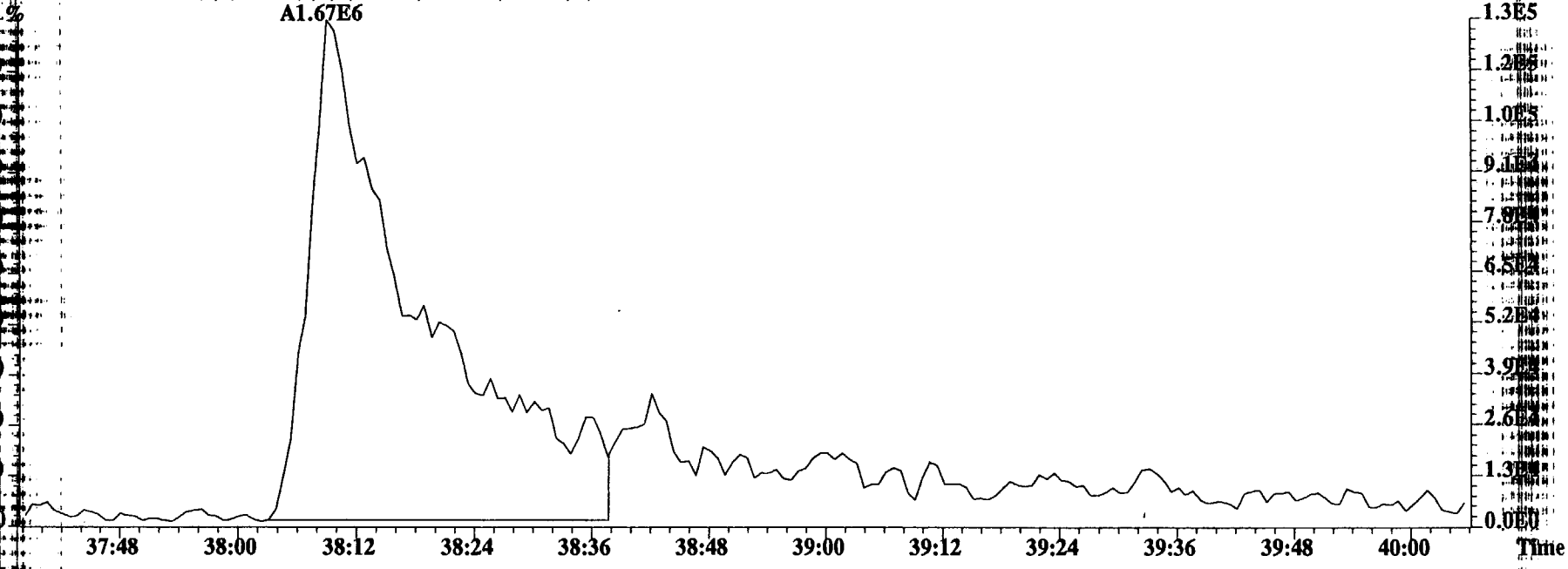
288.1692 S:10 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



File:30OC98V4 #1-878 Acq:31-OCT-1998 00:06:44 GC EI+ Voltage SIR 70SE
Sample#10 Text:301802-7 :10X DIL. : : : Exp:PAHAIR
278.1996 S:10 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

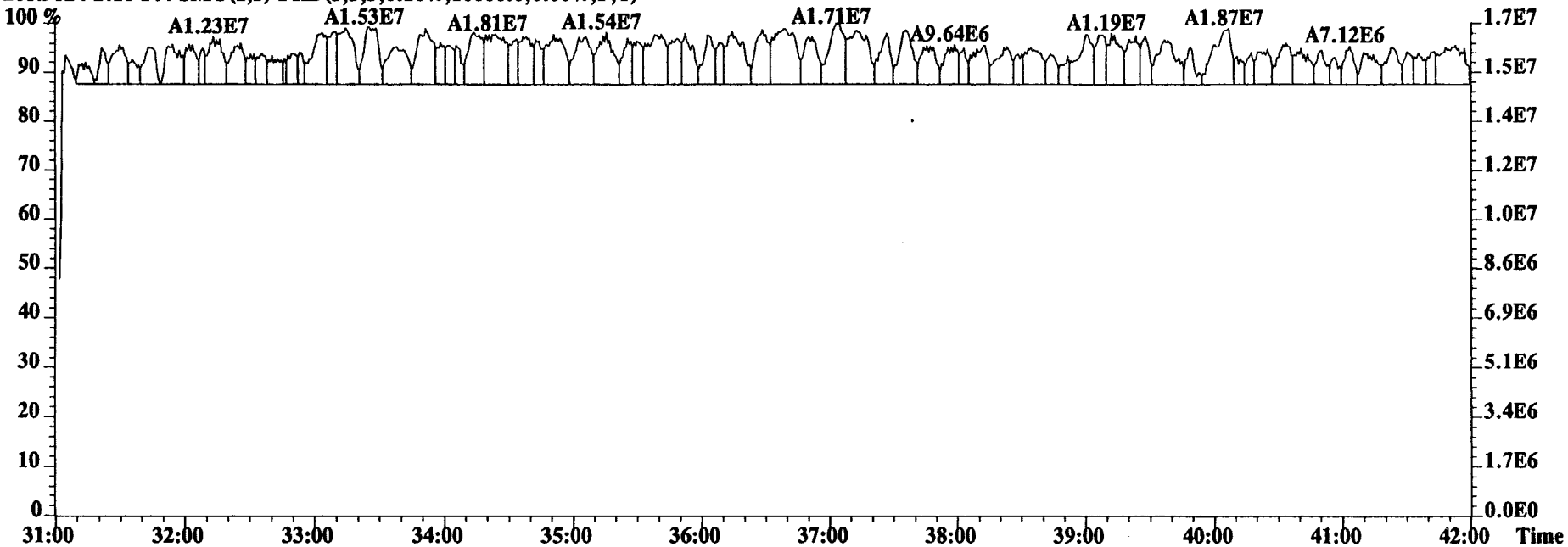


292.1974 S:10 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

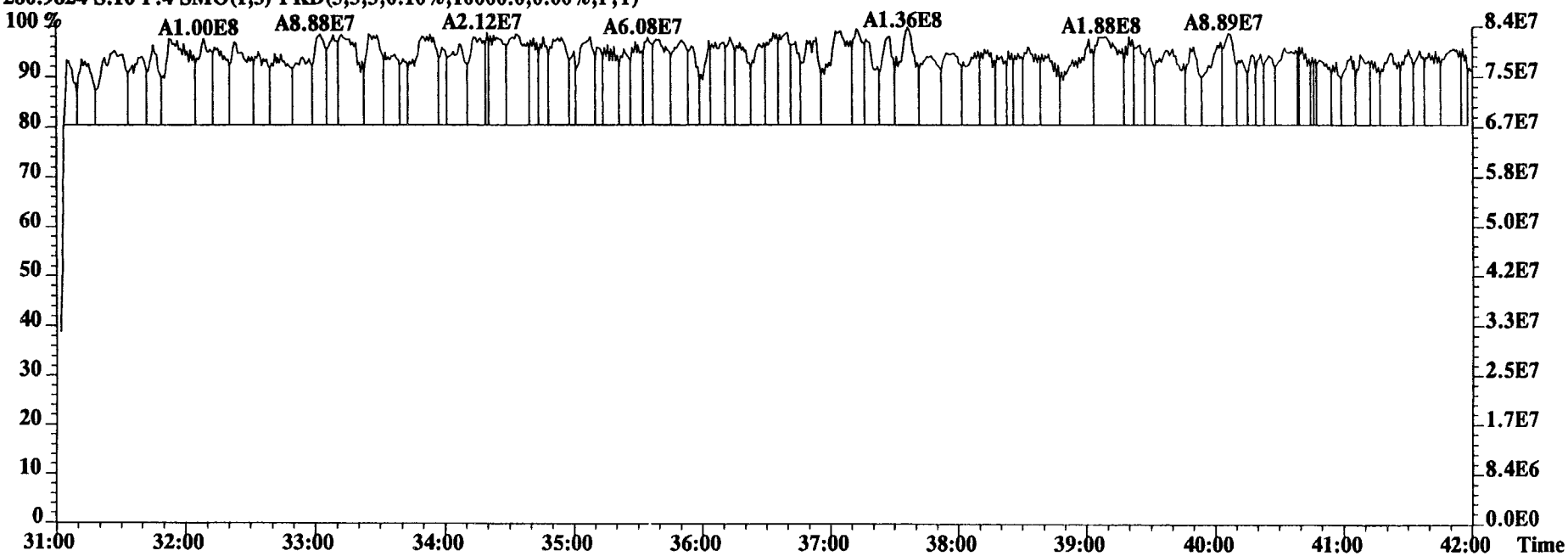


305

File:30OC98V4 #1-878 Acq:31-OCT-1998 00:06:44 GC EI+ Voltage SIR 70SE
Sample#10 Text:301802-7 :10X DIL. : : : Exp:PAHAIR
268.9824 S:10 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



280.9824 S:10 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



POLYNUCLEAR AROMATIC HYDROCARBONS
HIGH RESOLUTION GC/MS
Method HRGC/HRMS

Client Name: Pacific Environmental Services
Client ID: A-U-429-2
Lab ID: 301802-0008-SA
Matrix: AIRTRAIN Sampled: 24 SEP 98 Received: 29 SEP 98
Authorized: 29 SEP 98 Prepared: 03 OCT 98 Analyzed: 31 OCT 98
Dilution Factor: 1.0

Parameter	Result	Units	Reporting Limit	Data Qualifiers
Naphthalene	130000	ng/sample	--	B
2-Methylnaphthalene	2300	ng/sample	--	B
Acenaphthylene	68000	ng/sample	--	F
Acenaphthene	240	ng/sample	--	
Fluorene	690	ng/sample	--	
Phenanthrene	20000	ng/sample	--	
Anthracene	460	ng/sample	--	
Fluoranthene	12000	ng/sample	--	
Pyrene	21000	ng/sample	--	
Benzo(a)anthracene	100	ng/sample	--	
Chrysene	460	ng/sample	--	
Benzo(b)fluoranthene	420	ng/sample	--	
Benzo(k)fluoranthene	130	ng/sample	--	
Benzo(e)pyrene	1400	ng/sample	--	F
Benzo(a)pyrene	210	ng/sample	--	F
Perylene	ND	ng/sample	100	
Indeno(1,2,3-cd)pyrene	ND	ng/sample	100	
Dibenz(a,h)anthracene	ND	ng/sample	100	
Benzo(g,h,i)perylene	ND	ng/sample	100	

B = Compound is also detected in the blank.
F = Reported value estimated due to an interference.
ND = Not Detected

Reported By: Clark Pickell Approved By: Eric Redman

The cover letter is an integral part of this report.
Rev 230787

POLYNUCLEAR AROMATIC HYDROCARBONS
HIGH RESOLUTION GC/MS
Method HRGC/HRMS
(cont.)

Client Name: Pacific Environmental Services
Client ID: A-U-429-2
Lab ID: 301802-0008-SA
Matrix: AIRTRAIN Sampled: 24 SEP 98 Received: 29 SEP 98
Authorized: 29 SEP 98 Prepared: 03 OCT 98 Analyzed: 31 OCT 98
Dilution Factor: 1.0

Internal Standards	% Recovery	
Naphthalene-d8	42	
Acenaphthylene-d8	4.0	m
Acenaphthene-d10	49	
Fluorene-d10	78	
Phenanthrene-d10	95	
Fluoranthene-d10	65	
Pyrene-d10	55	
Benzo(a)anthracene-d12	61	
Perylene-d12	12	m
Indeno(123-cd)pyrene-d12	52	
Chrysene-d12	76	
Benzo(b)fluoranthene-d12	74	
Benzo(k)fluoranthene-d12	66	
Benzo(a)pyrene-d12	17	m
Dibenz(a,h)anthracene-d14	56	
Benzo(g,h,i)perylene-d12	40	m

Field Surrogates	% Recovery
13C-Fluorene	99

m = Internal Standard recovery is outside method recovery goal.

Reported By: Clark Pickell Approved By: Eric Redman

The cover letter is an integral part of this report.
Rev 230787

04-NOV-1998 07:17:37 PM Dioxin Furan Unknown RESULTS

Mass Spec : VG-4 Results : 30OC98V4111.RES : PAHAIR.TRG
GC Column : DB-5 Date analyzed : 30-OCT-98
Data file : 30OC98V4 301802-8 :10X DIL. : : : Ex Cal : PAHAIR102998V4.R
Weight : 0.5

Name	Total Response	Isotope Ratio	R. T. mm:ss	RRF	pg/ SAMP	Rec/ MDL
d10-2-Methylnaphthalene	5838300	1.00 Y	12: 28 Y	1.00	50.00	
d8-Naphthalene	5524320	1.00 Y	10: 12 Y	2.24	21.11	42
Naphthalene	9087580000	1.00 Y	10: 16 Y	1.23	1.3e+05	B E
2-Methylnaphthalene	70607600	1.00 Y	12: 34 Y	0.56	2280.12	B
d8-Acenaphthylene	290936	1.00 Y	15: 28 Y	1.21	2.05	4
Acenaphthylene	185853200	1.00 Y	15: 31 Y	0.94	6.8e+04	E F
d10-Acenaphthene	2146320	1.00 Y	16: 2 Y	0.74	24.69	49
Acenaphthene	6540000	1.00 Y	16: 8 Y	1.25	244.53	
d10-Anthracene	3258480	1.00 Y	20: 55 Y	1.00	50.00	
d10-Fluorene	3628840	1.00 Y	17: 42 Y	1.42	39.19	78
Fluorene	28931200	1.00 Y	17: 47 Y	1.16	686.98	
d10-Phenanthrene	8693120	1.00 Y	20: 45 Y	2.81	47.51	95
Phenanthrene	1569824000	1.00 Y	20: 49 Y	0.89	2.0e+04	E
Anthracene	31800000	1.00 Y	20: 59 Y	0.80	457.03	
d14-Terphenyl	11645580	1.00 Y	26: 0 Y	1.00	50.00	
d10-Fluoranthene	10675940	1.00 Y	24: 36 Y	1.41	32.49	65
Fluoranthene	1376432000	1.00 Y	24: 39 Y	1.11	1.2e+04	E
d10-Pyrene	9699220	1.00 Y	25: 17 Y	1.52	27.43	55
Pyrene	2455760000	1.00 Y	25: 20 Y	1.21	2.1e+04	E
d12-Benzo(a)anthracene	6392740	1.00 Y	29: 9 Y	0.90	30.50	61
Benzo(a)anthracene	7919440	1.00 Y	29: 13 Y	1.20	102.85	
d12-Chrysene	11354900	1.00 Y	29: 15 Y	1.28	38.11	76
Chrysene	56626400	1.00 Y	29: 20 Y	1.08	460.06	
d12-Benzo(e)pyrene	25020800	1.00 Y	33: 22 Y	1.00	50.00	
d12-Benzo(b)fluoranthene	8447640	1.00 Y	32: 30 Y	0.45	37.20	74
Benzo(b)fluoranthene	41400000	1.00 Y	32: 34 Y	1.17	419.86	
d12-Benzo(k)fluoranthene	15647720	1.00 Y	32: 35 Y	0.95	32.98	66
Benzo(k)fluoranthene	23000000	1.00 Y	32: 38 Y	1.16	126.26	
d12-Benzo(a)pyrene	2920000	1.00 Y	33: 32 Y	0.68	8.62	17
Benzo(e)pyrene	69200000	1.00 Y	33: 28 Y	1.64	1444.31 F	
Benzo(a)pyrene	6520000	1.00 Y	33: 38 N	1.07	208.29 F	
d12-Perylene	1906000	1.00 Y	33: 49 Y	0.63	6.04	12
Perylene	* No Peak	0.00 N	33: 55 N	1.71	NC <RL=100	
d12-Indeno(123-cd)pyrene	5828860	1.00 Y	38: 5 Y	0.44	26.20	52
Indeno(123-cd)pyrene	1235268	1.00 Y	38: 12 Y	0.62	<RL=100.00	
d14-Dibenz(ah)anthracene	3433960	1.00 Y	38: 8 Y	0.25	27.92	56
Dibenz(ah)anthracene	* No Peak	0.00 N	38: 15 N	1.40	<RL=100.00	
d12-Benzo(ghi)perylene	5857140	1.00 Y	39: 15 Y	0.58	20.19	40
Benzo(ghi)perylene	3609860	1.00 Y	39: 24 Y	1.02	<RL=100.00	
d10-Fluorene	3628840	1.00 Y	17: 42 Y	1.00	50.00	
13C-Fluorene	2906200	1.00 Y	17: 47 Y	0.81	49.49	99

11-4-98

0.5

98V4.RRF
Rec/
MDL

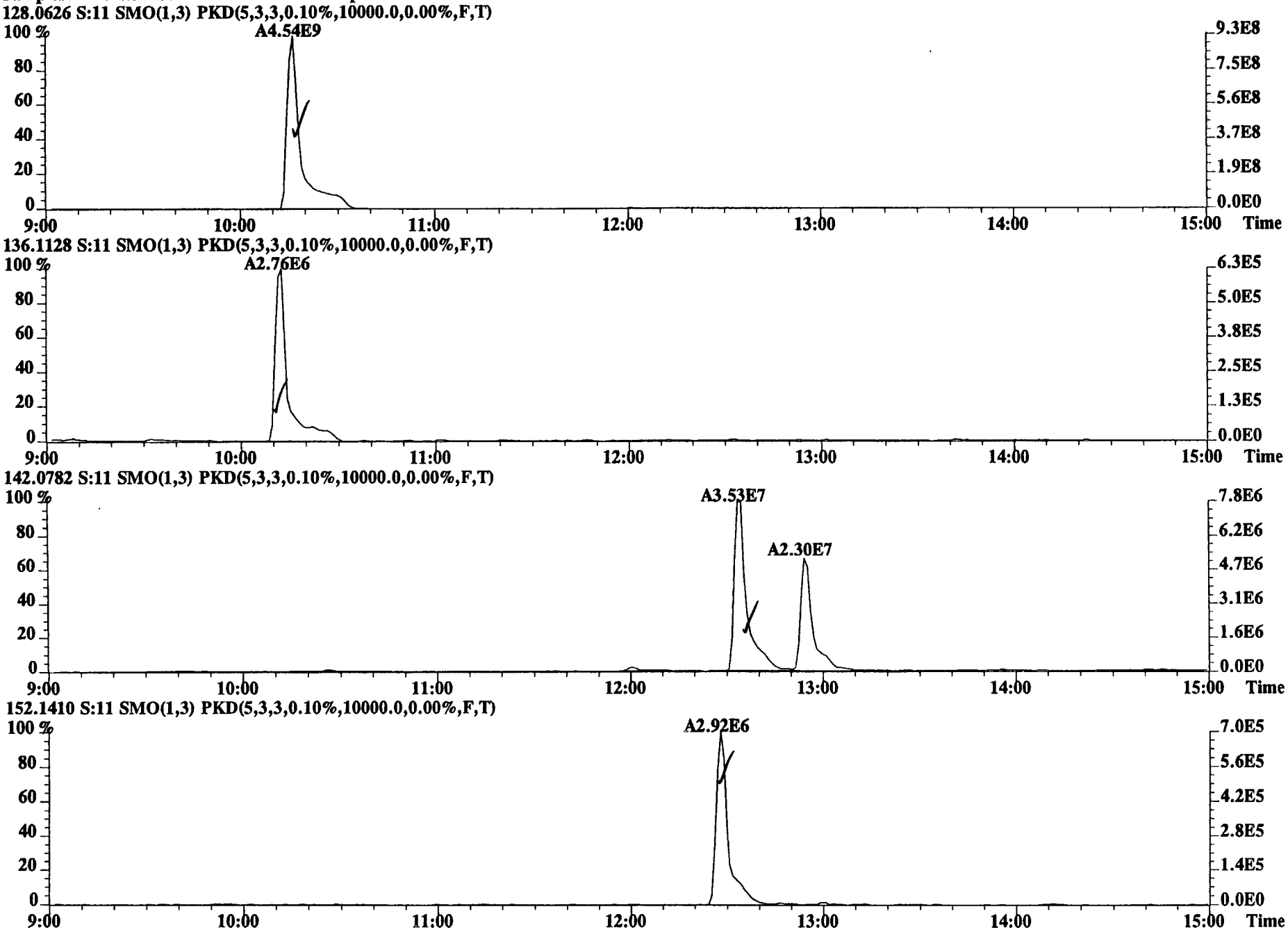
		2919150	2919150
	42	2762160	2762160
	B E	4543790000	4543790000
	B	35303800	35303800
	4	145468	145468
	E	92926600	92926600
	49	1073160	1073160
		3270000	3270000
		1629240	1629240
	78	1814420	1814420
		14465600	14465600
	95	4346560	4346560
	E	784912000	784912000
		15900000	15900000
		5822790	5822790
	65	5337970	5337970
	E	688216000	688216000
	55	4849610	4849610
	E	1227880000	1227880000
	61	3196370	3196370
		3959720	3959720
	76	5677450	5677450
		28313200	28313200
		12510400	12510400
	74	4223820	4223820
		20700000	20700000
	66	7823860	7823860
		11500000	11500000
	17	1460000	1460000
		34600000	34600000
		3260000	3260000
	12	953000	953000
		0	0
	52	2914430	2914430
00.00		617634	617634
	56	1716980	1716980
.00.00		0	0
	40	2928570	2928570
.00.00		1804930	1804930

02-NOV-1998 08:58:52 AM Dioxin Furan Unknown RESULTS

Mass Spec : VG-4 Results : 30OC98V4111.RES : PAHAIR.TRG
GC Column : DB-5 Date analyzed : 30-OCT-98
Data file : 30OC98V4 301802-8 :10X DIL. : : : Ex Cal : PAHAIR102998V4.R
Weight : 0.5

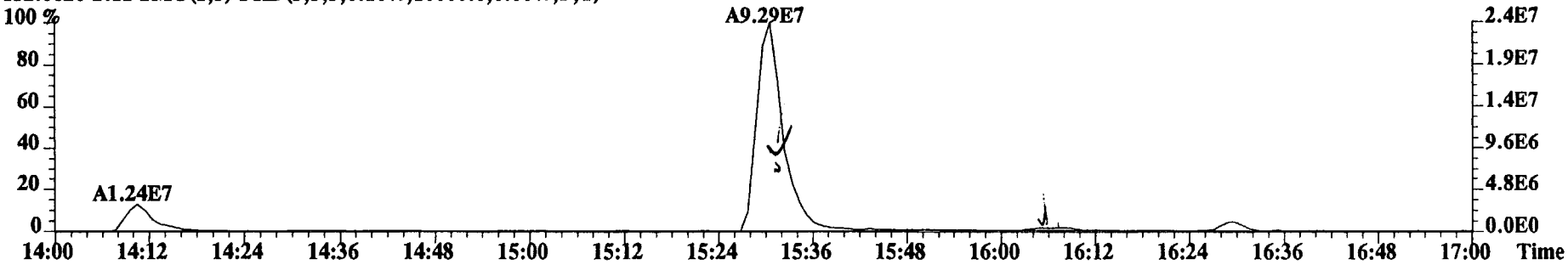
Name	Total Response	Isotope Ratio		R. T. mm:ss		RRF	pg/ SAMP	Rec/ MDL
d10-2-Methylnaphthalene	5838300	1.00	Y	12: 28	Y	1.00	50.00	
d8-Naphthalene	5524320	1.00	Y	10: 12	Y	2.24	21.11	42
Naphthalene	9087580000	1.00	Y	10: 16	Y	1.23	1.3e+05	0.000
2-Methylnaphthalene	70607600	1.00	Y	12: 34	Y	0.56	2280.12	0.000
d8-Acenaphthylene	290936	1.00	Y	15: 28	Y	1.21	2.05	4
Acenaphthylene	185853200	1.00	Y	15: 31	Y	0.94	6.8e+04	0.000
d10-Acenaphthene	2146320	1.00	Y	16: 2	Y	0.74	24.69	49
Acenaphthene	* No Peak	0.00	N	16: 8	N	1.25	0.00	0.000
d10-Anthracene	3258480	1.00	Y	20: 55	Y	1.00	50.00	
d10-Fluorene	3628840	1.00	Y	17: 42	Y	1.42	39.19	78
Fluorene	28931200	1.00	Y	17: 47	Y	1.16	686.98	0.000
d10-Phenanthrene	8693120	1.00	Y	20: 45	Y	2.81	47.51	95
Phenanthrene	1569824000	1.00	Y	20: 49	Y	0.89	2.0e+04	0.000
Anthracene	* No Peak	0.00	N	20: 59	N	0.80	0.00	0.000
d14-Terphenyl	11645580	1.00	Y	26: 0	Y	1.00	50.00	
d10-Fluoranthene	10675940	1.00	Y	24: 36	Y	1.41	32.49	65
Fluoranthene	1376432000	1.00	Y	24: 39	Y	1.11	1.2e+04	0.000
d10-Pyrene	9699220	1.00	Y	25: 17	Y	1.52	27.43	55
Pyrene	2455760000	1.00	Y	25: 20	Y	1.21	2.1e+04	0.000
d12-Benzo(a)anthracene	6392740	1.00	Y	29: 9	Y	0.90	30.50	61
Benzo(a)anthracene	7919440	1.00	Y	29: 13	Y	1.20	102.85	0.000
d12-Chrysene	11354900	1.00	Y	29: 15	Y	1.28	38.11	76
Chrysene	56626400	1.00	Y	29: 20	Y	1.08	460.06	0.000
d12-Benzo(e)pyrene	25020800	1.00	Y	33: 22	Y	1.00	50.00	
d12-Benzo(b)fluoranthene	8447640	1.00	Y	32: 30	Y	0.45	37.20	74
Benzo(b)fluoranthene	75738400	1.00	Y	32: 34	Y	1.17	768.10	0.000
d12-Benzo(k)fluoranthene	15647720	1.00	Y	32: 35	Y	0.95	32.98	66
Benzo(k)fluoranthene	75738400	1.00	Y	32: 34	Y	1.16	415.77	0.000
d12-Benzo(a)pyrene	* No Peak	0.00	N	33: 32	N	0.68	0.00	0
Benzo(e)pyrene	77195400	1.00	Y	33: 28	Y	1.64	*NoINoIs	
Benzo(a)pyrene	* No Peak	0.00	N	33: 38	N	1.07	*NoINoIs	
d12-Perylene	* No Peak	0.00	N	33: 49	N	0.63	0.00	0
Perylene	* No Peak	0.00	N	33: 55	N	1.71	*NoINoIs	
d12-Indeno(123-cd)pyrene	5828860	1.00	Y	38: 5	Y	0.44	26.20	52
Indeno(123-cd)pyrene	1235268	1.00	Y	38: 12	Y	0.62	34.13	0.000
d14-Dibenz(ah)anthracene	3433960	1.00	Y	38: 8	Y	0.25	27.92	56
Dibenz(ah)anthracene	* No Peak	0.00	N	38: 15	N	1.40	0.00	0.000
d12-Benzo(ghi)perylene	5857140	1.00	Y	39: 15	Y	0.58	20.19	40
Benzo(ghi)perylene	3609860	1.00	Y	39: 24	Y	1.02	60.66	0.000
d10-Fluorene	3628840	1.00	Y	17: 42	Y	1.42	5.10	10
13C-Fluorene	2906200	1.00	Y	17: 47	Y	1.00	80.09	0.000

File:30OC98V4 #1-510 Acq:31-OCT-1998 00:55:45 GC EI+ Voltage SIR 70SE
Sample#11 Text:301802-8 :10X DIL. : : : Exp:PAHAIR

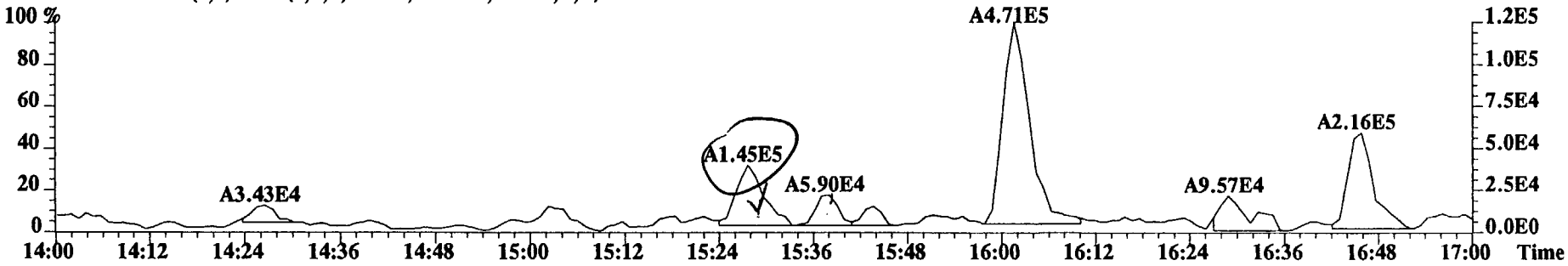


File:30OC98V4 #1-510 Acq:31-OCT-1998 00:55:45 GC EI+ Voltage SIR 70SE
Sample#11 Text:301802-8 :10X DIL. : : : Exp:PAHAIR

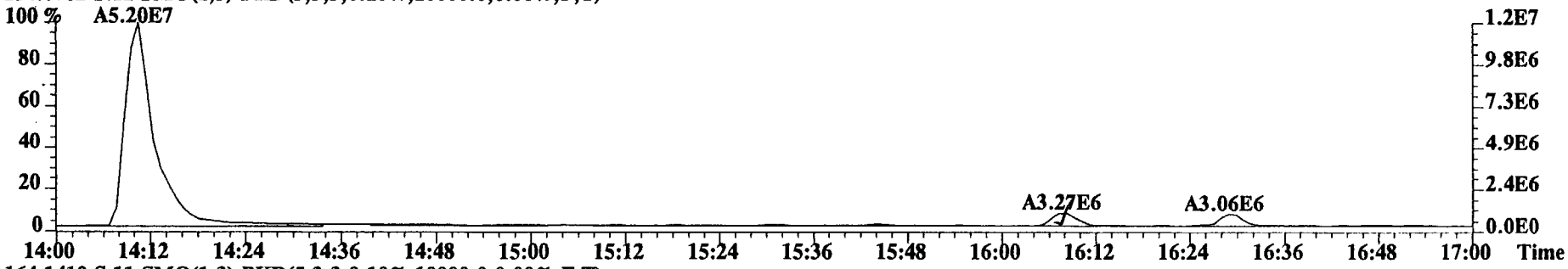
152.0626 S:11 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



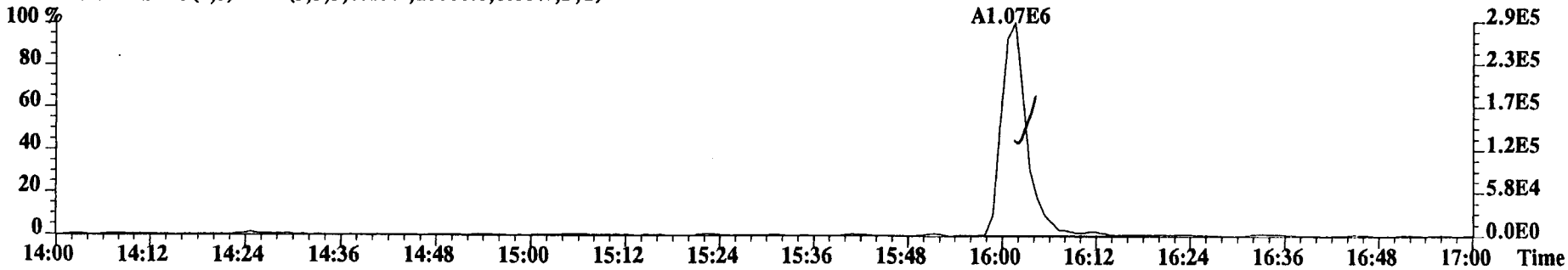
160.1128 S:11 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



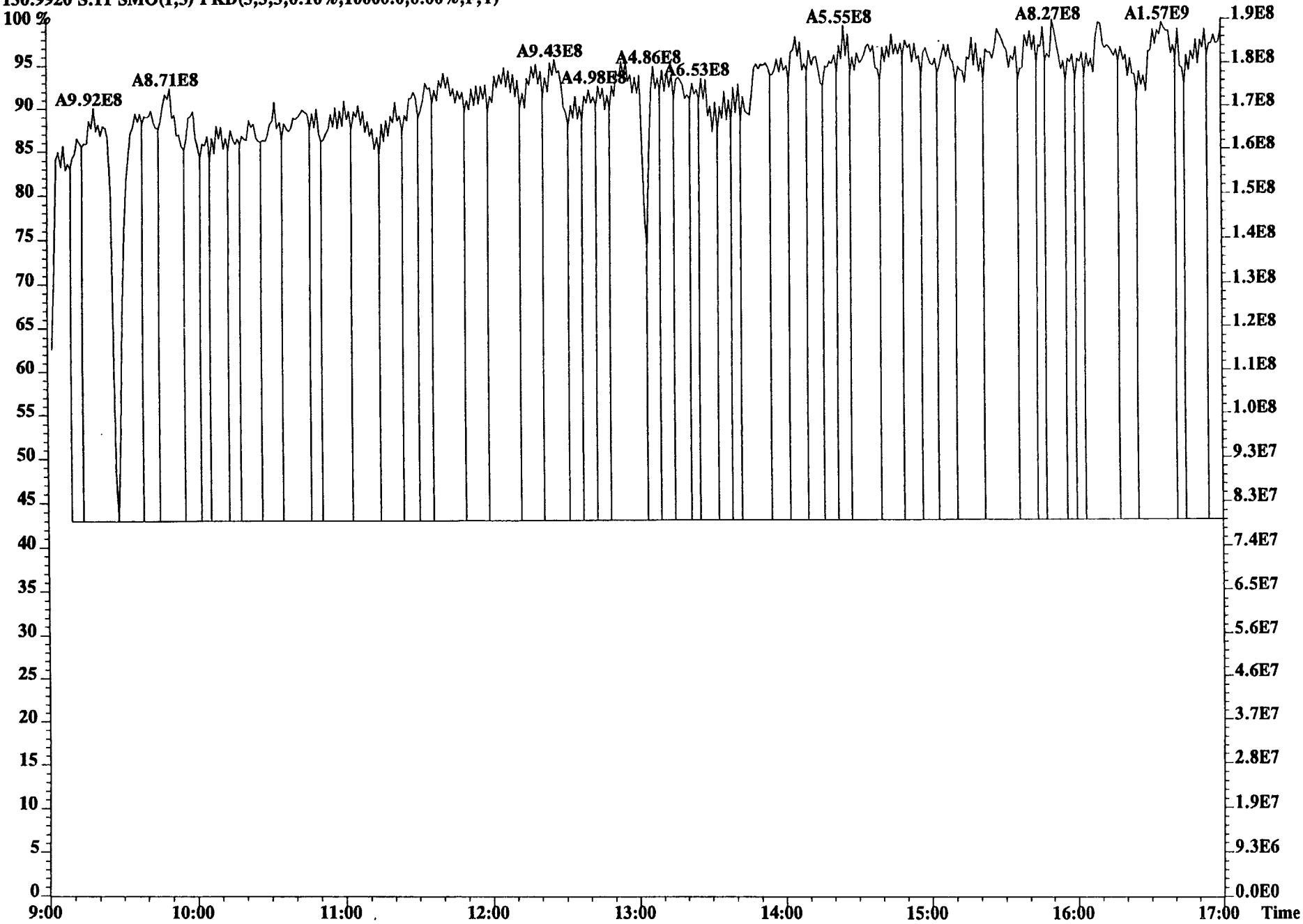
154.0782 S:11 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



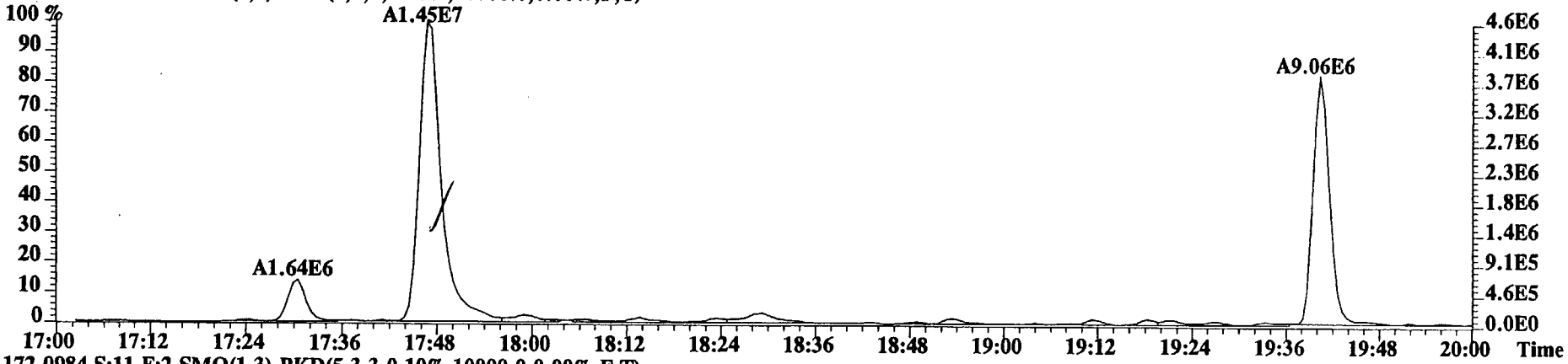
164.1410 S:11 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



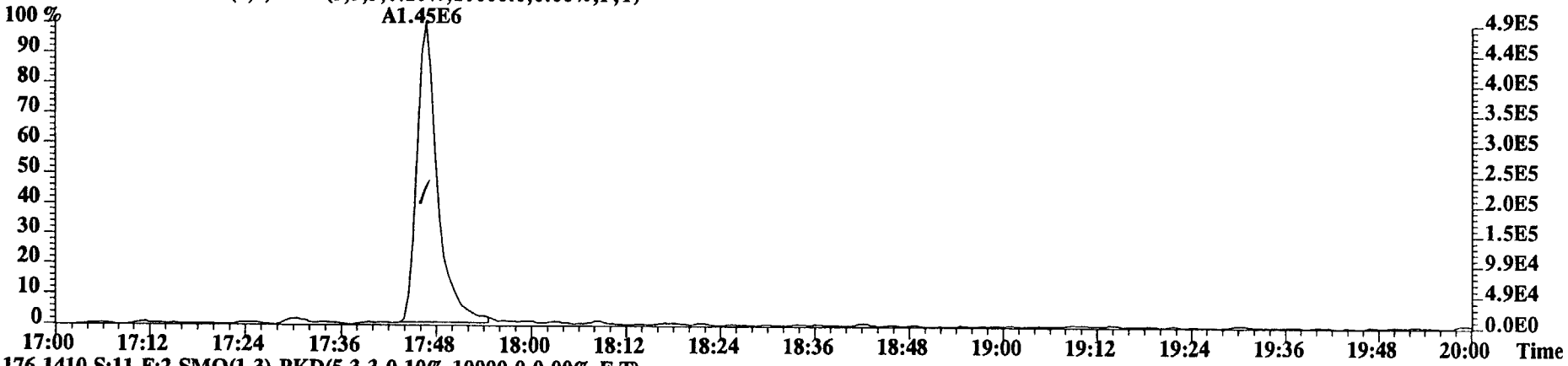
File:30OC98V4 #1-510 Acq:31-OCT-1998 00:55:45 GC EI+ Voltage SIR 70SE
Sample#11 Text:301802-8 :10X DIL. : : : Exp:PAHAIR
130.9920 S:11 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



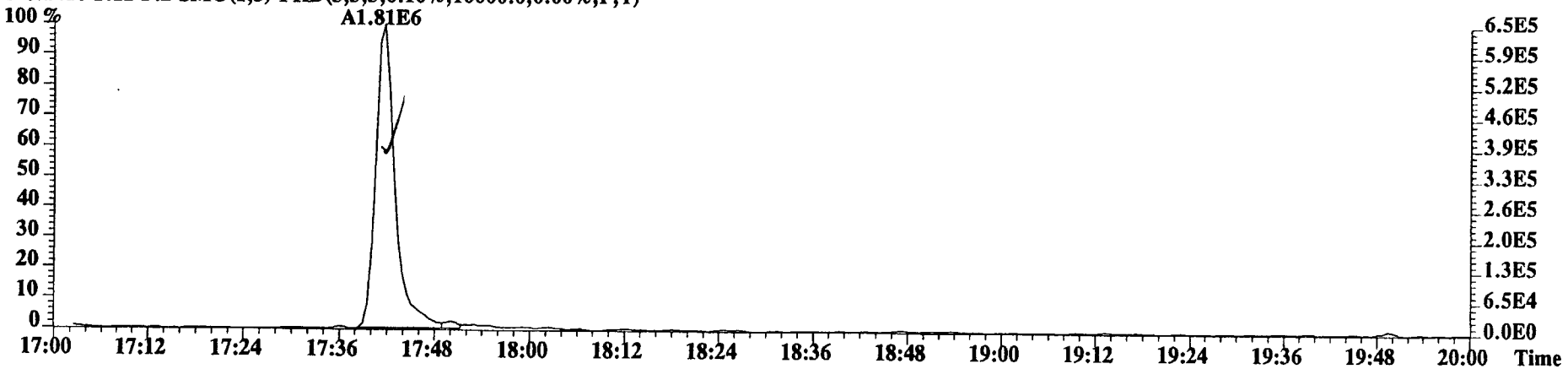
File:30OC98V4 #1-640 Acq:31-OCT-1998 00:55:45 GC EI+ Voltage SIR 70SE
Sample#11 Text:301802-8 :10X DIL. : : : Exp:PAHAIR
166.0798 S:11 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



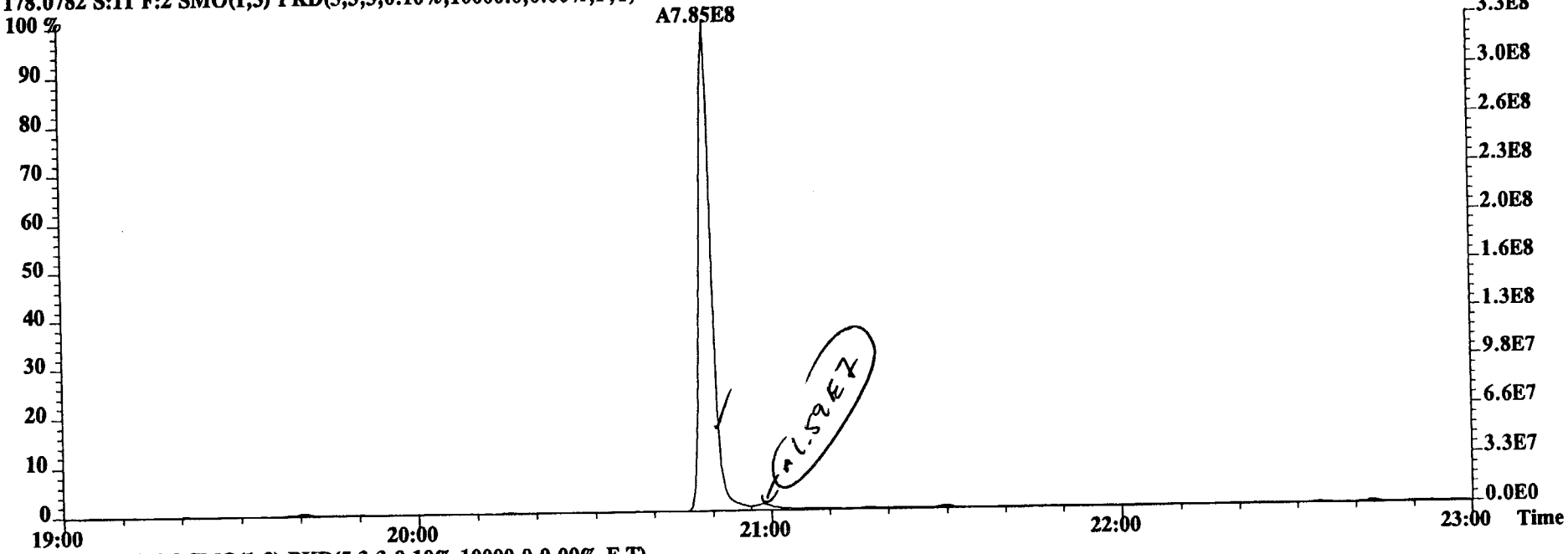
172.0984 S:11 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



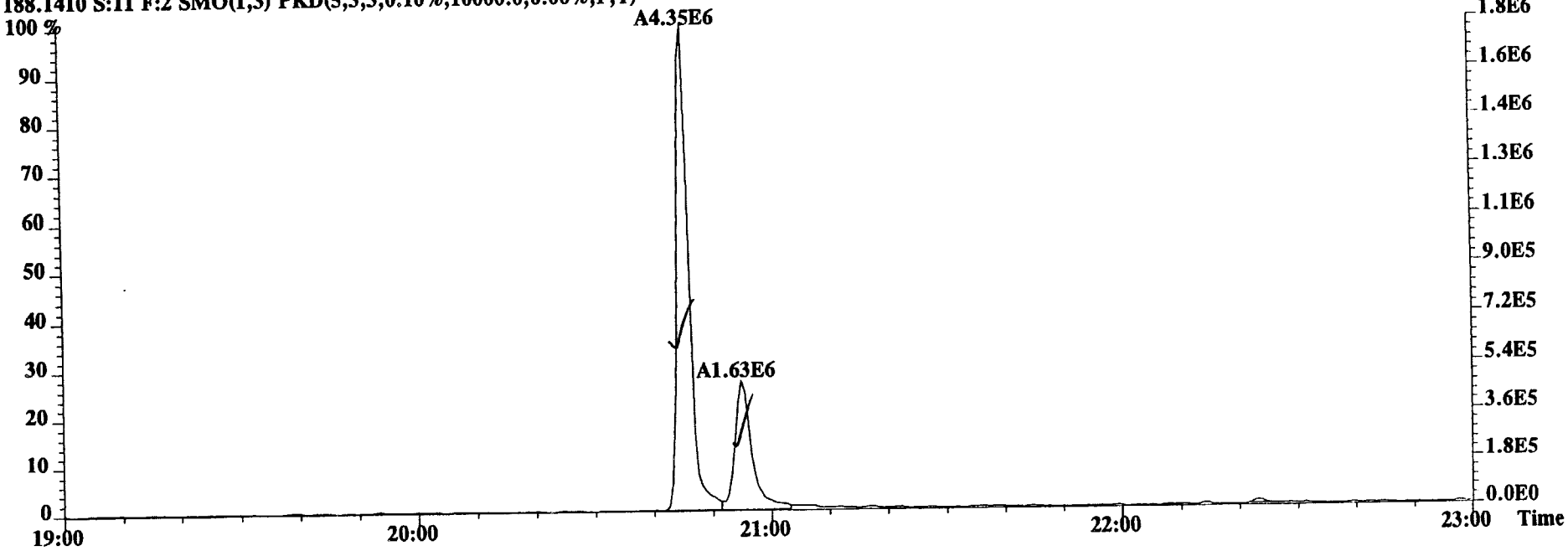
176.1410 S:11 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



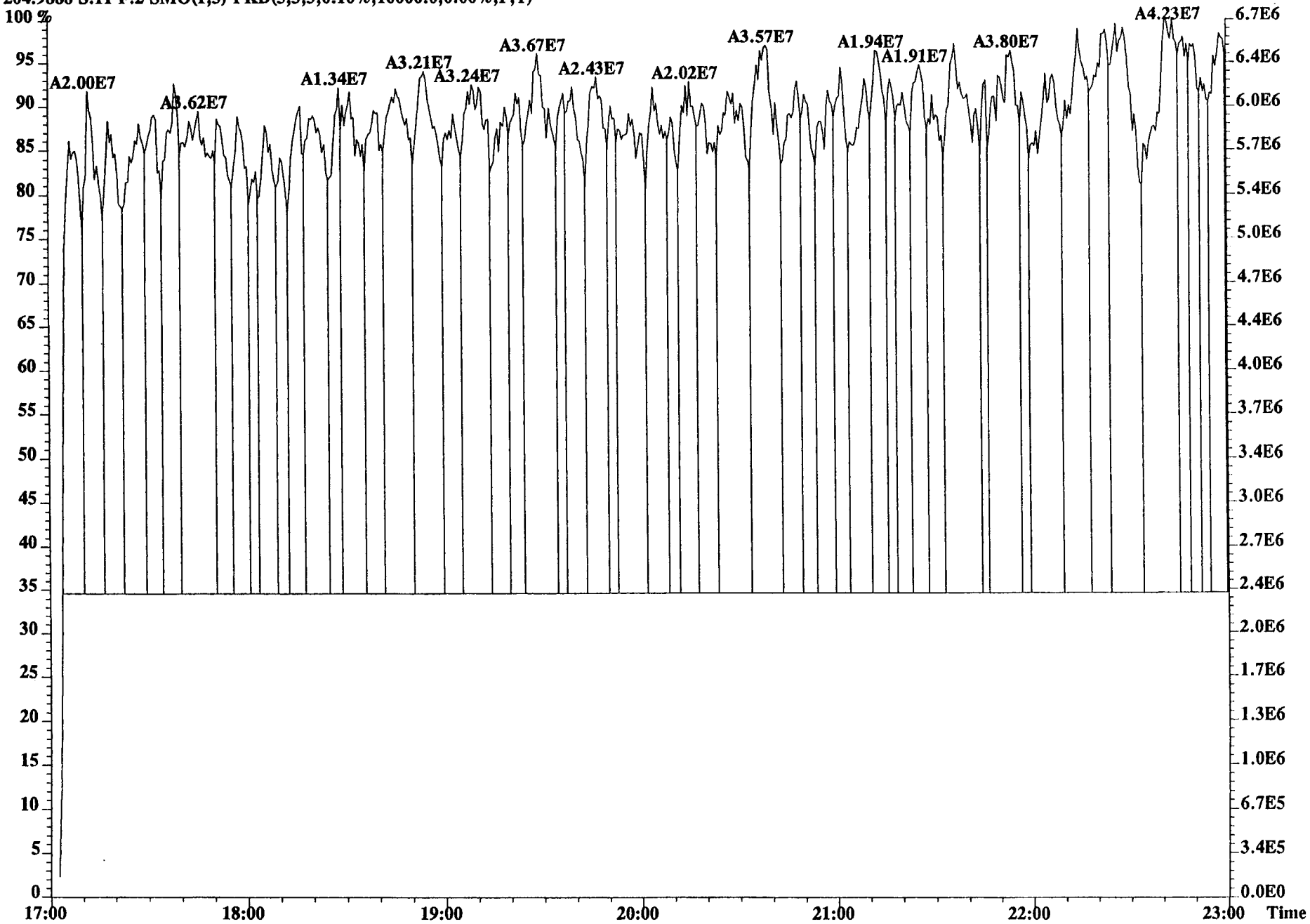
File:30OC98V4 #1-640 Acq:31-OCT-1998 00:55:45 GC EI+ Voltage SIR 70SE
Sample#11 Text:301802-8 :10X DIL. : : : Exp:PAHAIR
178.0782 S:11 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



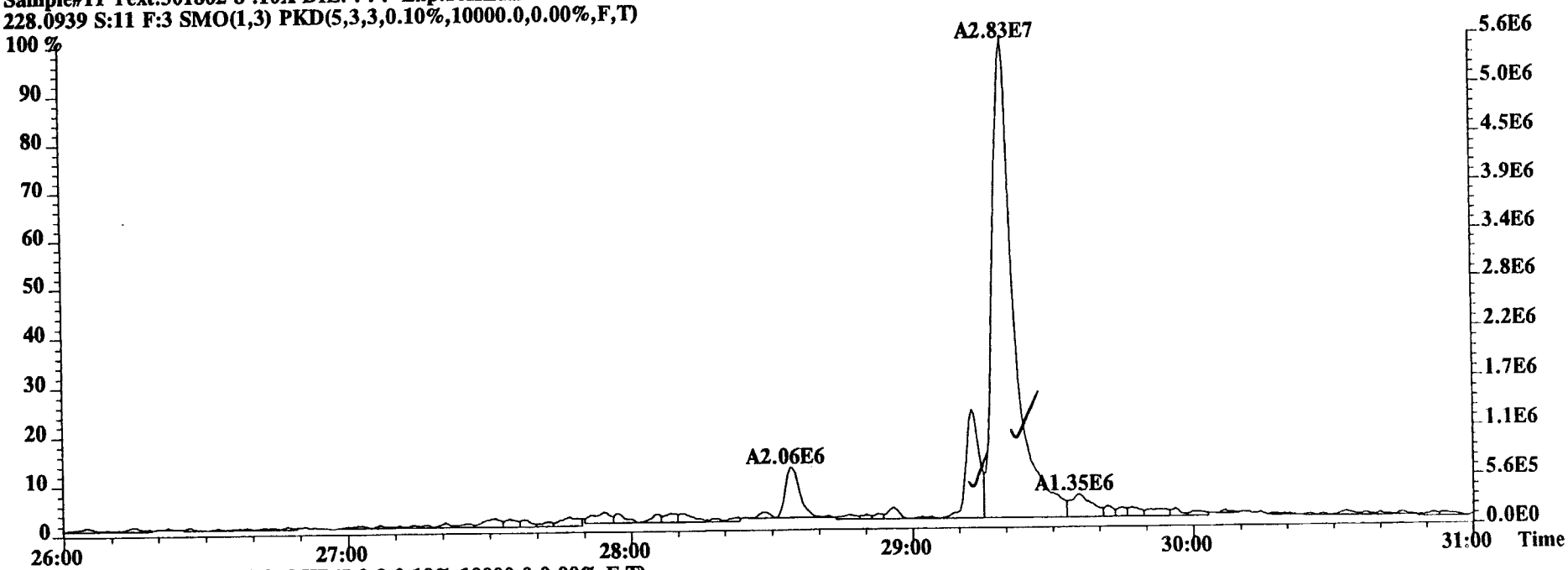
188.1410 S:11 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



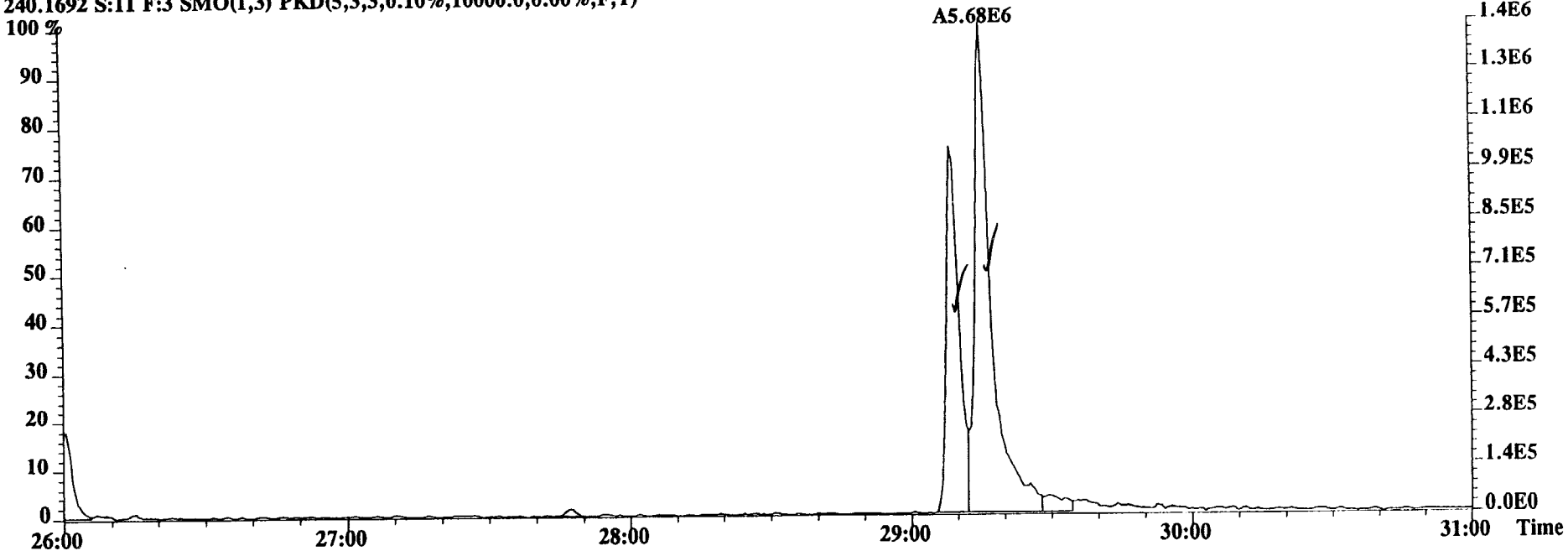
File:30OC98V4 #1-640 Acq:31-OCT-1998 00:55:45 GC EI+ Voltage SIR 70SE
Sample#11 Text:301802-8 :10X DIL. : : : Exp:PAHAIR
204.9888 S:11 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



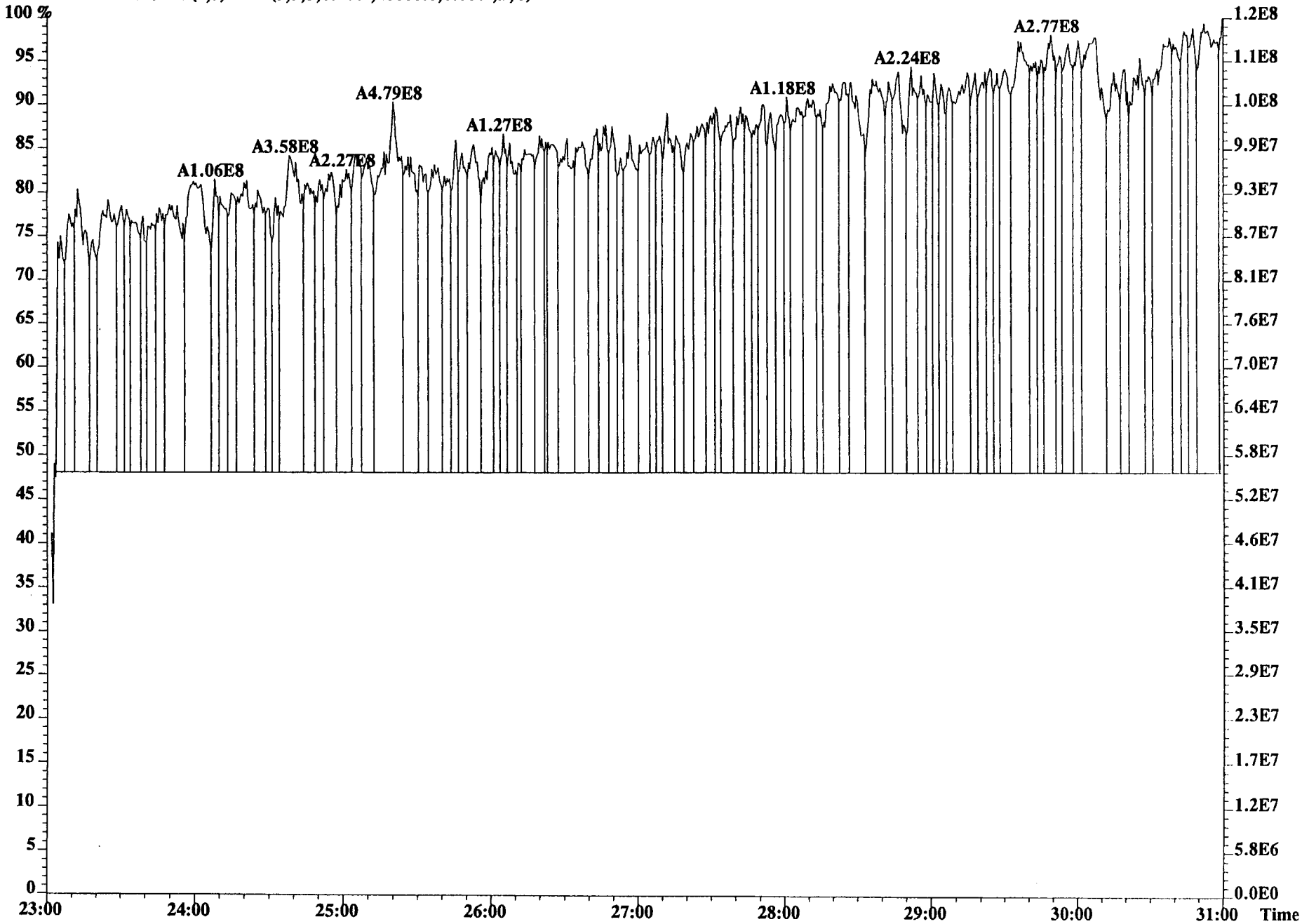
File:30OC98V4 #1-939 Acq:31-OCT-1998 00:55:45 GC EI+ Voltage SIR 70SE
Sample#11 Text:301802-8 :10X DIL. : : : Exp:PAHAIR
228.0939 S:11 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



240.1692 S:11 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

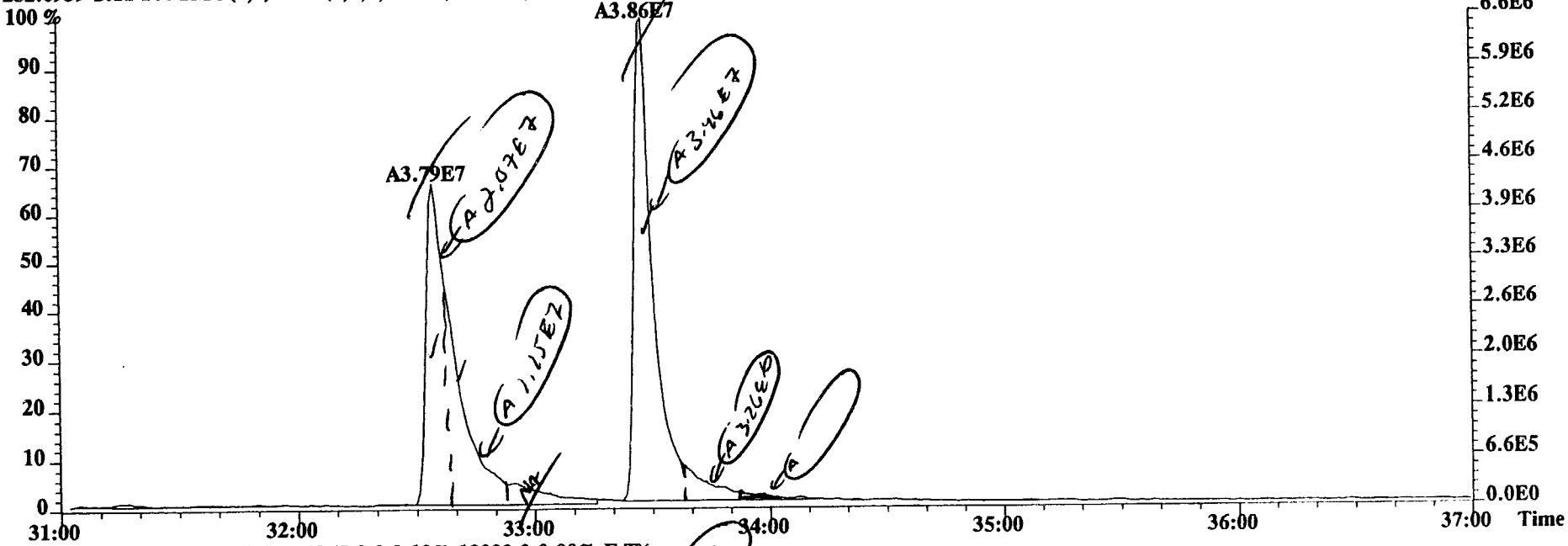


File:30OC98V4 #1-939 Acq:31-OCT-1998 00:55:45 GC EI+ Voltage SIR 70SE
Sample#11 Text:301802-8 :10X DIL. : : : Exp:PAHAIR
230.9856 S:11 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

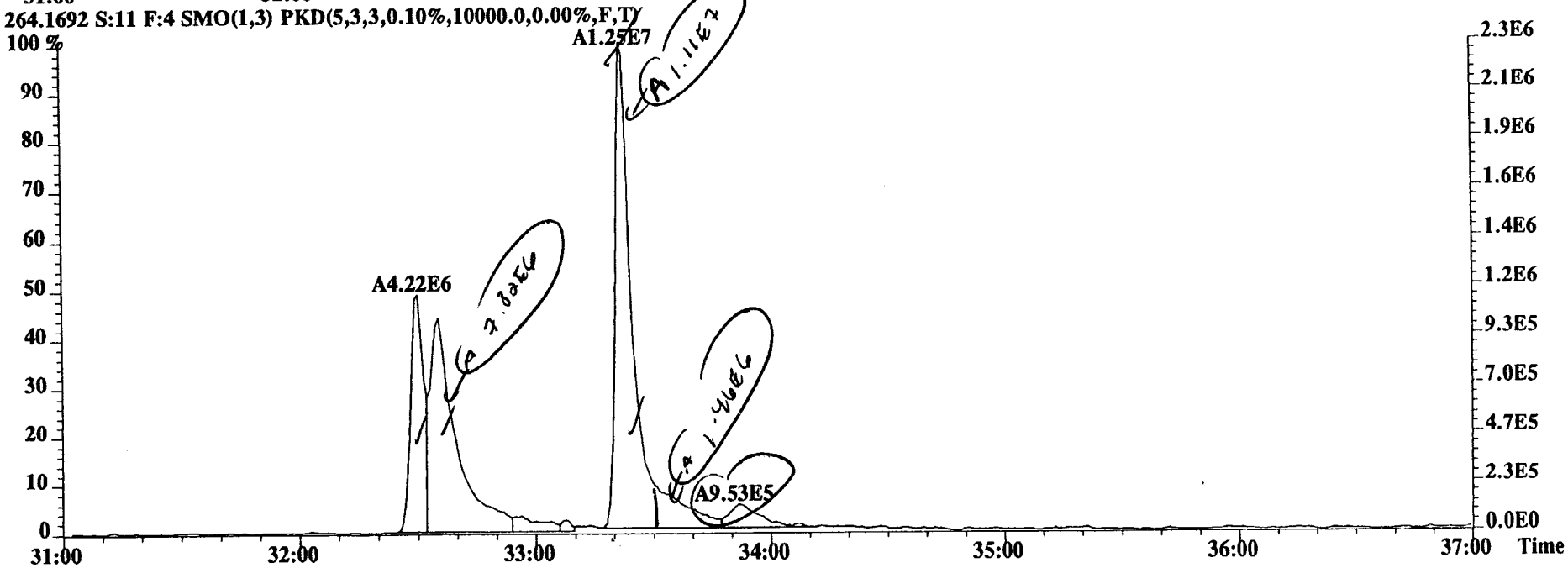


320

File:30OC98V4 #1-878 Acq:31-OCT-1998 00:55:45 GC EI+ Voltage SIR 70SE
Sample#11 Text:301802-8 :10X DIL. : : : Exp:PAHAIR
252.0939 S:11 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

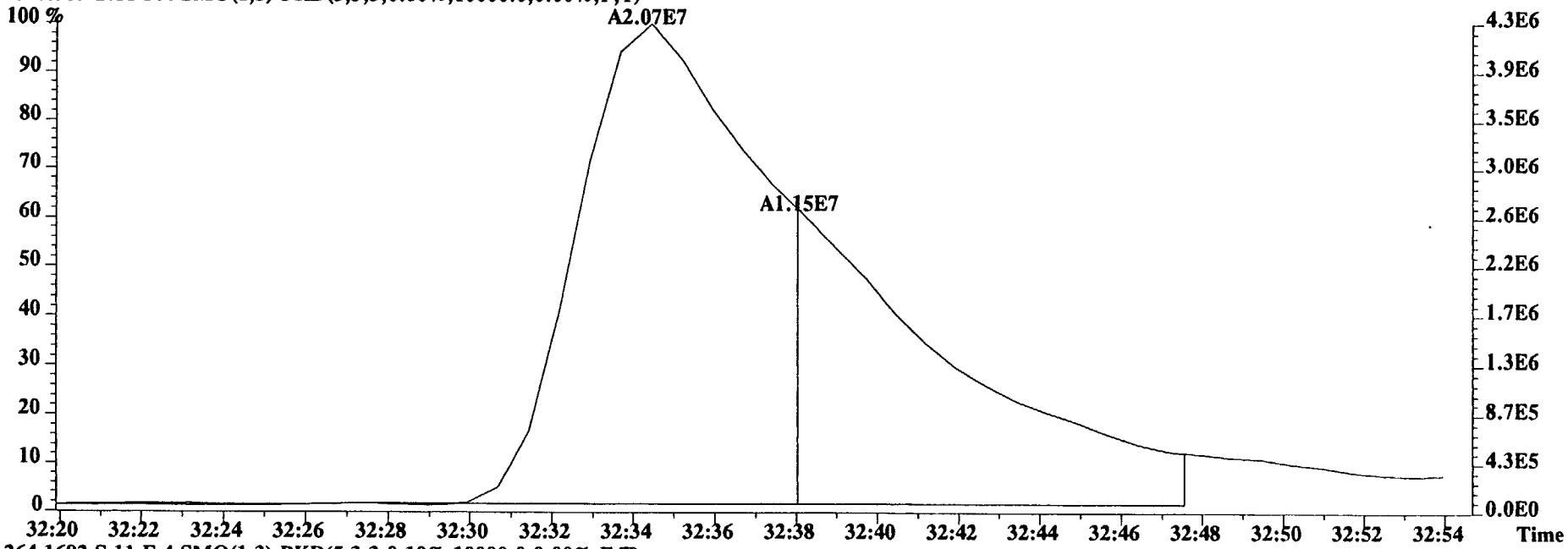


264.1692 S:11 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

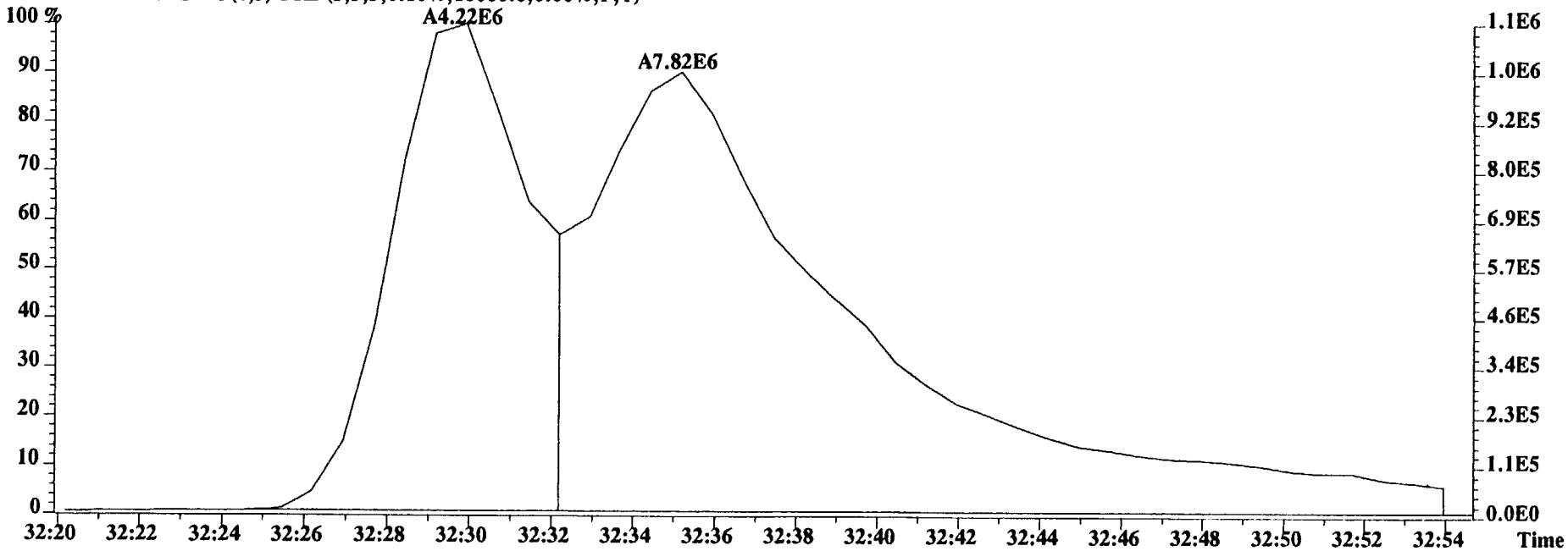


321

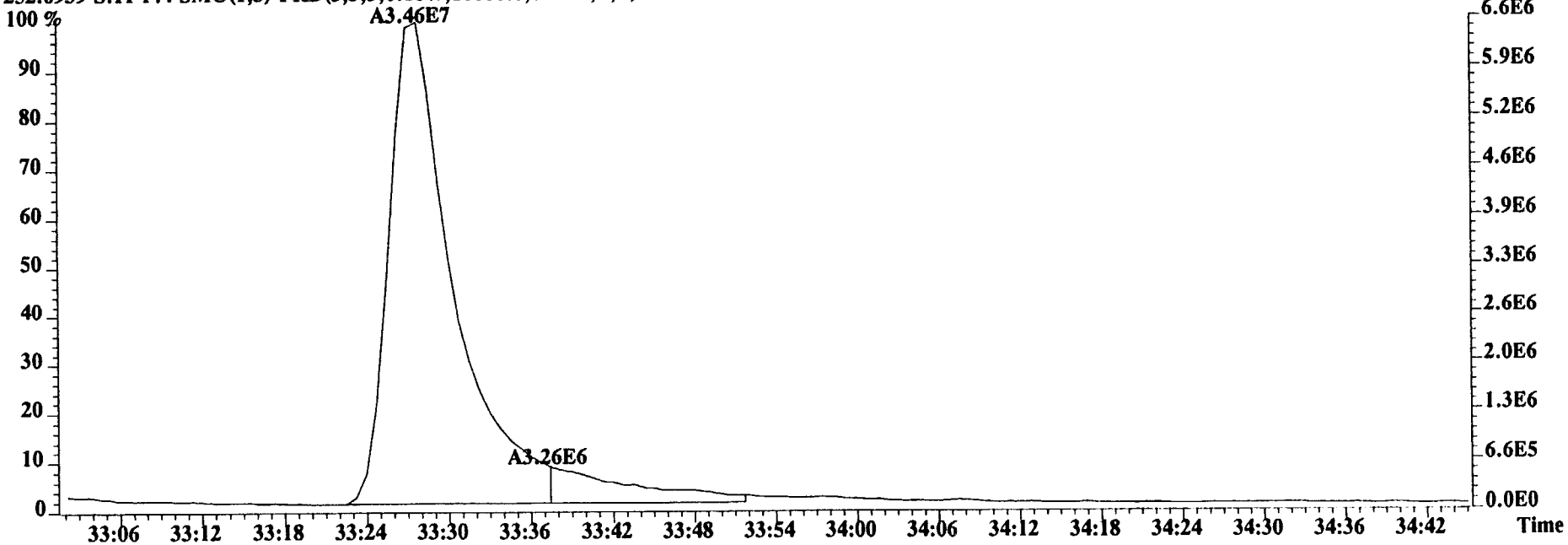
File:30OC98V4 #1-878 Acq:31-OCT-1998 00:55:45 GC EI+ Voltage SIR 70SE
Sample#11 Text:301802-8 :10X DIL. : : : Exp:PAHAIR
252.0939 S:11 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



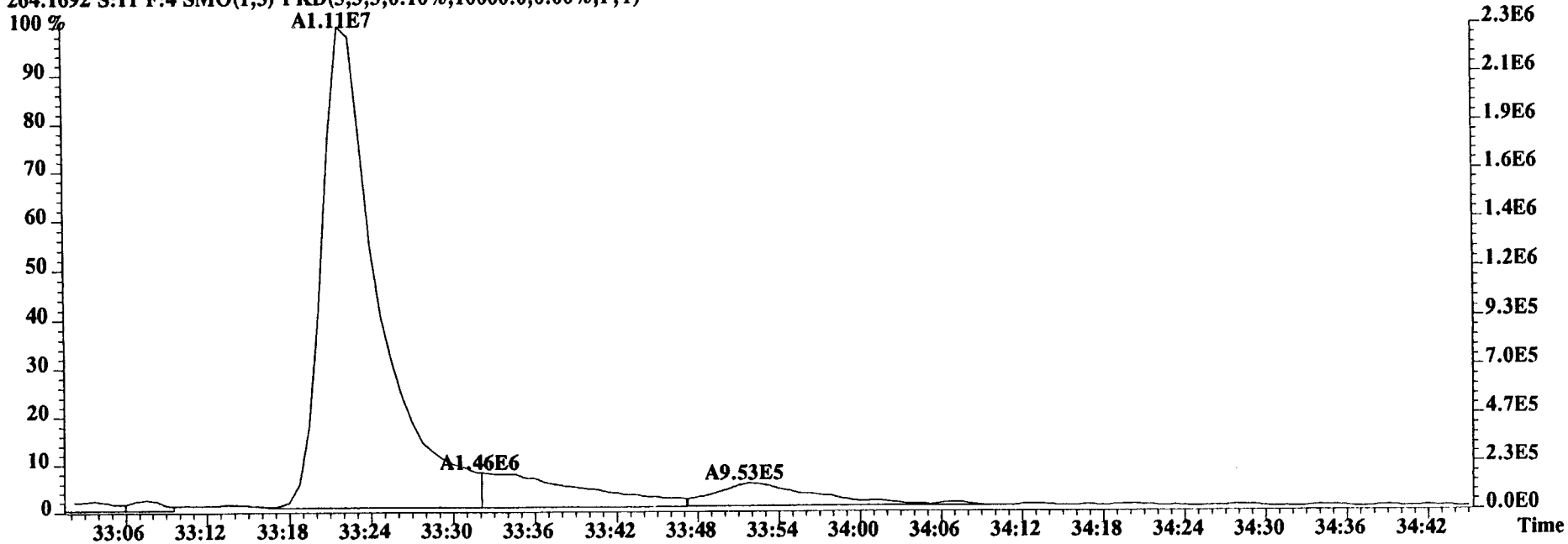
264.1692 S:11 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



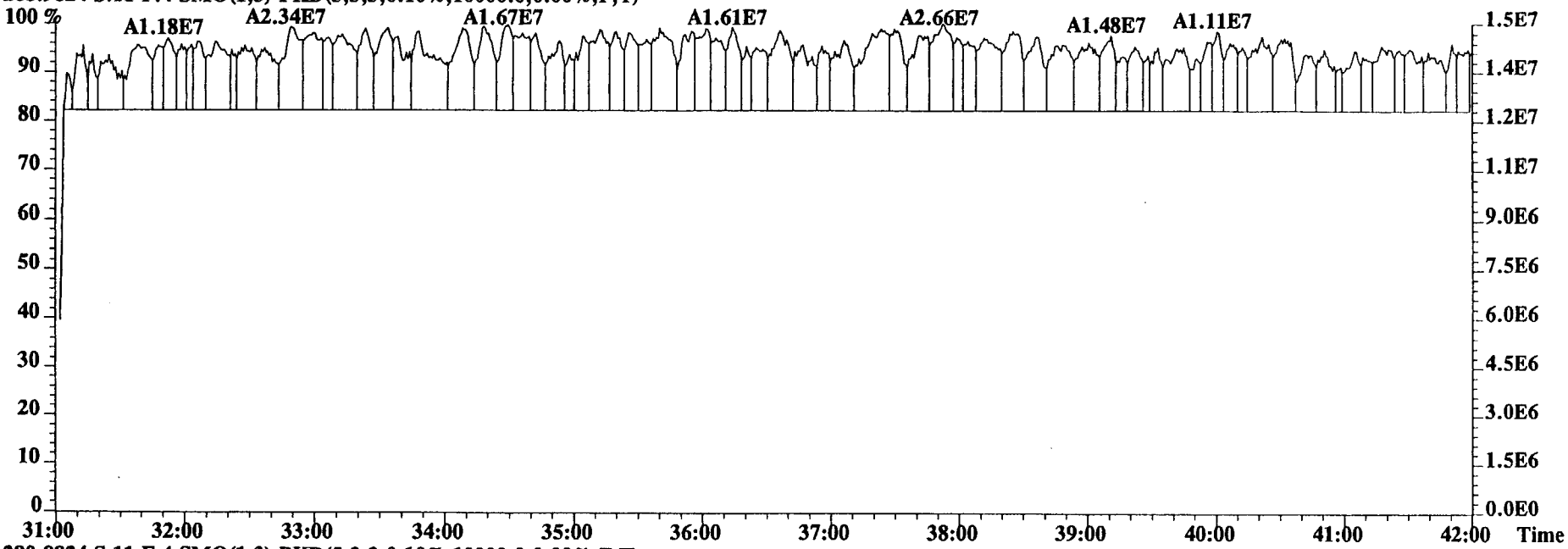
File:30OC98V4 #1-878 Acq:31-OCT-1998 00:55:45 GC EI+ Voltage SIR 70SE
Sample#11 Text:301802-8 :10X DIL. : : : Exp:PAHAIR
252.0939 S:11 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



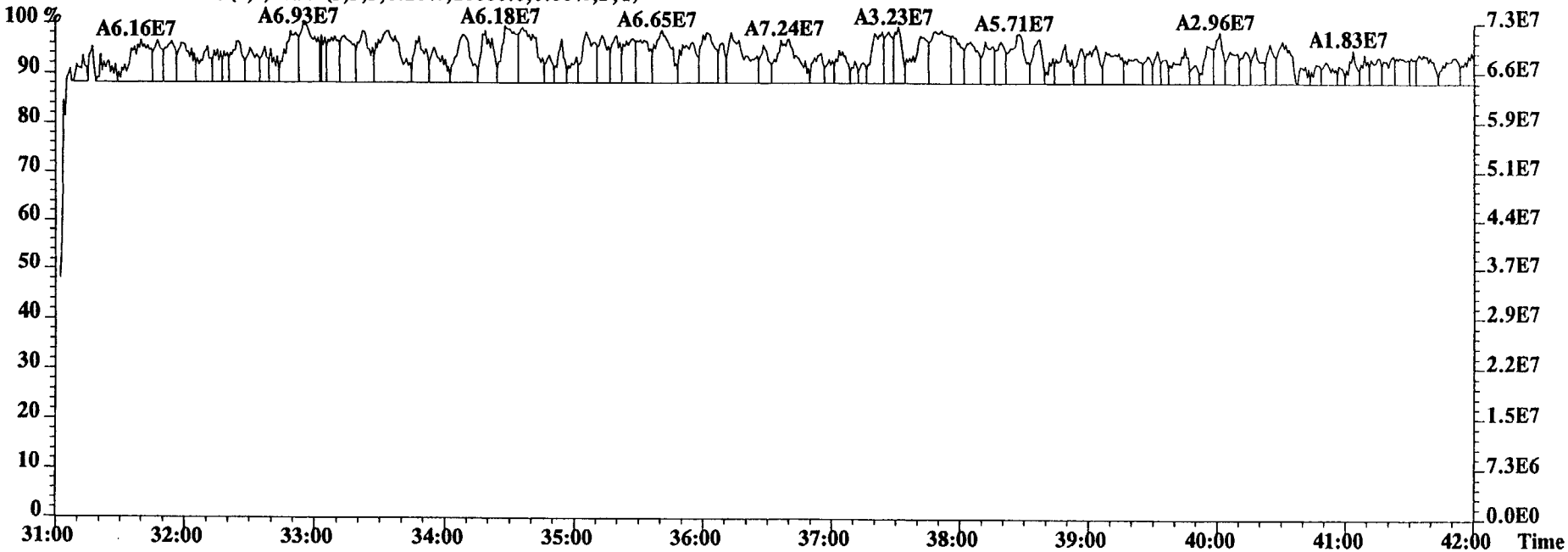
264.1692 S:11 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



File:30OC98V4 #1-878 Acq:31-OCT-1998 00:55:45 GC EI+ Voltage SIR 70SE
Sample#11 Text:301802-8 :10X DIL. : : : Exp:PAHAIR
268.9824 S:11 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



280.9824 S:11 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



325

POLYNUCLEAR AROMATIC HYDROCARBONS
HIGH RESOLUTION GC/MS
Method HRGC/HRMS

Client Name: Pacific Environmental Services
Client ID: A-U-429-3
Lab ID: 301802-0009-SA
Matrix: AIRTRAIN
Authorized: 29 SEP 98
Dilution Factor: 1.0

Sampled: 25 SEP 98
Prepared: 03 OCT 98

Received: 29 SEP 98
Analyzed: 31 OCT 98

Parameter	Result	Units	Reporting Limit	Data Qualifiers
Naphthalene	76000	ng/sample	--	B
2-Methylnaphthalene	1600	ng/sample	--	B
Acenaphthylene	13000	ng/sample	--	F
Acenaphthene	120	ng/sample	--	
Fluorene	360	ng/sample	--	
Phenanthrene	9900	ng/sample	--	B
Anthracene	220	ng/sample	--	
Fluoranthene	4800	ng/sample	--	
Pyrene	3300	ng/sample	--	
Benzo(a)anthracene	ND	ng/sample	100	
Chrysene	290	ng/sample	--	
Benzo(b)fluoranthene	210	ng/sample	--	
Benzo(k)fluoranthene	ND	ng/sample	100	
Benzo(e)pyrene	350	ng/sample	--	
Benzo(a)pyrene	ND	ng/sample	100	
Perylene	ND	ng/sample	100	
Indeno(1,2,3-cd)pyrene	ND	ng/sample	100	
Dibenz(a,h)anthracene	ND	ng/sample	100	
Benzo(g,h,i)perylene	ND	ng/sample	100	

B = Compound is also detected in the blank.
F = Reported value estimated due to an interference.
ND = Not Detected

Reported By: Clark Pickell

Approved By: Eric Redman

The cover letter is an integral part of this report.
Rev 230787

POLYNUCLEAR AROMATIC HYDROCARBONS
HIGH RESOLUTION GC/MS
Method HRGC/HRMS
(cont.)

Client Name: Pacific Environmental Services
Client ID: A-U-429-3
Lab ID: 301802-0009-SA
Matrix: AIRTRAIN Sampled: 25 SEP 98 Received: 29 SEP 98
Authorized: 29 SEP 98 Prepared: 03 OCT 98 Analyzed: 31 OCT 98
Dilution Factor: 1.0

Internal Standards	% Recovery	
Naphthalene-d8	52	
Acenaphthylene-d8	9.0	m
Acenaphthene-d10	59	
Fluorene-d10	73	
Phenanthrene-d10	88	
Fluoranthene-d10	77	
Pyrene-d10	64	
Benzo(a)anthracene-d12	75	
Perylene-d12	20	m
Indeno(123-cd)pyrene-d12	77	
Chrysene-d12	95	
Benzo(b)fluoranthene-d12	93	
Benzo(k)fluoranthene-d12	90	
Benzo(a)pyrene-d12	22	m
Dibenz(a,h)anthracene-d14	79	
Benzo(g,h,i)perylene-d12	57	

Field Surrogates	% Recovery
13C-Fluorene	104

m = Internal Standard recovery is outside method recovery goal.

Reported By: Clark Pickell Approved By: Eric Redman

The cover letter is an integral part of this report.
Rev 230787

04-NOV-1998 07:22:17 PM Dioxin Furan Unknown RESULTS

Mass Spec : VG-4
C Column : DB-5
Data file : 30OC98V4
Weight : 0.5

Results : 30OC98V4121.RES
Date analyzed : 30-OCT-98
301802-9 :10X DIL. : : : Ex Cal : PAHAIR102998V4.R

Name	Total Response	Isotope Ratio	R. T. mm:ss	RRF	pg/ SAMP	Rec/ MDL
d10-2-Methylnaphthalene	7708300	1.00 Y	12: 28 Y	1.00	50.00	
d8-Naphthalene	8989960	1.00 Y	10: 12 Y	2.24	26.02	52
Naphthalene	8349100000	1.00 Y	10: 16 Y	1.23	7.6e+04	B E
2-Methylnaphthalene	79278200	1.00 Y	12: 34 Y	0.56	1573.19	B
d8-Acenaphthylene	798254	1.00 Y	15: 28 Y	1.21	4.27	9 m
Acenaphthylene	97227200	1.00 Y	15: 30 Y	0.94	1.3e+04	E F
d10-Acenaphthene	3380080	1.00 Y	16: 2 Y	0.74	29.44	59
Acenaphthene	5080000	1.00 Y	16: 8 Y	1.25	120.61	
d10-Anthracene	4888660	1.00 Y	20: 55 Y	1.00	50.00	
d10-Fluorene	5057040	1.00 Y	17: 41 Y	1.42	36.40	73
Fluorene	20852000	1.00 Y	17: 47 Y	1.16	355.30	
d10-Phenanthrene	12122960	1.00 Y	20: 45 Y	2.81	44.16	88
Phenanthrene	1077356000	1.00 Y	20: 49 Y	0.89	9934.91	E
Anthracene	21200000	1.00 Y	20: 59 Y	0.80	218.48	
d14-Terphenyl	13195400	1.00 Y	26: 0 Y	1.00	50.00	
d10-Fluoranthene	14411760	1.00 Y	24: 36 Y	1.41	38.71	77
Fluoranthene	767880000	1.00 Y	24: 39 Y	1.11	4792.49	
d10-Pyrene	12748280	1.00 Y	25: 17 Y	1.52	31.82	64
Pyrene	511088000	1.00 Y	25: 20 Y	1.21	3326.87	
d12-Benzo(a)anthracene	8915960	1.00 Y	29: 9 Y	0.90	37.54	75
Benzo(a)anthracene	8564840	1.00 Y	29: 13 Y	1.20	<RL=100.00	
d12-Chrysene	16006240	1.00 Y	29: 15 Y	1.28	47.41	95
Chrysene	50730000	1.00 Y	29: 20 Y	1.08	292.39	
d12-Benzo(e)pyrene	30423600	1.00 Y	33: 22 Y	1.00	50.00	
d12-Benzo(b)fluoranthene	12877120	1.00 Y	32: 29 Y	0.45	46.63	93
Benzo(b)fluoranthene	32000000	1.00 Y	32: 34 Y	1.17	212.90	
d12-Benzo(k)fluoranthene	25817200	1.00 Y	32: 35 Y	0.95	44.75	90
Benzo(k)fluoranthene	25000000	1.00 Y	32: 34 Y	1.16	<RL=100.00	
d12-Benzo(a)pyrene	4540000	1.00 Y	33: 32 Y	0.68	11.03	22 m
Benzo(e)pyrene	26330600	1.00 Y	33: 28 Y	1.64	353.46	
Benzo(a)pyrene	2580000	1.00 Y	33: 38 N	1.07	<RL=100.00	
d12-Perylene	3760000	1.00 Y	33: 49 Y	0.63	9.81	20 m
Perylene	* No Peak	0.00 N	33: 55 N	1.71	<RL=100.00	
d12-Indeno(123-cd)pyrene	10360060	1.00 Y	38. 4 Y	0.44	38.30	77
Indeno(123-cd)pyrene	912632	1.00 Y	38: 10 Y	0.62	<RL=100.00	
d14-Dibenz(ah)anthracene	5934300	1.00 Y	38: 9 Y	0.25	39.67	79
Dibenz(ah)anthracene	97452	1.00 Y	38: 17 Y	1.40	<RL=100.00	
d12-Benzo(ghi)perylene	9997440	1.00 Y	39: 15 Y	0.58	28.34	57
Benzo(ghi)perylene	3370860	1.00 Y	39: 23 Y	1.02	<RL=100.00	
d10-Fluorene	5057040	1.00 Y	17: 41 Y	1.00	50.00	
13C-Fluorene	4272480	1.00 Y	17: 47 Y	0.81	52.95	104

11-4-98
CP

04-NOV-1998 07:22:14 PM Dioxin Furan Unknown RESULTS

0.5

98V4.RRF

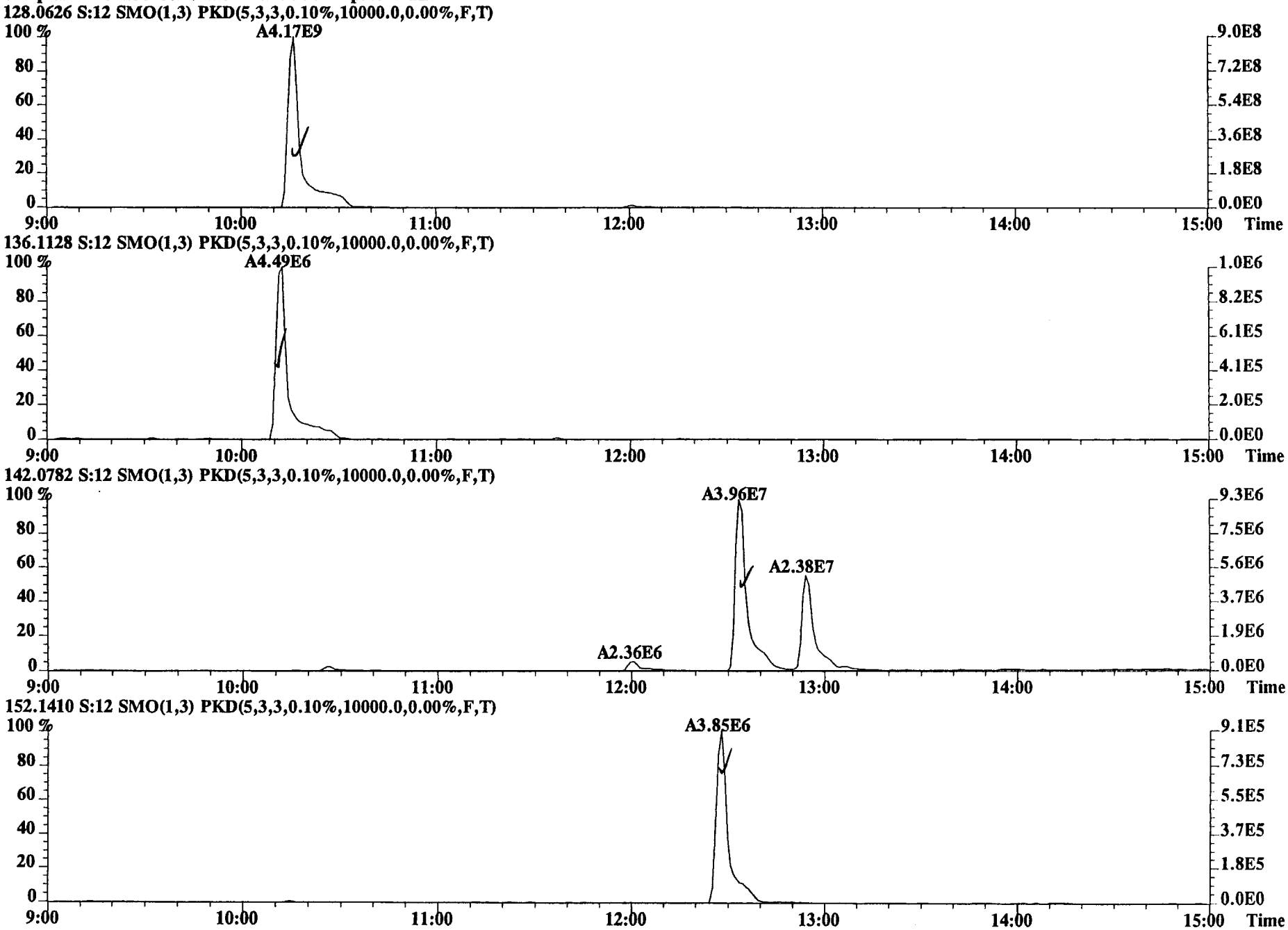
Rec/ MDL			
		3854150	3854150
	52	4494980	4494980
	B E	4174550000	4174550000
	B	39639100	39639100
	9	399127	399127
	E F	48613600	48613600
	59	1690040	1690040
		2540000	2540000
		2444330	2444330
	73	2528520	2528520
		10426000	10426000
	88	6061480	6061480
	E	538678000	538678000
		10600000	10600000
		6597700	6597700
	77	7205880	7205880
		383940000	383940000
	64	6374140	6374140
		255544000	255544000
	75	4457980	4457980
100.00		4282420	4282420
	95	8003120	8003120
		25365000	25365000
		15211800	15211800
	93	6438560	6438560
		16000000	16000000
	90	12908600	12908600
100.00		12500000	12500000
	22	2270000	2270000
		13165300	13165300
100.00		1290000	1290000
	20	1880000	1880000
100.00		0	0
	77	5180030	5180030
100.00		456316	456316
	79	2967150	2967150
100.00		48726	48726
	57	4998720	4998720
100.00		1685430	1685430

02-NOV-1998 09:02:03 AM Dioxin Furan Unknown RESULTS

Mass Spec : VG-4 Results : 300C98V4121.RES : PAHAIR.TRG
GC Column : DB-5 Date analyzed : 30-OCT-98
Data file : 300C98V4 301802-9 :10X DIL. : : : Ex Cal : PAHAIR102998V4.R
Weight : 0.5

Name	Total Response	Isotope Ratio		R. T. mm:ss		Ex Cal RRF	pg/ SAMP	Rec/ MDL
d10-2-Methylnaphthalene	7708300	1.00	Y	12: 28	Y	1.00	50.00	
d8-Naphthalene	8989960	1.00	Y	10: 12	Y	2.24	26.02	52
Naphthalene	8349100000	1.00	Y	10: 16	Y	1.23	7.6e+04	0.000
2-Methylnaphthalene	79278200	1.00	Y	12: 34	Y	0.56	1573.19	0.000
d8-Acenaphthylene	798254	1.00	Y	15: 28	Y	1.21	4.27	9
Acenaphthylene	97227200	1.00	Y	15: 30	Y	0.94	1.3e+04	0.000
d10-Acenaphthene	3380080	1.00	Y	16: 2	Y	0.74	29.44	59
Acenaphthene	* No Peak	0.00	N	16: 8	N	1.25	0.00	0.000
d10-Anthracene	4888660	1.00	Y	20: 55	Y	1.00	50.00	
d10-Fluorene	5057040	1.00	Y	17: 41	Y	1.42	36.40	73
Fluorene	20852000	1.00	Y	17: 47	Y	1.16	355.30	0.000
d10-Phenanthrene	12122960	1.00	Y	20: 45	Y	2.81	44.16	88
Phenanthrene	1077356000	1.00	Y	20: 49	Y	0.89	9934.91	0.000
Anthracene	* No Peak	0.00	N	20: 59	N	0.80	0.00	0.000
d14-Terphenyl	13195400	1.00	Y	26: 0	Y	1.00	50.00	
d10-Fluoranthene	14411760	1.00	Y	24: 36	Y	1.41	38.71	77
Fluoranthene	767880000	1.00	Y	24: 39	Y	1.11	4792.49	0.000
d10-Pyrene	12748280	1.00	Y	25: 17	Y	1.52	31.82	64
Pyrene	511088000	1.00	Y	25: 20	Y	1.21	3326.87	0.000
d12-Benzo(a)anthracene	8915960	1.00	Y	29: 9	Y	0.90	37.54	75
Benzo(a)anthracene	8564840	1.00	Y	29: 13	Y	1.20	79.75	0.000
d12-Chrysene	16006240	1.00	Y	29: 15	Y	1.28	47.41	95
Chrysene	50730000	1.00	Y	29: 20	Y	1.08	292.39	0.000
d12-Benzo(e)pyrene	30423600	1.00	Y	33: 22	Y	1.00	50.00	
d12-Benzo(b)fluoranthene	12877120	1.00	Y	32: 29	Y	0.45	46.63	93
Benzo(b)fluoranthene	61473800	1.00	Y	32: 34	Y	1.17	408.98	0.000
d12-Benzo(k)fluoranthene	25817200	1.00	Y	32: 35	Y	0.95	44.75	90
Benzo(k)fluoranthene	61473800	1.00	Y	32: 34	Y	1.16	204.54	0.000
d12-Benzo(a)pyrene	* No Peak	0.00	N	33: 32	N	0.68	0.00	0
Benzo(e)pyrene	26330600	1.00	Y	33: 28	Y	1.64	*NoINoIs	
Benzo(a)pyrene	* No Peak	0.00	N	33: 38	N	1.07	*NoINoIs	
d12-Perylene	* No Peak	0.00	N	33: 49	N	0.63	0.00	0
Perylene	* No Peak	0.00	N	33: 55	N	1.71	*NoINoIs	
d12-Indeno(123-cd)pyrene	10360060	1.00	Y	38: 4	Y	0.44	38.30	77
Indeno(123-cd)pyrene	912632	1.00	Y	38: 10	Y	0.62	14.19	0.000
d14-Dibenz(ah)anthracene	5934300	1.00	Y	38: 9	Y	0.25	39.67	79
Dibenz(ah)anthracene	97452	1.00	Y	38: 17	Y	1.40	1.17	0.000
d12-Benzo(ghi)perylene	9997440	1.00	Y	39: 15	Y	0.58	28.34	57
Benzo(ghi)perylene	3370860	1.00	Y	39: 23	Y	1.02	33.19	0.000
d10-Fluorene	5057040	1.00	Y	17: 41	Y	1.42	5.85	12
13C-Fluorene	4272480	1.00	Y	17: 47	Y	1.00	84.49	0.000

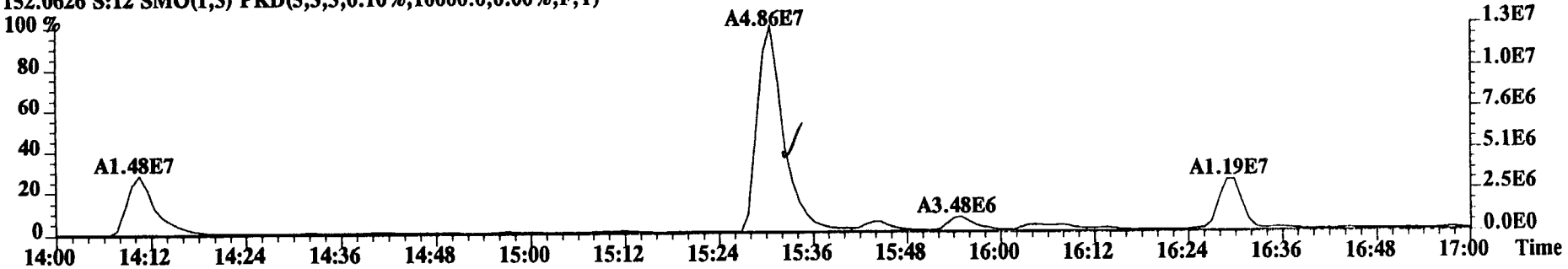
File:30OC98V4 #1-510 Acq:31-OCT-1998 01:44:49 GC EI+ Voltage SIR 70SE
Sample#12 Text:301802-9 :10X DIL. : : : Exp:PAHAIR



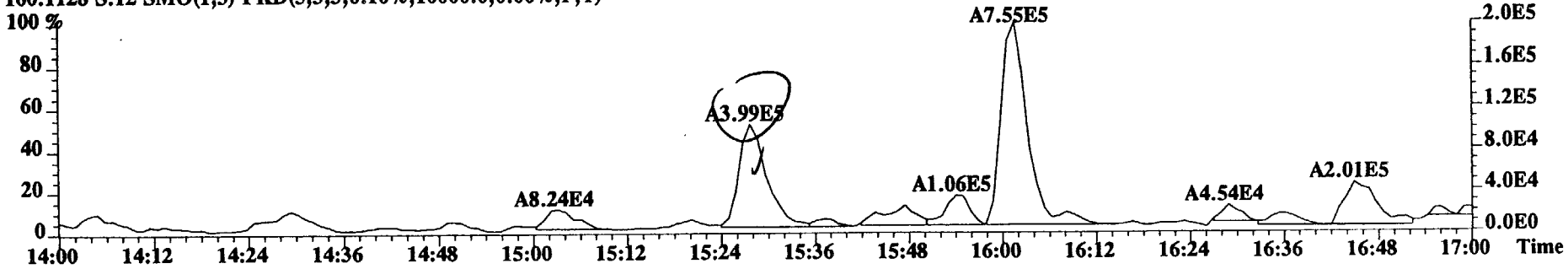
331

File:30OC98V4 #1-510 Acq:31-OCT-1998 01:44:49 GC EI+ Voltage SIR 70SE
Sample#12 Text:301802-9 :10X DIL. : : : Exp:PAHAIR

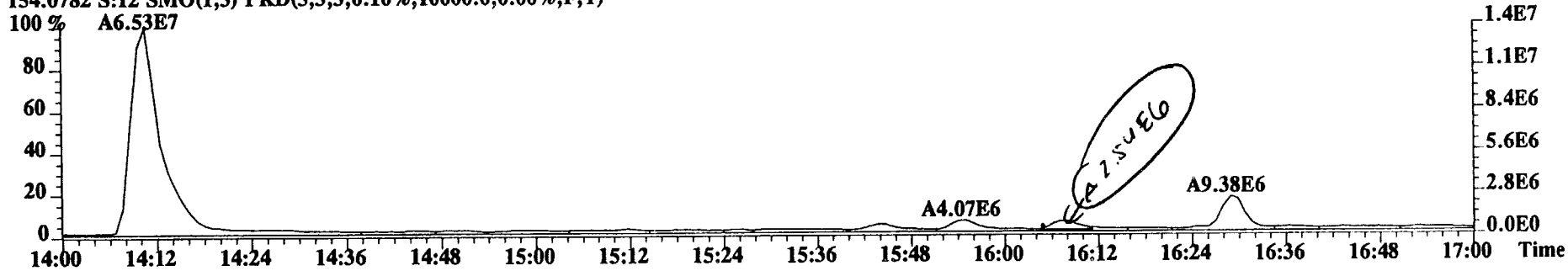
152.0626 S:12 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



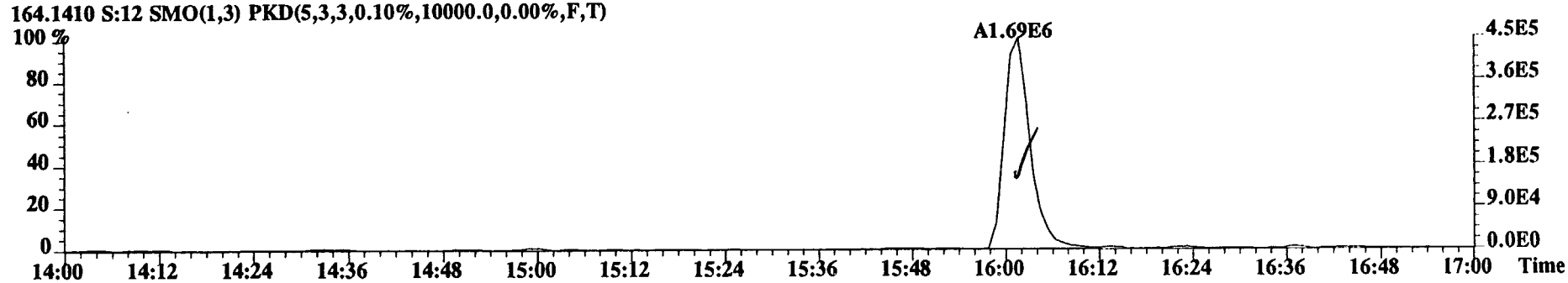
160.1128 S:12 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



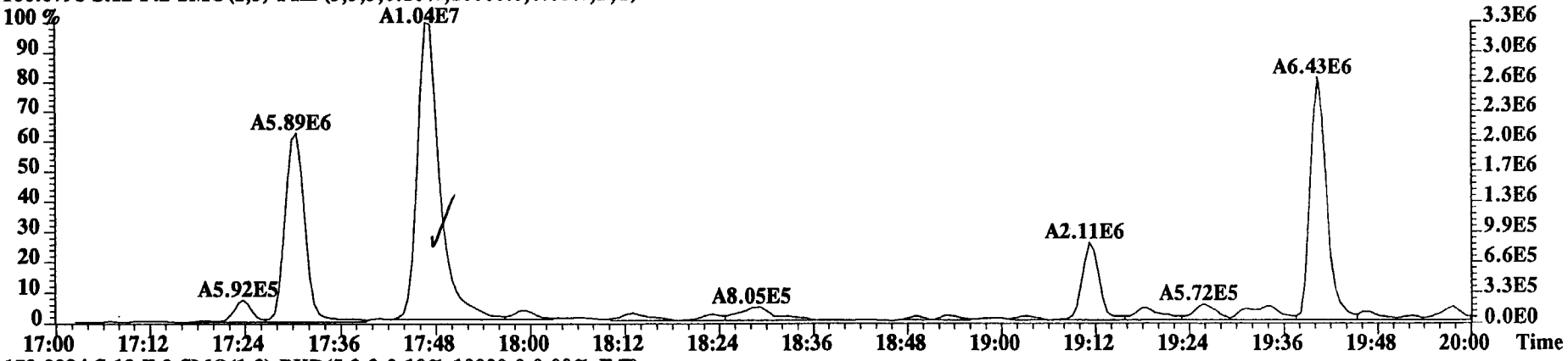
154.0782 S:12 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



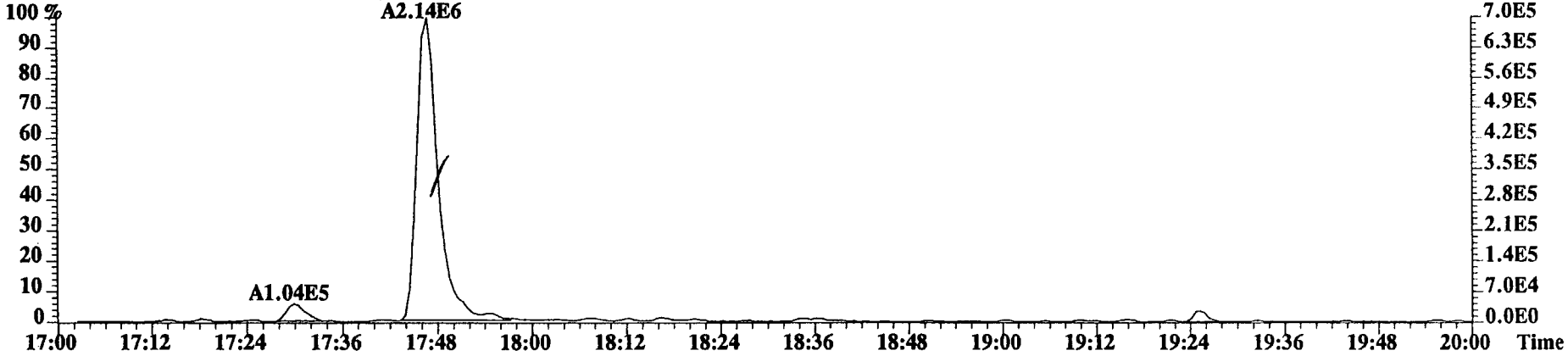
164.1410 S:12 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



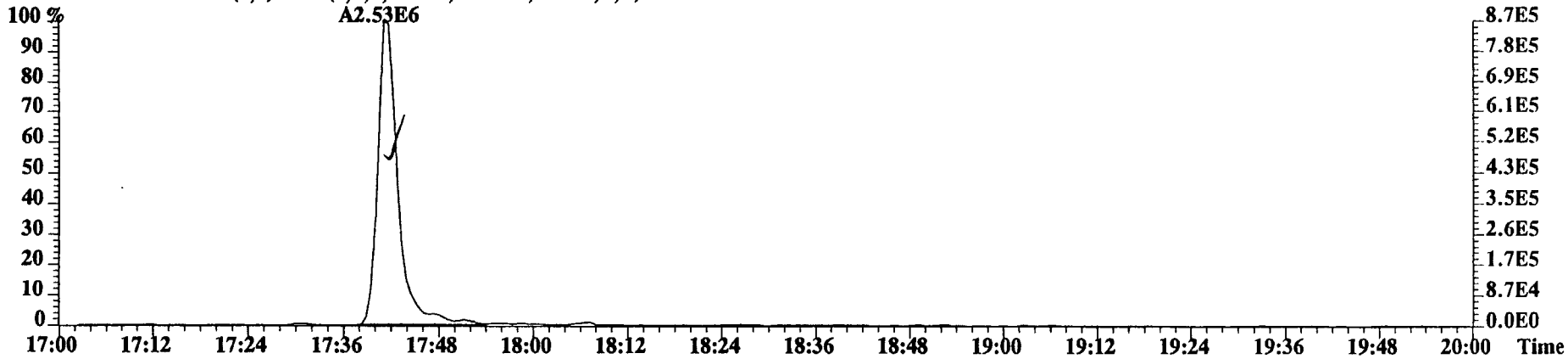
File:30OC98V4 #1-640 Acq:31-OCT-1998 01:44:49 GC EI+ Voltage SIR 70SE
Sample#12 Text:301802-9 :10X DIL. : : : Exp:PAHAIR
166.0798 S:12 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



172.0984 S:12 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

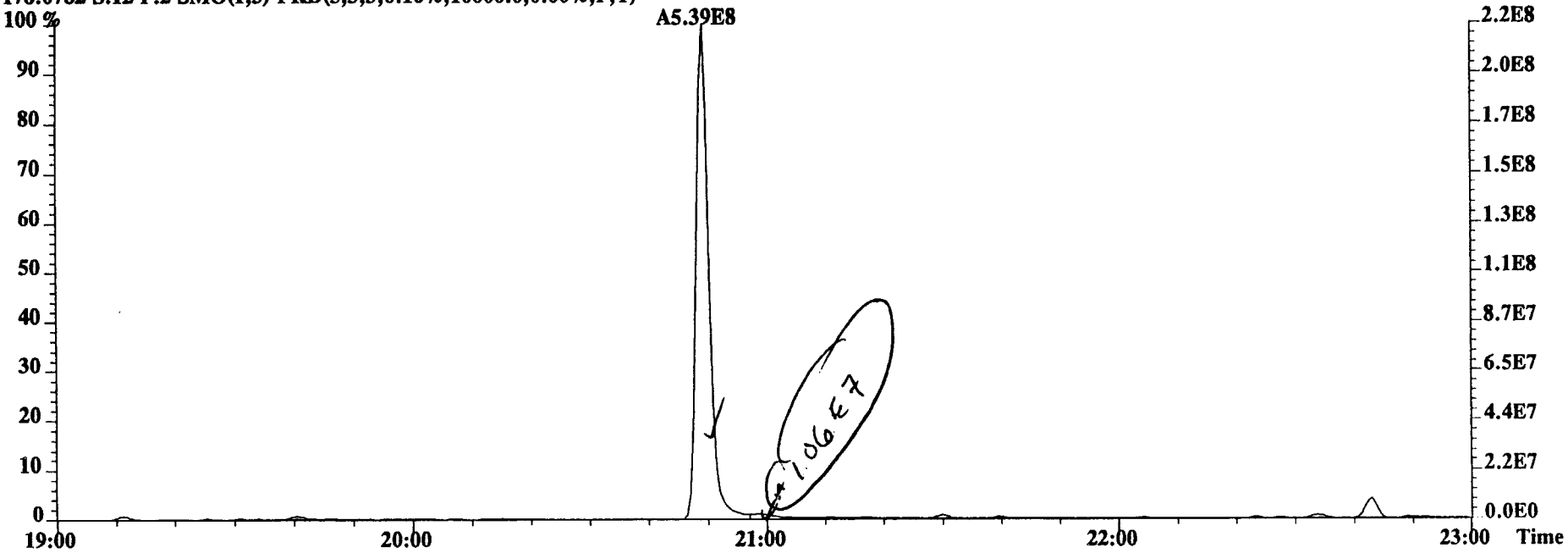


176.1410 S:12 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

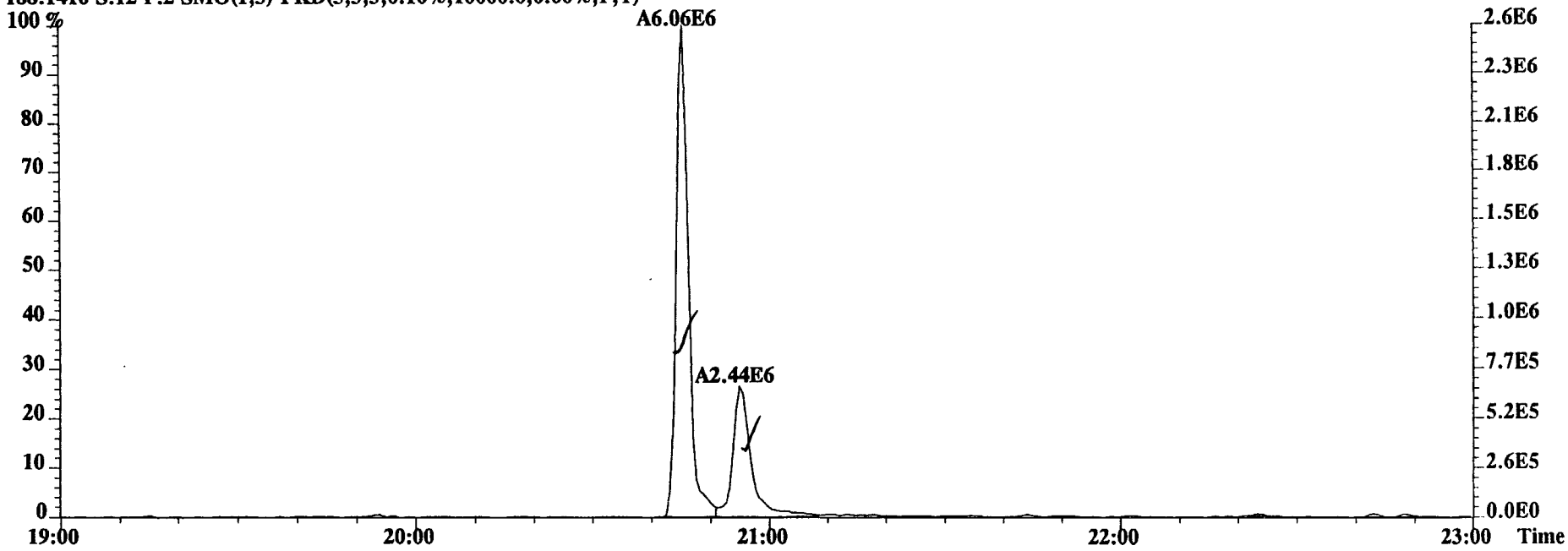


335

File:30OC98V4 #1-640 Acq:31-OCT-1998 01:44:49 GC EI+ Voltage SIR 70SE
Sample#12 Text:301802-9 :10X DIL. : : : Exp:PAHAIR
178.0782 S:12 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

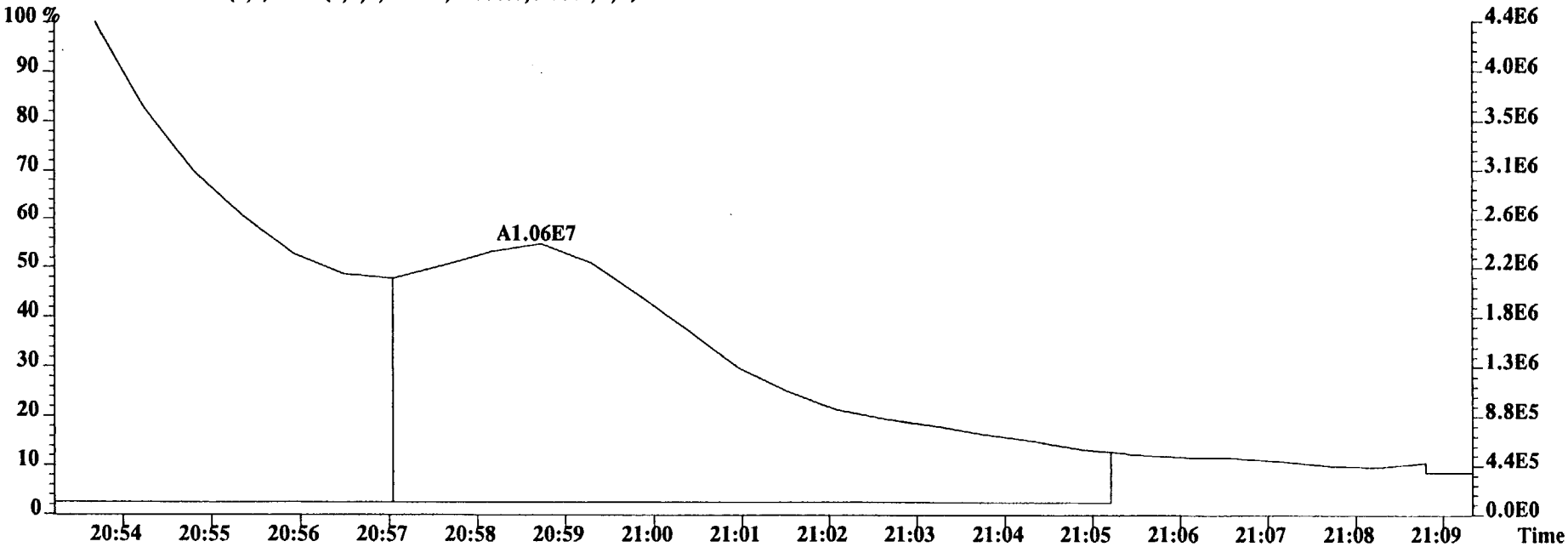


188.1410 S:12 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

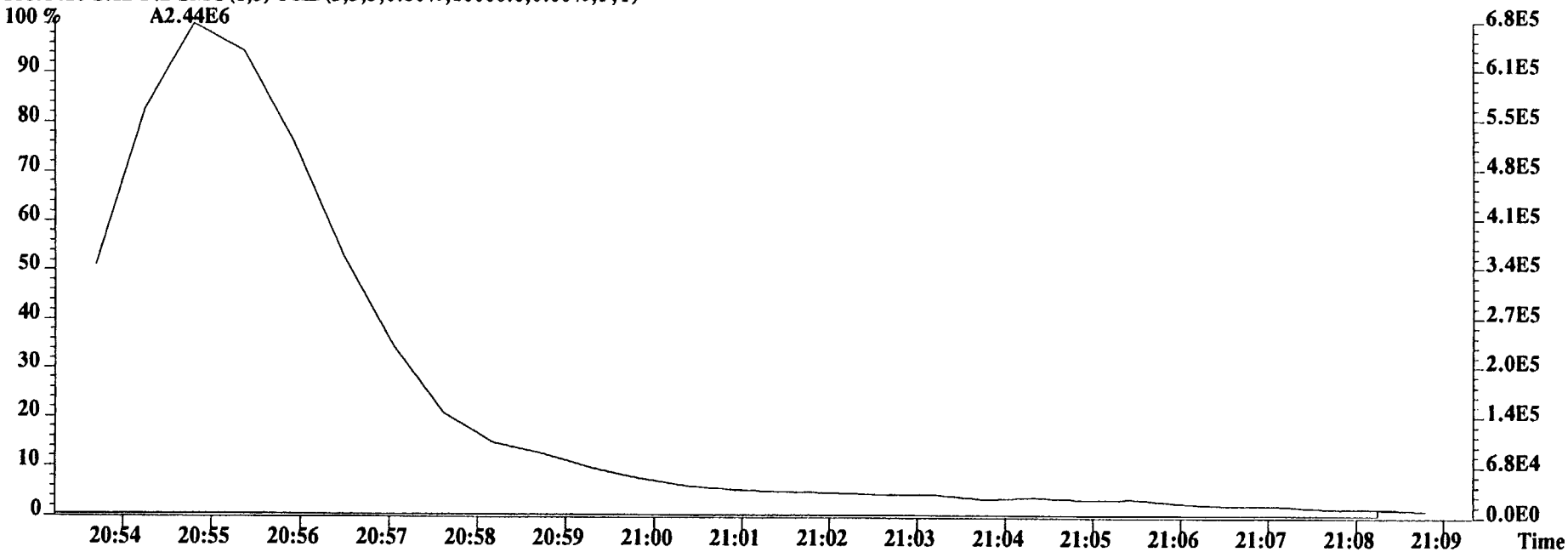


336

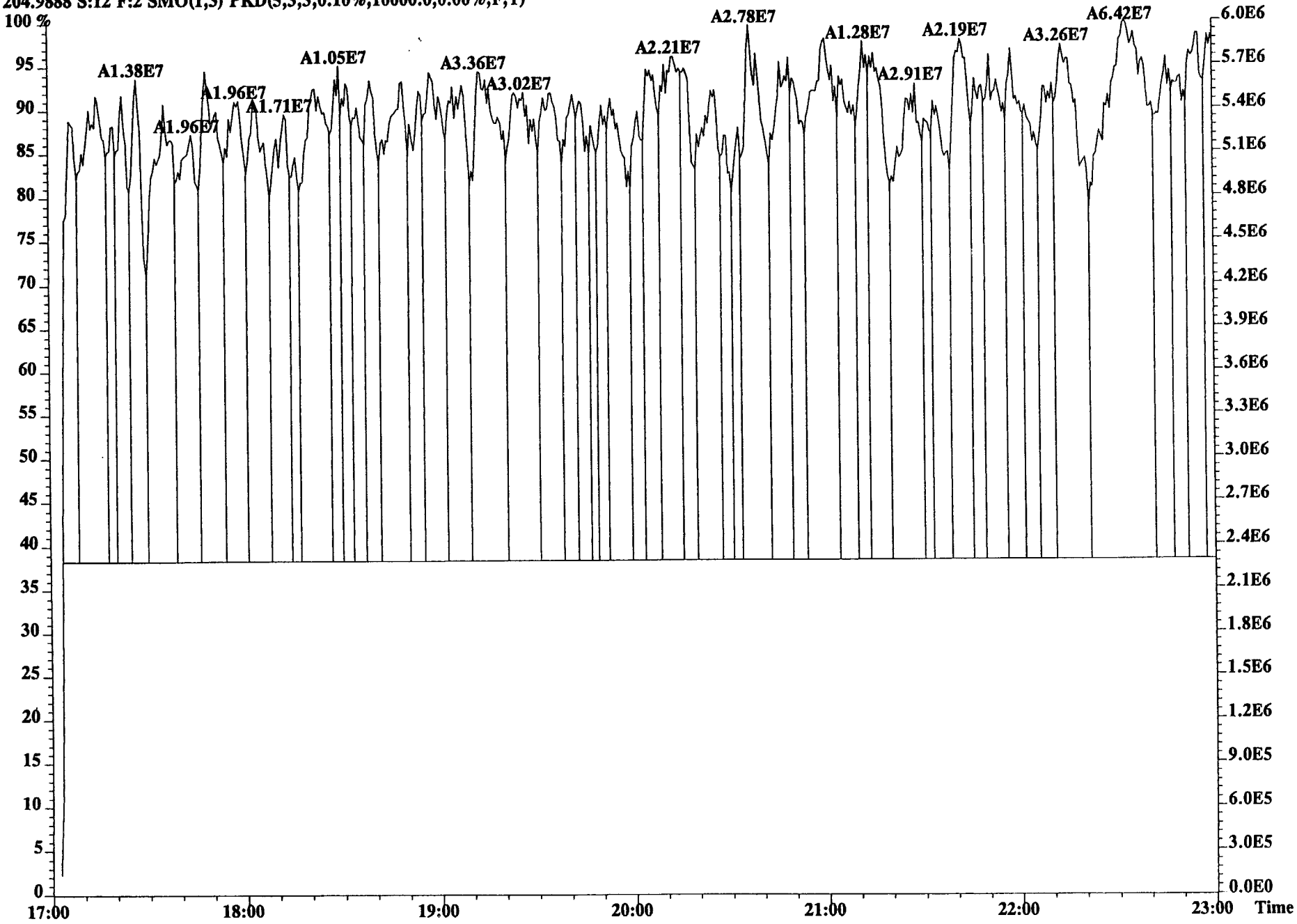
File:30OC98V4 #1-640 Acq:31-OCT-1998 01:44:49 GC EI+ Voltage SIR 70SE
Sample#12 Text:301802-9 :10X DIL. : : : Exp:PAHAIR
178.0782 S:12 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



188.1410 S:12 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

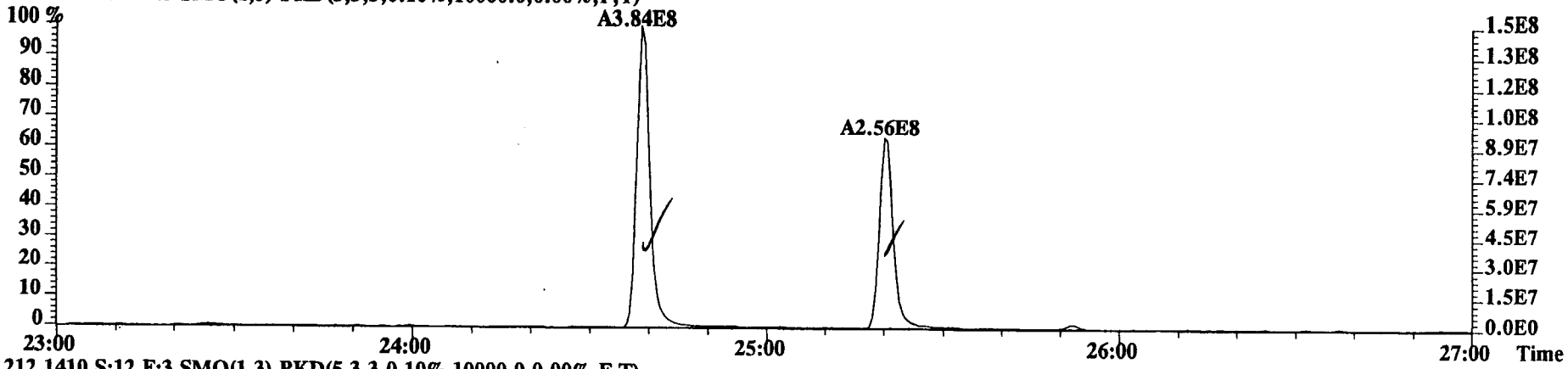


File:30OC98V4 #1-640 Acq:31-OCT-1998 01:44:49 GC EI+ Voltage SIR 70SE
Sample#12 Text:301802-9 :10X DIL. : : : Exp:PAHAIR
204.9888 S:12 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

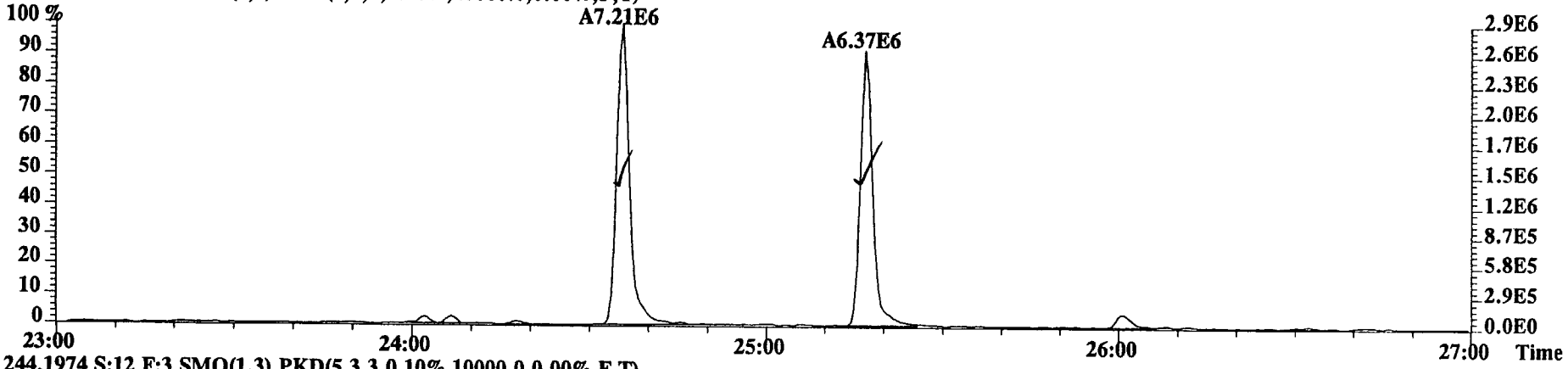


338

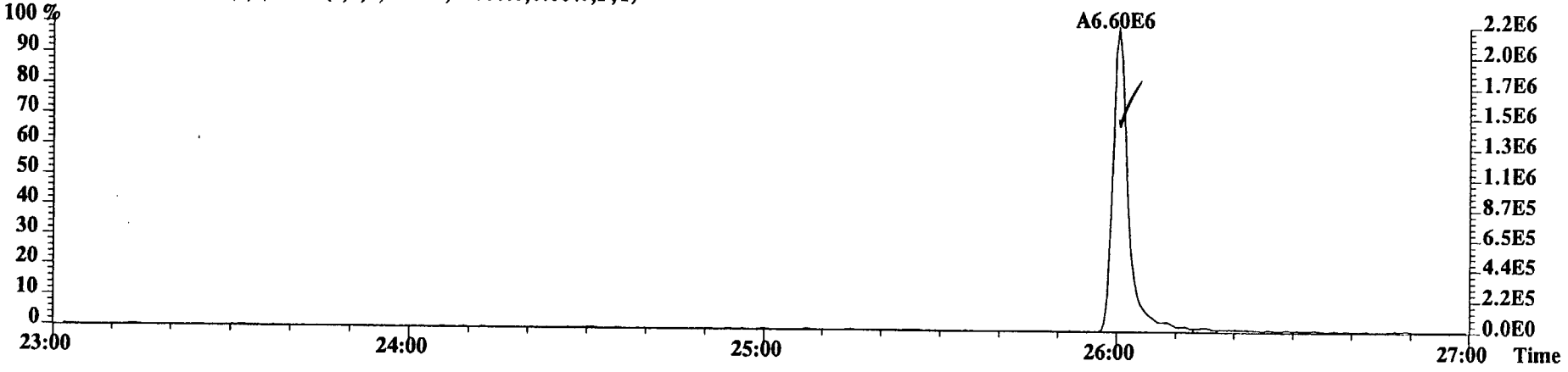
File:30OC98V4 #1-939 Acq:31-OCT-1998 01:44:49 GC EI+ Voltage SIR 70SE
Sample#12 Text:301802-9 :10X DIL. : : : Exp:PAHAIR
202.0782 S:12 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



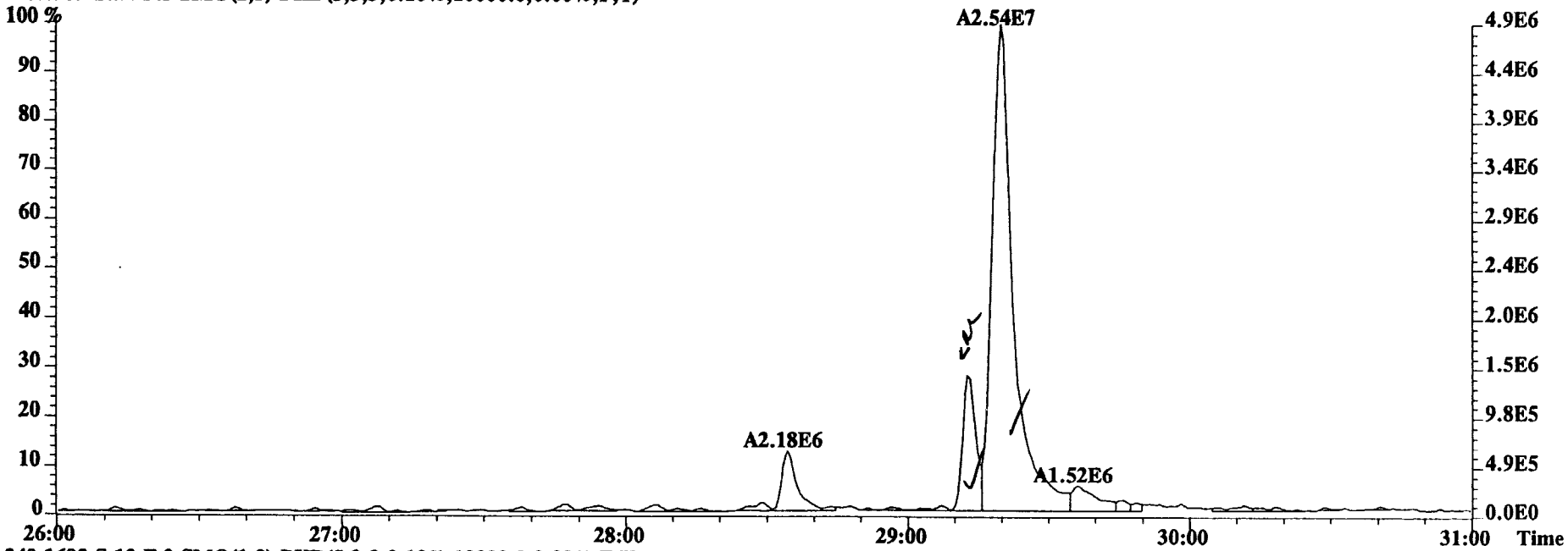
212.1410 S:12 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



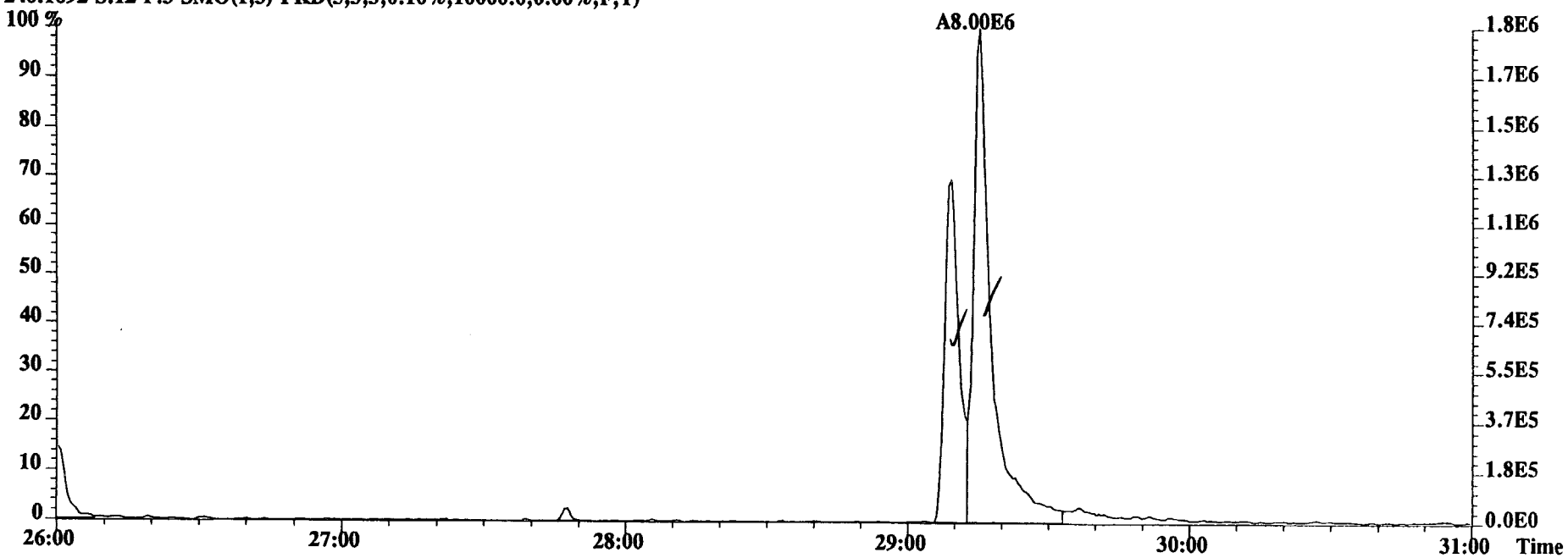
244.1974 S:12 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



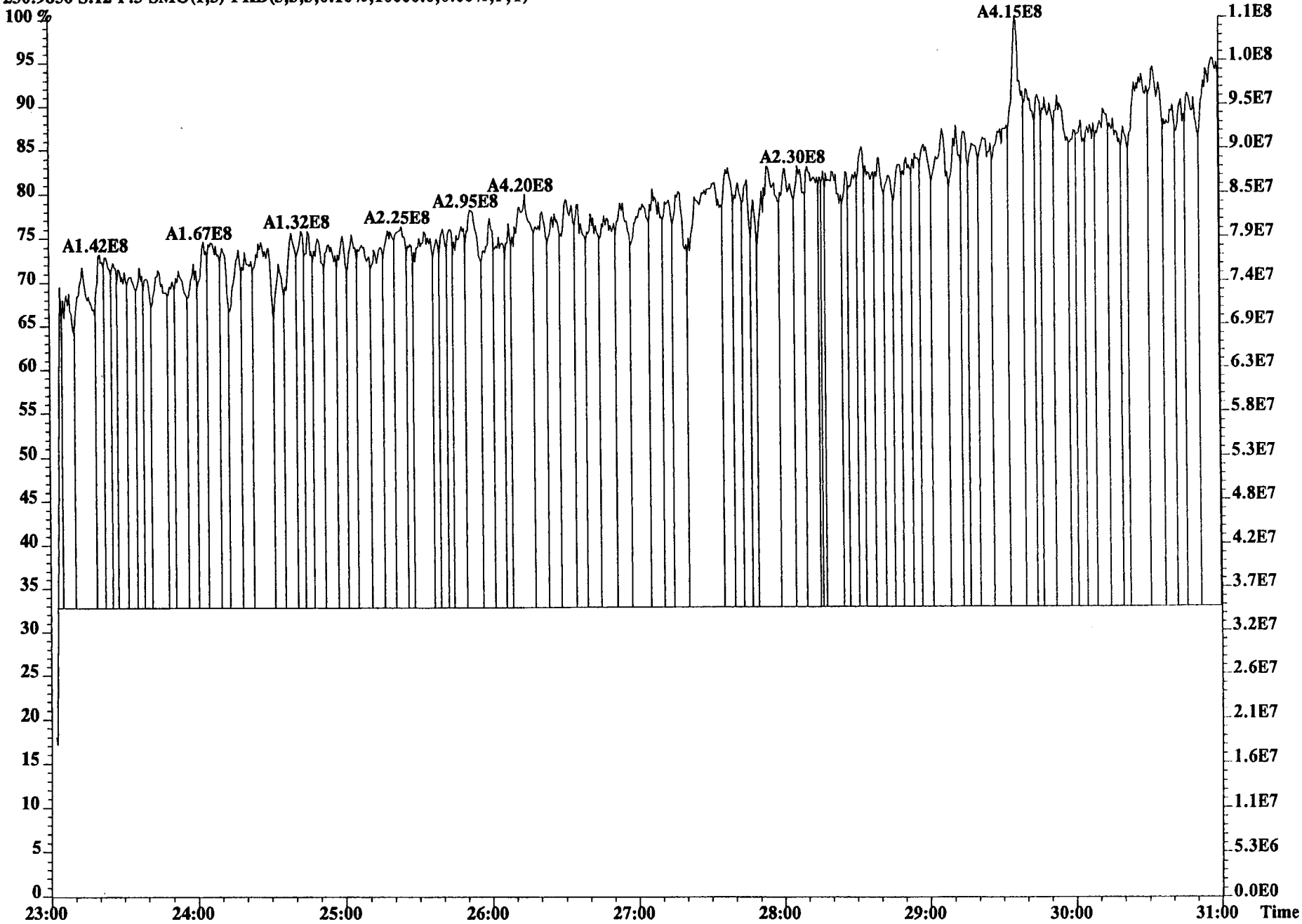
File:30OC98V4 #1-939 Acq:31-OCT-1998 01:44:49 GC EI+ Voltage SIR 70SE
Sample#12 Text:301802-9 :10X DIL. : : : Exp:PAHAIR
228.0939 S:12 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



240.1692 S:12 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

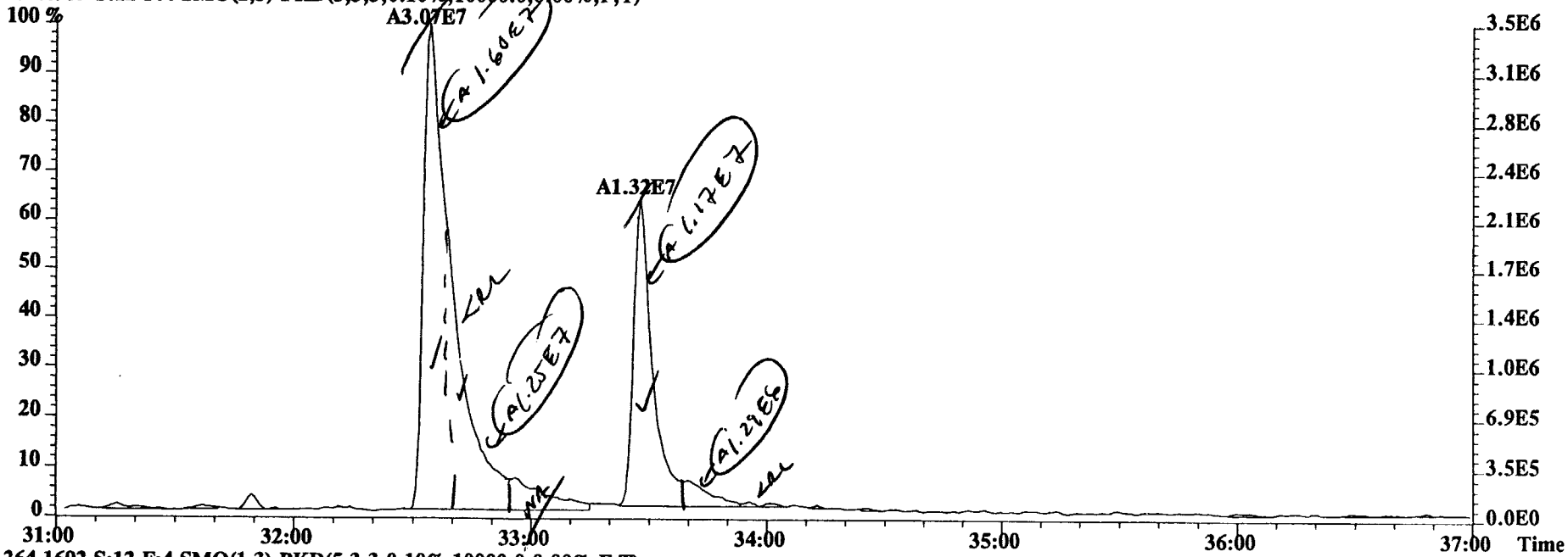


File:30OC98V4 #1-939 Acq:31-OCT-1998 01:44:49 GC EI+ Voltage SIR 70SE
Sample#12 Text:301802-9 :10X DIL. : : : Exp:PAHAIR
230.9856 S:12 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

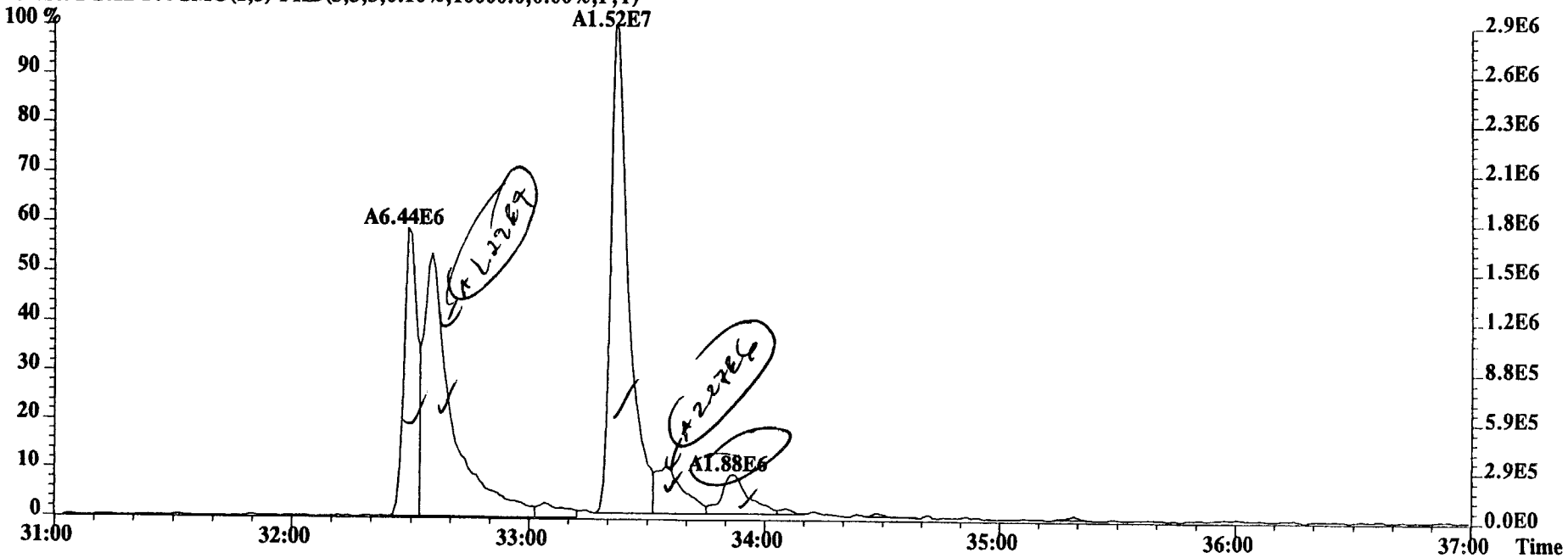


341

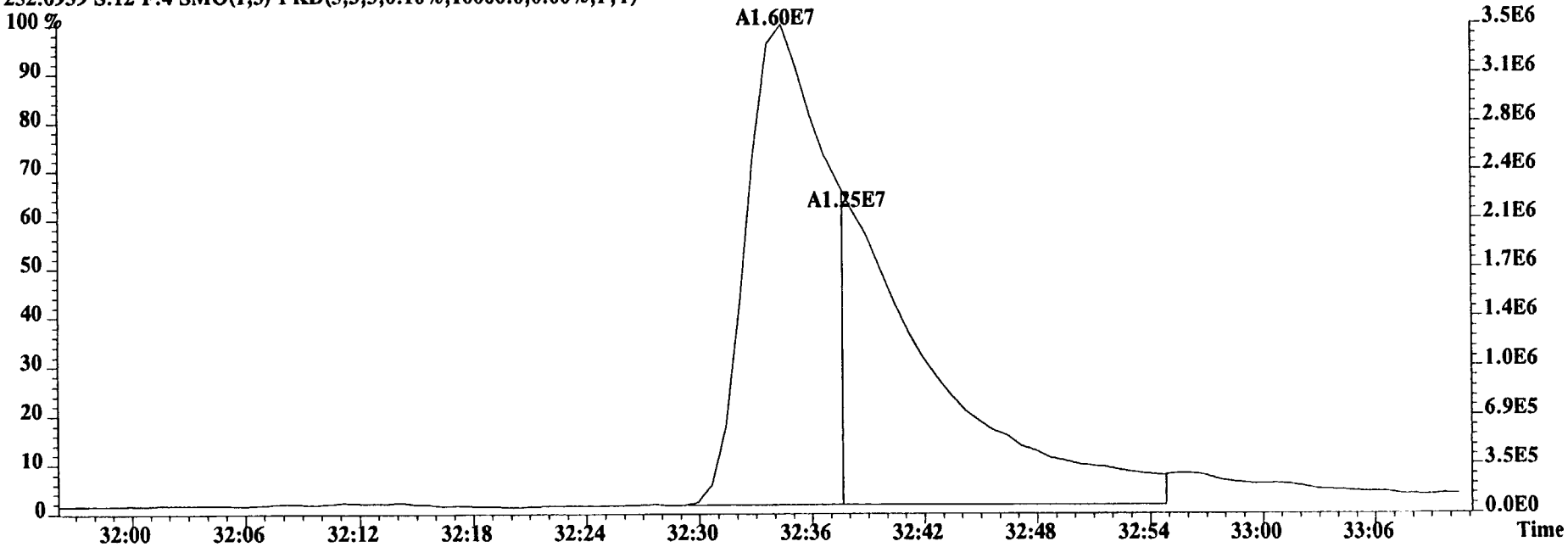
File:30OC98V4 #1-878 Acq:31-OCT-1998 01:44:49 GC EI+ Voltage SIR 70SE
Sample#12 Text:301802-9 :10X DIL. : : : Exp:PAHAIR
252.0939 S:12 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



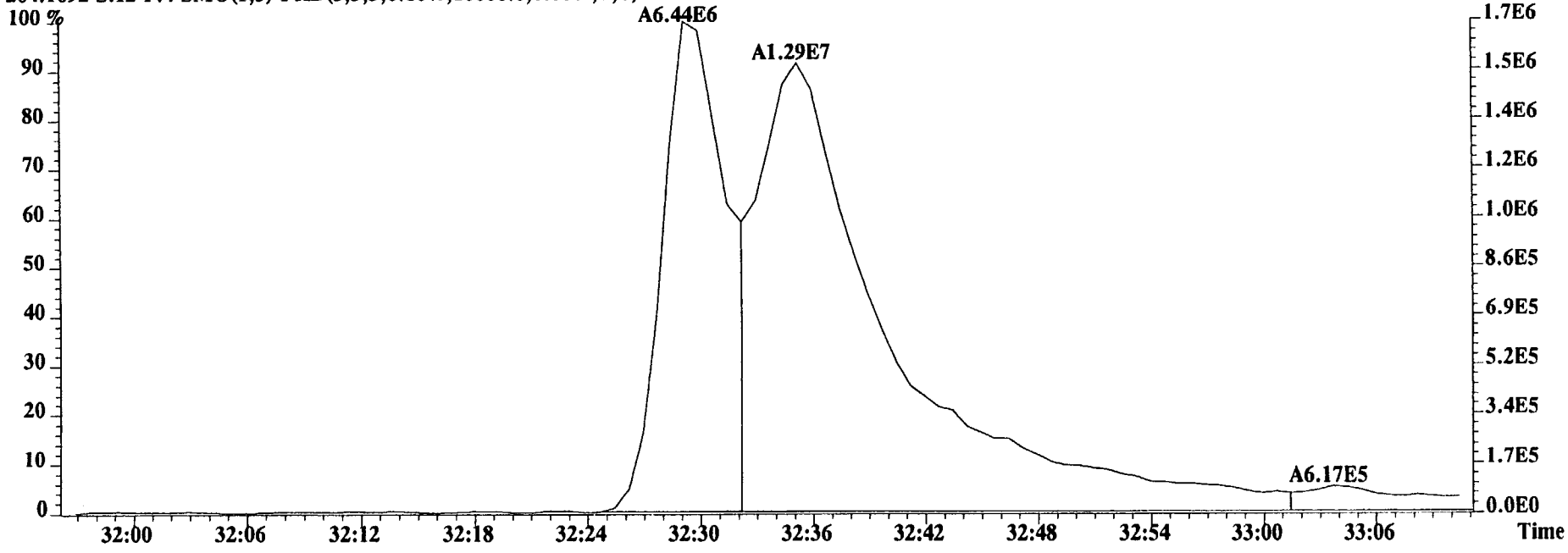
264.1692 S:12 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



File:30OC98V4 #1-878 Acq:31-OCT-1998 01:44:49 GC EI+ Voltage SIR 70SE
Sample#12 Text:301802-9 :10X DIL. : : : Exp:PAHAIR
252.0939 S:12 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

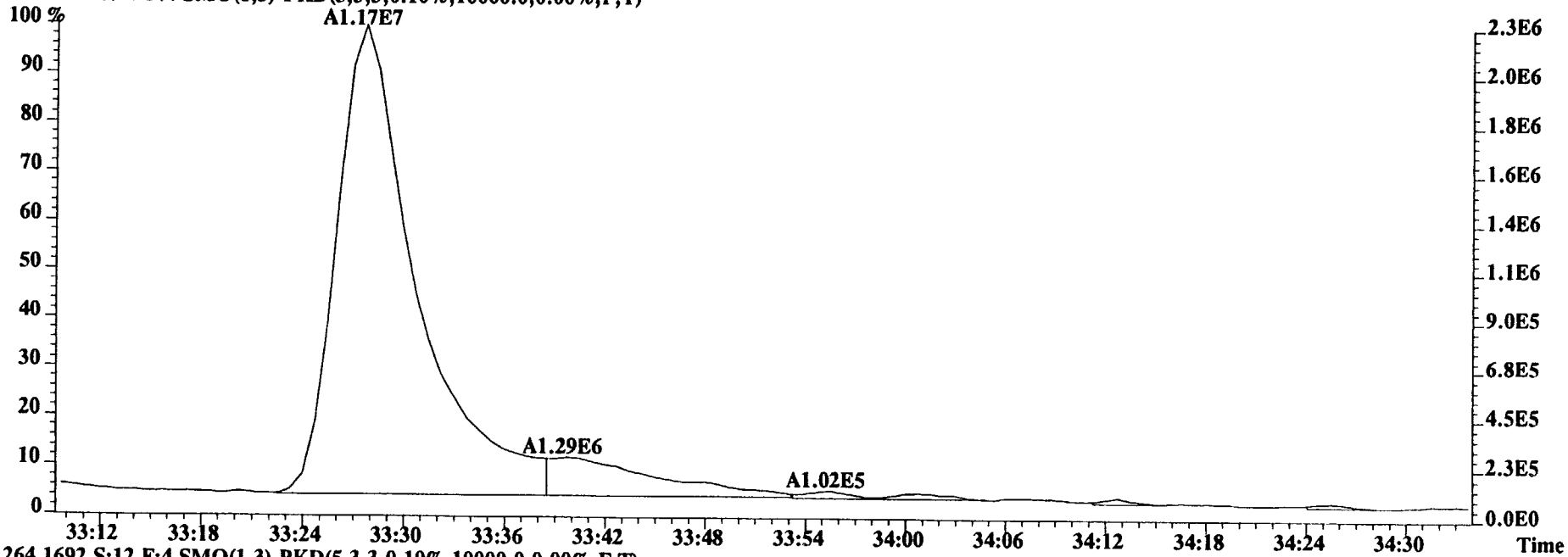


264.1692 S:12 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

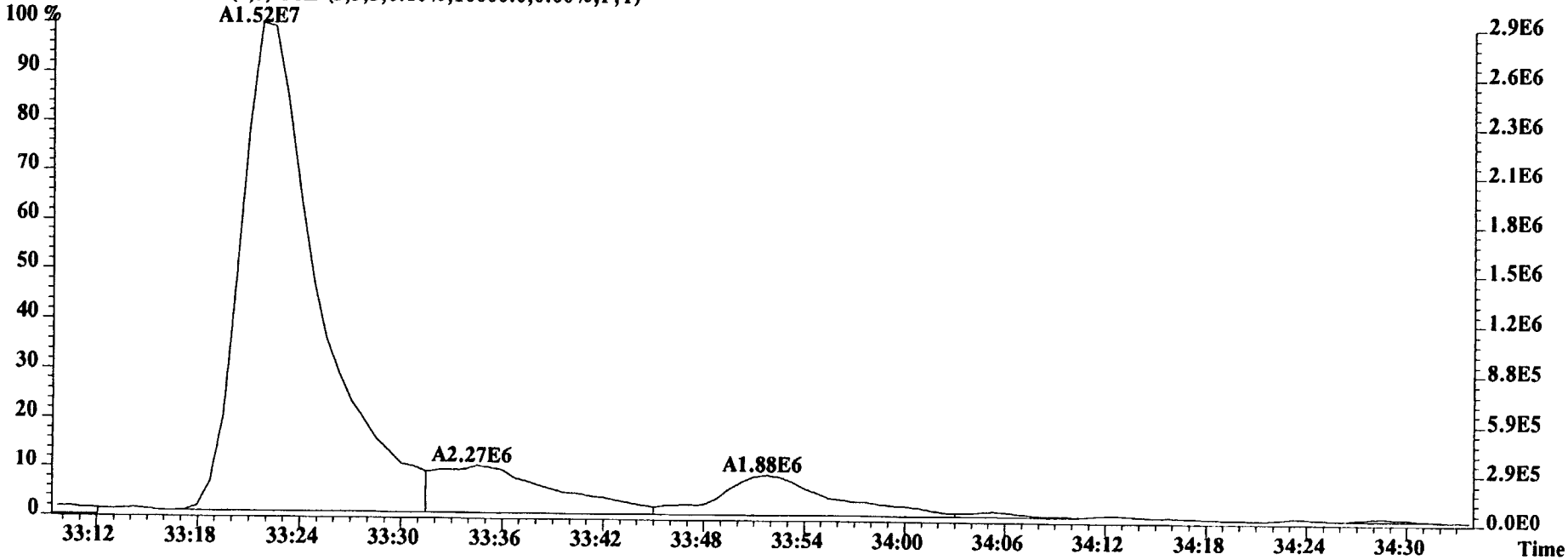


343

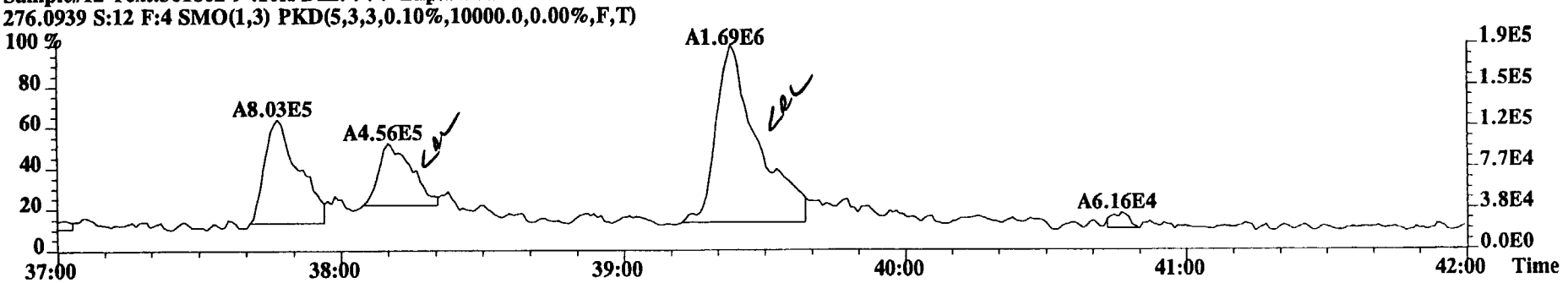
File:30OC98V4 #1-878 Acq:31-OCT-1998 01:44:49 GC EI+ Voltage SIR 70SE
Sample#12 Text:301802-9 :10X DIL. : : : Exp:PAHAIR
252.0939 S:12 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

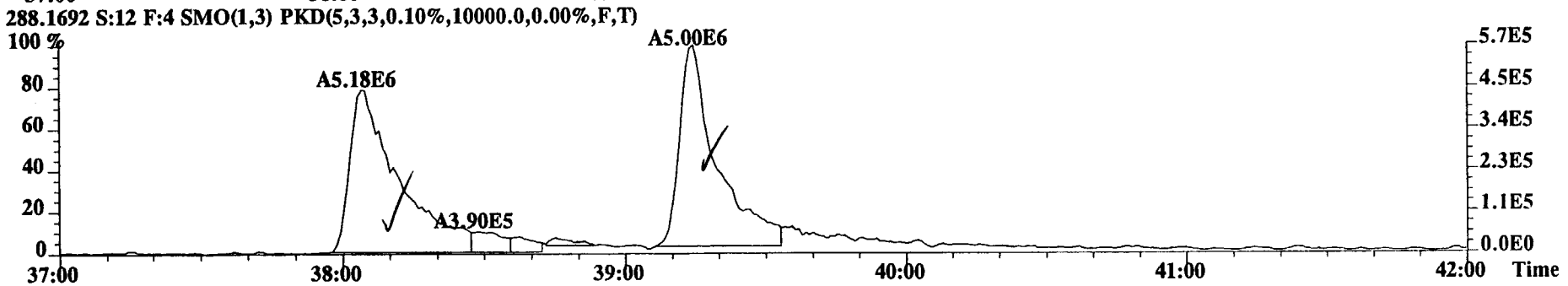


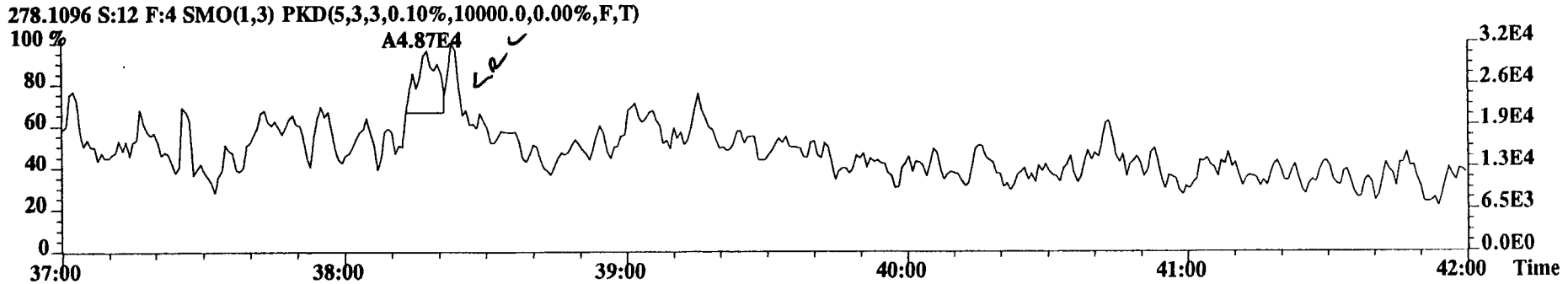
264.1692 S:12 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

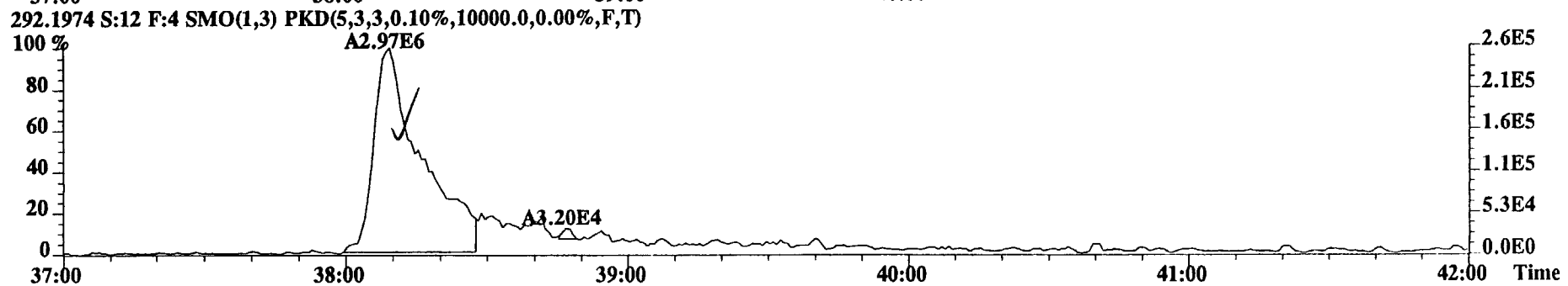


File:30OC98V4 #1-878 Acq:31-OCT-1998 01:44:49 GC EI+ Voltage SIR 70SE
Sample#12 Text:301802-9 :10X DIL. : : : Exp:PAHAIR

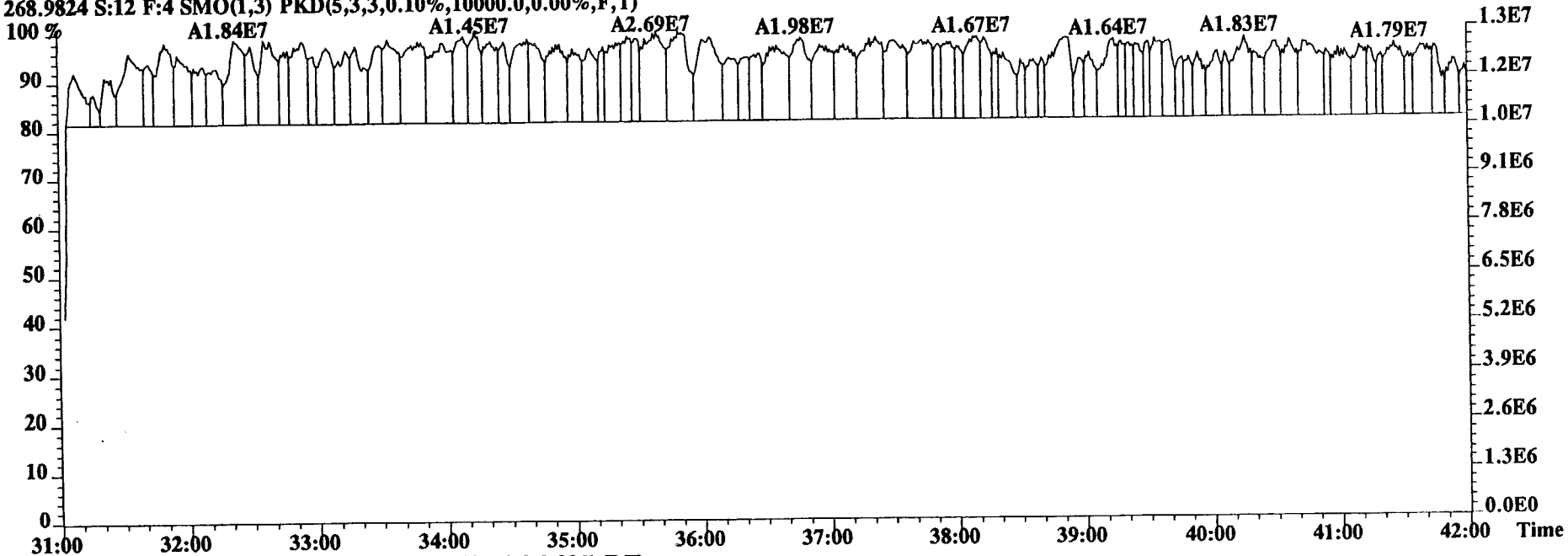




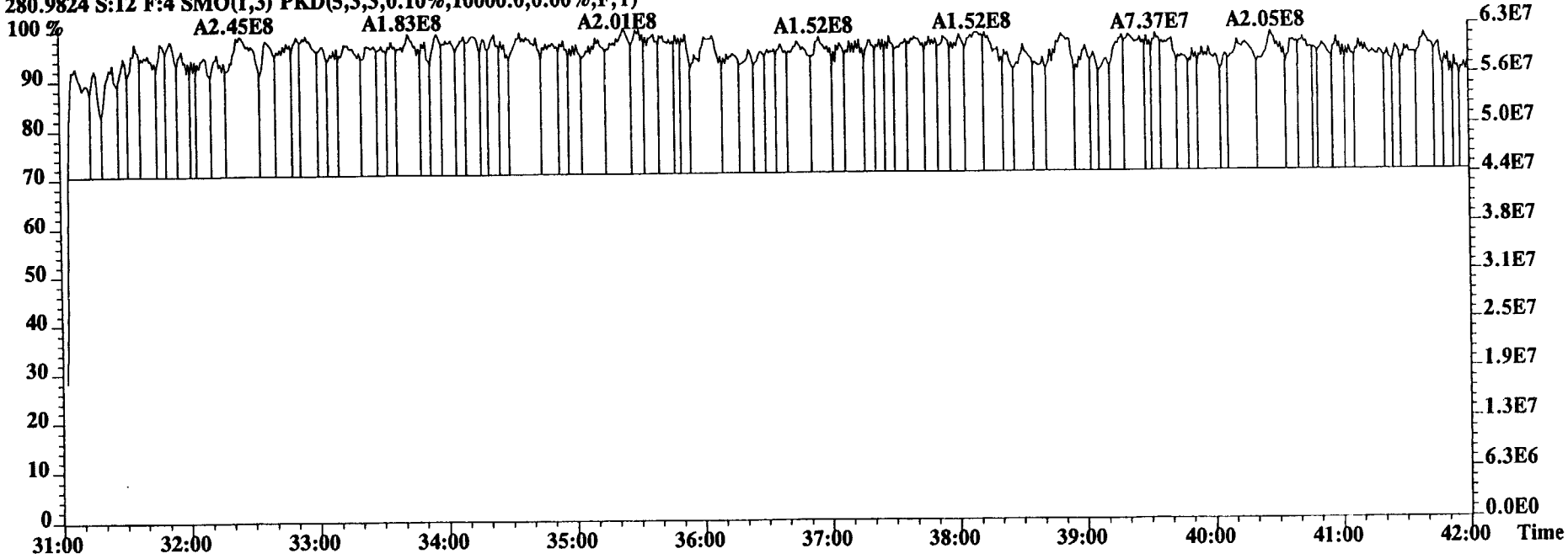




File:30OC98V4 #1-878 Acq:31-OCT-1998 01:44:49 GC EI+ Voltage SIR 70SE
Sample#12 Text:301802-9 :10X DIL. : : : Exp:PAHAIR
268.9824 S:12 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



280.9824 S:12 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



POLYNUCLEAR AROMATIC HYDROCARBONS
HIGH RESOLUTION GC/MS
Method HRGC/HRMS

Client Name: Pacific Environmental Services
Client ID: A-U-429-4
Lab ID: 301802-0010-SA
Matrix: AIRTRAIN Sampled: 25 SEP 98 Received: 29 SEP 98
Authorized: 29 SEP 98 Prepared: 03 OCT 98 Analyzed: 31 OCT 98
Dilution Factor: 1.0

Parameter	Result	Units	Reporting Limit	Data Qualifiers
Naphthalene	99000	ng/sample	--	B
2-Methylnaphthalene	4400	ng/sample	--	B
Acenaphthylene	NC	ng/sample	--	
Acenaphthene	240	ng/sample	--	
Fluorene	1300	ng/sample	--	
Phenanthrene	18000	ng/sample	--	B
Anthracene	280	ng/sample	--	
Fluoranthene	7100	ng/sample	--	
Pyrene	4600	ng/sample	--	
Benzo(a)anthracene	150	ng/sample	--	
Chrysene	520	ng/sample	--	
Benzo(b)fluoranthene	260	ng/sample	--	
Benzo(k)fluoranthene	110	ng/sample	--	
Benzo(e)pyrene	300	ng/sample	--	F
Benzo(a)pyrene	160	ng/sample	--	F
Perylene	ND	ng/sample	100	
Indeno(1,2,3-cd)pyrene	ND	ng/sample	100	
Dibenz(a,h)anthracene	ND	ng/sample	100	
Benzo(g,h,i)perylene	ND	ng/sample	100	

B = Compound is also detected in the blank.
F = Reported value estimated due to an interference.
NC = Not Calculated, calculation not applicable.
ND = Not Detected

Reported By: Clark Pickell Approved By: Eric Redman

The cover letter is an integral part of this report.
Rev 230787

POLYNUCLEAR AROMATIC HYDROCARBONS
HIGH RESOLUTION GC/MS
Method HRGC/HRMS
(cont.)

Client Name: Pacific Environmental Services
Client ID: A-U-429-4
Lab ID: 301802-0010-SA
Matrix: AIRTRAIN
Authorized: 29 SEP 98
Dilution Factor: 1.0

Sampled: 25 SEP 98
Prepared: 03 OCT 98

Received: 29 SEP 98
Analyzed: 31 OCT 98

Internal Standards	% Recovery	
Naphthalene-d8	43	m
Acenaphthylene-d8	NC	
Acenaphthene-d10	45	
Fluorene-d10	79	
Phenanthrene-d10	87	
Fluoranthene-d10	80	
Pyrene-d10	53	
Benzo(a)anthracene-d12	53	
Perylene-d12	8.0	m
Indeno(123-cd)pyrene-d12	55	
Chrysene-d12	79	
Benzo(b)fluoranthene-d12	94	
Benzo(k)fluoranthene-d12	75	
Benzo(a)pyrene-d12	16	m
Dibenz(a,h)anthracene-d14	61	
Benzo(g,h,i)perylene-d12	41	m

Field Surrogates	% Recovery
13C-Fluorene	122

m = Internal Standard recovery is outside method recovery goal.
NC = Not Calculated, calculation not applicable.

Reported By: Clark Pickell

Approved By: Eric Redman

The cover letter is an integral part of this report.
Rev 230787

04-NOV-1998 07:27:40 PM Dioxin Furan Unknown RESULTS

Mass Spec : VG-4 Results : 30OC98V4131.RES : PAHAIR.TRG
GC Column : DB-5 Date analyzed : 30-OCT-98
Data file : 30OC98V4 301802-10 :10X DIL. : : : Ex Cal : PAHAIR102998V4.R
Weight : 0.5

Name	Total Response	Isotope Ratio		R. T. mm:ss		RRF	pg/ SAMP		Rec/ MDL	
d10-2-Methylnaphthalene	7498280	1.00	Y	12: 28	Y	1.00	50.00			
d8-Naphthalene	7174680	1.00	Y	10: 12	Y	2.24	21.35		43	m
Naphthalene	8741280000	1.00	Y	10: 16	Y	1.23	9.9e+04	B	E	
2-Methylnaphthalene	176474000	1.00	Y	12: 33	Y	0.56	4387.96	B		
d8-Acenaphthylene	* No Peak	0.00	N	15: 28	N	1.21	0.00		0	N
Acenaphthylene	63711000	1.00	Y	15: 30	Y	0.94	NC			
d10-Acenaphthene	2518540	1.00	Y	16: 1	Y	0.74	22.55		45	
Acenaphthene	7640000	1.00	Y	16: 8	Y	1.25	243.44			
d10-Anthracene	4569820	1.00	Y	20: 55	Y	1.00	50.00			
d10-Fluorene	5126960	1.00	Y	17: 41	Y	1.42	39.48		79	
Fluorene	74847600	1.00	Y	17: 46	Y	1.16	1257.96			
d10-Phenanthrene	11134240	1.00	Y	20: 45	Y	2.81	43.39		87	
Phenanthrene	1834640000	1.00	Y	20: 49	Y	0.89	1.8e+04	B	E	
Anthracene	24600000	1.00	Y	20: 59	Y	0.80	276.04			
d14-Terphenyl	14911620	1.00	Y	26: 0	Y	1.00	50.00			
d10-Fluoranthene	16826180	1.00	Y	24: 35	Y	1.41	39.99		80	
Fluoranthene	1323714000	1.00	Y	24: 39	Y	1.11	7076.09	E		
d10-Pyrene	12074540	1.00	Y	25: 17	Y	1.52	26.67		53	
Pyrene	667264000	1.00	Y	25: 20	Y	1.21	4585.84			
d12-Benzo(a)anthracene	7170060	1.00	Y	29: 9	Y	0.90	26.71		53	
Benzo(a)anthracene	13040660	1.00	Y	29: 13	Y	1.20	151.00			
d12-Chrysene	14987060	1.00	Y	29: 15	Y	1.28	39.29		79	
Chrysene	83859000	1.00	Y	29: 20	Y	1.08	516.20			
d12-Benzo(e)pyrene	29000000	1.00	Y	33: 22	Y	1.00	50.00			
d12-Benzo(b)fluoranthene	12379800	1.00	Y	32: 30	Y	0.45	47.03		94	
Benzo(b)fluoranthene	37600000	1.00	Y	32: 34	Y	1.17	260.20			
d12-Benzo(k)fluoranthene	20678000	1.00	Y	32: 35	Y	0.95	37.61		75	
Benzo(k)fluoranthene	27000000	1.00	Y	32: 38	Y	1.16	112.16			
d12-Benzo(a)pyrene	3120000	1.00	Y	33: 32	Y	0.68	7.95		16	r
Benzo(e)pyrene	15172820	1.00	Y	33: 28	Y	1.64	296.38	F		
Benzo(a)pyrene	5217900	1.00	Y	33: 35	Y	1.07	156.01	F		
d12-Perylene	1512000	1.00	Y	33: 49	Y	0.63	4.14		8	
Perylene	1606000	1.00	Y	33: 55	Y	1.71	<RL=100.00			
d12-Indeno(123-cd)pyrene	7038920	1.00	Y	38: 4	Y	0.44	27.30		55	
Indeno(123-cd)pyrene	1625238	1.00	Y	38: 10	Y	0.62	<RL=100.00			
d14-Dibenz(ah)anthracene	4313320	1.00	Y	38: 8	Y	0.25	30.25		61	
Dibenz(ah)anthracene	* No Peak	0.00	N	38: 15	N	1.40	<RL=100.00			
d12-Benzo(ghi)perylene	6836620	1.00	Y	39: 14	Y	0.58	20.33		41	m
Benzo(ghi)perylene	3314680	1.00	Y	39: 23	Y	1.02	<RL=100.00			
d10-Fluorene	5126960	1.00	Y	17: 41	Y	1.00	50.00			
13C-Fluorene	5067840	1.00	Y	17: 46	Y	0.81	61.02		122	

0.5

98V4.RRF

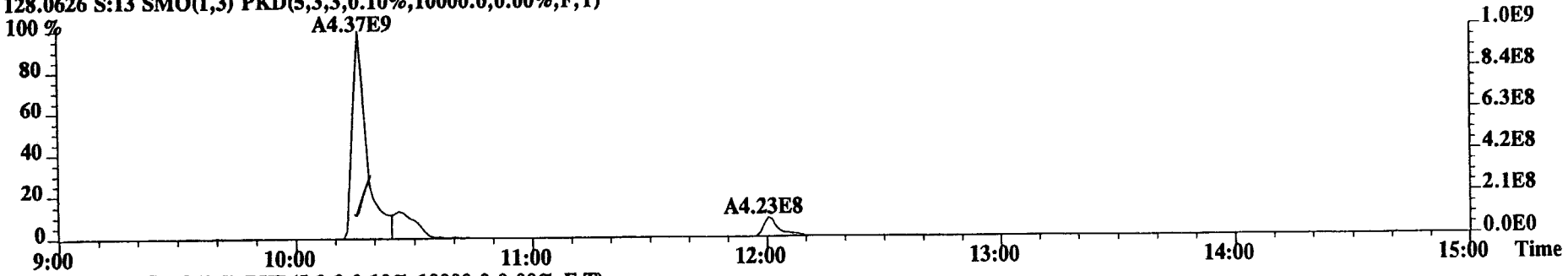
Rec/ MDL			
		3749140	3749140
	43	3587340	3587340
	B E	4370640000	4370640000
	B	88237000	88237000
	0	0	0
		31855500	31855500
	45	1259270	1259270
		3820000	3820000
		2284910	2284910
	79	2563480	2563480
		37423800	37423800
	87	5567120	5567120
	B E	917320000	917320000
		12300000	12300000
		7455810	7455810
	80	8413090	8413090
	E	661857000	661857000
	53	6037270	6037270
		333632000	333632000
	53	3585030	3585030
		6520330	6520330
	79	7493530	7493530
		41929500	41929500
		14500000	14500000
	94	6189900	6189900
		18800000	18800000
	75	10339000	10339000
		13500000	13500000
	16	1560000	1560000
	F	7586410	7586410
	F	2608950	2608950
	8	756000	756000
	100.00	803000	803000
	55	3519460	3519460
	100.00	812619	812619
	61	2156660	2156660
	100.00	0	0
	41	3418310	3418310
	100.00	1657340	1657340

02-NOV-1998 09:05:34 AM Dioxin Furan Unknown RESULTS

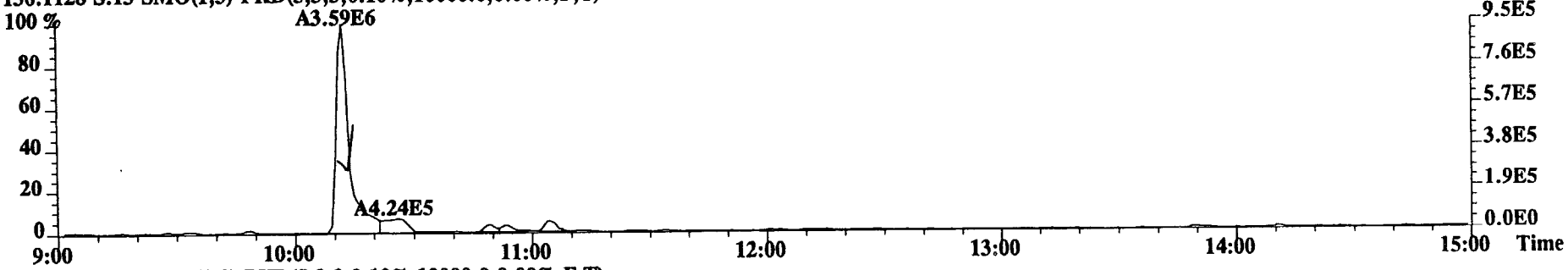
Mass Spec : VG-4 Results : 30OC98V4131.RES : PAHAIR.TRG
GC Column : DB-5 Date analyzed : 30-OCT-98
Data file : 30OC98V4 301802-10 :10X DIL. : : : Ex Cal : PAHAIR102998V4.R
Weight : 0.5

Name	Total Response	Isotope Ratio		R. T. mm:ss		RRF	pg/ SAMP	Rec/ MDL
d10-2-Methylnaphthalene	7498280	1.00	Y	12: 28	Y	1.00	50.00	
d8-Naphthalene	7174680	1.00	Y	10: 12	Y	2.24	21.35	43
Naphthalene	8741280000	1.00	Y	10: 16	Y	1.23	9.9e+04	0.000
2-Methylnaphthalene	176474000	1.00	Y	12: 33	Y	0.56	4387.96	0.000
d8-Acenaphthylene	* No Peak	0.00	N	15: 28	N	1.21	0.00	0
Acenaphthylene	63711000	1.00	Y	15: 30	Y	0.94	*NoINoIs	
d10-Acenaphthene	2518540	1.00	Y	16: 1	Y	0.74	22.55	45
Acenaphthene	* No Peak	0.00	N	16: 8	N	1.25	0.00	0.000
d10-Anthracene	4569820	1.00	Y	20: 55	Y	1.00	50.00	
d10-Fluorene	5126960	1.00	Y	17: 41	Y	1.42	39.48	79
Fluorene	74847600	1.00	Y	17: 46	Y	1.16	1257.96	0.000
d10-Phenanthrene	11134240	1.00	Y	20: 45	Y	2.81	43.39	87
Phenanthrene	1834640000	1.00	Y	20: 49	Y	0.89	1.8e+04	0.000
Anthracene	* No Peak	0.00	N	20: 59	N	0.80	0.00	0.000
d14-Terphenyl	14911620	1.00	Y	26: 0	Y	1.00	50.00	
d10-Fluoranthene	16826180	1.00	Y	24: 35	Y	1.41	39.99	80
Fluoranthene	1323714000	1.00	Y	24: 39	Y	1.11	7076.09	0.000
d10-Pyrene	12074540	1.00	Y	25: 17	Y	1.52	26.67	53
Pyrene	667264000	1.00	Y	25: 20	Y	1.21	4585.84	0.000
d12-Benzo(a)anthracene	7170060	1.00	Y	29: 9	Y	0.90	26.71	53
Benzo(a)anthracene	13040660	1.00	Y	29: 13	Y	1.20	151.00	0.000
d12-Chrysene	14987060	1.00	Y	29: 15	Y	1.28	39.29	79
Chrysene	83859000	1.00	Y	29: 20	Y	1.08	516.20	0.000
d12-Benzo(e)pyrene	32214200	1.00	Y	33: 22	Y	1.00	50.00	
d12-Benzo(b)fluoranthene	12379800	1.00	Y	32: 30	Y	0.45	42.34	85
Benzo(b)fluoranthene	64974200	1.00	Y	32: 34	Y	1.17	449.64	0.000
d12-Benzo(k)fluoranthene	20678000	1.00	Y	32: 35	Y	0.95	33.85	68
Benzo(k)fluoranthene	64974200	1.00	Y	32: 34	Y	1.16	269.91	0.000
d12-Benzo(a)pyrene	* No Peak	0.00	N	33: 32	N	0.68	0.00	0
Benzo(e)pyrene	15172820	1.00	Y	33: 28	Y	1.64	*NoINoIs	
Benzo(a)pyrene	5217900	1.00	Y	33: 35	Y	1.07	*NoINoIs	
d12-Perylene	* No Peak	0.00	N	33: 49	N	0.63	0.00	0
Perylene	* No Peak	0.00	N	33: 55	N	1.71	*NoINoIs	
d12-Indeno(123-cd)pyrene	7038920	1.00	Y	38: 4	Y	0.44	24.58	49
Indeno(123-cd)pyrene	1625238	1.00	Y	38: 10	Y	0.62	37.18	0.000
d14-Dibenz(ah)anthracene	4313320	1.00	Y	38: 8	Y	0.25	27.23	54
Dibenz(ah)anthracene	* No Peak	0.00	N	38: 15	N	1.40	0.00	0.000
d12-Benzo(ghi)perylene	6836620	1.00	Y	39: 14	Y	0.58	18.30	37
Benzo(ghi)perylene	3314680	1.00	Y	39: 23	Y	1.02	47.72	0.000
d10-Fluorene	5126960	1.00	Y	17: 41	Y	1.42	5.60	11
13C-Fluorene	5067840	1.00	Y	17: 46	Y	1.00	98.85	0.000

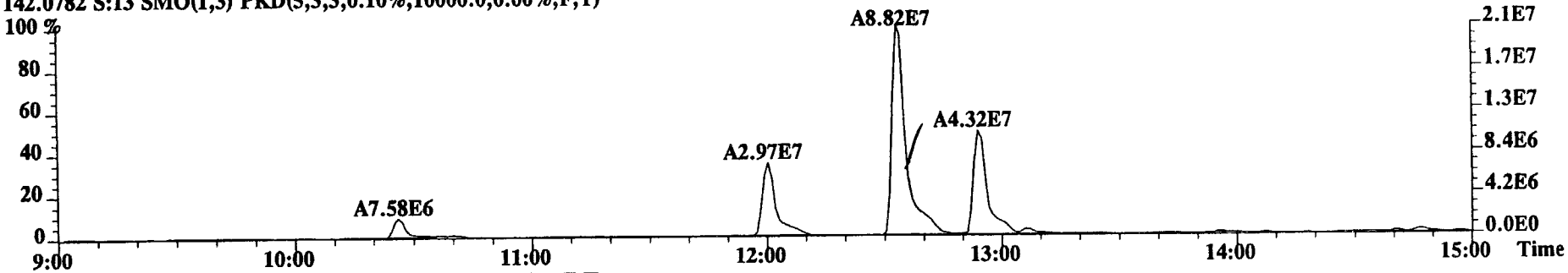
File:30OC98V4 #1-510 Acq:31-OCT-1998 02:33:51 GC EI+ Voltage SIR 70SE
Sample#13 Text:301802-10 :10X DIL. : : : Exp:PAHAIR
128.0626 S:13 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



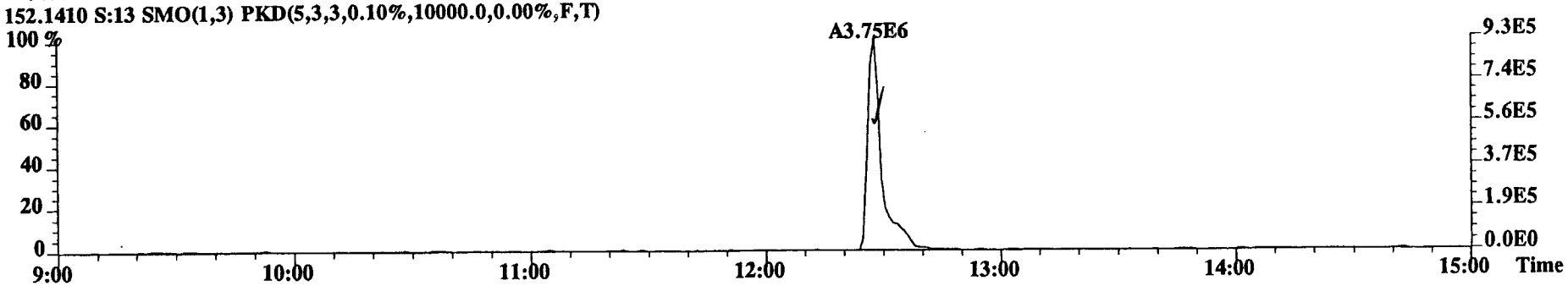
136.1128 S:13 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



142.0782 S:13 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

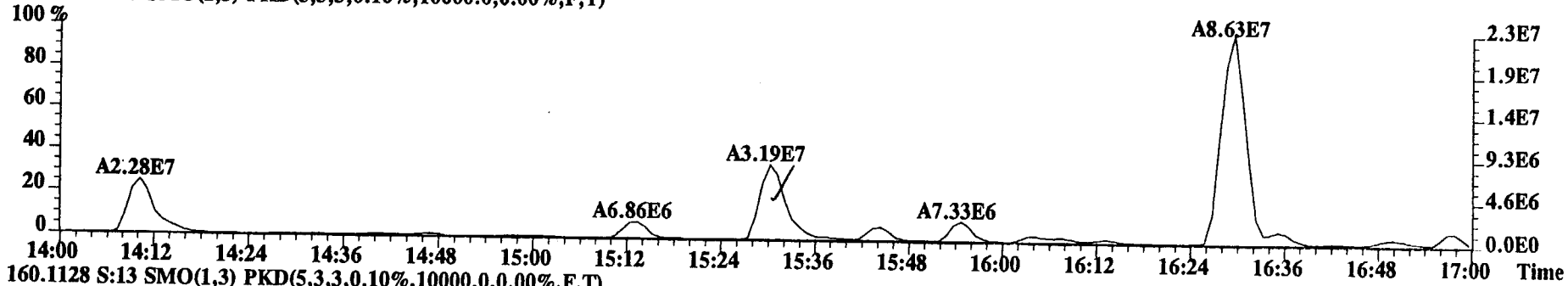


152.1410 S:13 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

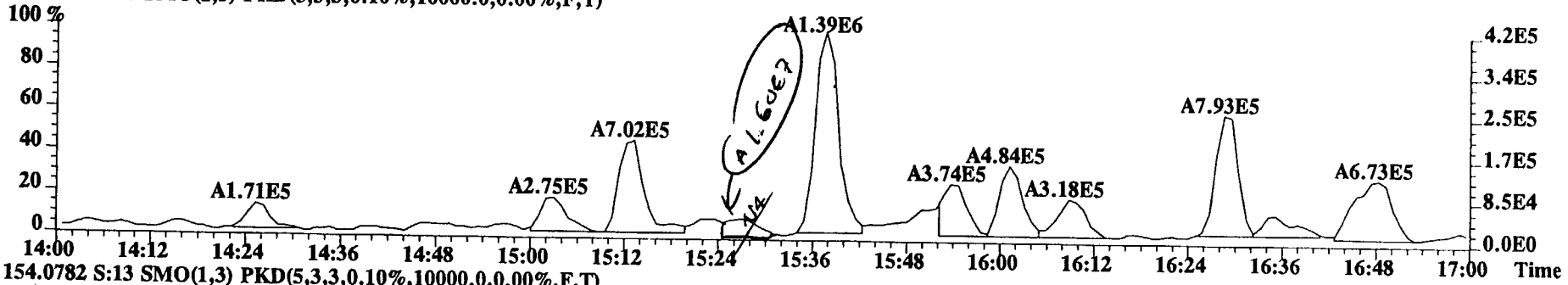


352

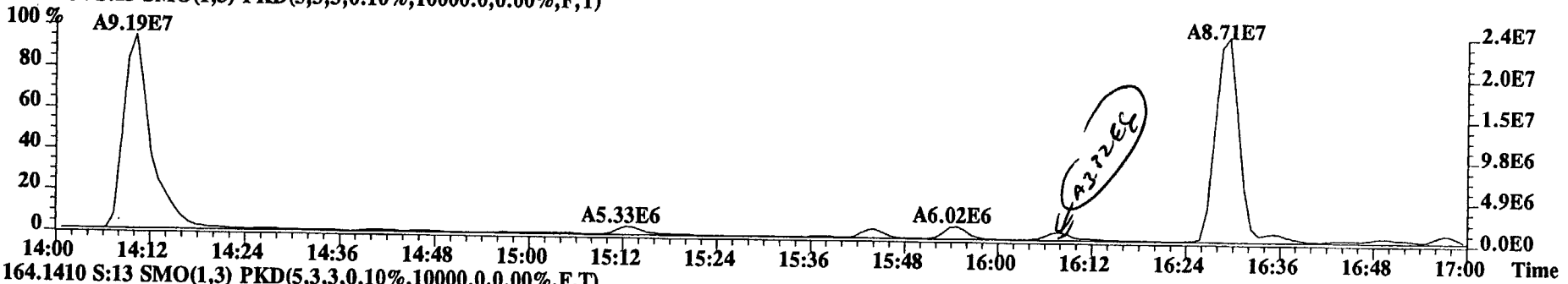
File:30OC98V4 #1-510 Acq:31-OCT-1998 02:33:51 GC EI+ Voltage SIR 70SE
Sample#13 Text:301802-10 :10X DIL. : : : Exp:PAHAIR
152.0626 S:13 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



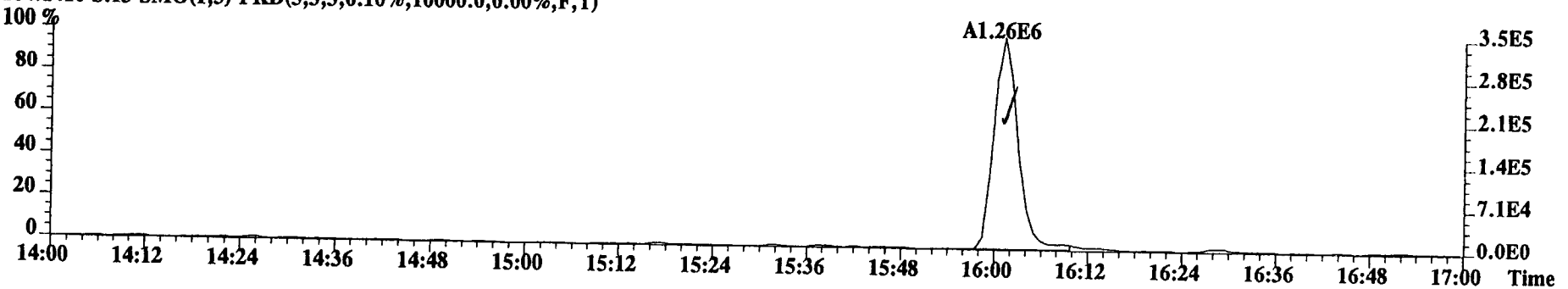
160.1128 S:13 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



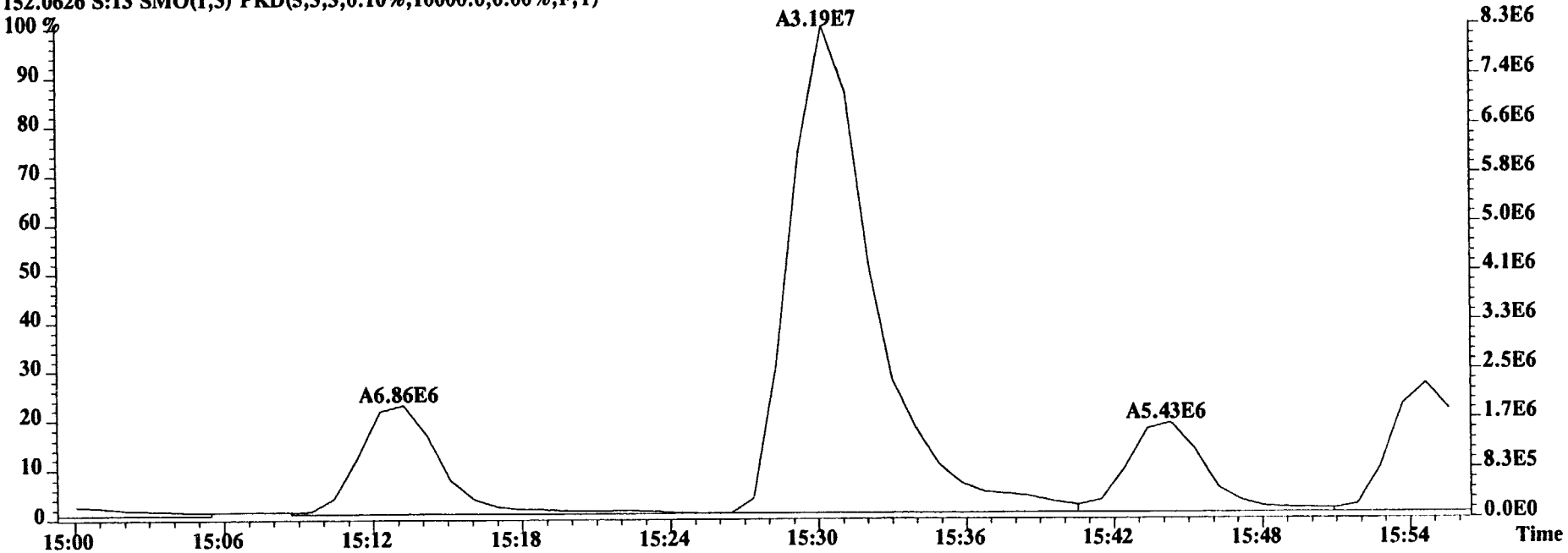
154.0782 S:13 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



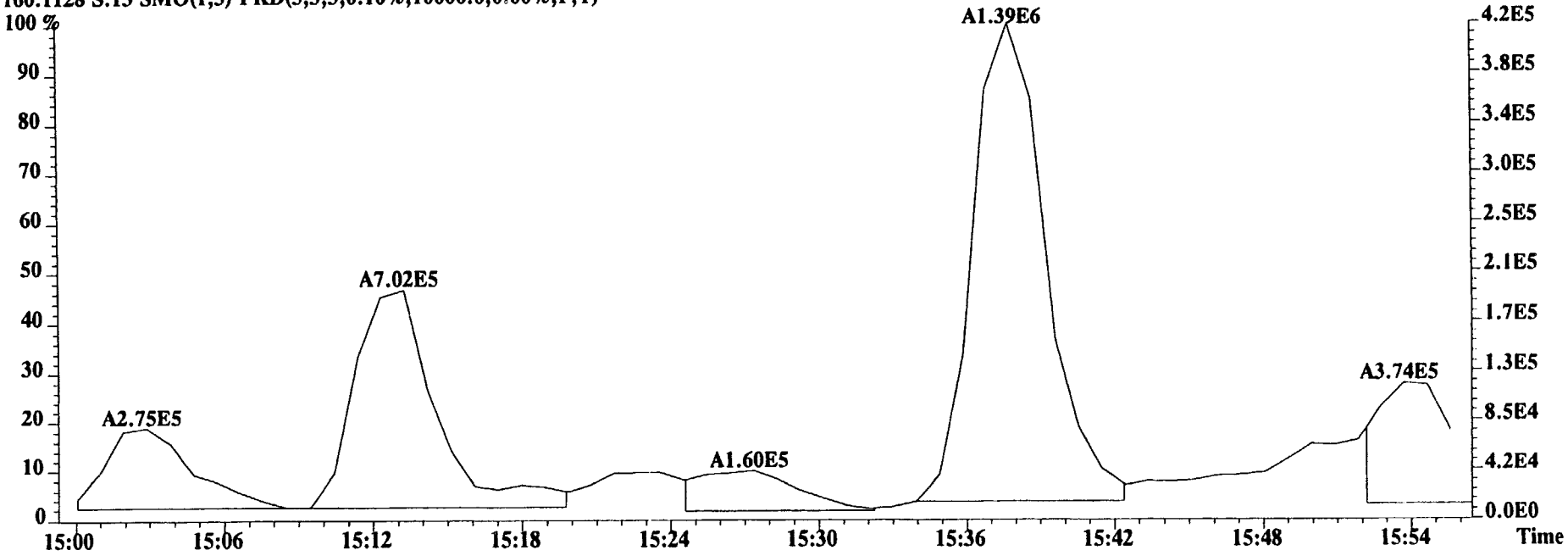
164.1410 S:13 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



File:30OC98V4 #1-510 Acq:31-OCT-1998 02:33:51 GC EI+ Voltage SIR 70SE
Sample#13 Text:301802-10 :10X DIL. : : : Exp:PAHAIR
152.0626 S:13 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

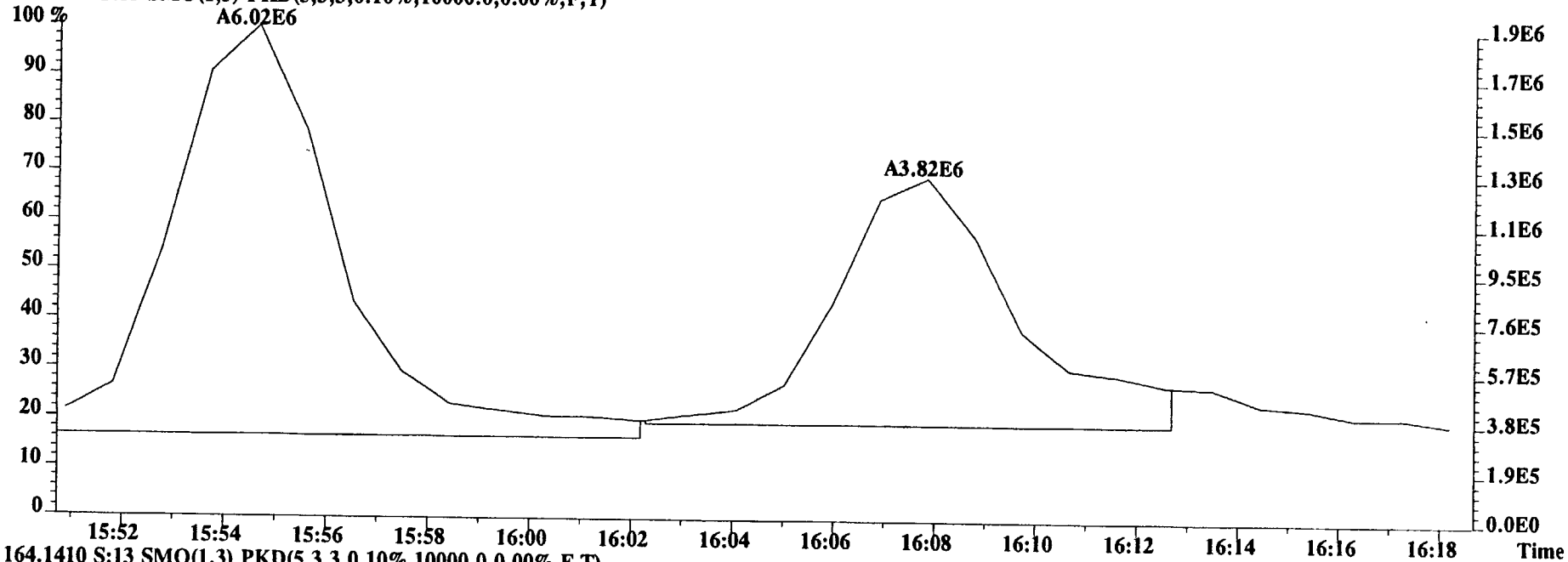


160.1128 S:13 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

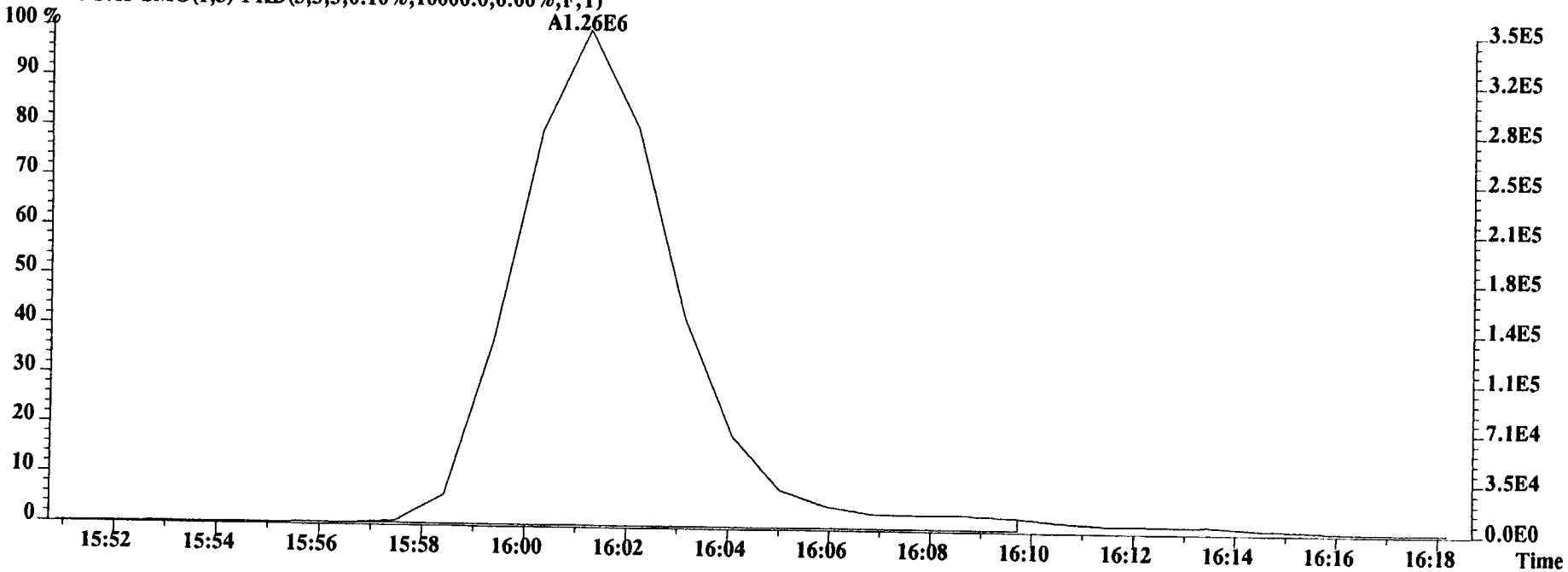


354

File:30OC98V4 #1-510 Acq:31-OCT-1998 02:33:51 GC EI+ Voltage SIR 70SE
Sample#13 Text:301802-10 :10X DIL. : : : Exp:PAHAIR
154.0782 S:13 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

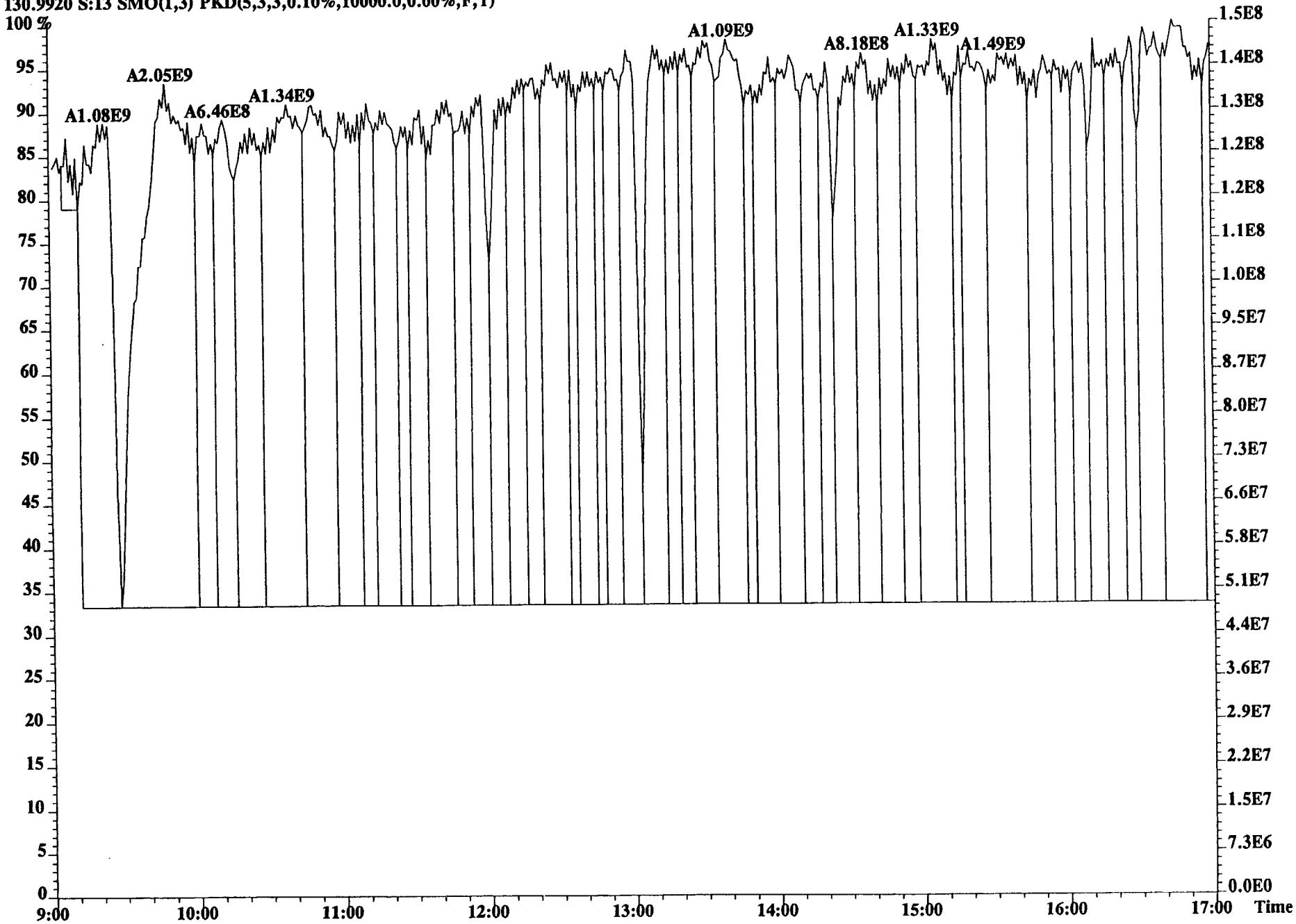


164.1410 S:13 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



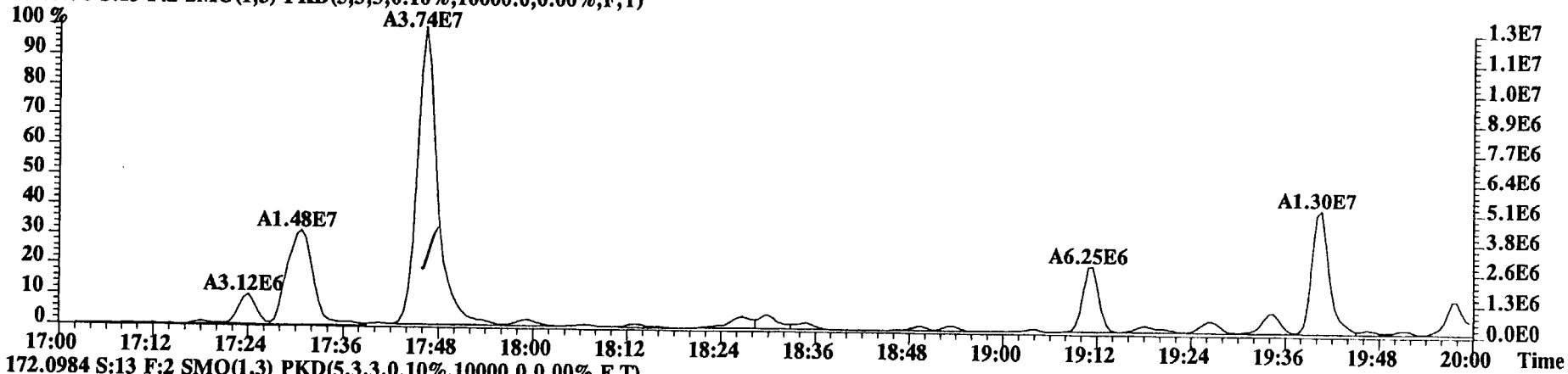
355

File:30OC98V4 #1-510 Acq:31-OCT-1998 02:33:51 GC EI+ Voltage SIR 70SE
Sample#13 Text:301802-10 :10X DIL. : : : Exp:PAHAIR
130.9920 S:13 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

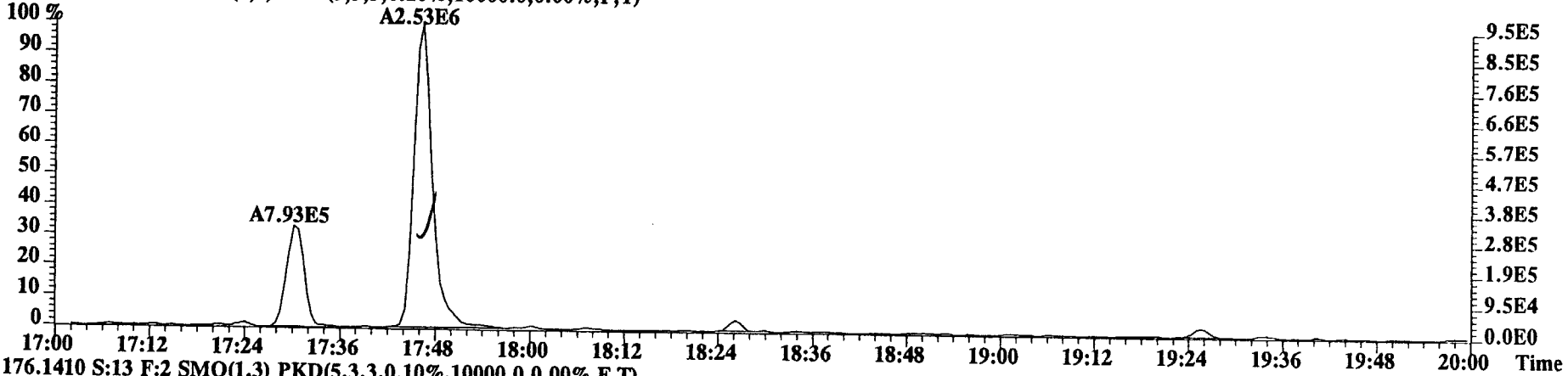


356

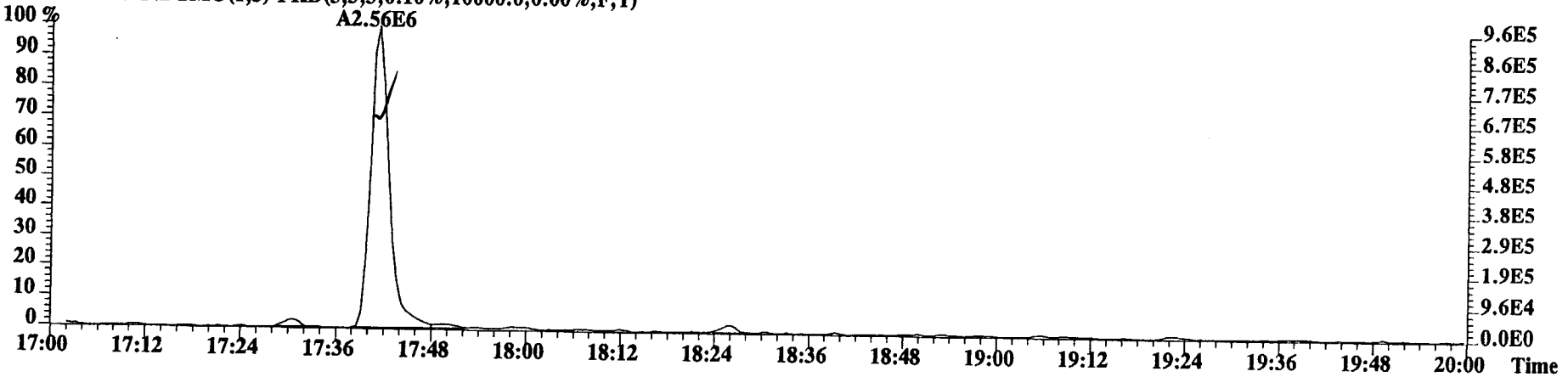
File:30OC98V4 #1-641 Acq:31-OCT-1998 02:33:51 GC EI+ Voltage SIR 70SE
Sample#13 Text:301802-10 :10X DIL. : : : Exp:PAHAIR
166.0798 S:13 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



172.0984 S:13 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

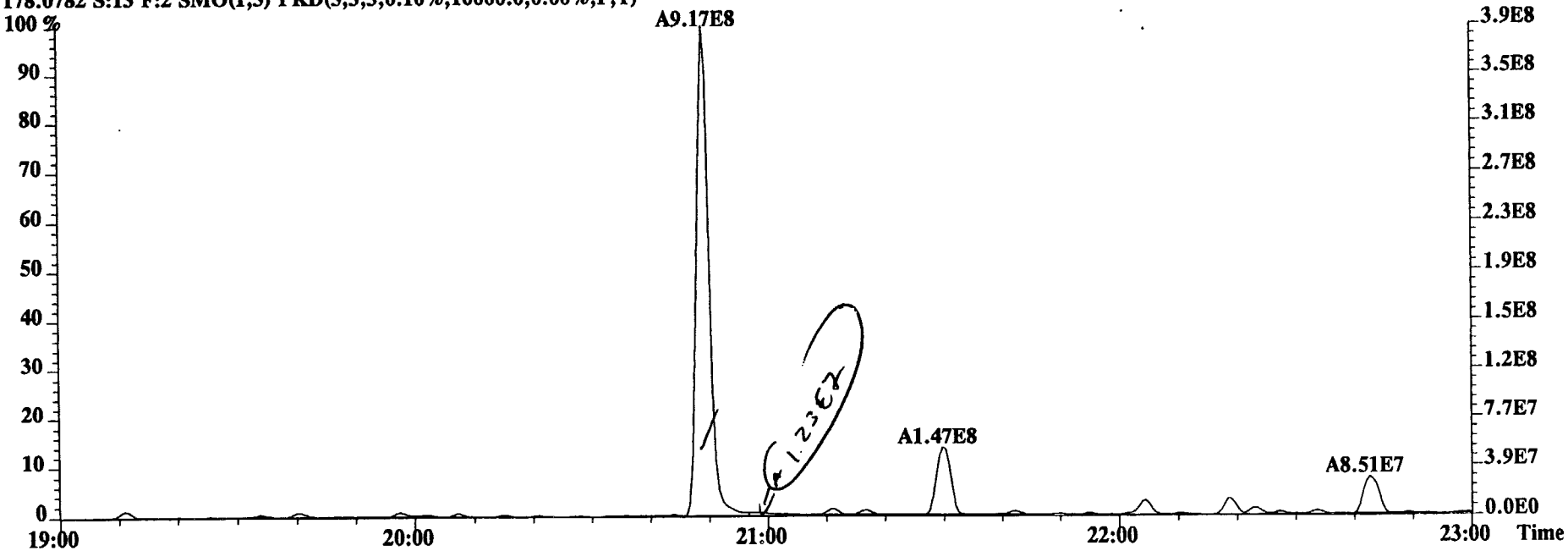


176.1410 S:13 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

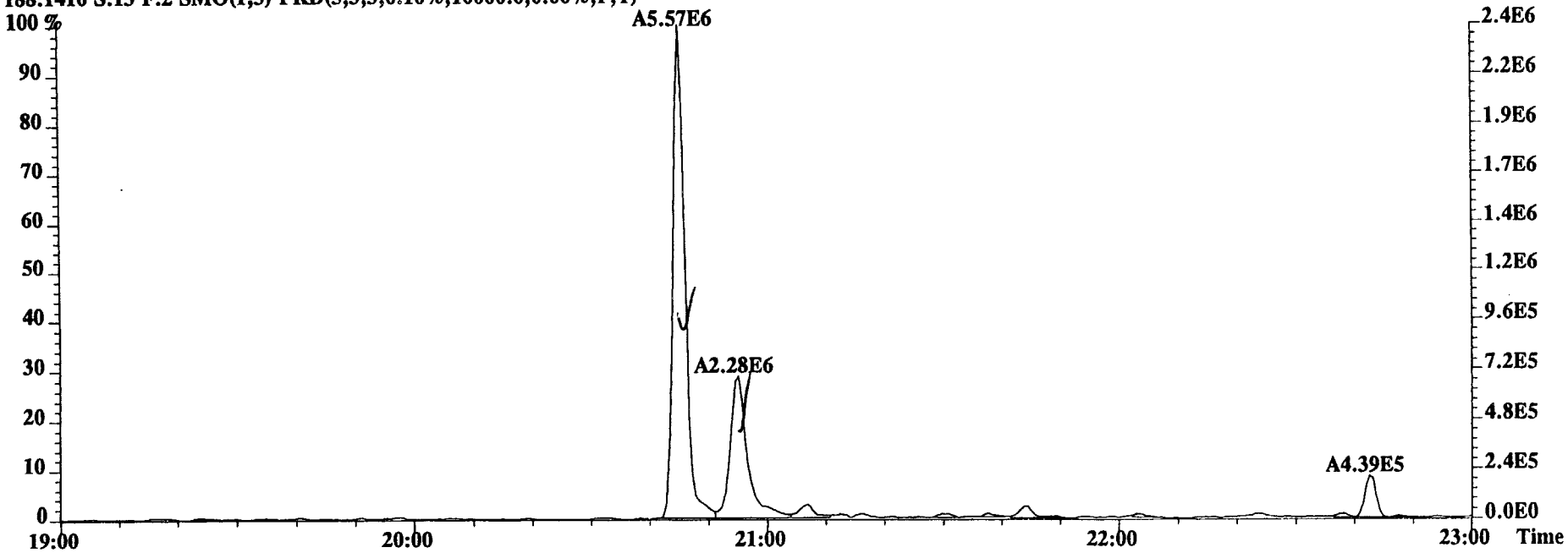


357

File:30OC98V4 #1-641 Acq:31-OCT-1998 02:33:51 GC EI+ Voltage SIR 70SE
Sample#13 Text:301802-10 :10X DIL. : : : Exp:PAHAIR
178.0782 S:13 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

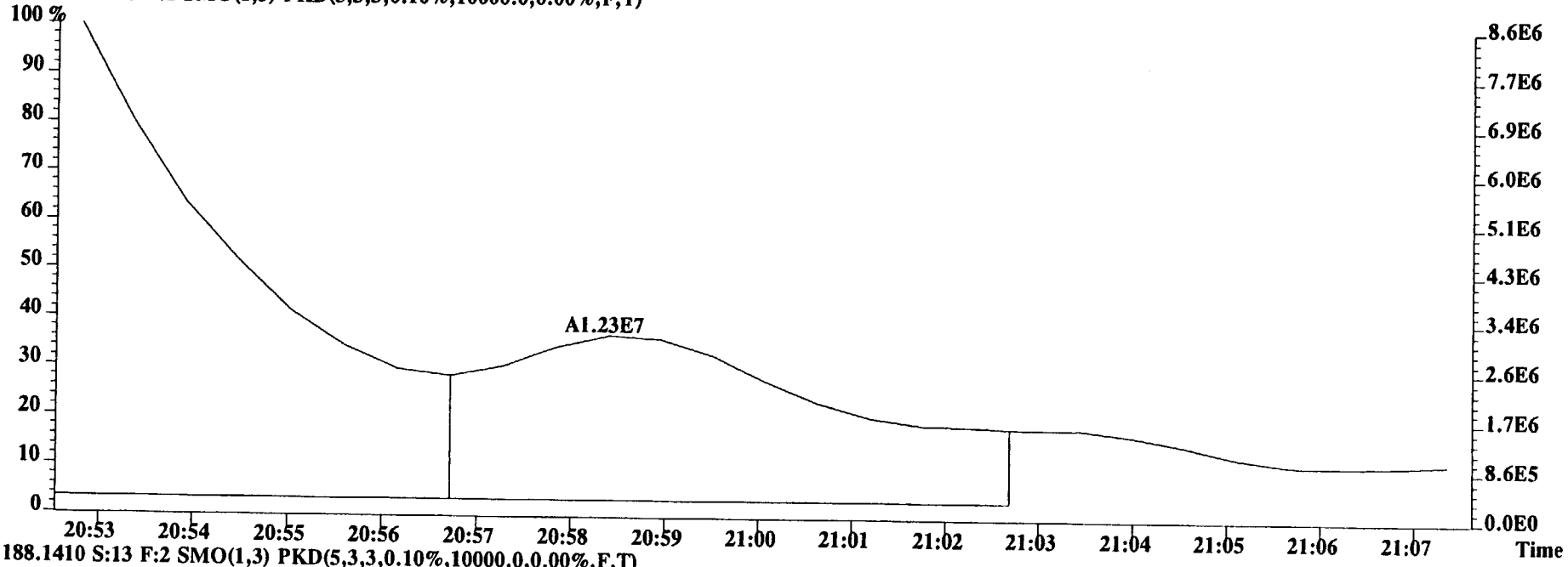


188.1410 S:13 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

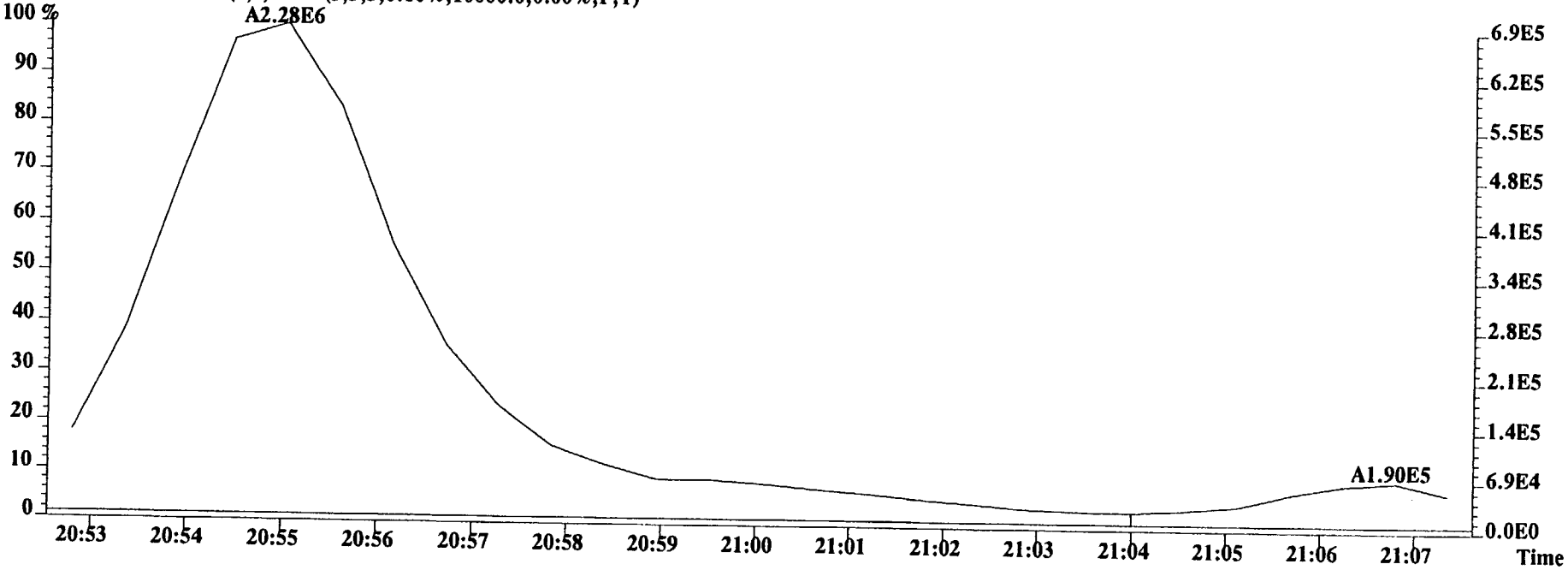


358

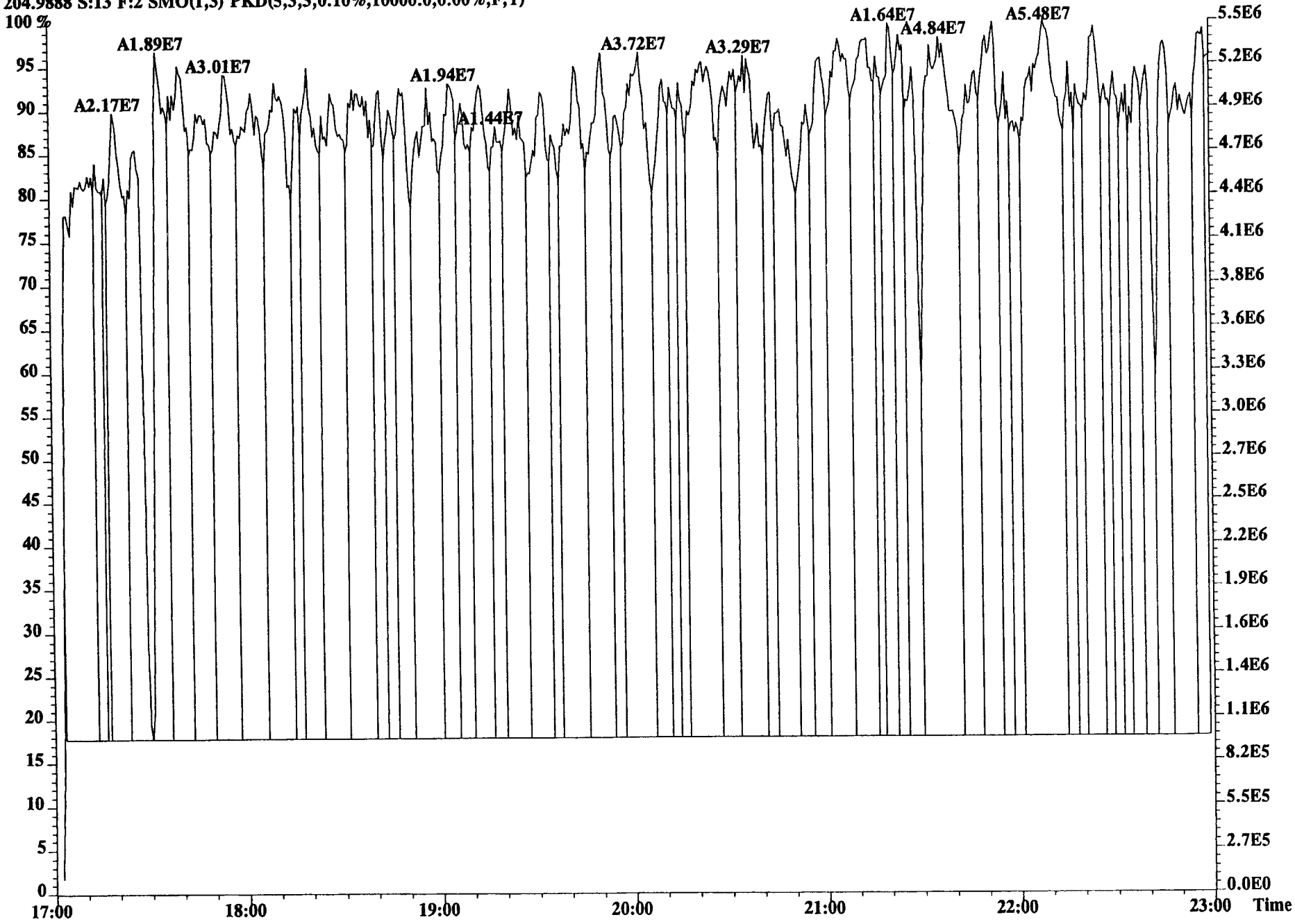
File:30OC98V4 #1-641 Acq:31-OCT-1998 02:33:51 GC EI+ Voltage SIR 70SE
Sample#13 Text:301802-10 :10X DIL. : : : Exp:PAHAIR
178.0782 S:13 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



188.1410 S:13 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

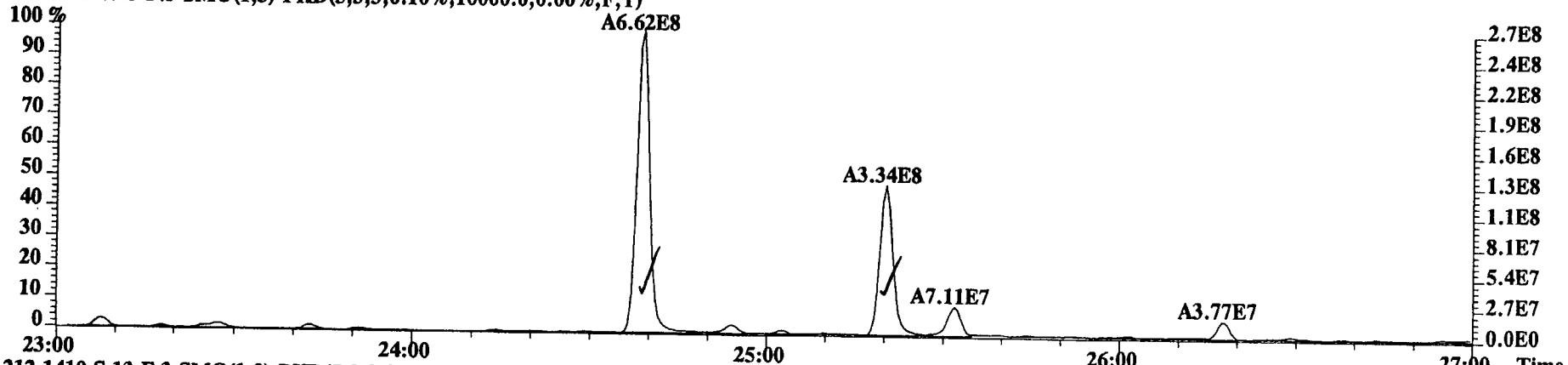


File:30OC98V4 #1-641 Acq:31-OCT-1998 02:33:51 GC EI+ Voltage SIR 70SE
Sample#13 Text:301802-10 :10X DIL. : : : Exp:PAHAIR
204.9888 S:13 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

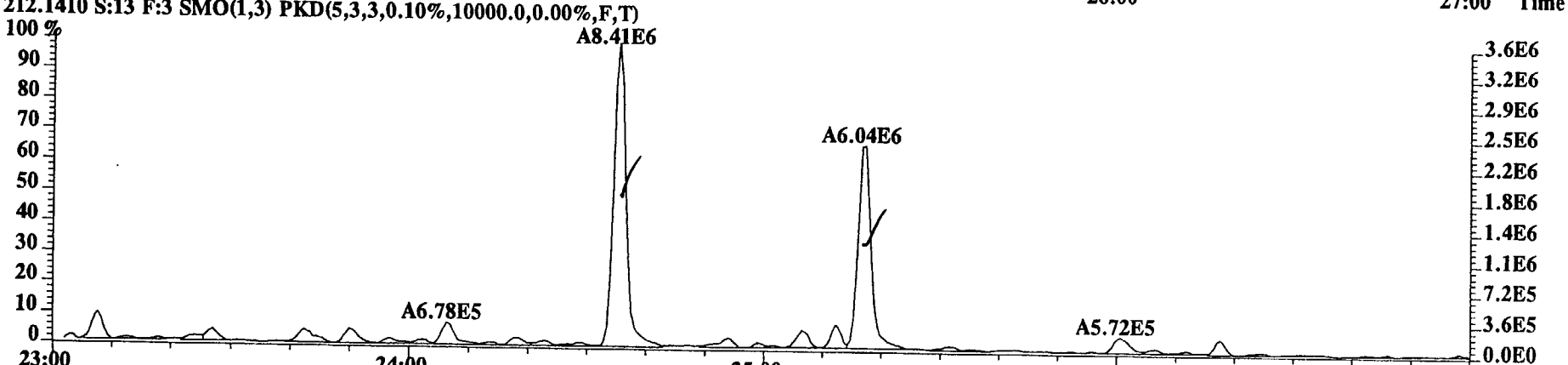


360

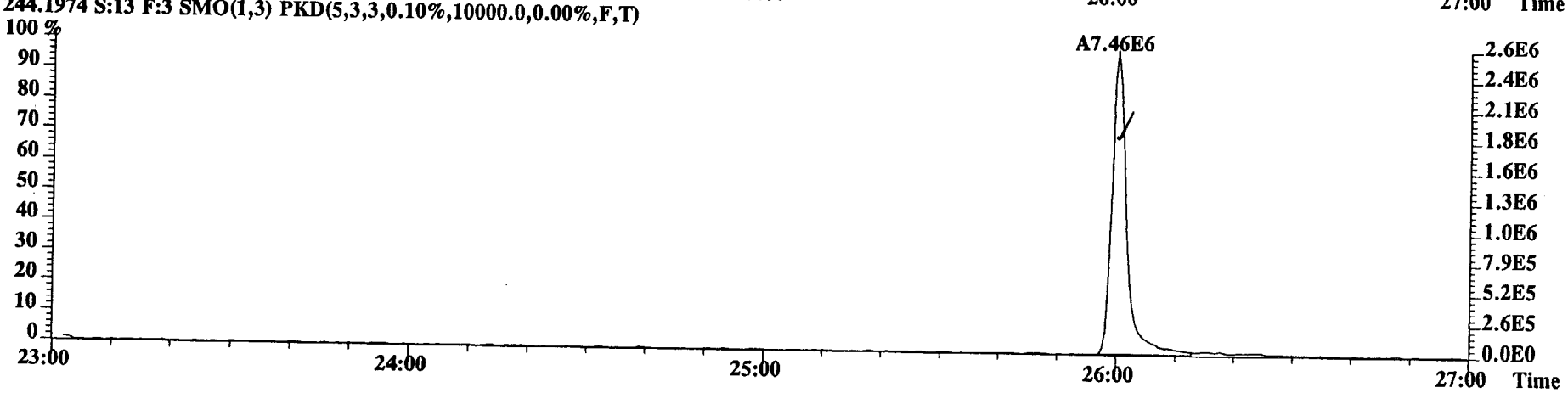
File:30OC98V4 #1-938 Acq:31-OCT-1998 02:33:51 GC EI+ Voltage SIR 70SE
Sample#13 Text:301802-10 :10X DIL. : : : Exp:PAHAIR
202.0782 S:13 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



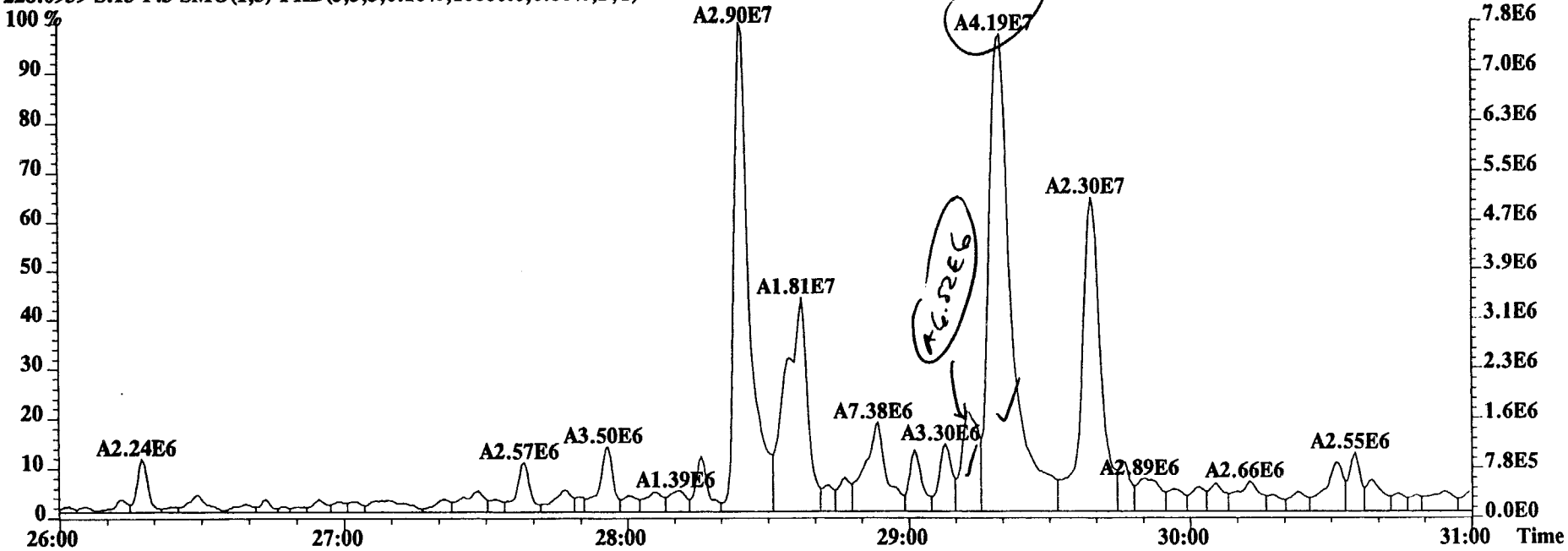
212.1410 S:13 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



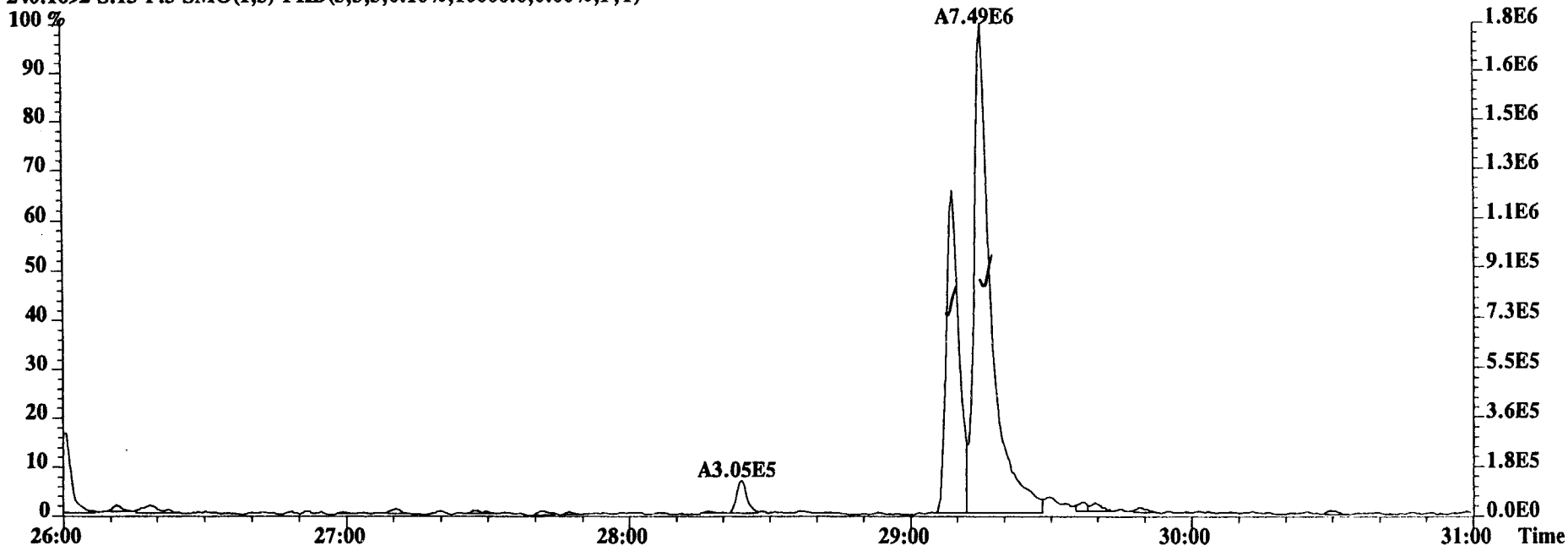
244.1974 S:13 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



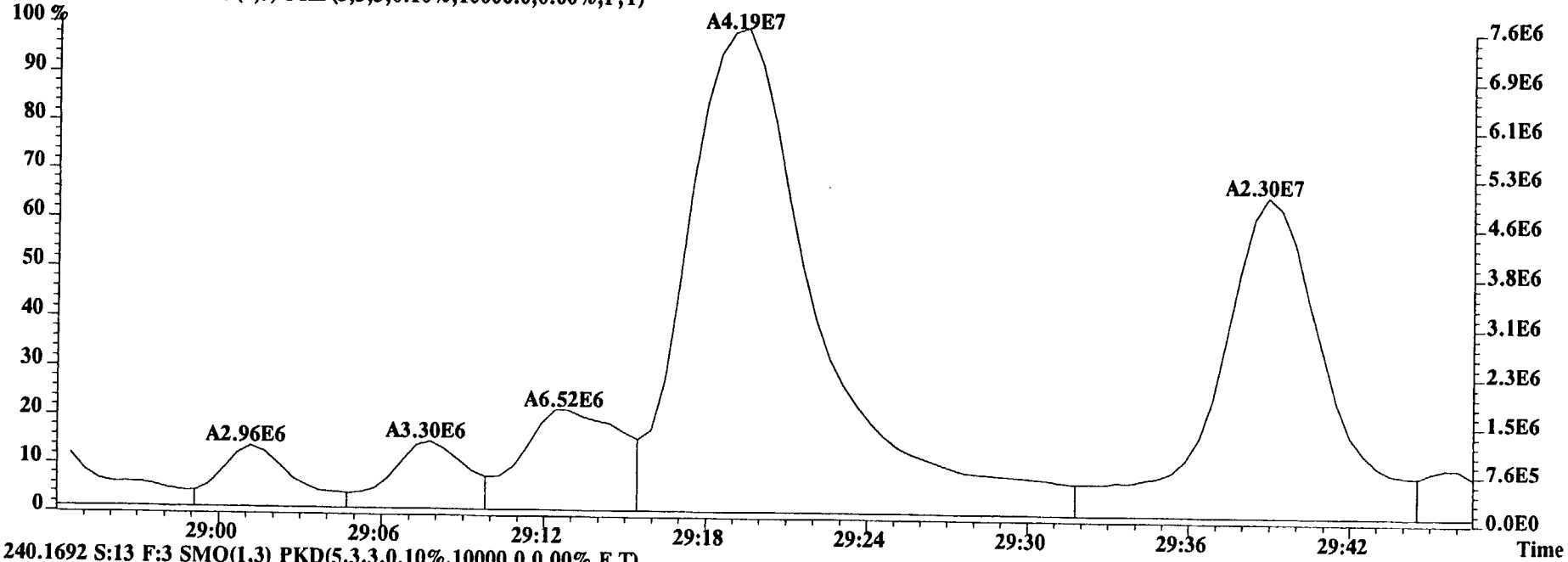
File:30OC98V4 #1-938 Acq:31-OCT-1998 02:33:51 GC EI+ Voltage SIR 70SE
Sample#13 Text:301802-10 :10X DIL. : : : Exp:PAHAIR
228.0939 S:13 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



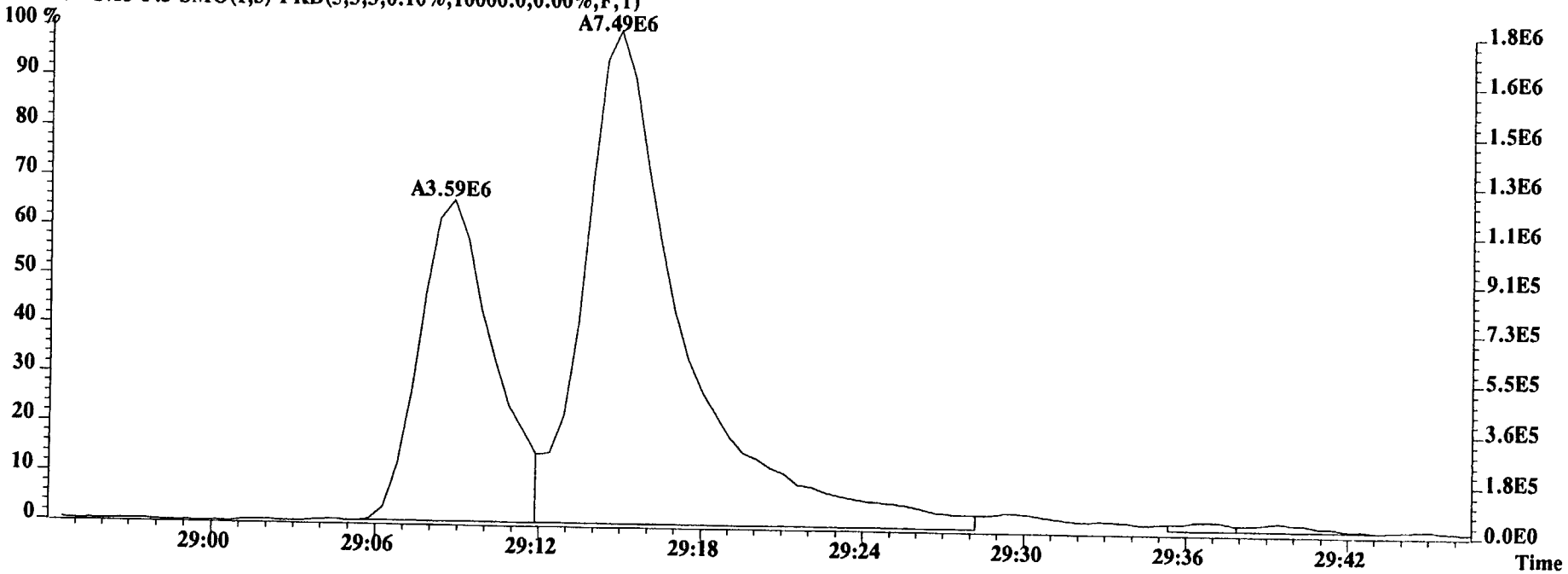
240.1692 S:13 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



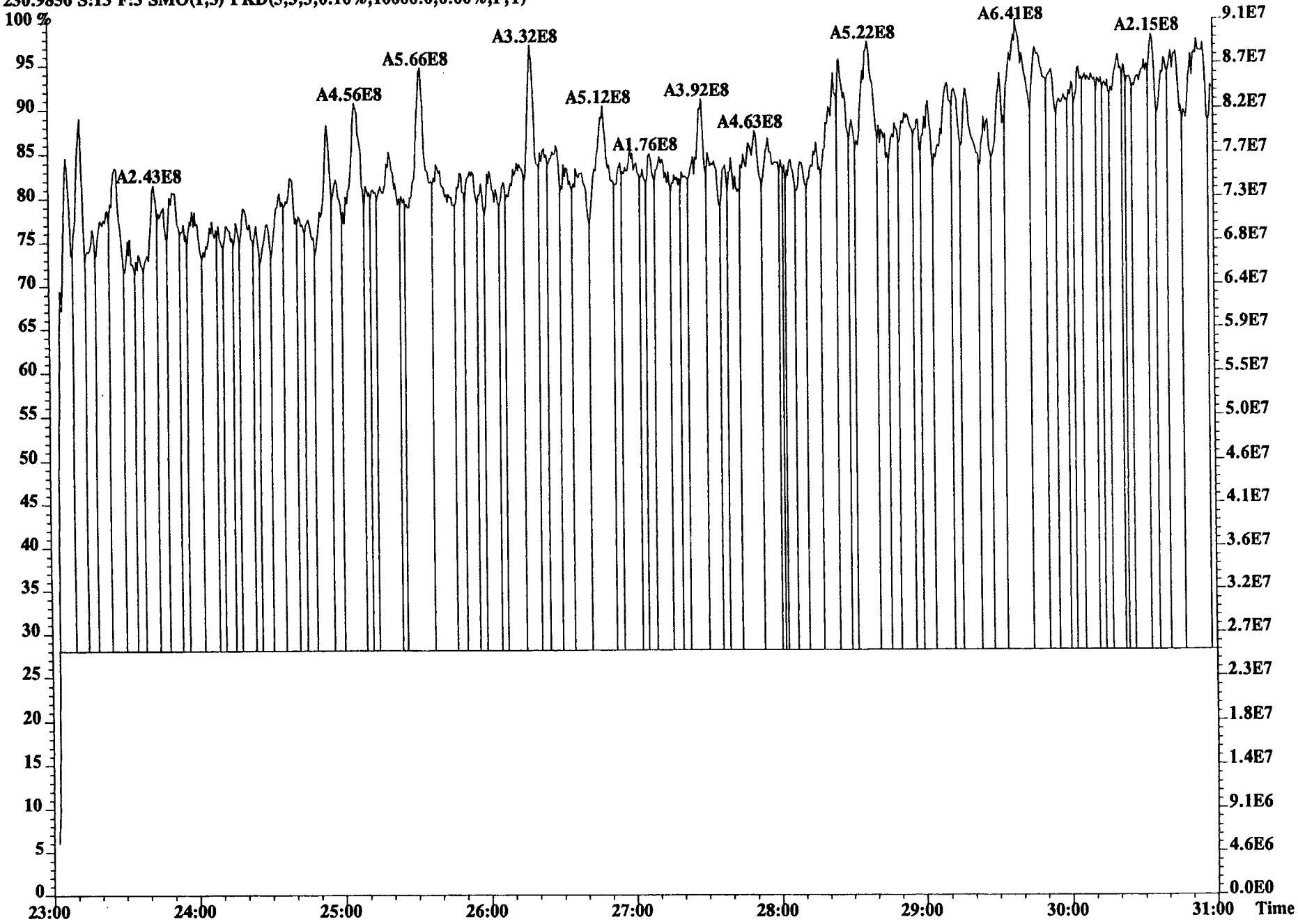
File:30OC98V4 #1-938 Acq:31-OCT-1998 02:33:51 GC EI+ Voltage SIR 70SE
Sample#13 Text:301802-10 :10X DIL. : : : Exp:PAHAIR
228.0939 S:13 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



240.1692 S:13 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



File:30OC98V4 #1-938 Acq:31-OCT-1998 02:33:51 GC EI+ Voltage SIR 70SE
Sample#13 Text:301802-10 :10X DIL. : : : Exp:PAHAIR
230.9856 S:13 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



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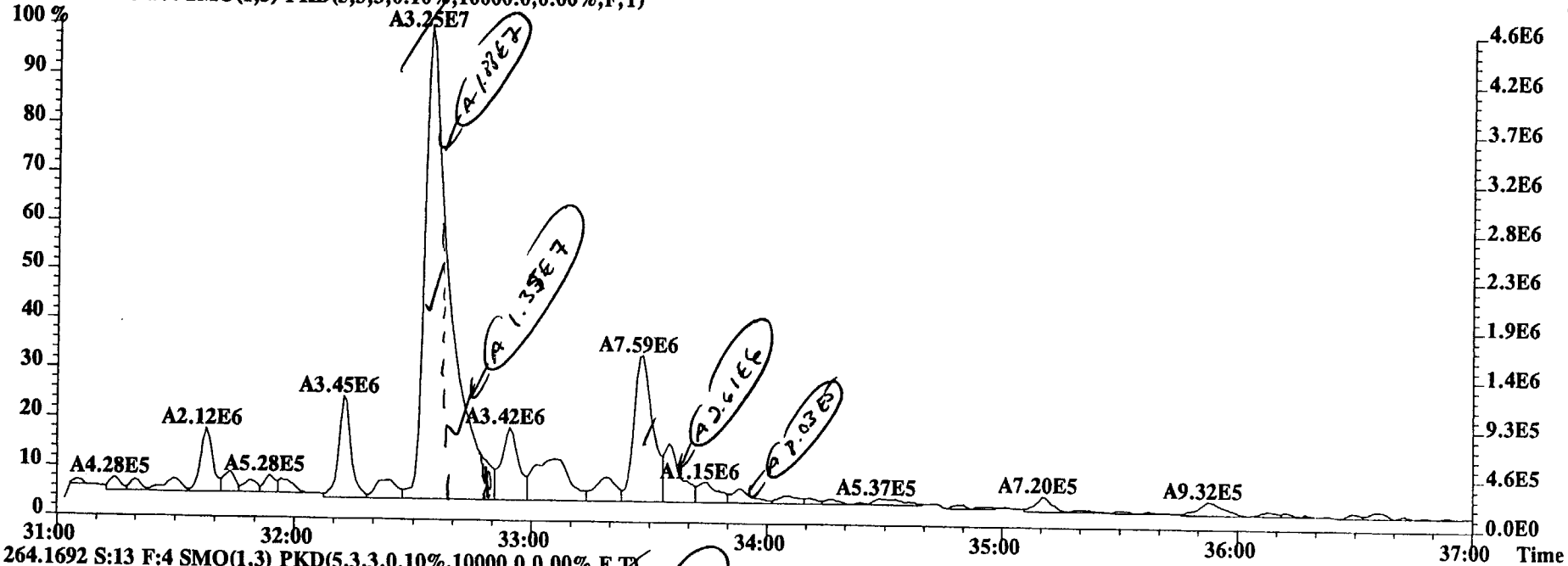
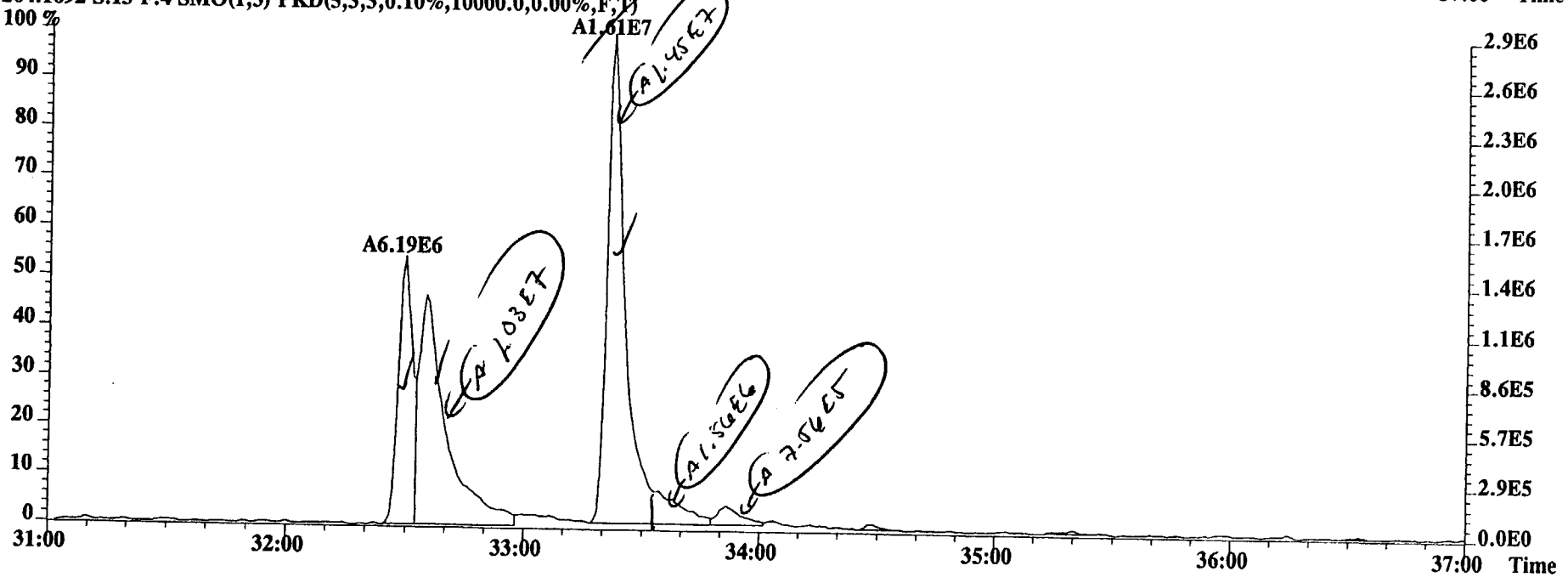
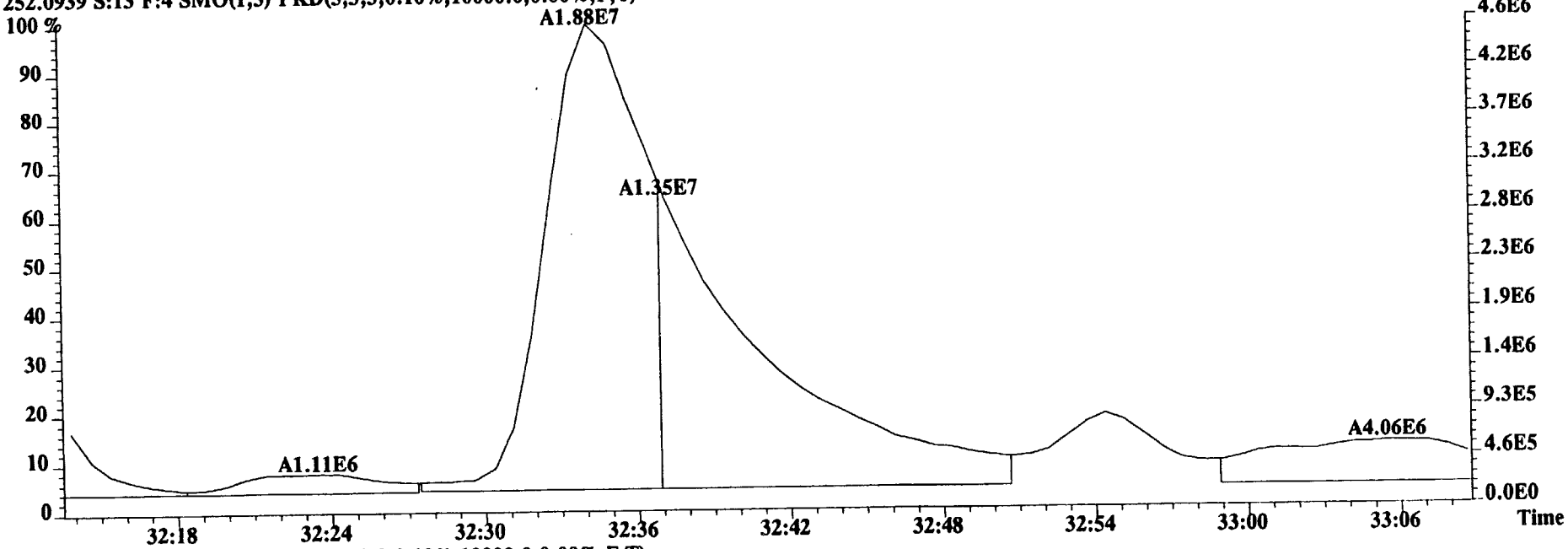
File:30OC98V4 #1-878 Acq:31-OCT-1998 02:33:51 GC EI+ Voltage SIR 70SE
Sample#13 Text:301802-10 :10X DIL. : : : Exp:PAHAIR
252.0939 S:13 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



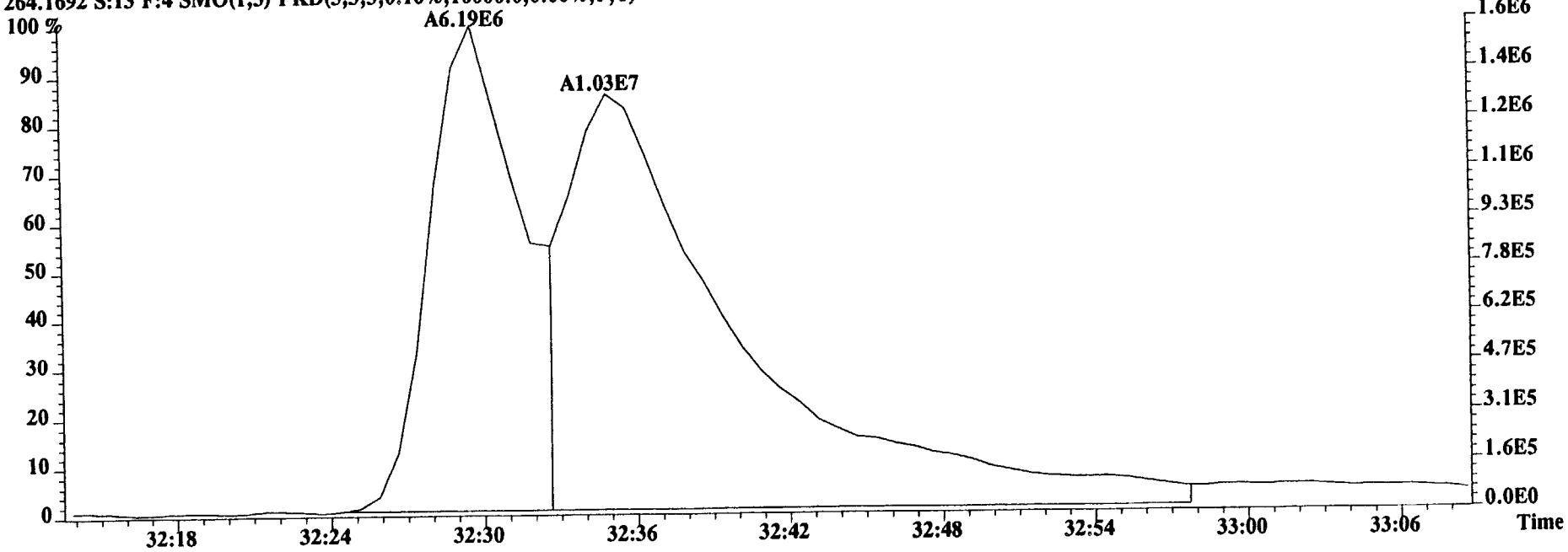
264.1692 S:13 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



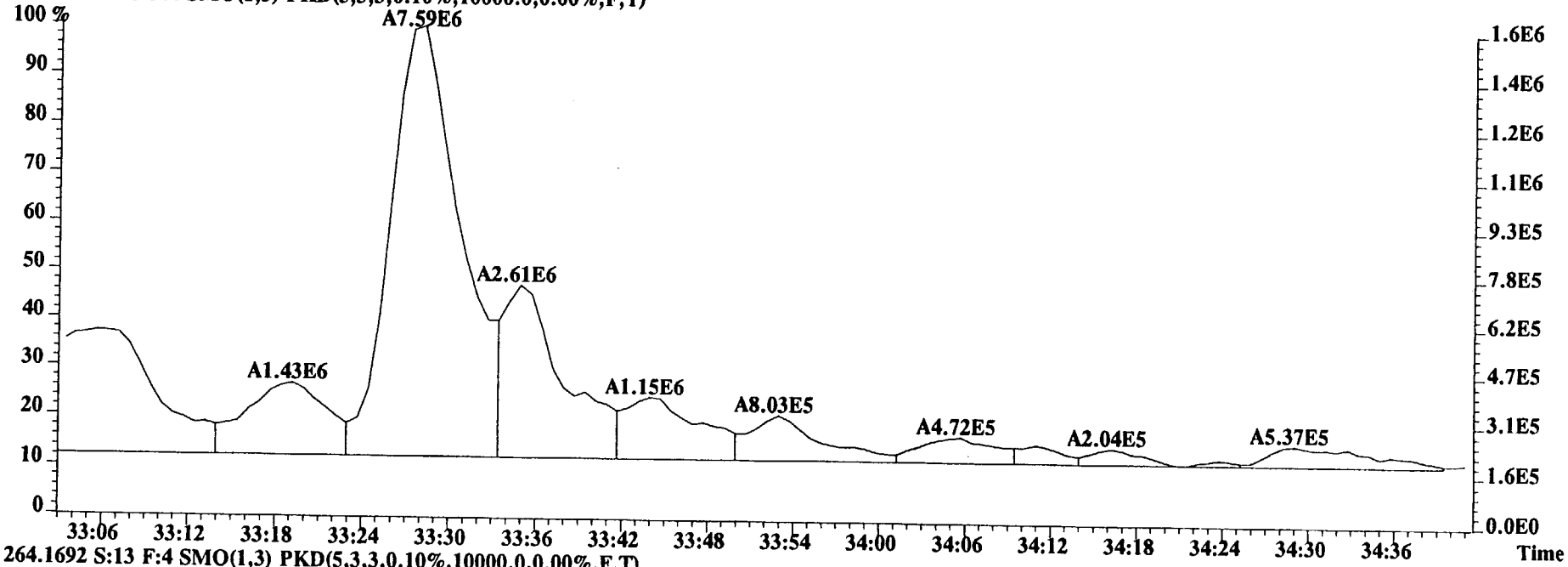
File:30OC98V4 #1-878 Acq:31-OCT-1998 02:33:51 GC EI+ Voltage SIR 70SE
Sample#13 Text:301802-10 :10X DIL. : : : Exp:PAHAIR
252.0939 S:13 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



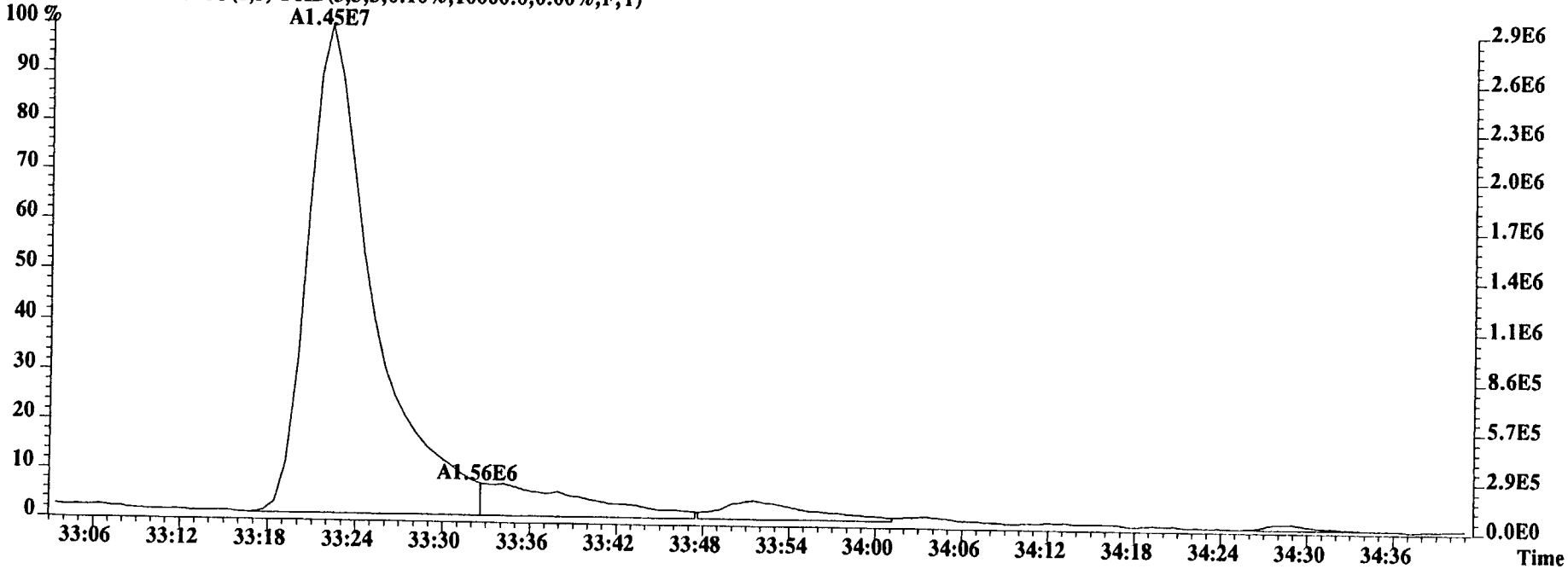
264.1692 S:13 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



File:30OC98V4 #1-878 Acq:31-OCT-1998 02:33:51 GC EI+ Voltage SIR 70SE
Sample#13 Text:301802-10 :10X DIL. : : : Exp:PAHAIR
252.0939 S:13 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



264.1692 S:13 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



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File:30OC98V4 #1-878 Acq:31-OCT-1998 02:33:51 GC EI+ Voltage SIR 70SE
Sample#13 Text:301802-10 :10X DIL. : : : Exp:PAHAIR

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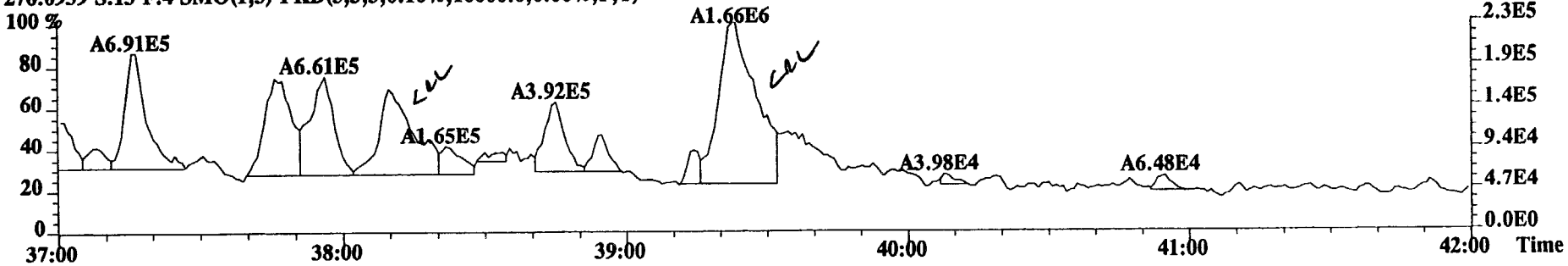
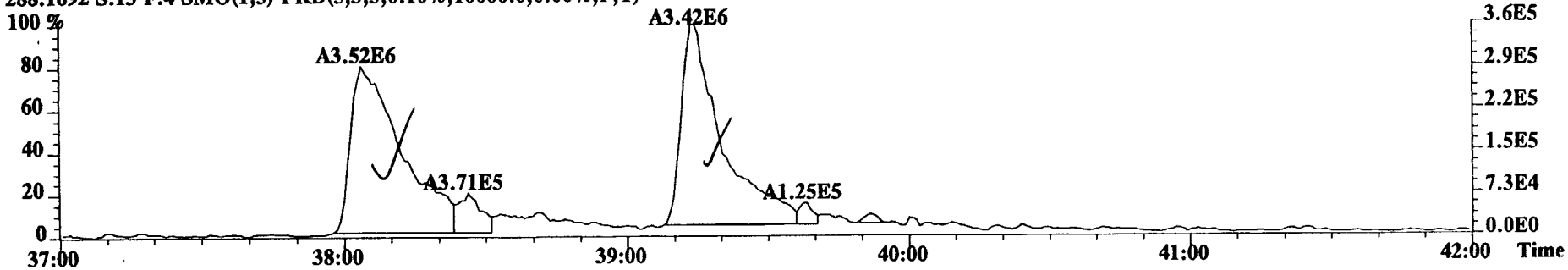
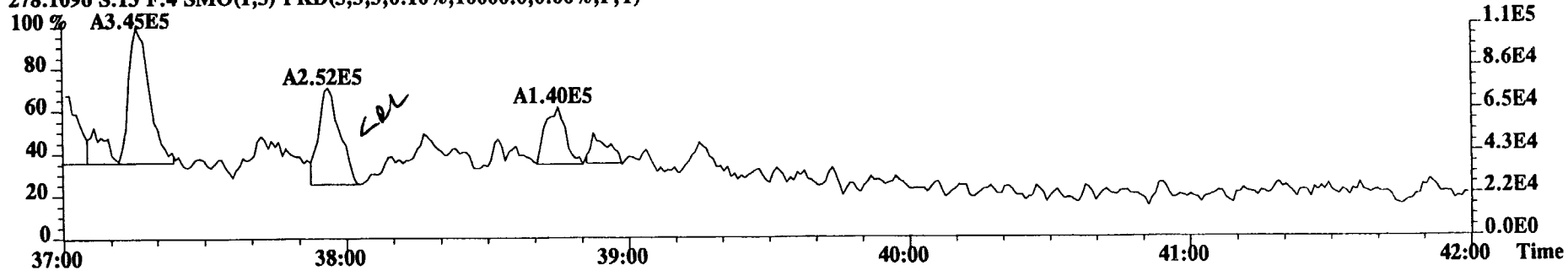
276.0939 S:13 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



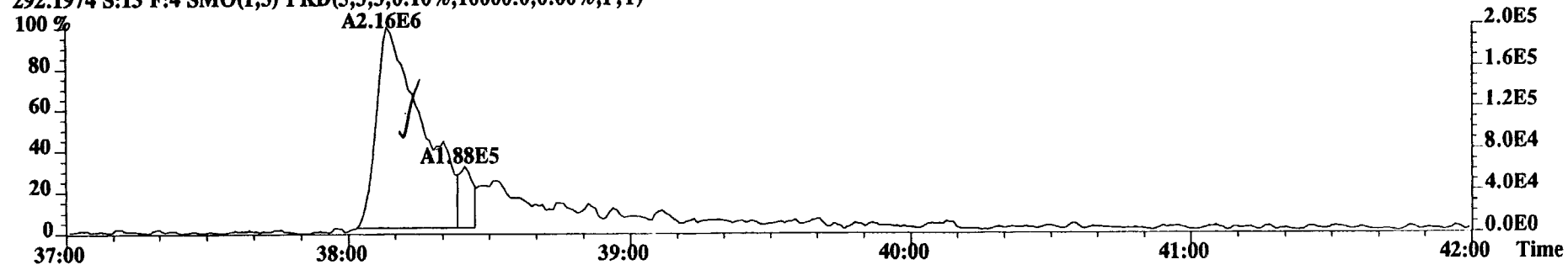
288.1692 S:13 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



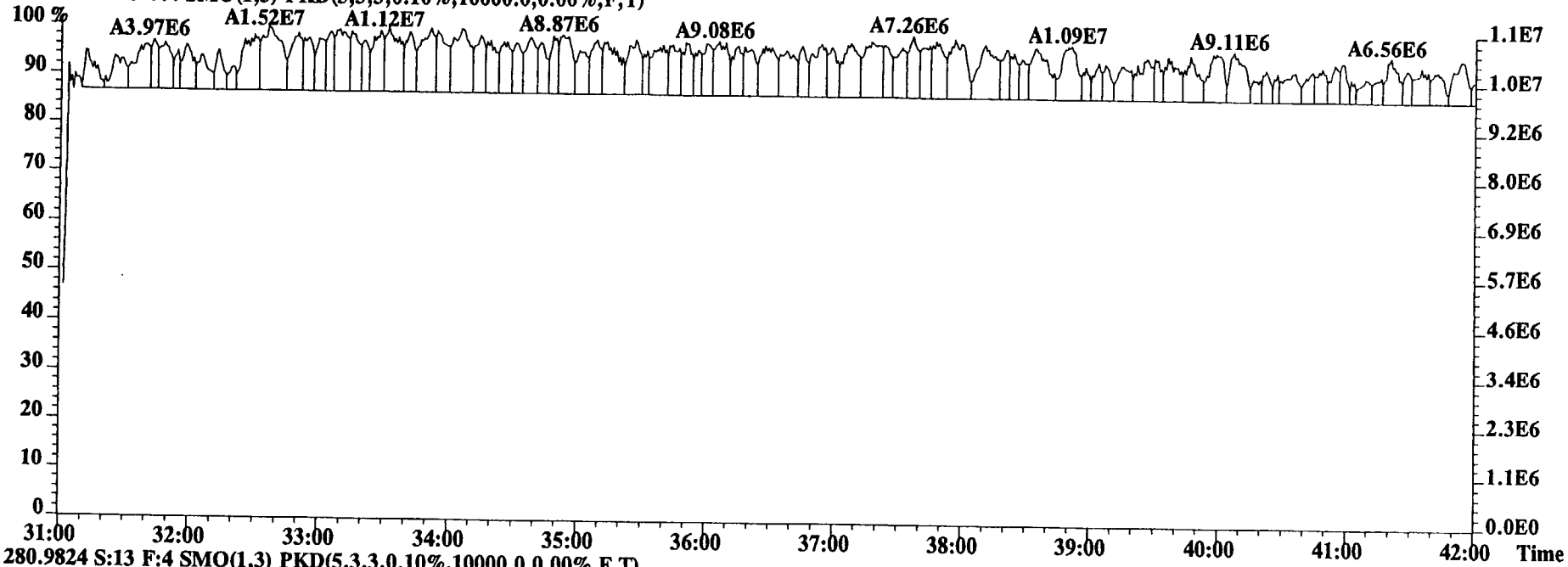
278.1096 S:13 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



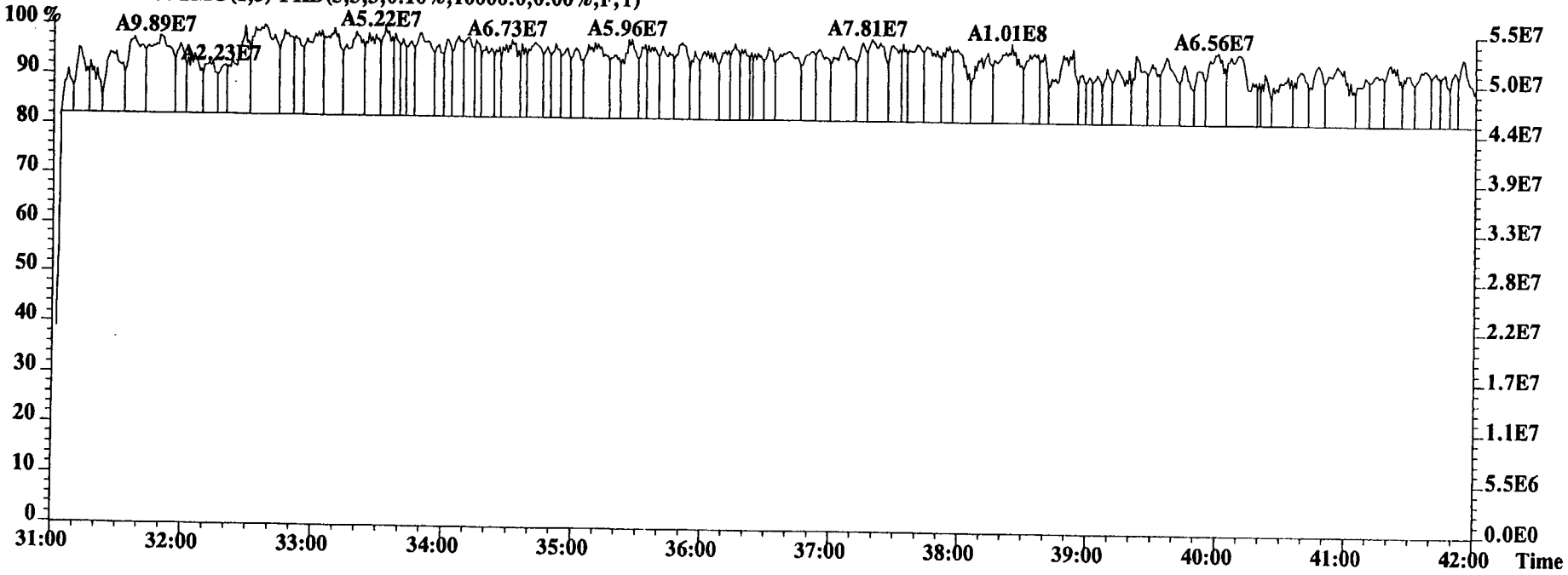
292.1974 S:13 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



File:30OC98V4 #1-878 Acq:31-OCT-1998 02:33:51 GC EI+ Voltage SIR 70SE
Sample#13 Text:301802-10 :10X DIL. : : : Exp:PAHAIR
268.9824 S:13 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



280.9824 S:13 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



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POLYNUCLEAR AROMATIC HYDROCARBONS
HIGH RESOLUTION GC/MS
Method HRGC/HRMS

Client Name: Pacific Environmental Services
Client ID: A-I-429-FB
Lab ID: 301802-0011-SA
Matrix: AIRTRAIN
Authorized: 29 SEP 98
Dilution Factor: 1.0

Sampled: 24 SEP 98
Prepared: 03 OCT 98

Received: 29 SEP 98
Analyzed: 31 OCT 98

Parameter	Result	Units	Reporting Limit	Data Qualifiers
Naphthalene	1600	ng/sample	--	B
2-Methylnaphthalene	200	ng/sample	--	B
Acenaphthylene	ND	ng/sample	100	
Acenaphthene	ND	ng/sample	100	
Fluorene	ND	ng/sample	100	
Phenanthrene	210	ng/sample	--	B
Anthracene	ND	ng/sample	100	
Fluoranthene	ND	ng/sample	100	
Pyrene	ND	ng/sample	100	
Benzo(a)anthracene	ND	ng/sample	100	
Chrysene	ND	ng/sample	100	
Benzo(b)fluoranthene	ND	ng/sample	100	
Benzo(k)fluoranthene	ND	ng/sample	100	
Benzo(e)pyrene	ND	ng/sample	100	
Benzo(a)pyrene	ND	ng/sample	100	
Perylene	ND	ng/sample	100	
Indeno(1,2,3-cd)pyrene	ND	ng/sample	100	
Dibenz(a,h)anthracene	ND	ng/sample	100	
Benzo(g,h,i)perylene	ND	ng/sample	100	

B = Compound is also detected in the blank.
ND = Not Detected

Reported By: Clark Pickell

Approved By: Eric Redman

The cover letter is an integral part of this report.
Rev 230787

POLYNUCLEAR AROMATIC HYDROCARBONS
HIGH RESOLUTION GC/MS
Method HRGC/HRMS
(cont.)

Client Name: Pacific Environmental Services
Client ID: A-I-429-FB
Lab ID: 301802-0011-SA
Matrix: AIRTRAIN Sampled: 24 SEP 98 Received: 29 SEP 98
Authorized: 29 SEP 98 Prepared: 03 OCT 98 Analyzed: 31 OCT 98
Dilution Factor: 1.0

Internal Standards	% Recovery	
Naphthalene-d8	45	m
Acenaphthylene-d8	54	
Acenaphthene-d10	62	
Fluorene-d10	57	
Phenanthrene-d10	61	
Fluoranthene-d10	68	
Pyrene-d10	70	
Benzo(a)anthracene-d12	64	
Perylene-d12	65	
Indeno(123-cd)pyrene-d12	81	
Chrysene-d12	89	
Benzo(b)fluoranthene-d12	72	
Benzo(k)fluoranthene-d12	87	
Benzo(a)pyrene-d12	68	
Dibenz(a,h)anthracene-d14	75	
Benzo(g,h,i)perylene-d12	70	

Field Surrogates	% Recovery
13C-Fluorene	103

m = Internal Standard recovery is outside method recovery goal.

Reported By: Clark Pickell Approved By: Eric Redman

The cover letter is an integral part of this report.
Rev 230787

04-NOV-1998 06:34:05 PM Dioxin Furan Unknown RESULTS

Mass Spec : VG-4
GC Column : DB-5
Data file : 30OC98V4
Weight : 0.5

Results : 30OC98V4141.RES : PAHAIR.TRG
Date analyzed : 30-OCT-98
301802-11 :10X DIL. : : : Ex Cal : PAHAIR102998V4.R

Name	Total Response	Isotope Ratio		R. T. mm:ss		Ex Cal RRF	pg/ SAMP	Rec/ MDL	
d10-2-Methylnaphthalene	7751400	1.00	Y	12: 27	Y	1.00	50.00		
d8-Naphthalene	7890140	1.00	Y	10: 13	Y	2.24	22.71	45	m
Naphthalene	151028800	1.00	Y	10: 16	Y	1.23	1562.43	B	
2-Methylnaphthalene	8790760	1.00	Y	12: 34	Y	0.56	198.76	B	
d8-Acenaphthylene	5068280	1.00	Y	15: 28	Y	1.21	26.94	54	
Acenaphthylene	2545600	1.00	Y	15: 31	Y	0.94	<RL=100.00		
d10-Acenaphthene	3581540	1.00	Y	16: 1	Y	0.74	31.03	62	
Acenaphthene	1356346	1.00	Y	16: 8	Y	1.25	<RL=100.00		
d10-Anthracene	5198000	1.00	Y	20: 56	Y	1.00	50.00		
d10-Fluorene	4176380	1.00	Y	17: 42	Y	1.42	28.27	57	
Fluorene	* No Peak	0.00	N	17: 48	N	1.16	<RL=100.00		
d10-Phenanthrene	8892200	1.00	Y	20: 46	Y	2.81	30.47	61	
Phenanthrene	16545020	1.00	Y	20: 50	Y	0.89	208.00	B	
Anthracene	* No Peak	0.00	N	21: 0	N	0.80	<RL=100.00		
d14-Terphenyl	10706800	1.00	Y	26: 1	Y	1.00	50.00		
d10-Fluoranthene	10283040	1.00	Y	24: 37	Y	1.41	34.04	68	
Fluoranthene	6852180	1.00	Y	24: 40	Y	1.11	<RL=100.00		
d10-Pyrene	11419840	1.00	Y	25: 18	Y	1.52	35.13	70	
Pyrene	4832060	1.00	Y	25: 21	Y	1.21	<RL=100.00		
d12-Benzo(a)anthracene	6196900	1.00	Y	29: 10	Y	0.90	32.15	64	
Benzo(a)anthracene	496926	1.00	Y	29: 14	Y	1.20	<RL=100.00		
d12-Chrysene	12217860	1.00	Y	29: 16	Y	1.28	44.60	89	
Chrysene	1754734	1.00	Y	29: 21	Y	1.08	<RL=100.00		
d12-Benzo(e)pyrene	29385200	1.00	Y	33: 22	Y	1.00	50.00		
d12-Benzo(b)fluoranthene	9575520	1.00	Y	32: 31	Y	0.45	35.90	72	
Benzo(b)fluoranthene	3097500	1.00	Y	32: 36	Y	1.17	<RL=100.00		
d12-Benzo(k)fluoranthene	24254600	1.00	Y	32: 36	Y	0.95	43.53	87	
Benzo(k)fluoranthene	3097500	1.00	Y	32: 39	Y	1.16	<RL=100.00		
d12-Benzo(a)pyrene	13446080	1.00	Y	33: 35	Y	0.68	33.81	68	
Benzo(e)pyrene	1355680	1.00	Y	33: 28	Y	1.64	<RL=100.00		
Benzo(a)pyrene	583780	1.00	Y	33: 41	Y	1.07	<RL=100.00		
d12-Perylene	12063480	1.00	Y	33: 51	Y	0.63	32.57	65	
Perylene	87404	1.00	Y	33: 56	Y	1.71	<RL=100.00		
d12-Indeno(123-cd)pyrene	10531720	1.00	Y	38: 5	Y	0.44	40.31	81	
Indeno(123-cd)pyrene	85246	1.00	Y	38: 11	Y	0.62	<RL=100.00		
d14-Dibenz(ah)anthracene	5405380	1.00	Y	38: 10	Y	0.25	37.42	75	
Dibenz(ah)anthracene	* No Peak	0.00	N	38: 15	N	1.40	<RL=100.00		
d12-Benzo(ghi)perylene	11903780	1.00	Y	39: 14	Y	0.58	34.94	70	
Benzo(ghi)perylene	389202	1.00	Y	39: 23	Y	1.02	<RL=100.00		
d10-Fluorene	4176380	1.00	Y	17: 42	Y	1.00	50.00		
13C-Fluorene	3469460	1.00	Y	17: 47	Y	0.81	51.28	103	

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11-4-98
CI

04-NOV-1998 06:34:01 PM Dioxin Furan Unknown RESULTS

98V4.RRF Rec/ MDL	0.5	
	3875700	3875700
45	3945070	3945070
B	75514400	75514400
B	4395380	4395380
54	2534140	2534140
100.00	1272800	1272800
62	1790770	1790770
100.00	678173	678173
	2599000	2599000
57	2088190	2088190
100.00	0	0
61	4446100	4446100
B	8272510	8272510
100.00	0	0
	5353400	5353400
68	5141520	5141520
100.00	3426090	3426090
70	5709920	5709920
100.00	2416030	2416030
64	3098450	3098450
100.00	248463	248463
89	6108930	6108930
100.00	877367	877367
	14692600	14692600
72	4787760	4787760
100.00	1548750	1548750
87	12127300	12127300
100.00	1548750	1548750
68	6723040	6723040
100.00	677840	677840
100.00	291890	291890
65	6031740	6031740
100.00	43702	43702
81	5265860	5265860
100.00	42623	42623
75	2702690	2702690
100.00	0	0
70	5951890	5951890
100.00	194601	194601

02-NOV-1998 09:09:00 AM Dioxin Furan Unknown RESULTS

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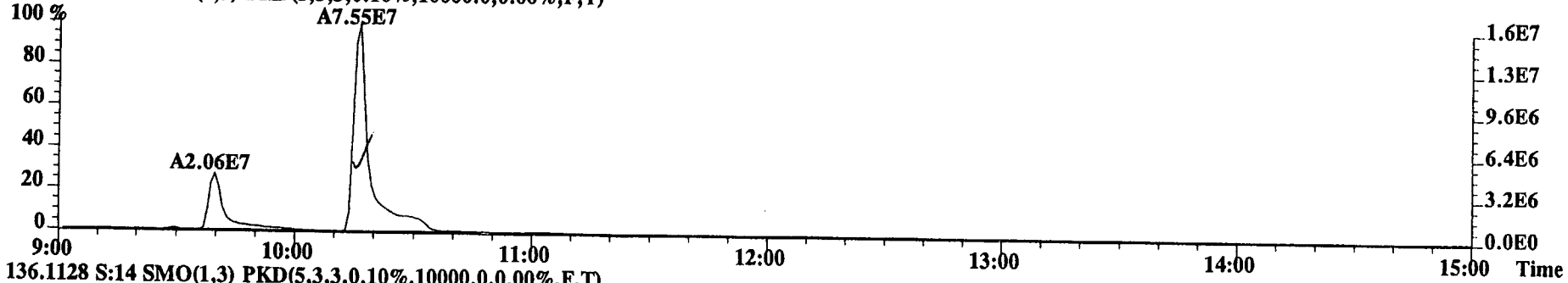
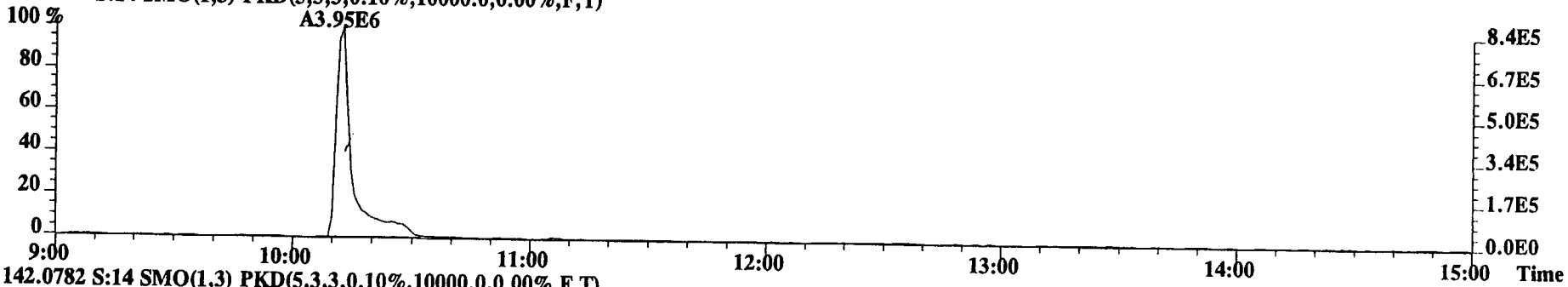
Mass Spec : VG-4 Results : 30OC98V4141.RES : PAHAIR.TRG
GC Column : DB-5 Date analyzed : 30-OCT-98
Data file : 30OC98V4 301802-11 :10X DIL. : : : Ex Cal : PAHAIR102998V4.R
Weight : 0.5

Name	Total Response	Isotope Ratio		R. T. mm:ss		RRF	pg/ SAMP	Rec/ MDL
d10-2-Methylnaphthalene	7751400	1.00	Y	12: 27	Y	1.00	50.00	
d8-Naphthalene	7890140	1.00	Y	10: 13	Y	2.24	22.71	45
Naphthalene	151028800	1.00	Y	10: 16	Y	1.23	1562.43	0.000
2-Methylnaphthalene	8790760	1.00	Y	12: 34	Y	0.56	198.76	0.000
d8-Acenaphthylene	5068280	1.00	Y	15: 28	Y	1.21	26.94	54
Acenaphthylene	2545600	1.00	Y	15: 31	Y	0.94	53.20	0.000
d10-Acenaphthene	3581540	1.00	Y	16: 1	Y	0.74	31.03	62
Acenaphthene	1356346	1.00	Y	16: 8	Y	1.25	30.39	0.000
d10-Anthracene	5198000	1.00	Y	20: 56	Y	1.00	50.00	
d10-Fluorene	4176380	1.00	Y	17: 42	Y	1.42	28.27	57
Fluorene	* No Peak	0.00	N	17: 48	N	1.16	0.00	0.000
d10-Phenanthrene	8892200	1.00	Y	20: 46	Y	2.81	30.47	61
Phenanthrene	16545020	1.00	Y	20: 50	Y	0.89	208.00	0.000
Anthracene	* No Peak	0.00	N	21: 0	N	0.80	0.00	0.000
d14-Terphenyl	10706800	1.00	Y	26: 1	Y	1.00	50.00	
d10-Fluoranthene	10283040	1.00	Y	24: 37	Y	1.41	34.04	68
Fluoranthene	6852180	1.00	Y	24: 40	Y	1.11	59.94	0.000
d10-Pyrene	11419840	1.00	Y	25: 18	Y	1.52	35.13	70
Pyrene	4832060	1.00	Y	25: 21	Y	1.21	35.11	0.000
d12-Benzo(a)anthracene	6196900	1.00	Y	29: 10	Y	0.90	32.15	64
Benzo(a)anthracene	496926	1.00	Y	29: 14	Y	1.20	6.66	0.000
d12-Chrysene	12217860	1.00	Y	29: 16	Y	1.28	44.60	89
Chrysene	1754734	1.00	Y	29: 21	Y	1.08	13.25	0.000
d12-Benzo(e)pyrene	29385200	1.00	Y	33: 22	Y	1.00	50.00	
d12-Benzo(b)fluoranthene	9575520	1.00	Y	32: 31	Y	0.45	35.90	72
Benzo(b)fluoranthene	3097500	1.00	Y	32: 39	Y	1.17	27.71	0.000
d12-Benzo(k)fluoranthene	24254600	1.00	Y	32: 36	Y	0.95	43.53	87
Benzo(k)fluoranthene	3097500	1.00	Y	32: 39	Y	1.16	10.97	0.000
d12-Benzo(a)pyrene	13446080	1.00	Y	33: 35	Y	0.68	33.81	68
Benzo(e)pyrene	1355680	1.00	Y	33: 28	Y	1.64	6.14	0.000
Benzo(a)pyrene	583780	1.00	Y	33: 41	Y	1.07	4.05	0.000
d12-Perylene	12063480	1.00	Y	33: 51	Y	0.63	32.57	65
Perylene	87404	1.00	Y	33: 56	Y	1.71	0.42	0.000
d12-Indeno(123-cd)pyrene	10531720	1.00	Y	38: 5	Y	0.44	40.31	81
Indeno(123-cd)pyrene	85246	1.00	Y	38: 11	Y	0.62	1.30	0.000
d14-Dibenz(ah)anthracene	5405380	1.00	Y	38: 10	Y	0.25	37.42	75
Dibenz(ah)anthracene	* No Peak	0.00	N	38: 15	N	1.40	0.00	0.000
d12-Benzo(ghi)perylene	11903780	1.00	Y	39: 14	Y	0.58	34.94	70
Benzo(ghi)perylene	389202	1.00	Y	39: 23	Y	1.02	3.22	0.000
d10-Fluorene	4176380	1.00	Y	17: 42	Y	1.42	5.00	10
13C-Fluorene	3469460	1.00	Y	17: 47	Y	1.00	83.07	0.000

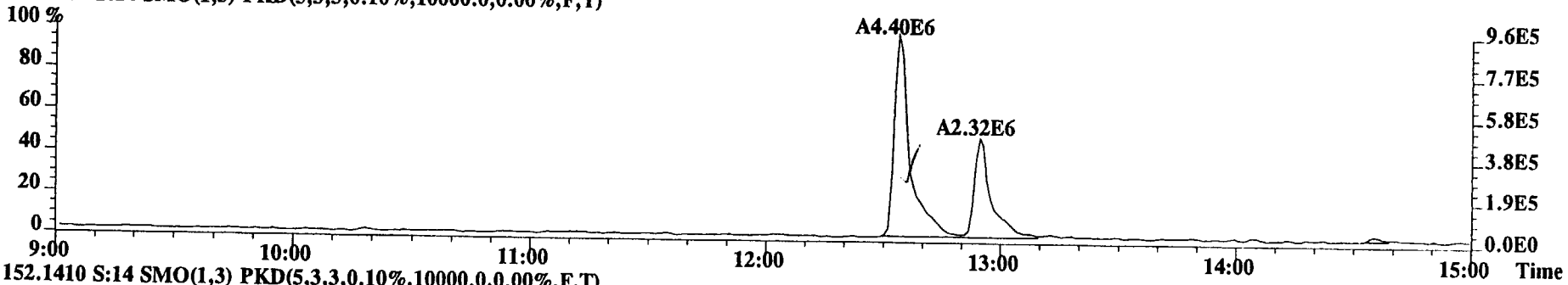
File:30OC98V4 #1-510 Acq:31-OCT-1998 03:22:54 GC EI+ Voltage SIR 70SE
Sample#14 Text:301802-11 :10X DIL. : : : Exp:PAHAIR
128.0626 S:14 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



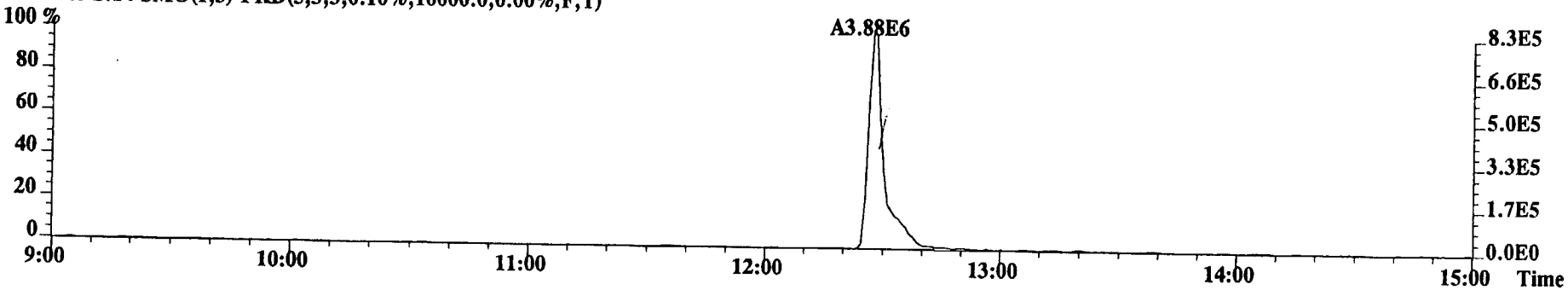
136.1128 S:14 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



142.0782 S:14 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

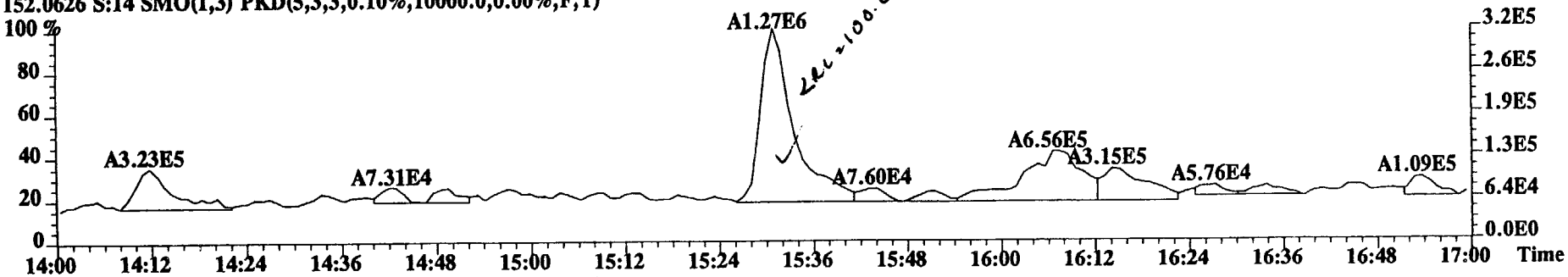


152.1410 S:14 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

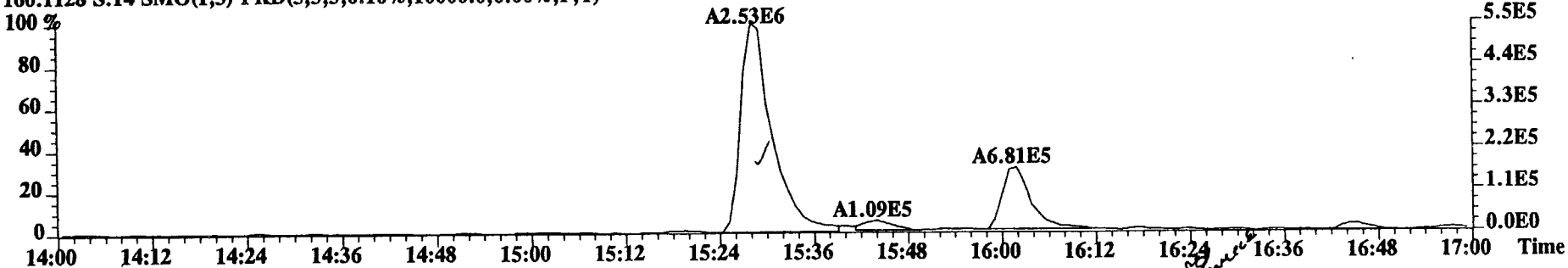


375

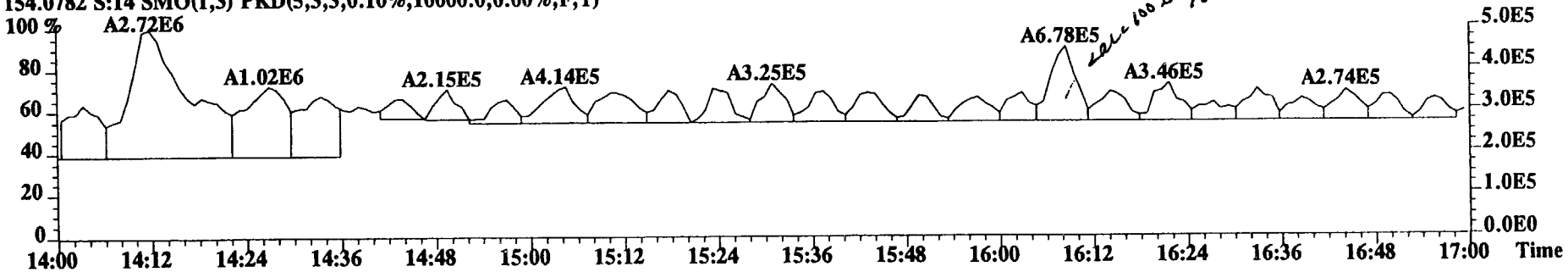
File:30OC98V4 #1-510 Acq:31-OCT-1998 03:22:54 GC EI+ Voltage SIR 70SE
Sample#14 Text:301802-11 :10X DIL. : : : Exp:PAHAIR
152.0626 S:14 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



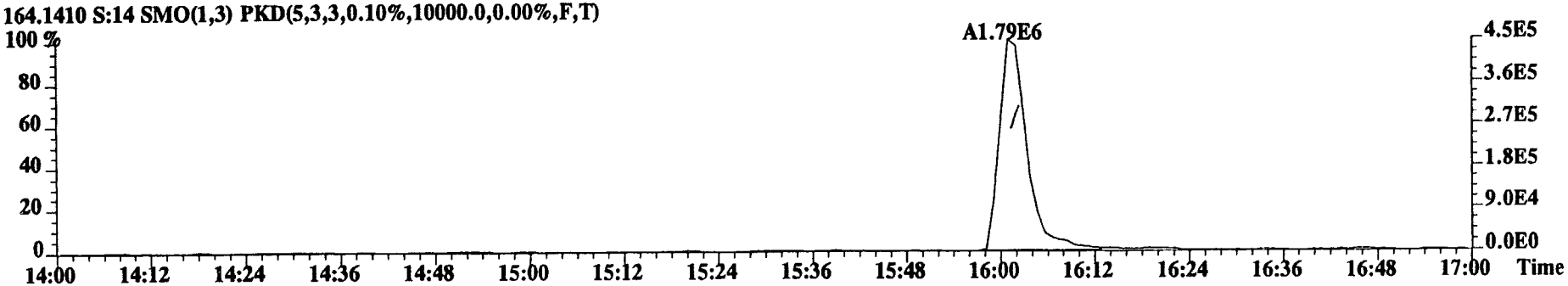
160.1128 S:14 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



154.0782 S:14 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

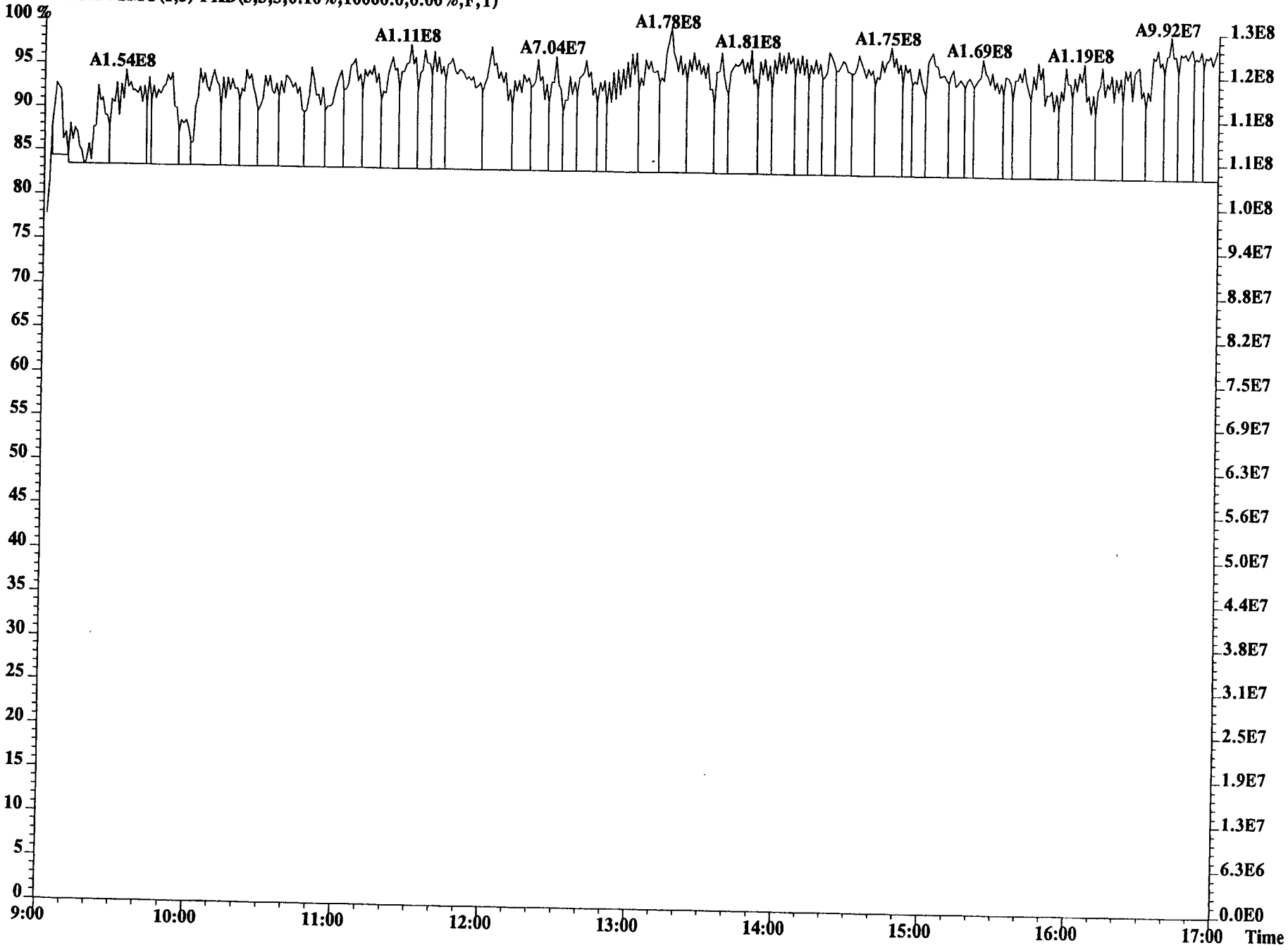


164.1410 S:14 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

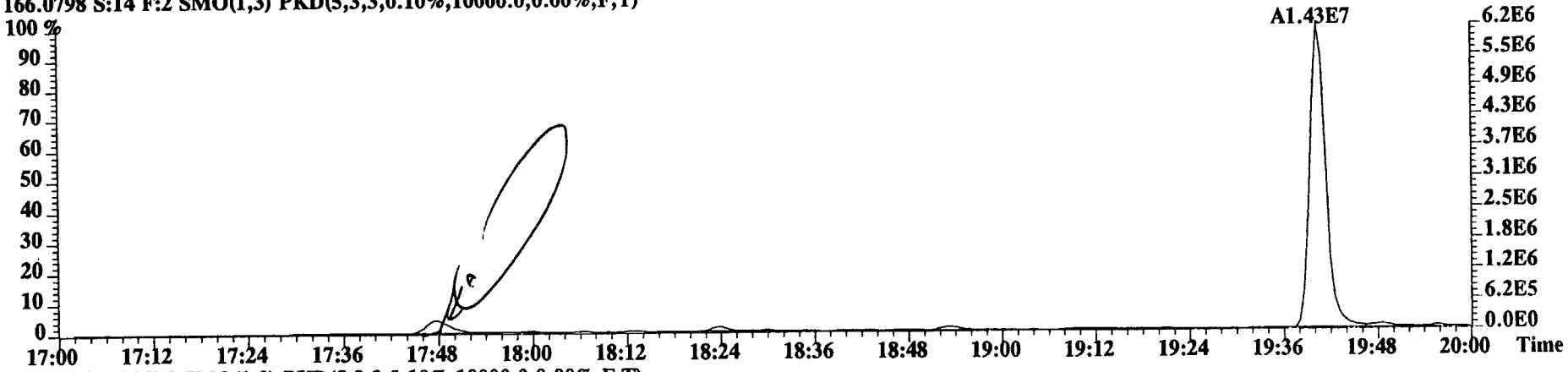


376

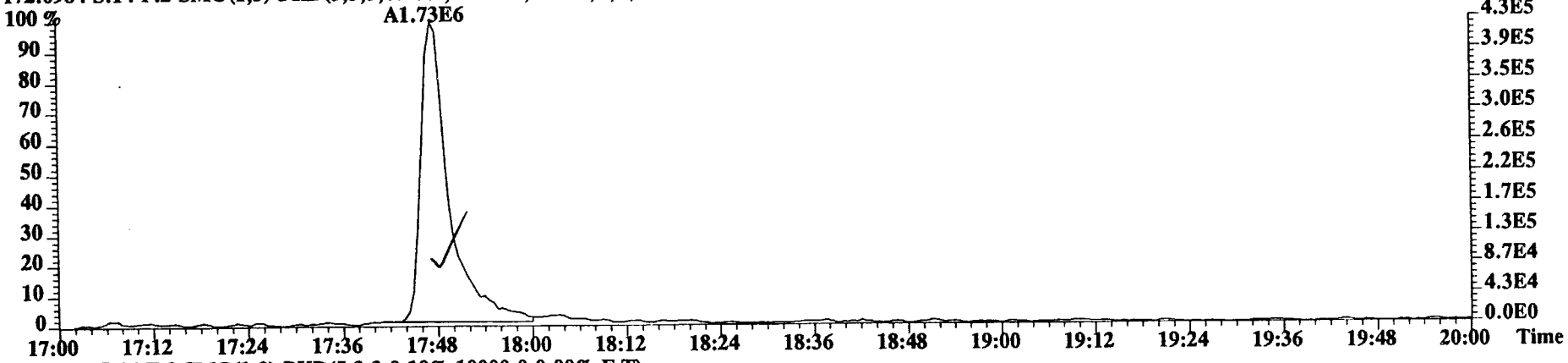
File:30OC98V4 #1-510 Acq:31-OCT-1998 03:22:54 GC EI+ Voltage SIR 70SE
Sample#14 Text:301802-11 :10X DIL. : : : Exp:PAHAIR
130.9920 S:14 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



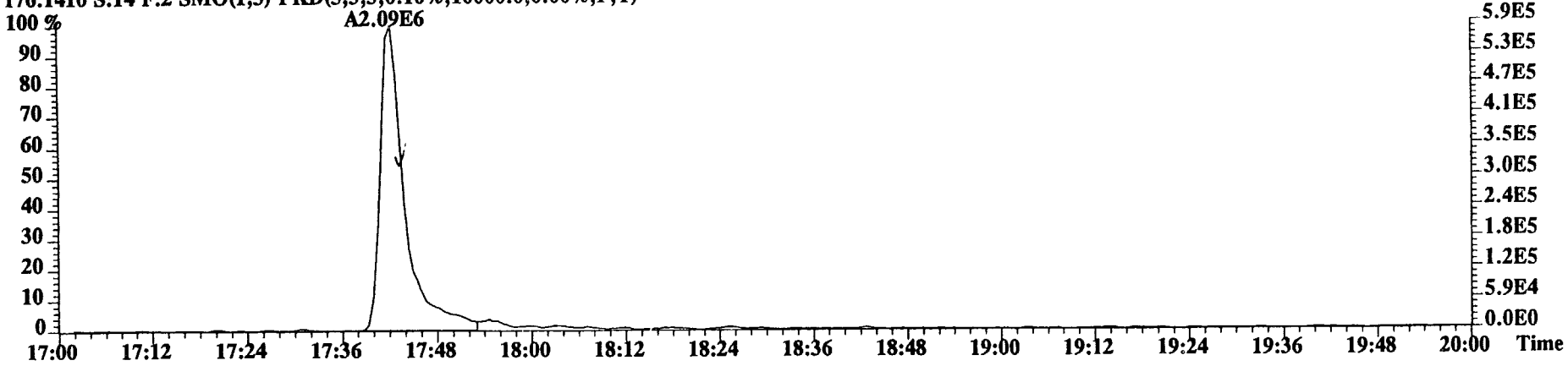
File:30OC98V4 #1-641 Acq:31-OCT-1998 03:22:54 GC EI+ Voltage SIR 70SE
Sample#14 Text:301802-11 :10X DIL. : : : Exp:PAHAIR
166.0798 S:14 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



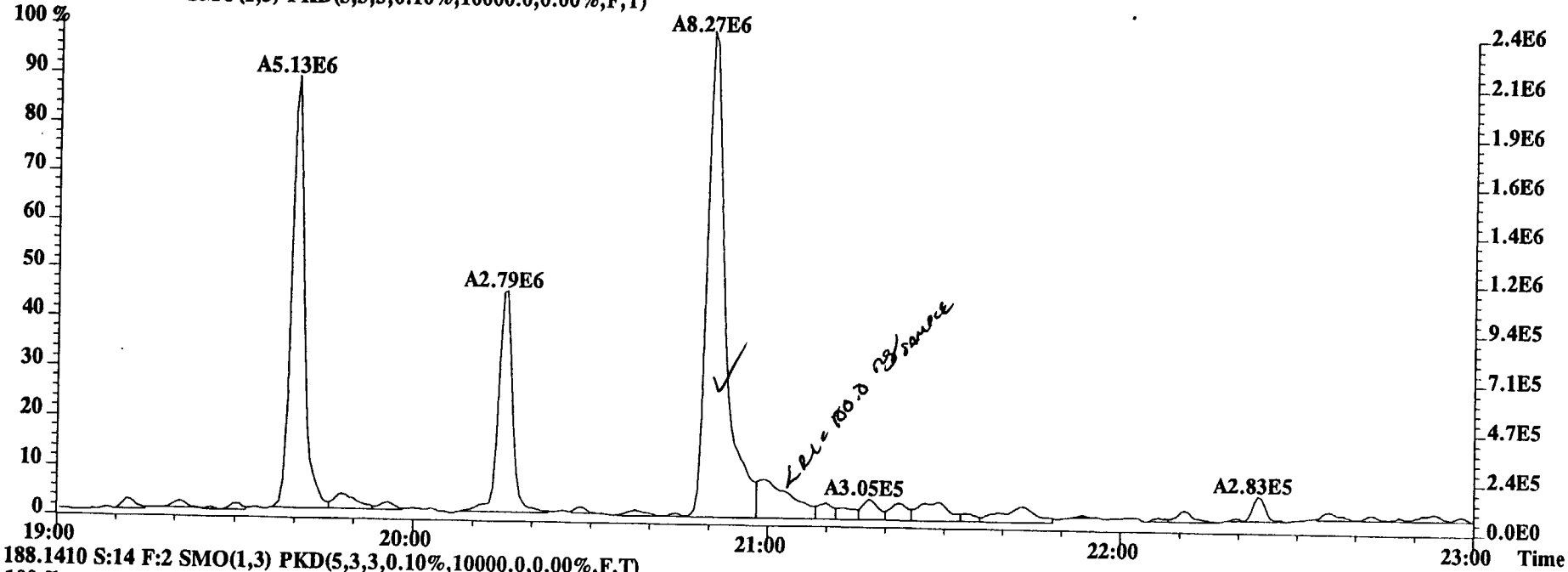
172.0984 S:14 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



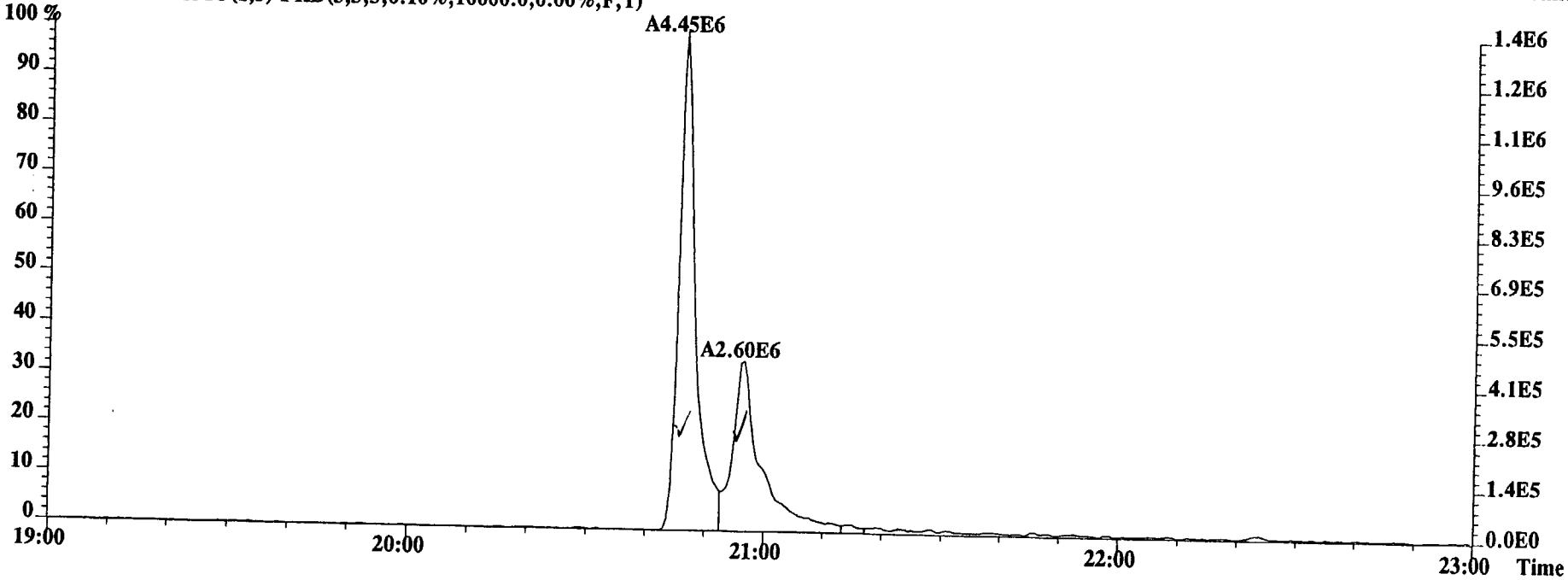
176.1410 S:14 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



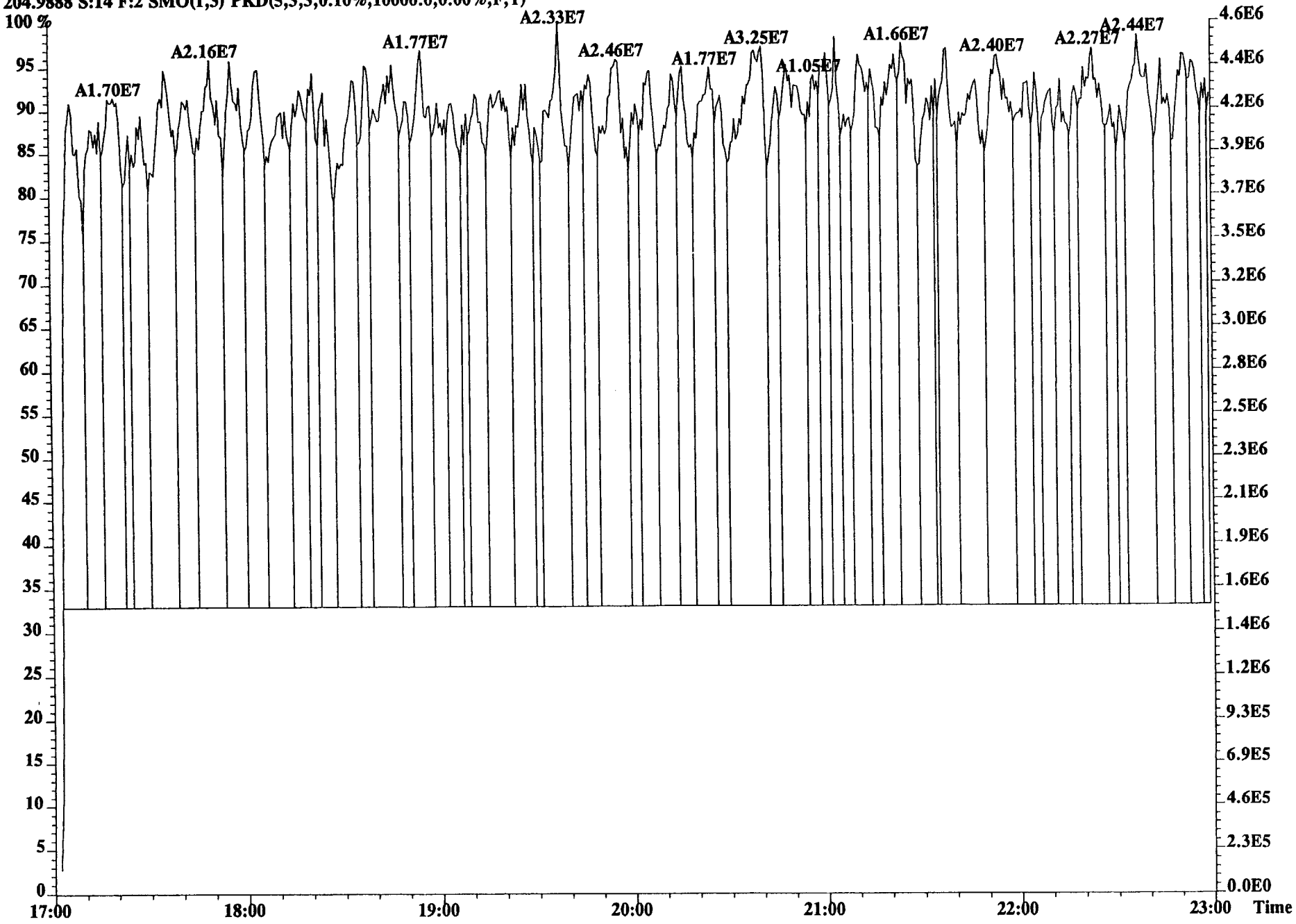
File:30OC98V4 #1-641 Acq:31-OCT-1998 03:22:54 GC EI+ Voltage SIR 70SE
Sample#14 Text:301802-11 :10X DIL. : : : Exp:PAHAIR
178.0782 S:14 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



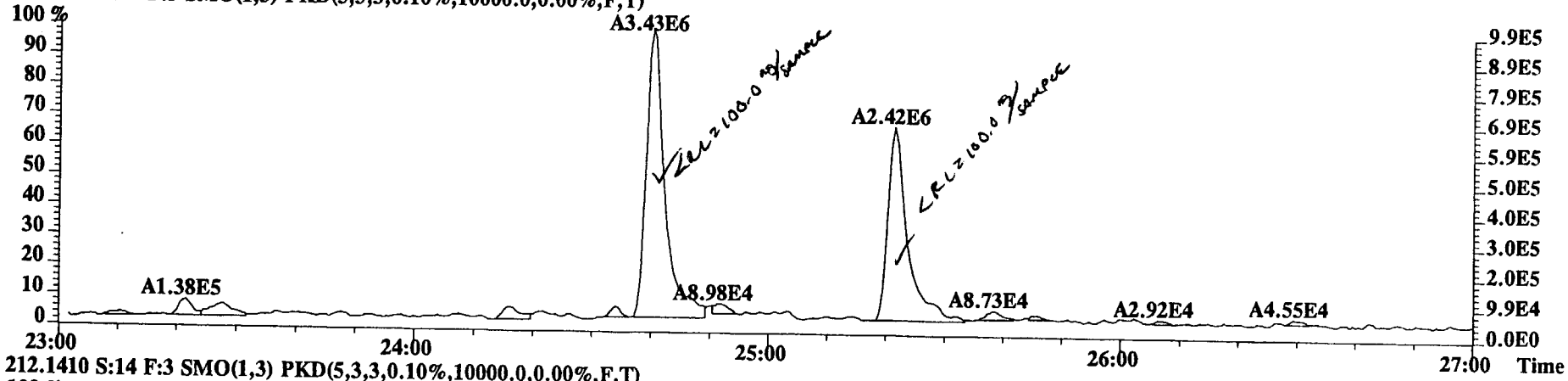
188.1410 S:14 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



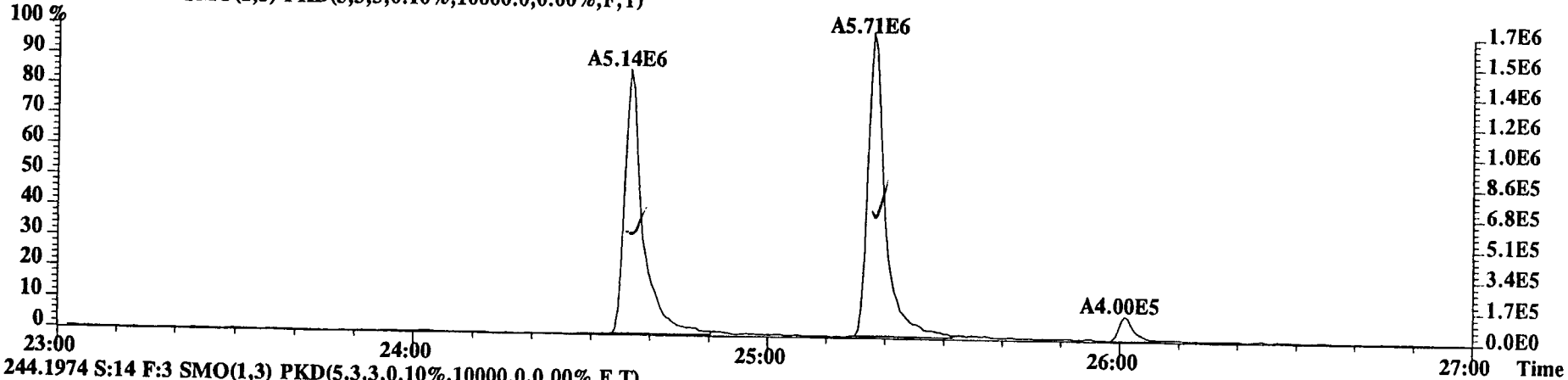
File:30OC98V4 #1-641 Acq:31-OCT-1998 03:22:54 GC EI+ Voltage SIR 70SE
Sample#14 Text:301802-11 :10X DIL. : : : Exp:PAHAIR
204.9888 S:14 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



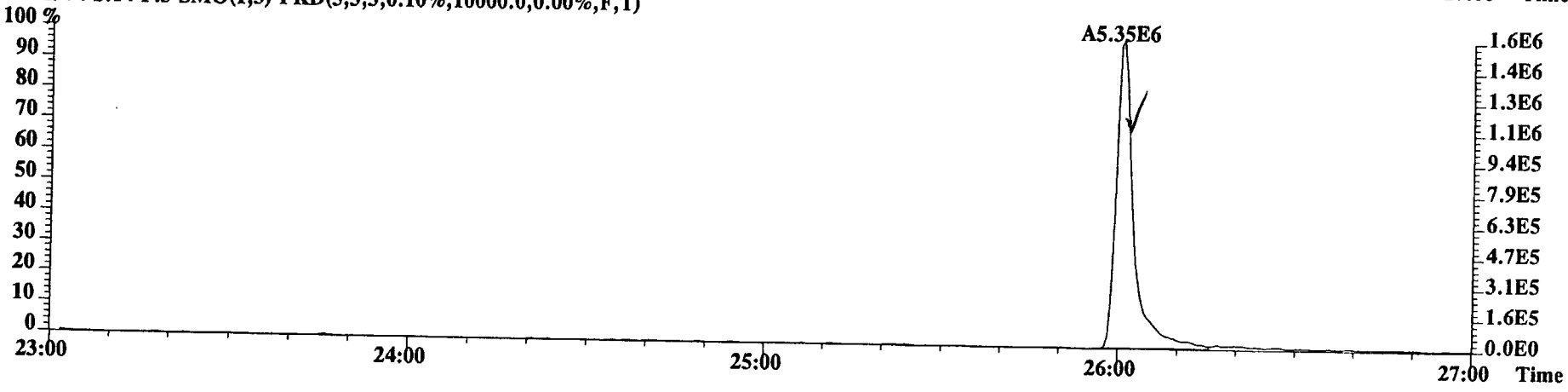
File:30OC98V4 #1-939 Acq:31-OCT-1998 03:22:54 GC EI+ Voltage SIR 70SE
Sample#14 Text:301802-11 :10X DIL. : : : Exp:PAHAIR
202.0782 S:14 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



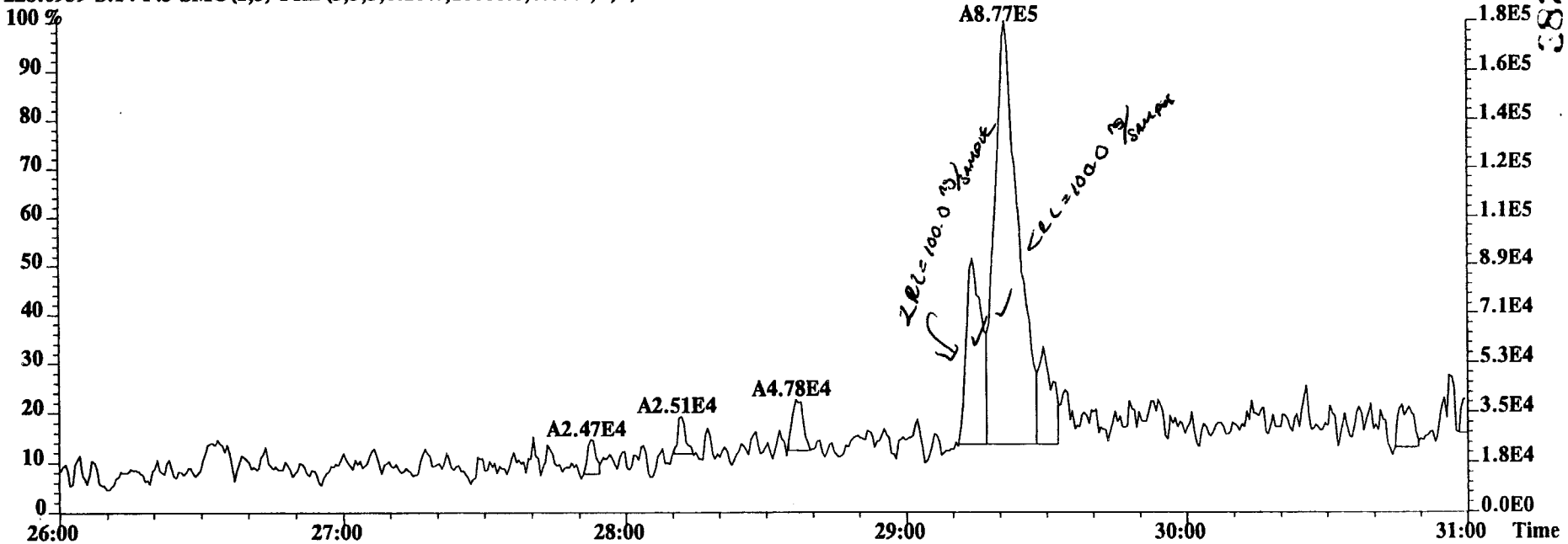
212.1410 S:14 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



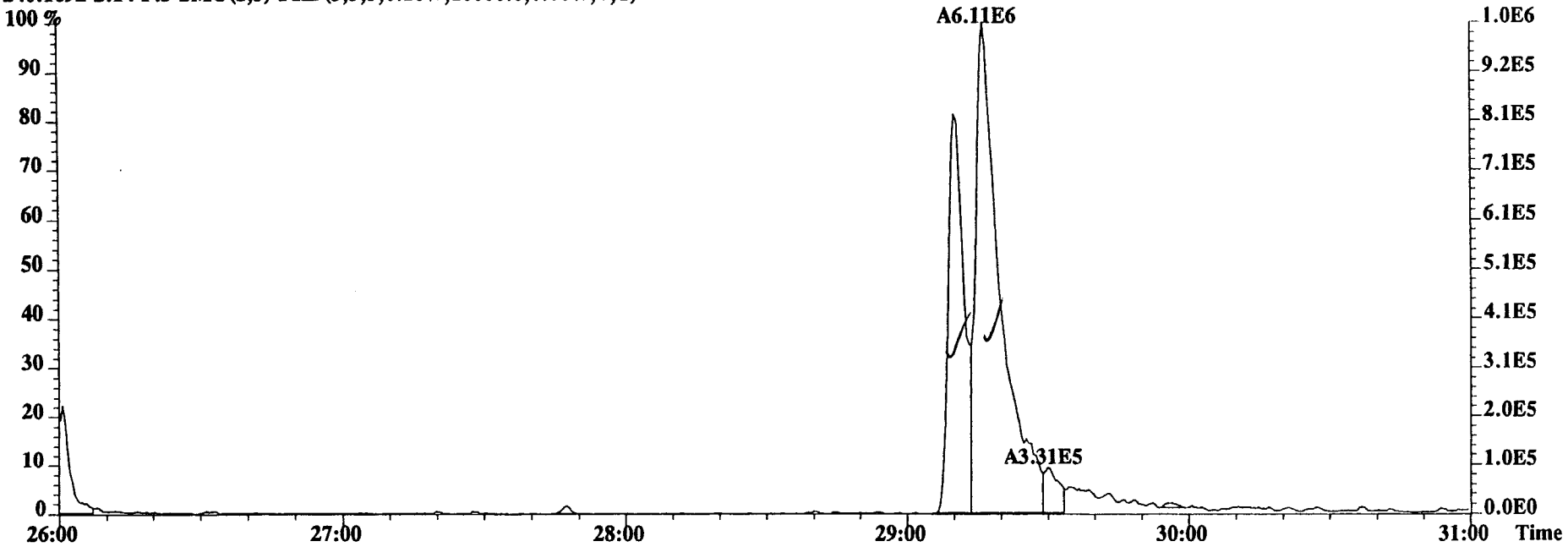
244.1974 S:14 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



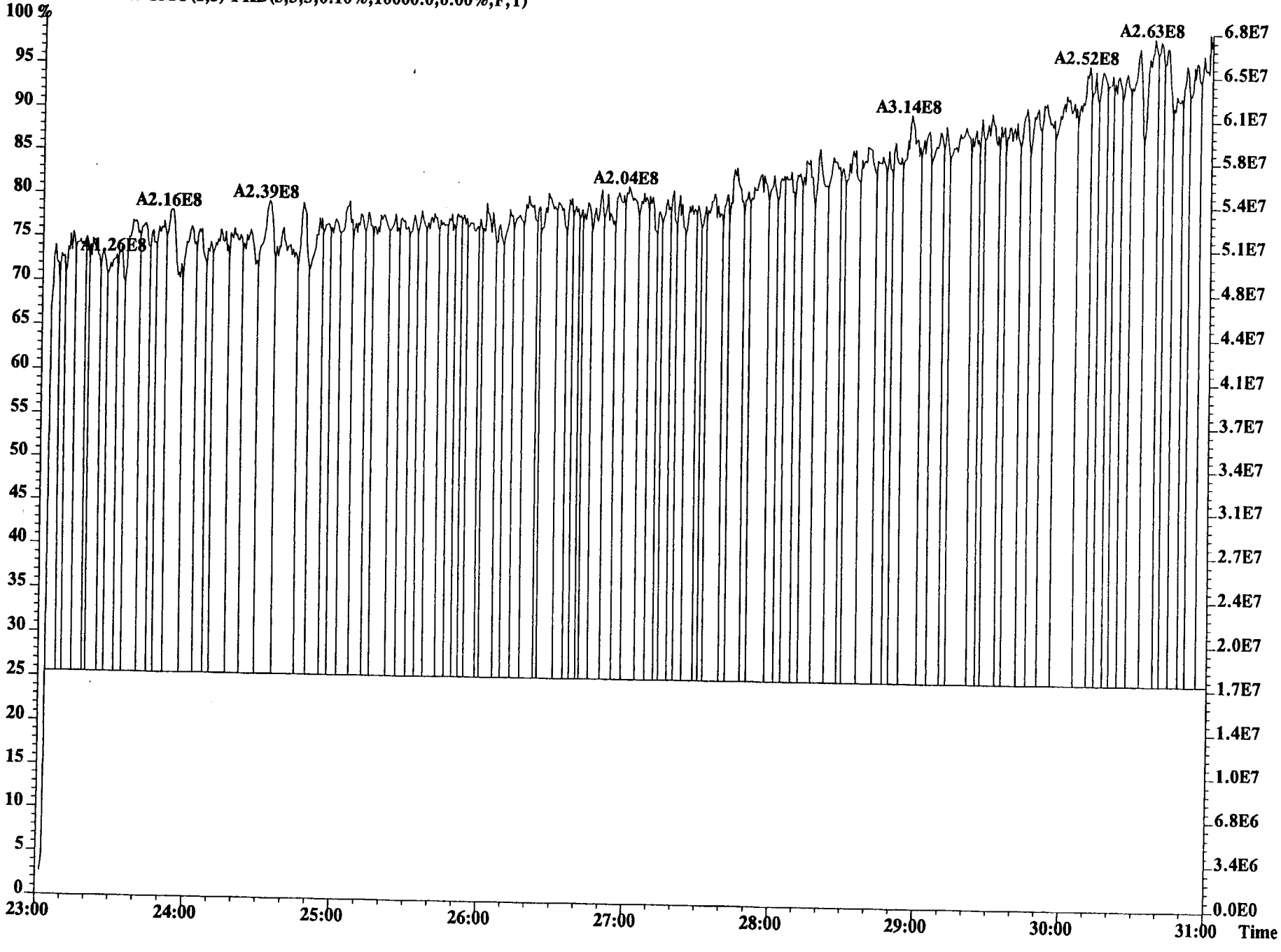
File:30OC98V4 #1-939 Acq:31-OCT-1998 03:22:54 GC EI+ Voltage SIR 70SE
Sample#14 Text:301802-11 :10X DIL. : : : Exp:PAHAIR
228.0939 S:14 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



240.1692 S:14 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

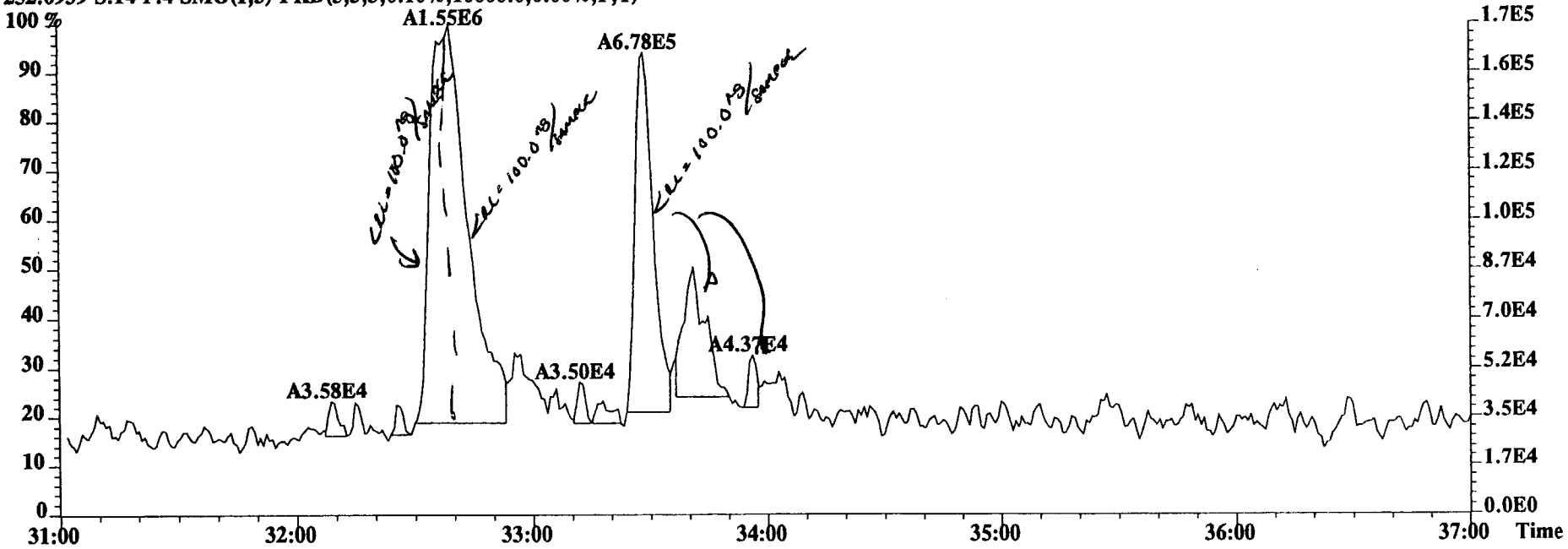


File:30OC98V4 #1-939 Acq:31-OCT-1998 03:22:54 GC EI+ Voltage SIR 70SE
Sample#14 Text:301802-11 :10X DIL. : : : Exp:PAHAIR
230.9856 S:14 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

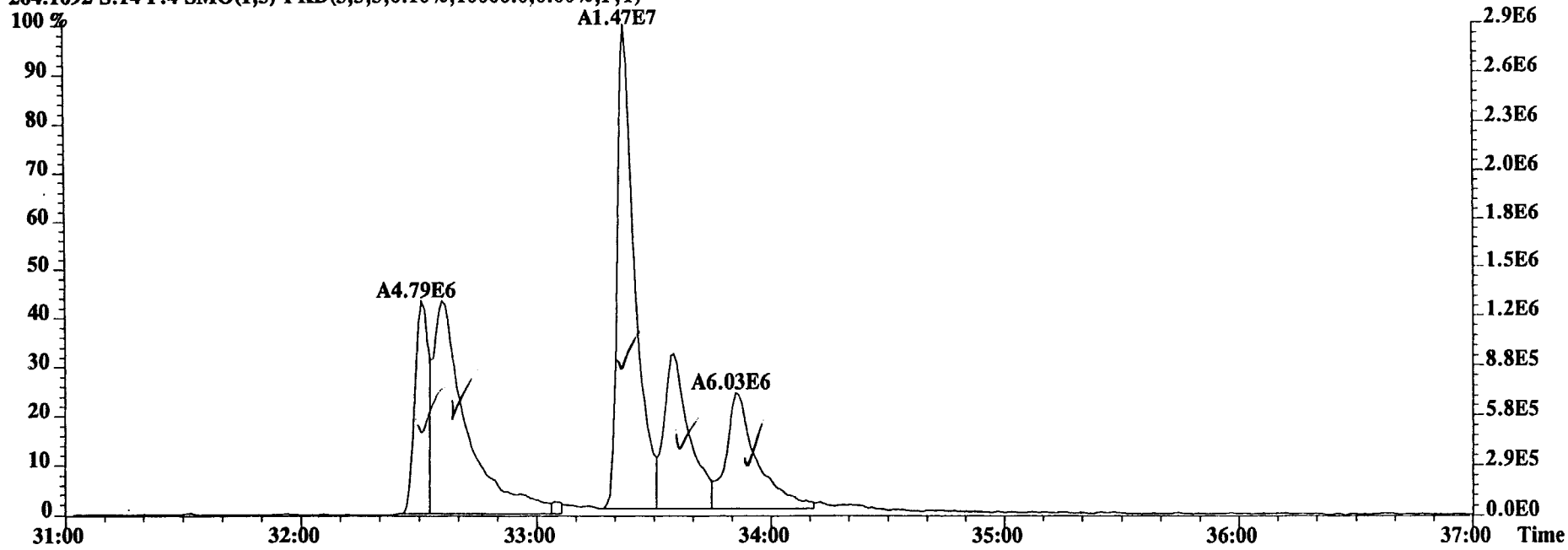


383

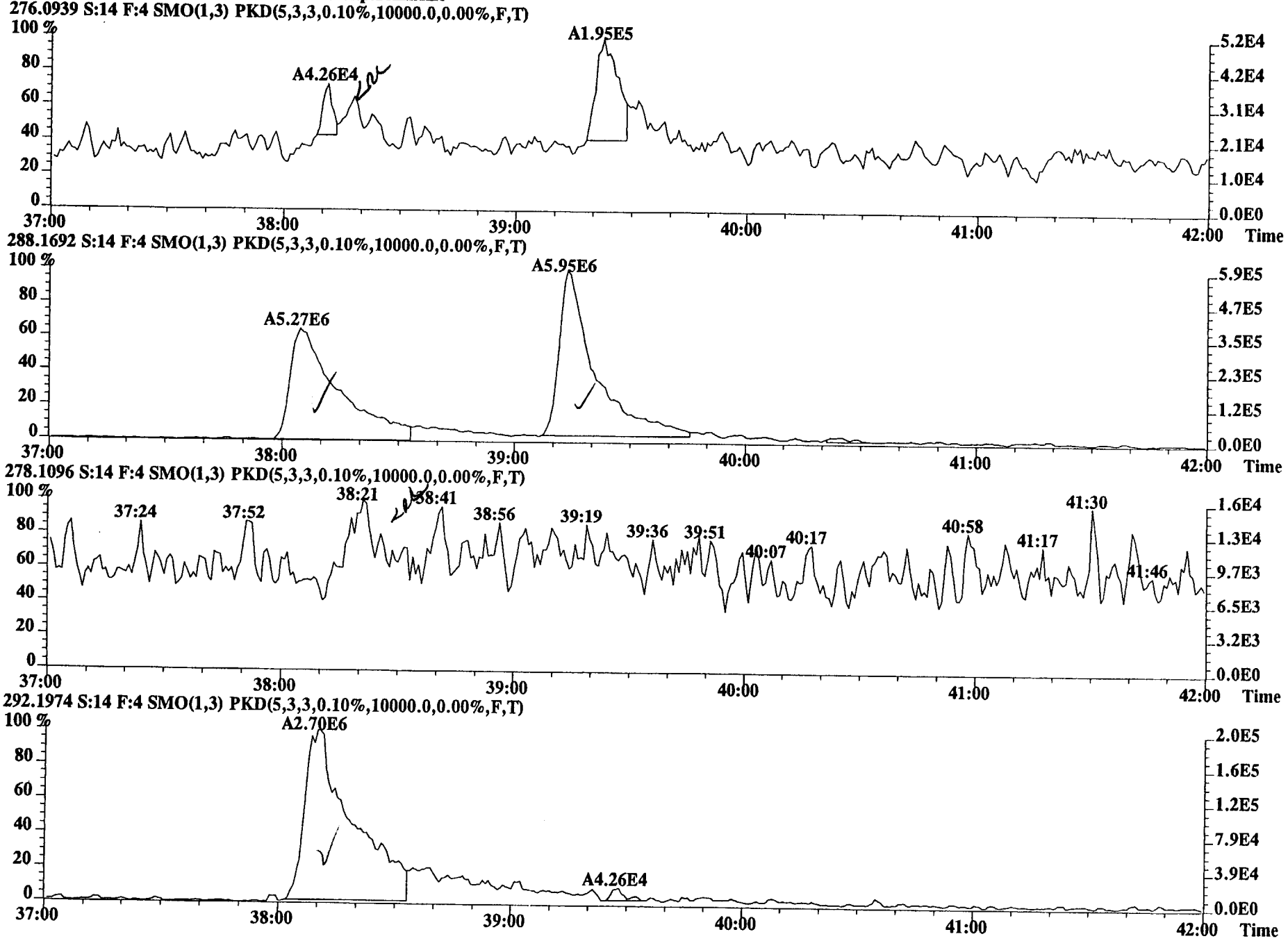
File:30OC98V4 #1-878 Acq:31-OCT-1998 03:22:54 GC EI+ Voltage SIR 70SE
Sample#14 Text:301802-11 :10X DIL. : : : Exp:PAHAIR
252.0939 S:14 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



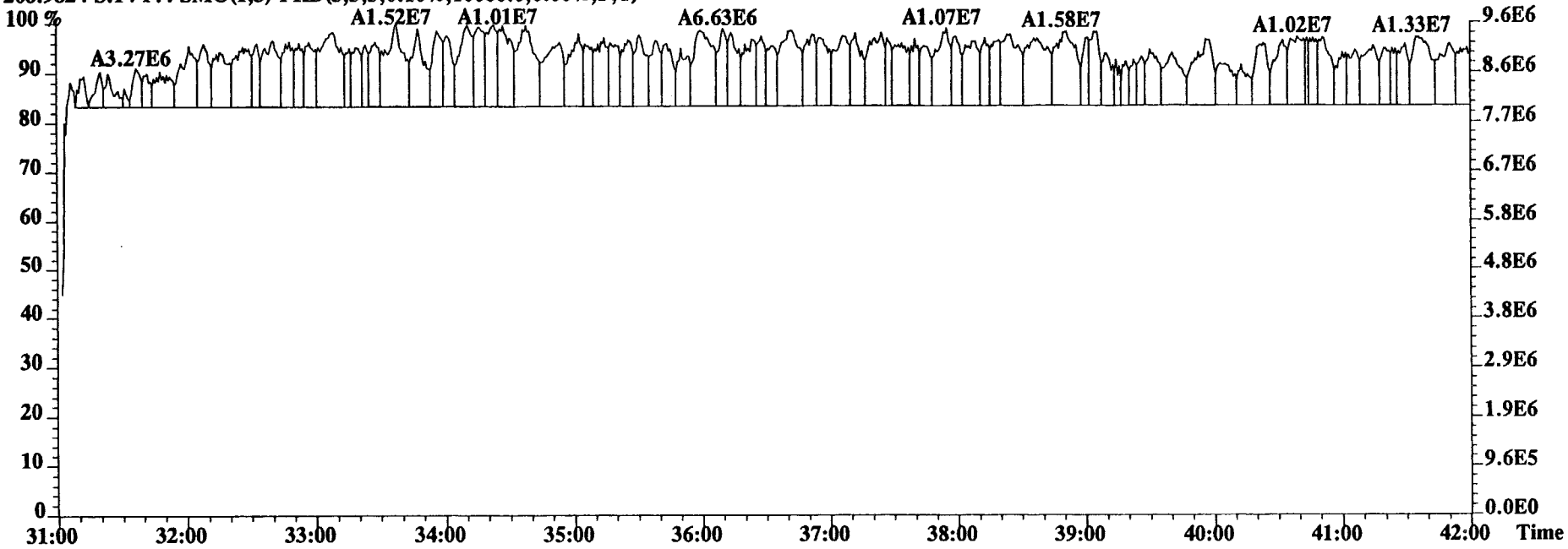
264.1692 S:14 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



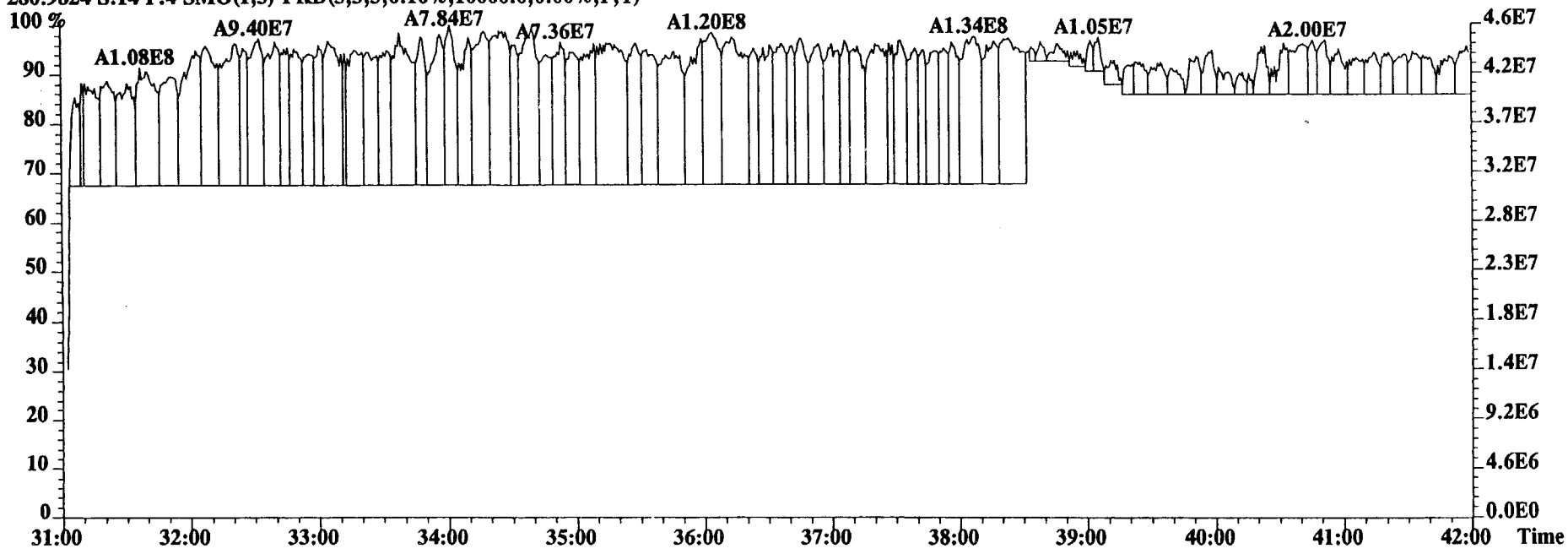
File:30OC98V4 #1-878 Acq:31-OCT-1998 03:22:54 GC EI+ Voltage SIR 70SE
Sample#14 Text:301802-11 :10X DIL. : : : Exp:PAHAIR



File:30OC98V4 #1-878 Acq:31-OCT-1998 03:22:54 GC EI+ Voltage SIR 70SE
Sample#14 Text:301802-11 :10X DIL. : : : Exp:PAHAIR
268.9824 S:14 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



280.9824 S:14 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



POLYNUCLEAR AROMATIC HYDROCARBONS
HIGH RESOLUTION GC/MS
Method HRGC/HRMS

Client Name: Pacific Environmental Services
Client ID: A-0-429-FB
Lab ID: 301802-0012-SA
Matrix: AIRTRAIN Sampled: 24 SEP 98 Received: 29 SEP 98
Authorized: 29 SEP 98 Prepared: 03 OCT 98 Analyzed: 31 OCT 98
Dilution Factor: 1.0

Parameter	Result	Units	Reporting Limit	Data Qualifiers
Naphthalene	1000	ng/sample	--	B
2-Methylnaphthalene	ND	ng/sample	100	
Acenaphthylene	ND	ng/sample	100	
Acenaphthene	ND	ng/sample	100	
Fluorene	ND	ng/sample	100	
Phenanthrene	270	ng/sample	--	B
Anthracene	ND	ng/sample	100	
Fluoranthene	190	ng/sample	--	
Pyrene	150	ng/sample	--	
Benzo(a)anthracene	ND	ng/sample	100	
Chrysene	ND	ng/sample	100	
Benzo(b)fluoranthene	ND	ng/sample	100	
Benzo(k)fluoranthene	ND	ng/sample	100	
Benzo(e)pyrene	ND	ng/sample	100	
Benzo(a)pyrene	ND	ng/sample	100	
Perylene	ND	ng/sample	100	
Indeno(1,2,3-cd)pyrene	ND	ng/sample	100	
Dibenz(a,h)anthracene	ND	ng/sample	100	
Benzo(g,h,i)perylene	ND	ng/sample	100	

B = Compound is also detected in the blank.
ND = Not Detected

Reported By: Clark Pickell Approved By: Eric Redman

The cover letter is an integral part of this report.
Rev 230787

POLYNUCLEAR AROMATIC HYDROCARBONS
HIGH RESOLUTION GC/MS
Method HRGC/HRMS
(cont.)

Client Name: Pacific Environmental Services
Client ID: A-0-429-FB
Lab ID: 301802-0012-SA
Matrix: AIRTRAIN
Authorized: 29 SEP 98
Dilution Factor: 1.0

Sampled: 24 SEP 98
Prepared: 03 OCT 98

Received: 29 SEP 98
Analyzed: 31 OCT 98

Internal Standards	% Recovery	
Naphthalene-d8	46	m
Acenaphthylene-d8	54	
Acenaphthene-d10	68	
Fluorene-d10	51	
Phenanthrene-d10	65	
Fluoranthene-d10	75	
Pyrene-d10	71	
Benzo(a)anthracene-d12	60	
Perylene-d12	57	
Indeno(123-cd)pyrene-d12	73	
Chrysene-d12	94	
Benzo(b)fluoranthene-d12	80	
Benzo(k)fluoranthene-d12	77	
Benzo(a)pyrene-d12	61	
Dibenz(a,h)anthracene-d14	66	
Benzo(g,h,i)perylene-d12	66	

Field Surrogates	% Recovery
13C-Fluorene	107

m = Internal Standard recovery is outside method recovery goal.

Reported By: Clark Pickell

Approved By: Eric Redman

The cover letter is an integral part of this report.
Rev 230787

04-NOV-1998 06:32:52 PM Dioxin Furan Unknown RESULTS

Mass Spec : VG-4
GC Column : DB-5
Data file : 30OC98V4
Weight : 0.5

Results : 30OC98V4151.RES : PAHAIR.TRG
Date analyzed : 30-OCT-98
301802-12 :10X DIL. : : : Ex Cal : PAHAIR102998V4.R

Name	Total Response	Isotope Ratio	R. T. mm:ss	RRF	pg/ SAMP	Rec/ MDL
d10-2-Methylnaphthalene	5288960	1.00 Y	12: 28 Y	1.00	50.00	
d8-Naphthalene	5453300	1.00 Y	10: 12 Y	2.24	23.01	46
Naphthalene	69007400	1.00 Y	10: 16 Y	1.23	1032.91	B
2-Methylnaphthalene	2464560	1.00 Y	12: 34 Y	0.56	<RL=100.00	
d8-Acenaphthylene	3478260	1.00 Y	15: 29 Y	1.21	27.09	54
Acenaphthylene	555228	1.00 Y	15: 31 Y	0.94	<RL=100.00	
d10-Acenaphthene	2661640	1.00 Y	16: 1 Y	0.74	33.79	68
Acenaphthene	1579826	1.00 Y	16: 7 Y	1.25	<RL=100.00	
d10-Anthracene	3746380	1.00 Y	20: 56 Y	1.00	50.00	
d10-Fluorene	2729320	1.00 Y	17: 42 Y	1.42	25.64	51
Fluorene	965902	1.00 Y	17: 48 Y	1.16	<RL=100.00	
d10-Phenanthrene	6811120	1.00 Y	20: 46 Y	2.81	32.38	65
Phenanthrene	16420000	1.00 Y	20: 51 Y	0.89	269.51	B
Anthracene	* No Peak	0.00 N	21: 0 N	0.80	<RL=100.00	
d14-Terphenyl	7701460	1.00 Y	26: 1 Y	1.00	50.00	
d10-Fluoranthene	8133080	1.00 Y	24: 37 Y	1.41	37.43	75
Fluoranthene	16742020	1.00 Y	24: 40 Y	1.11	185.16	
d10-Pyrene	8254040	1.00 Y	25: 18 Y	1.52	35.30	71
Pyrene	15148300	1.00 Y	25: 21 Y	1.21	152.30	
d12-Benzo(a)anthracene	4176740	1.00 Y	29: 10 Y	0.90	30.13	60
Benzo(a)anthracene	977006	1.00 Y	29: 14 Y	1.20	<RL=100.00	
d12-Chrysene	9286780	1.00 Y	29: 16 Y	1.28	47.13	94
Chrysene	4474660	1.00 Y	29: 21 Y	1.08	<RL=100.00	
d12-Benzo(e)pyrene	21132600	1.00 Y	33: 22 Y	1.00	50.00	
d12-Benzo(b)fluoranthene	7689560	1.00 Y	32: 30 Y	0.45	40.09	80
Benzo(b)fluoranthene	9149740	1.00 Y	32: 36 Y	1.17	<RL=100.00	
d12-Benzo(k)fluoranthene	15475900	1.00 Y	32: 36 Y	0.95	38.62	77
Benzo(k)fluoranthene	9149740	1.00 Y	32: 39 Y	1.16	<RL=100.00	
d12-Benzo(a)pyrene	8657940	1.00 Y	33: 35 Y	0.68	30.27	61
Benzo(e)pyrene	4443260	1.00 Y	33: 28 Y	1.64	<RL=100.00	
Benzo(a)pyrene	2517480	1.00 Y	33: 40 Y	1.07	<RL=100.00	
d12-Perylene	7564260	1.00 Y	33: 52 Y	0.63	28.40	57
Perylene	968200	1.00 Y	33: 58 Y	1.71	<RL=100.00	
d12-Indeno(123-cd)pyrene	6884340	1.00 Y	38: 5 Y	0.44	36.64	73
Indeno(123-cd)pyrene	799534	1.00 Y	38: 12 Y	0.62	<RL=100.00	
d14-Dibenz(ah)anthracene	3421880	1.00 Y	38: 9 Y	0.25	32.94	66
Dibenz(ah)anthracene	* No Peak	0.00 N	38: 15 N	1.40	<RL=100.00	
d12-Benzo(ghi)perylene	8065080	1.00 Y	39: 14 Y	0.58	32.92	66
Benzo(ghi)perylene	2360660	1.00 Y	39: 23 Y	1.02	<RL=100.00	
d10-Fluorene	2729320	1.00 Y	17: 42 Y	1.00	50.00	
13C-Fluorene	2357220	1.00 Y	17: 47 Y	0.81	53.31	107

289 11-4-98

0.5

98V4.RRF
Rec/
MDL

	2644480	2644480
46	2726650	2726650
B	34503700	34503700
100.00	1232280	1232280
54	1739130	1739130
00.00	277614	277614
68	1330820	1330820
00.00	789913	789913
	1873190	1873190
51	1364660	1364660
00.00	482951	482951
65	3405560	3405560
B	8210000	8210000
00.00	0	0
	3850730	3850730
75	4066540	4066540
	8371010	8371010
71	4127020	4127020
	7574150	7574150
60	2088370	2088370
00.00	488503	488503
94	4643390	4643390
100.00	2237330	2237330
	10566300	10566300
80	3844780	3844780
100.00	4574870	4574870
77	7737950	7737950
100.00	4574870	4574870
61	4328970	4328970
100.00	2221630	2221630
100.00	1258740	1258740
57	3782130	3782130
100.00	484100	484100
73	3442170	3442170
100.00	399767	399767
66	1710940	1710940
100.00	0	0
66	4032540	4032540
100.00	1180330	1180330

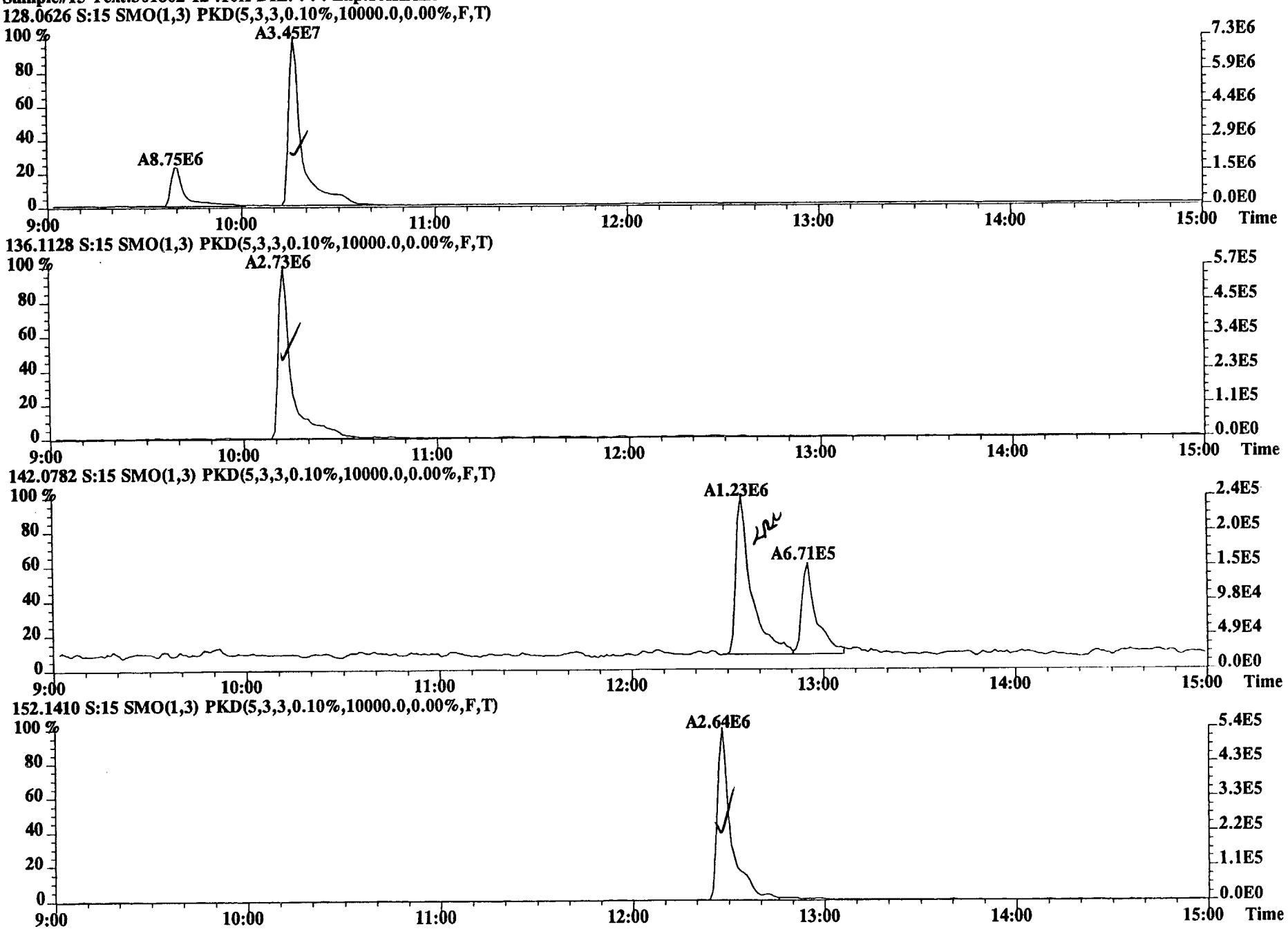
02-NOV-1998 09:12:25 AM Dioxin Furan Unknown RESULTS

Mass Spec : VG-4
GC Column : DB-5
Data file : 30OC98V4
Weight : 0.5

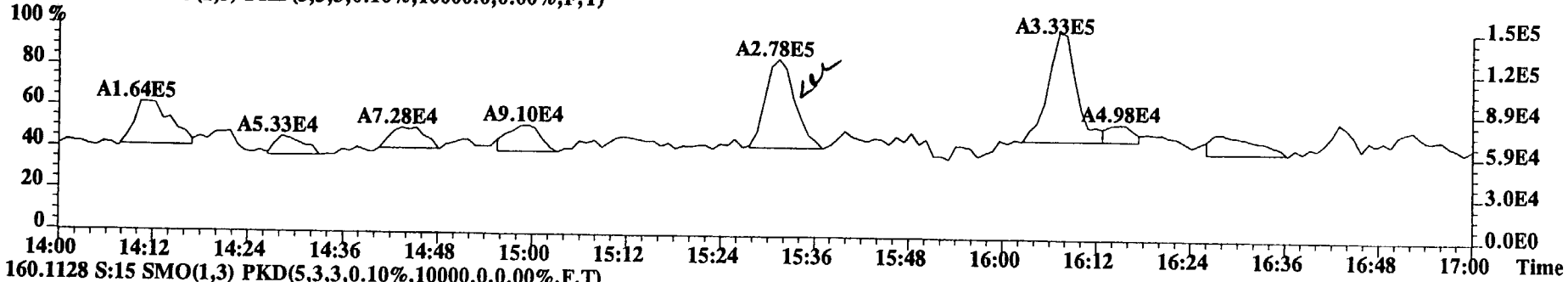
Results : 30OC98V4151.RES : PAHAIR.TRG
Date analyzed : 30-OCT-98
301802-12 :10X DIL. : : : Ex Cal : PAHAIR102998V4.R

Name	Total Response	Isotope Ratio	R. T. mm:ss	RRF	pg/ SAMP	Rec/ MDL
d10-2-Methylnaphthalene	5288960	1.00 Y	12: 28 Y	1.00	50.00	
d8-Naphthalene	5453300	1.00 Y	10: 12 Y	2.24	23.01	46
Naphthalene	69007400	1.00 Y	10: 16 Y	1.23	1032.91	0.000
2-Methylnaphthalene	2464560	1.00 Y	12: 34 Y	0.56	80.62	0.000
d8-Acenaphthylene	3478260	1.00 Y	15: 29 Y	1.21	27.09	54
Acenaphthylene	555228	1.00 Y	15: 31 Y	0.94	16.91	0.000
d10-Acenaphthene	2661640	1.00 Y	16: 1 Y	0.74	33.79	68
Acenaphthene	1579826	1.00 Y	16: 7 Y	1.25	47.63	0.000
d10-Anthracene	3746380	1.00 Y	20: 56 Y	1.00	50.00	
d10-Fluorene	2729320	1.00 Y	17: 42 Y	1.42	25.64	51
Fluorene	965902	1.00 Y	17: 48 Y	1.16	30.49	0.000
d10-Phenanthrene	6811120	1.00 Y	20: 46 Y	2.81	32.38	65
Phenanthrene	19592620	1.00 Y	20: 51 Y	0.89	321.58	0.000
Anthracene	* No Peak	0.00 N	21: 0 N	0.80	0.00	0.000
d14-Terphenyl	7701460	1.00 Y	26: 1 Y	1.00	50.00	
d10-Fluoranthene	8133080	1.00 Y	24: 37 Y	1.41	37.43	75
Fluoranthene	16742020	1.00 Y	24: 40 Y	1.11	185.16	0.000
d10-Pyrene	8254040	1.00 Y	25: 18 Y	1.52	35.30	71
Pyrene	15148300	1.00 Y	25: 21 Y	1.21	152.30	0.000
d12-Benzo(a)anthracene	4176740	1.00 Y	29: 10 Y	0.90	30.13	60
Benzo(a)anthracene	977006	1.00 Y	29: 14 Y	1.20	19.42	0.000
d12-Chrysene	9286780	1.00 Y	29: 16 Y	1.28	47.13	94
Chrysene	4474660	1.00 Y	29: 21 Y	1.08	44.45	0.000
d12-Benzo(e)pyrene	21132600	1.00 Y	33: 22 Y	1.00	50.00	
d12-Benzo(b)fluoranthene	7689560	1.00 Y	32: 30 Y	0.45	40.09	80
Benzo(b)fluoranthene	9149740	1.00 Y	32: 39 Y	1.17	101.94	0.000
d12-Benzo(k)fluoranthene	15475900	1.00 Y	32: 36 Y	0.95	38.62	77
Benzo(k)fluoranthene	9149740	1.00 Y	32: 39 Y	1.16	50.79	0.000
d12-Benzo(a)pyrene	8657940	1.00 Y	33: 35 Y	0.68	30.27	61
Benzo(e)pyrene	4443260	1.00 Y	33: 28 Y	1.64	31.28	0.000
Benzo(a)pyrene	2517480	1.00 Y	33: 40 Y	1.07	27.12	0.000
d12-Perylene	7564260	1.00 Y	33: 52 Y	0.63	28.40	57
Perylene	968200	1.00 Y	33: 58 Y	1.71	7.47	0.000
d12-Indeno(123-cd)pyrene	6884340	1.00 Y	38: 5 Y	0.44	36.64	73
Indeno(123-cd)pyrene	799534	1.00 Y	38: 12 Y	0.62	18.70	0.000
d14-Dibenz(ah)anthracene	3421880	1.00 Y	38: 9 Y	0.25	32.94	66
Dibenz(ah)anthracene	* No Peak	0.00 N	38: 15 N	1.40	0.00	0.000
d12-Benzo(ghi)perylene	8065080	1.00 Y	39: 14 Y	0.58	32.92	66
Benzo(ghi)perylene	2360660	1.00 Y	39: 23 Y	1.02	28.81	0.000
d10-Fluorene	2729320	1.00 Y	17: 42 Y	1.42	4.54	9
13C-Fluorene	2357220	1.00 Y	17: 47 Y	1.00	86.37	0.000

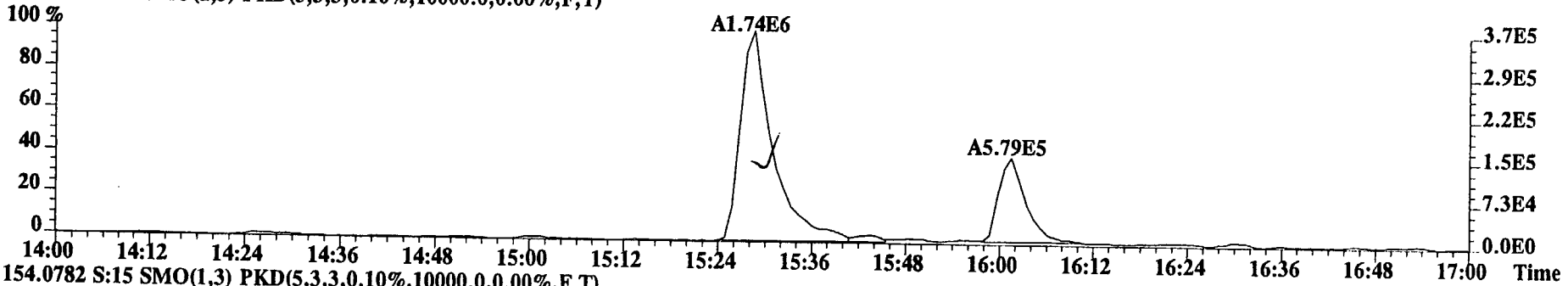
File:30OC98V4 #1-510 Acq:31-OCT-1998 04:11:55 GC EI+ Voltage SIR 70SE
Sample#15 Text:301802-12 :10X DIL. : : : Exp:PAHAIR



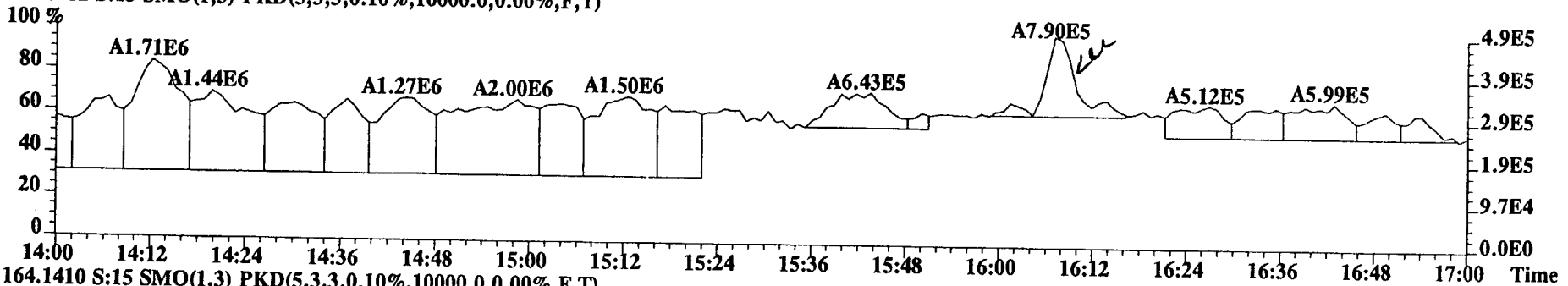
File:30OC98V4 #1-510 Acq:31-OCT-1998 04:11:55 GC EI+ Voltage SIR 70SE
Sample#15 Text:301802-12 :10X DIL. : : : Exp:PAHAIR
152.0626 S:15 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



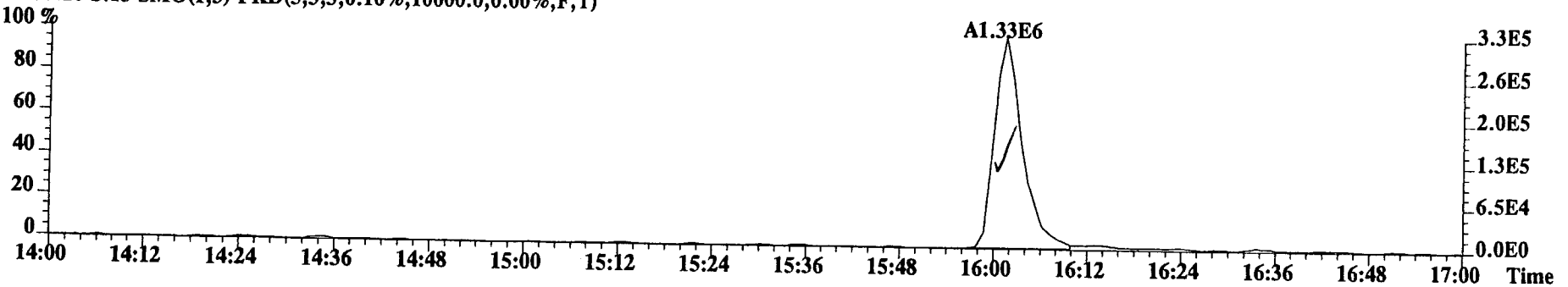
160.1128 S:15 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



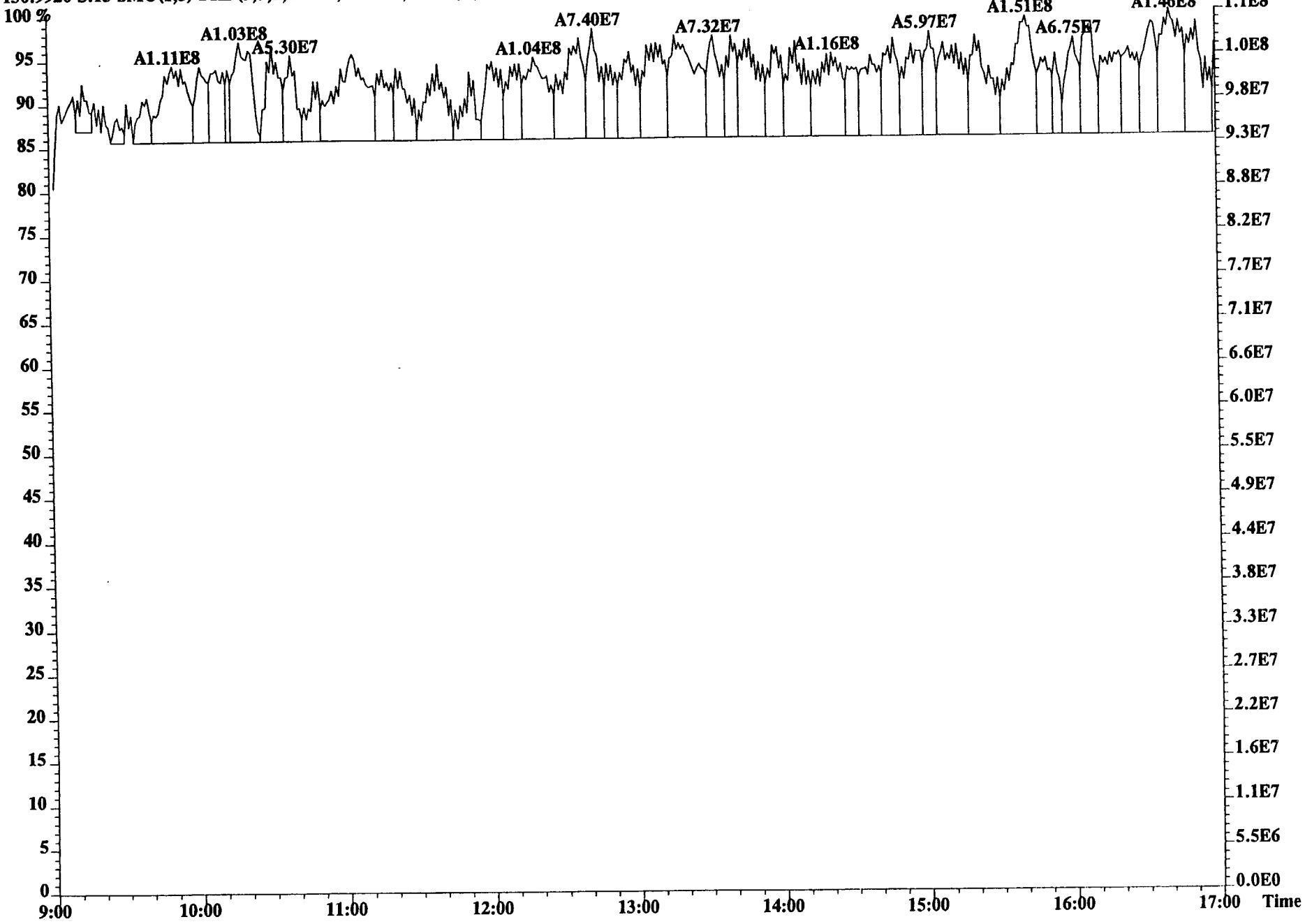
154.0782 S:15 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



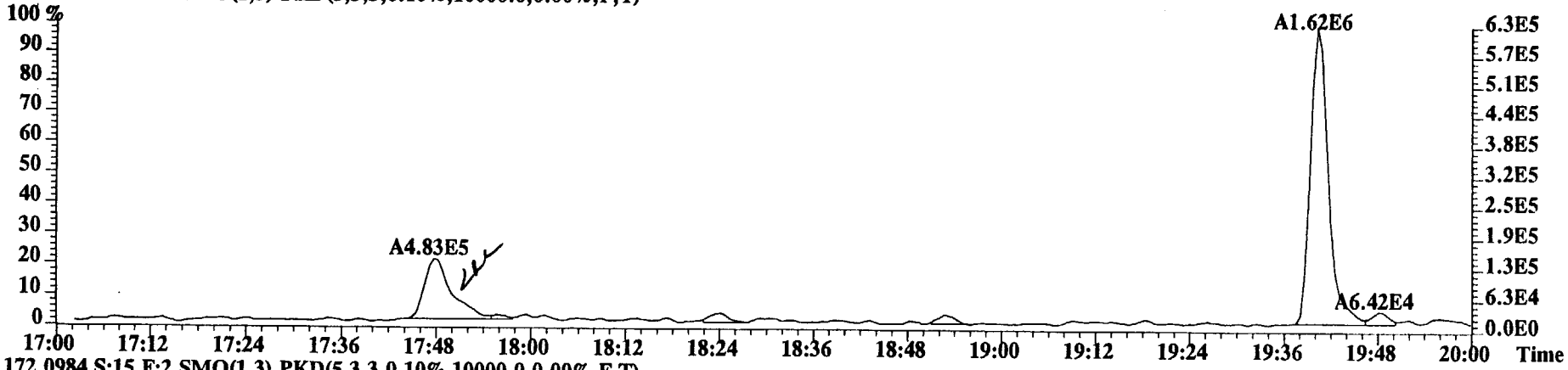
164.1410 S:15 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



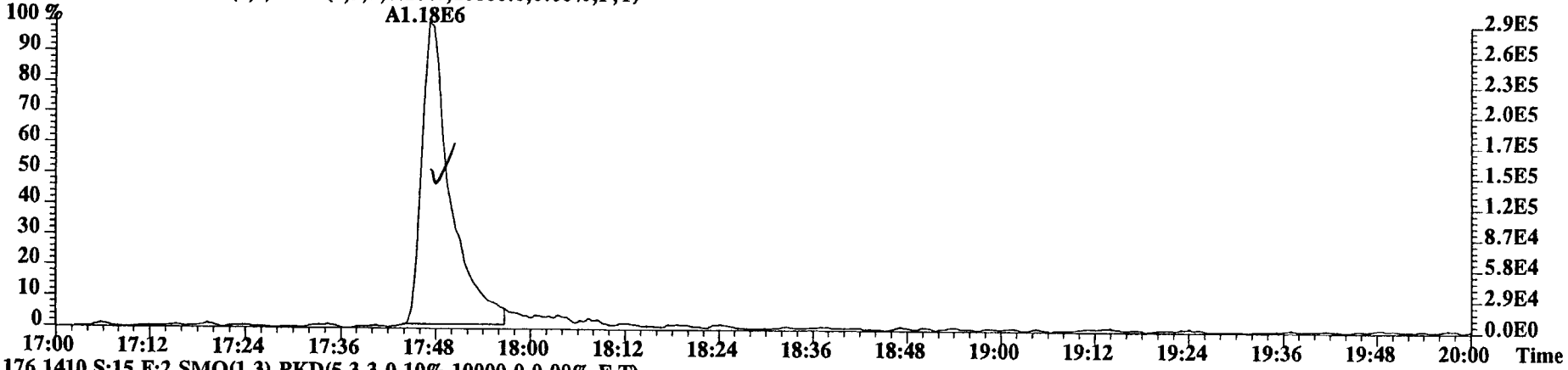
File:30OC98V4 #1-510 Acq:31-OCT-1998 04:11:55 GC EI+ Voltage SIR 70SE
Sample#15 Text:301802-12 :10X DIL. : : : Exp:PAHAIR
130.9920 S:15 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



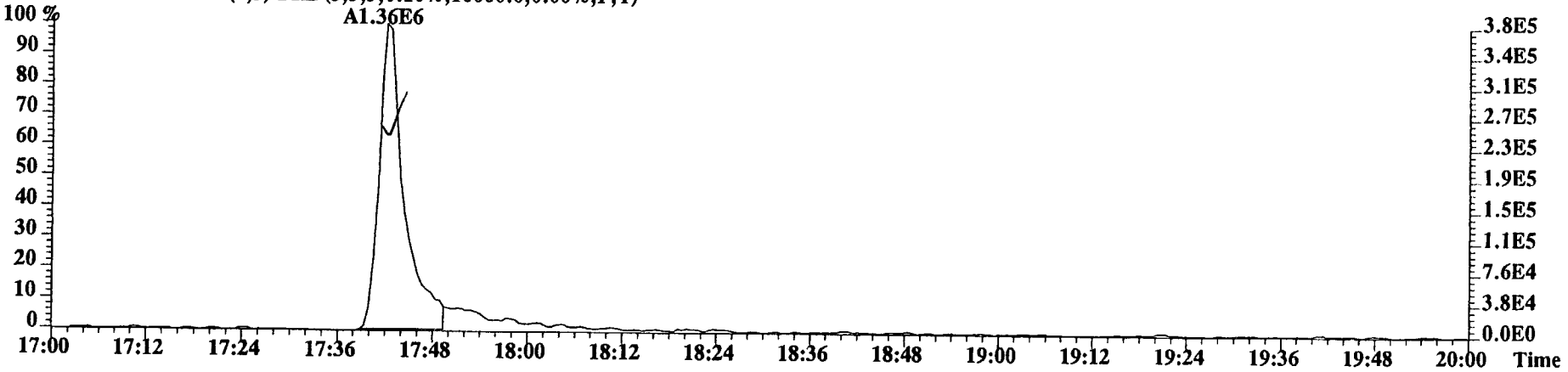
File:30OC98V4 #1-640 Acq:31-OCT-1998 04:11:55 GC EI+ Voltage SIR 70SE
Sample#15 Text:301802-12 :10X DIL. : : : Exp:PAHAIR
166.0798 S:15 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



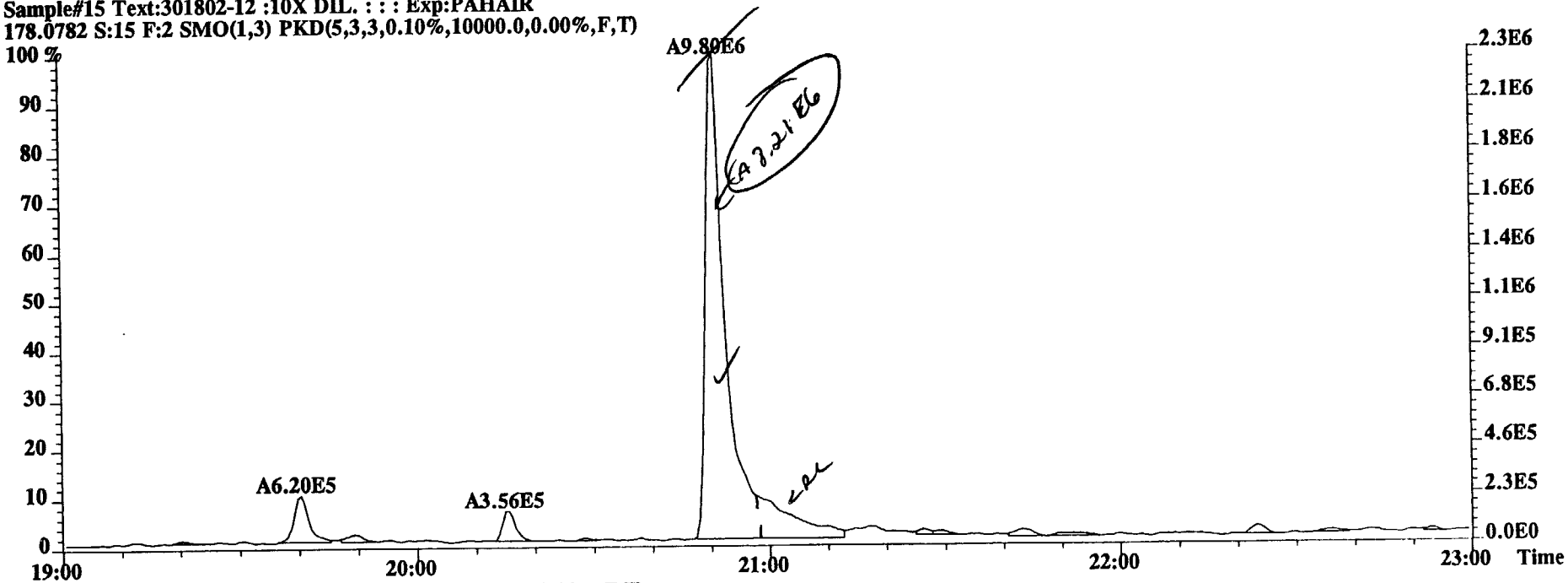
172.0984 S:15 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



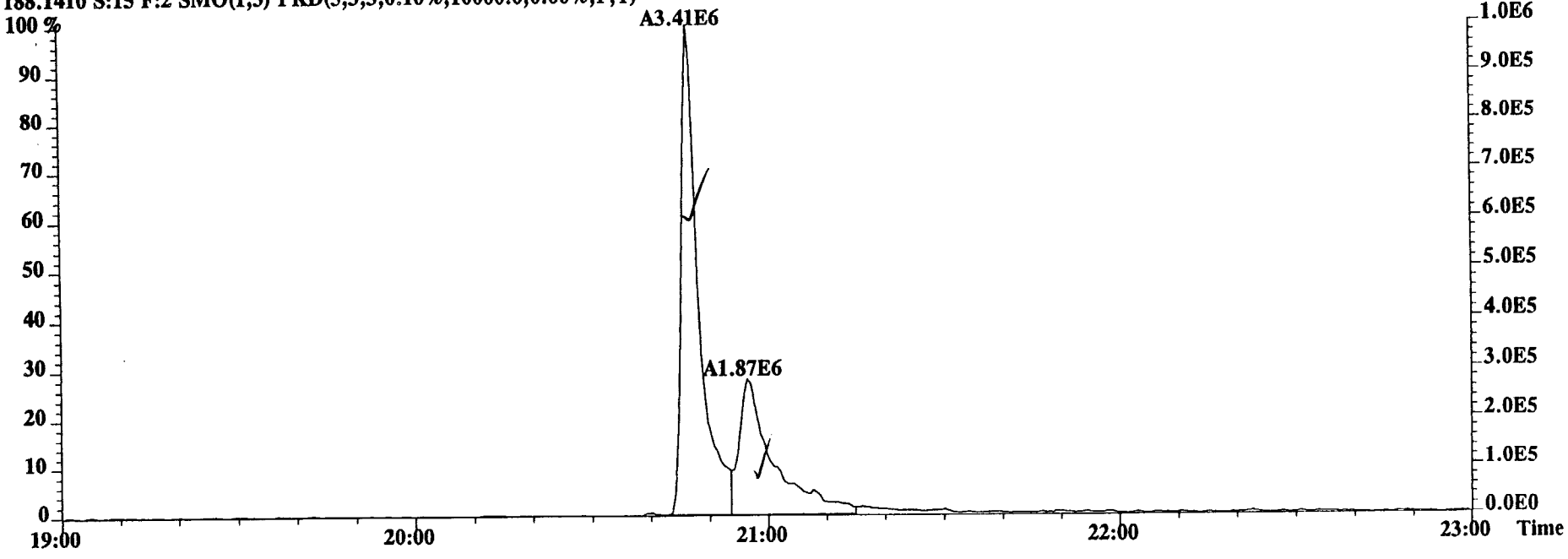
176.1410 S:15 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



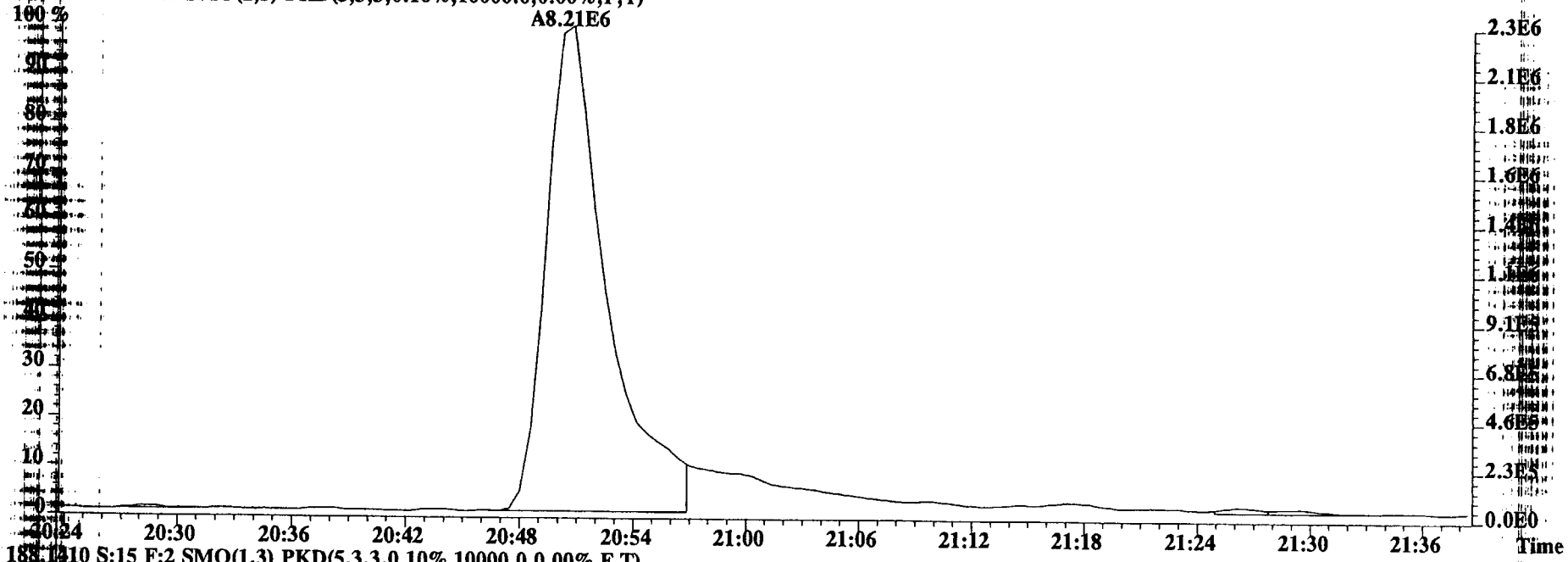
File:30OC98V4 #1-640 Acq:31-OCT-1998 04:11:55 GC EI+ Voltage SIR 70SE
Sample#15 Text:301802-12 :10X DIL. : : : Exp:PAHAIR
178.0782 S:15 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



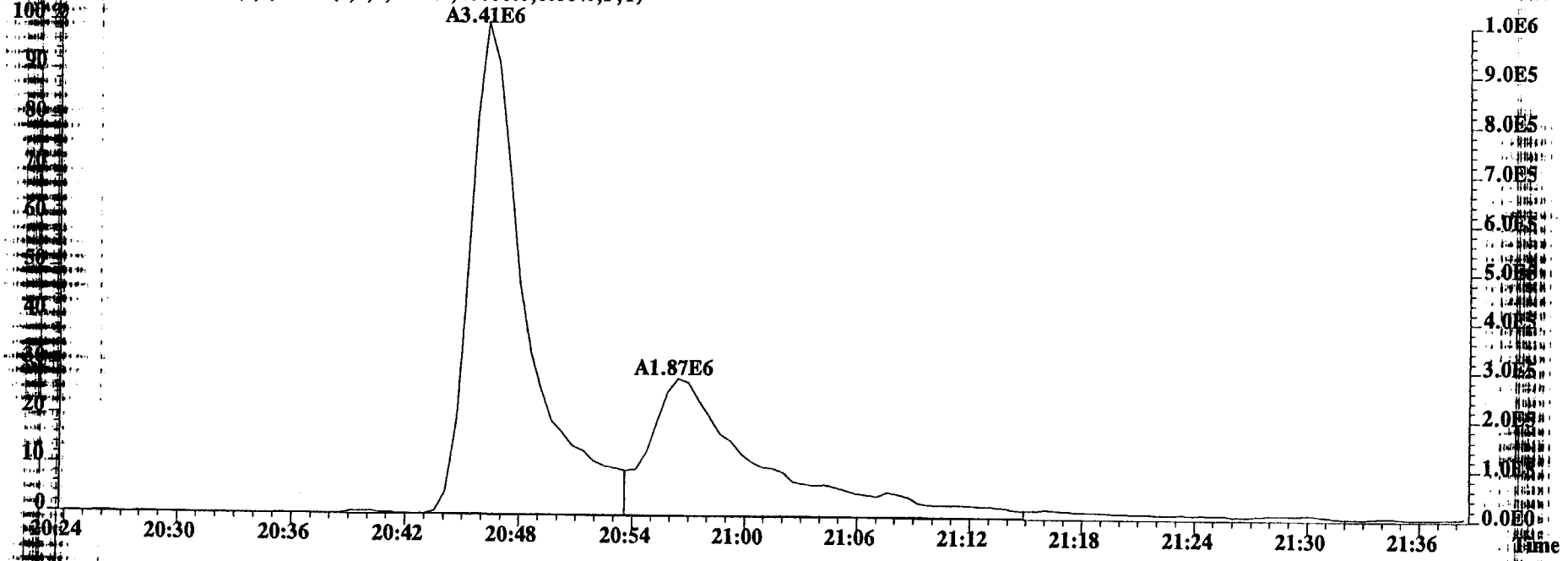
188.1410 S:15 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



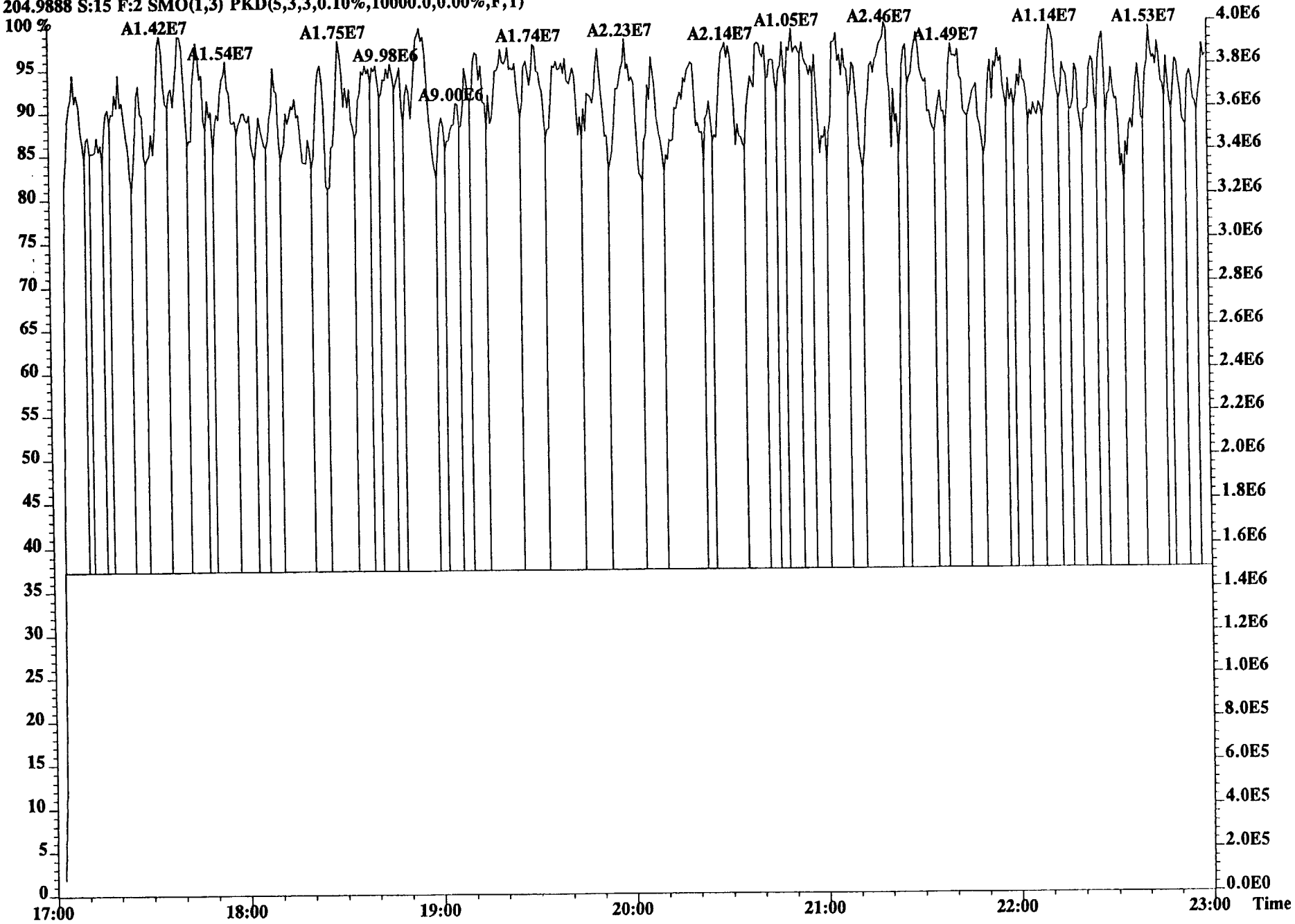
File:3DOC98V4 #1-640 Acq:31-OCT-1998 04:11:55 GC EI+ Voltage SIR 70SE
Sample#15 Text:301802-12 :10X DIL. : : : Exp:PAHAIR
17X.0782 S:15 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



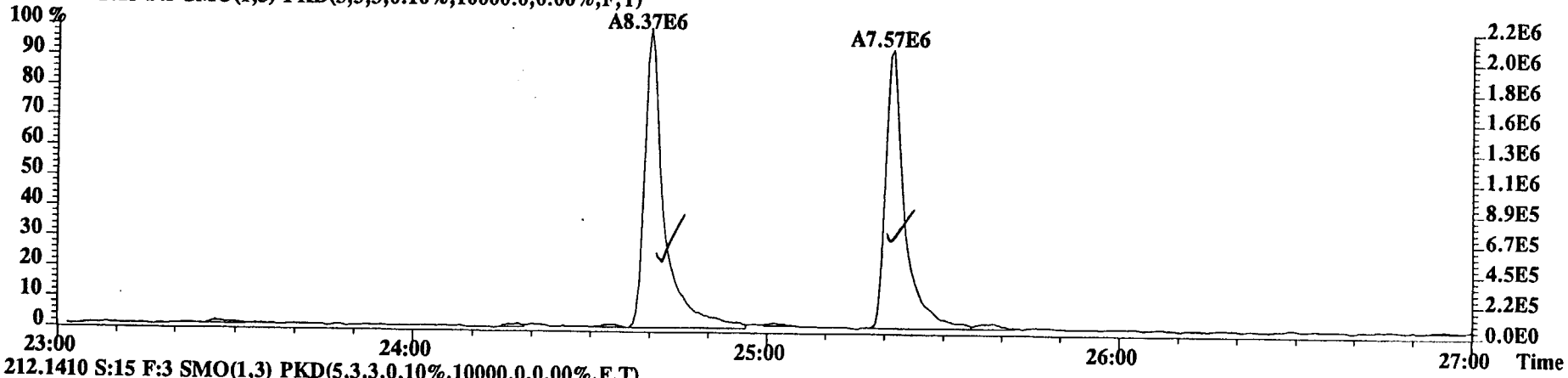
18X.1210 S:15 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



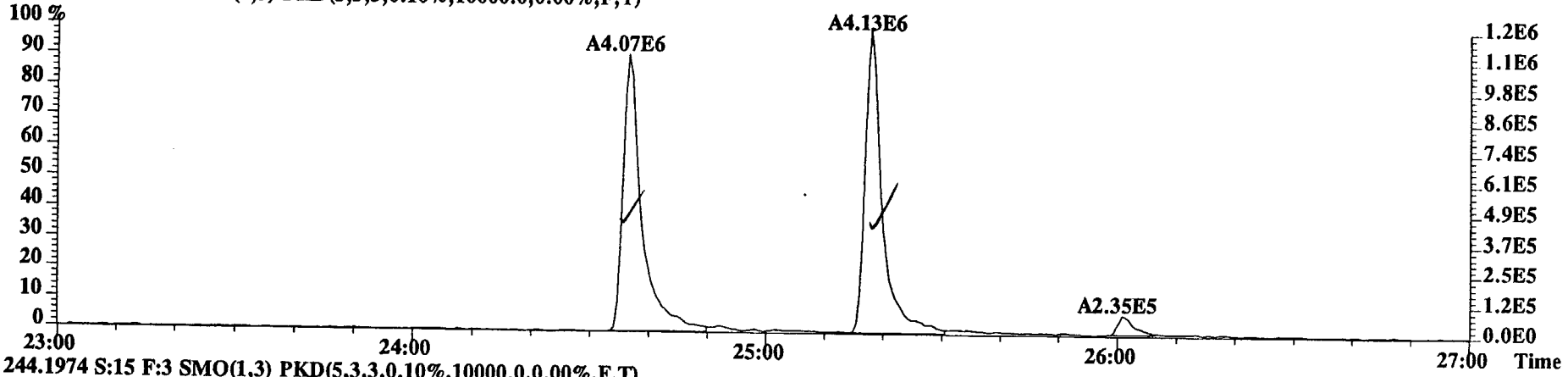
File:30OC98V4 #1-640 Acq:31-OCT-1998 04:11:55 GC EI+ Voltage SIR 70SE
Sample#15 Text:301802-12 :10X DIL. : : : Exp:PAHAIR
204.9888 S:15 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



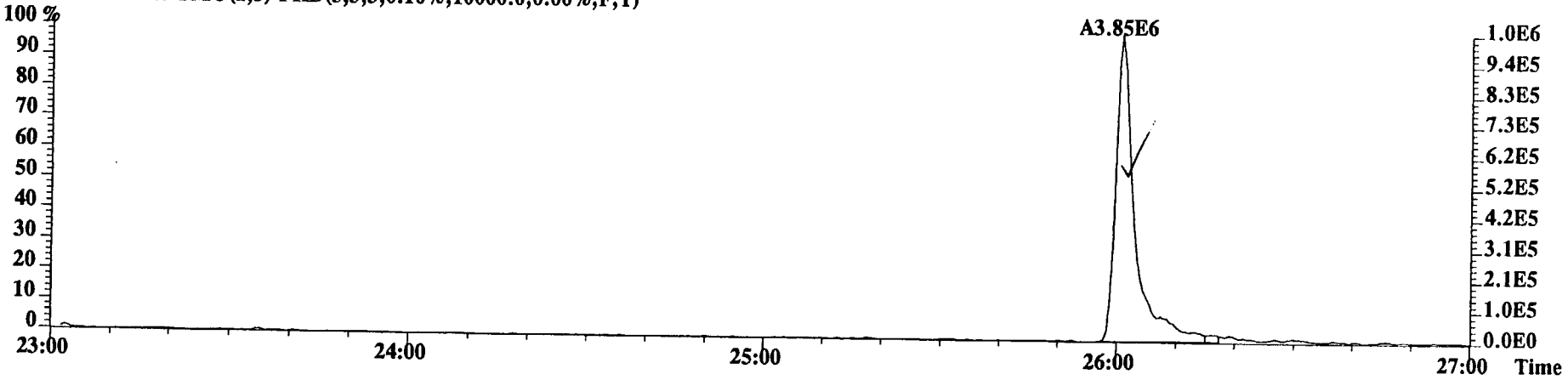
File:30OC98V4 #1-939 Acq:31-OCT-1998 04:11:55 GC EI+ Voltage SIR 70SE
Sample#15 Text:301802-12 :10X DIL. : : : Exp:PAHAIR
202.0782 S:15 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



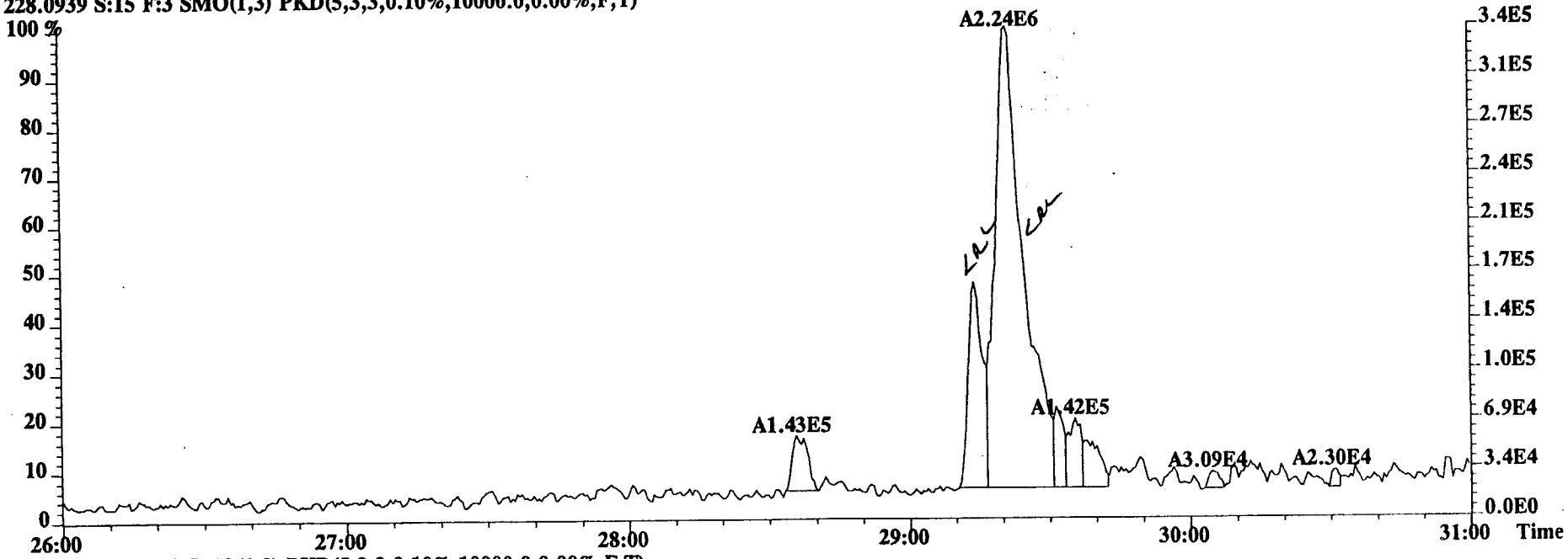
212.1410 S:15 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



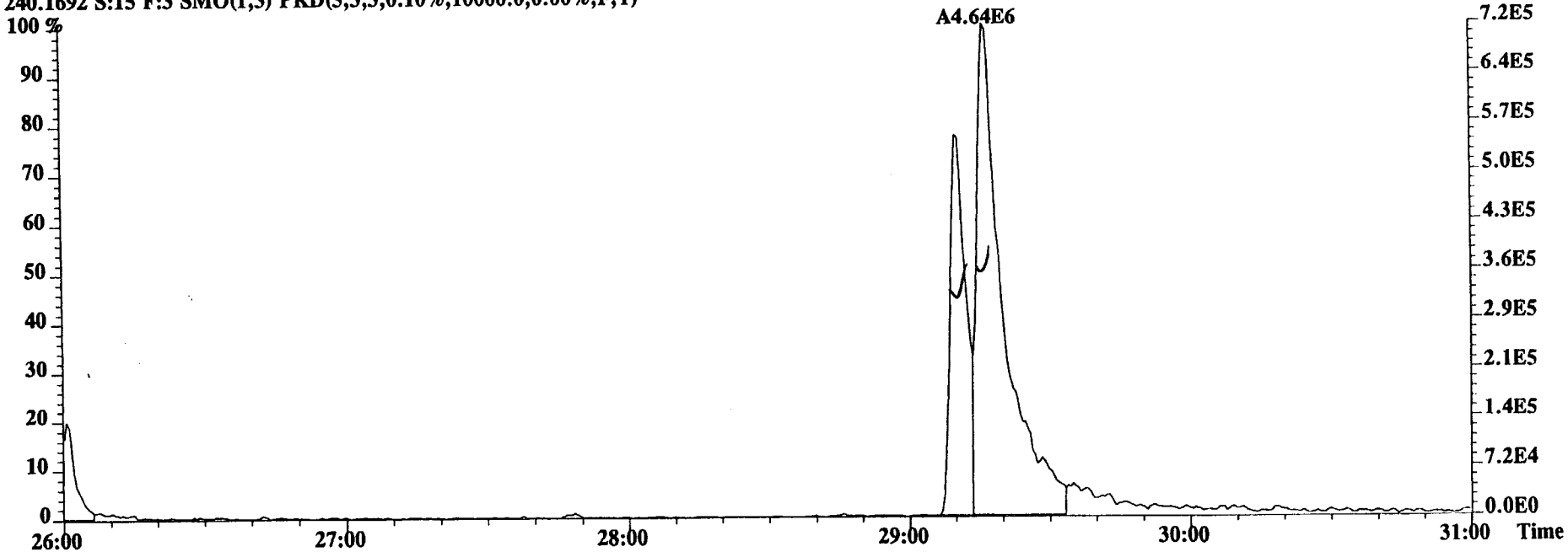
244.1974 S:15 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



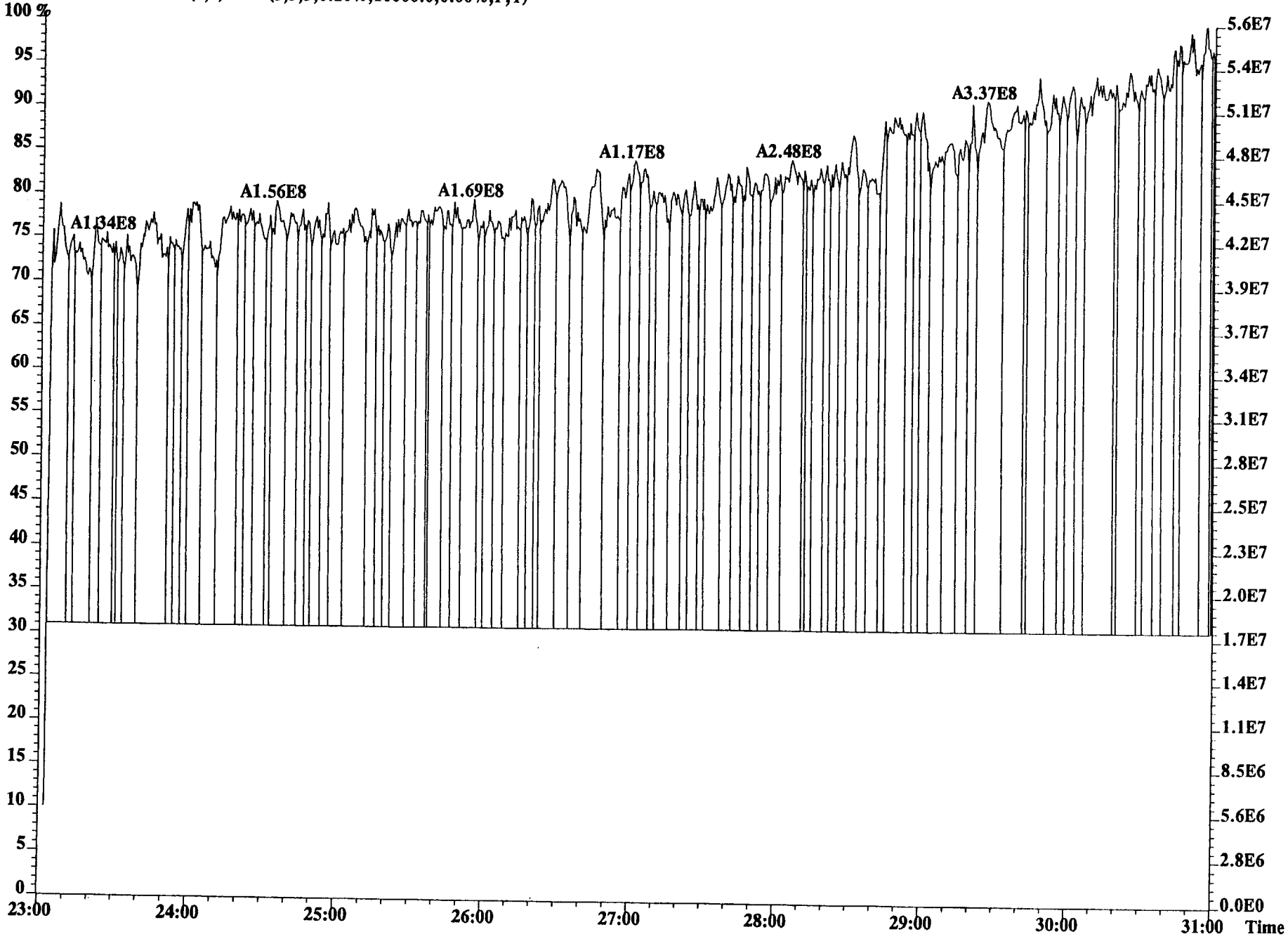
File:30OC98V4 #1-939 Acq:31-OCT-1998 04:11:55 GC EI+ Voltage SIR 70SE
Sample#15 Text:301802-12 :10X DIL. : : : Exp:PAHAIR
228.0939 S:15 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



240.1692 S:15 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

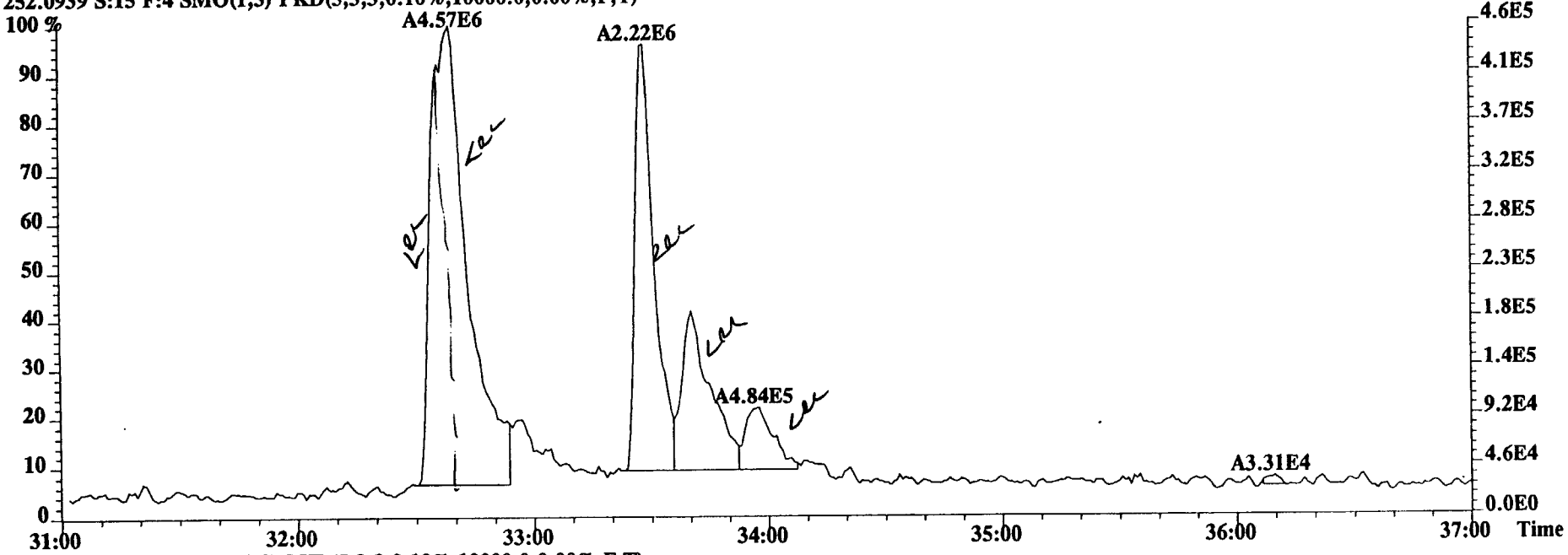


File:30OC98V4 #1-939 Acq:31-OCT-1998 04:11:55 GC EI+ Voltage SIR 70SE
Sample#15 Text:301802-12 :10X DIL. : : : Exp:PAHAIR
230.9856 S:15 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

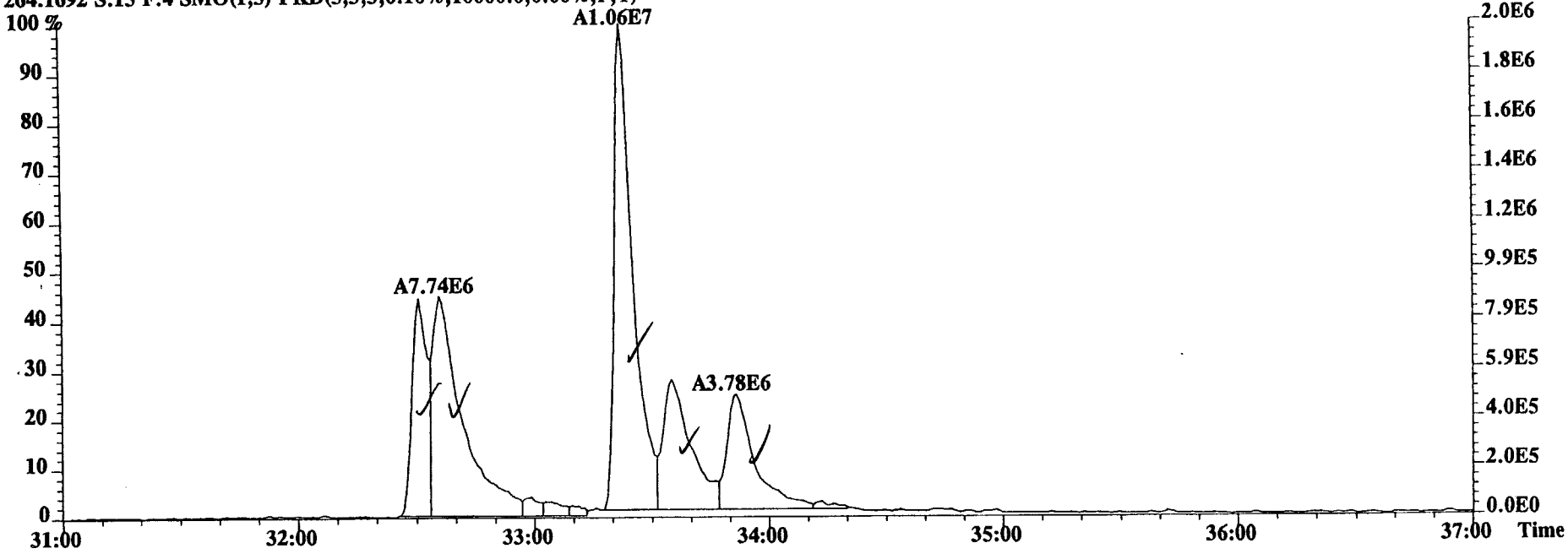


401

File:30OC98V4 #1-878 Acq:31-OCT-1998 04:11:55 GC EI+ Voltage SIR 70SE
Sample#15 Text:301802-12 :10X DIL. : : : Exp:PAHAIR
252.0939 S:15 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

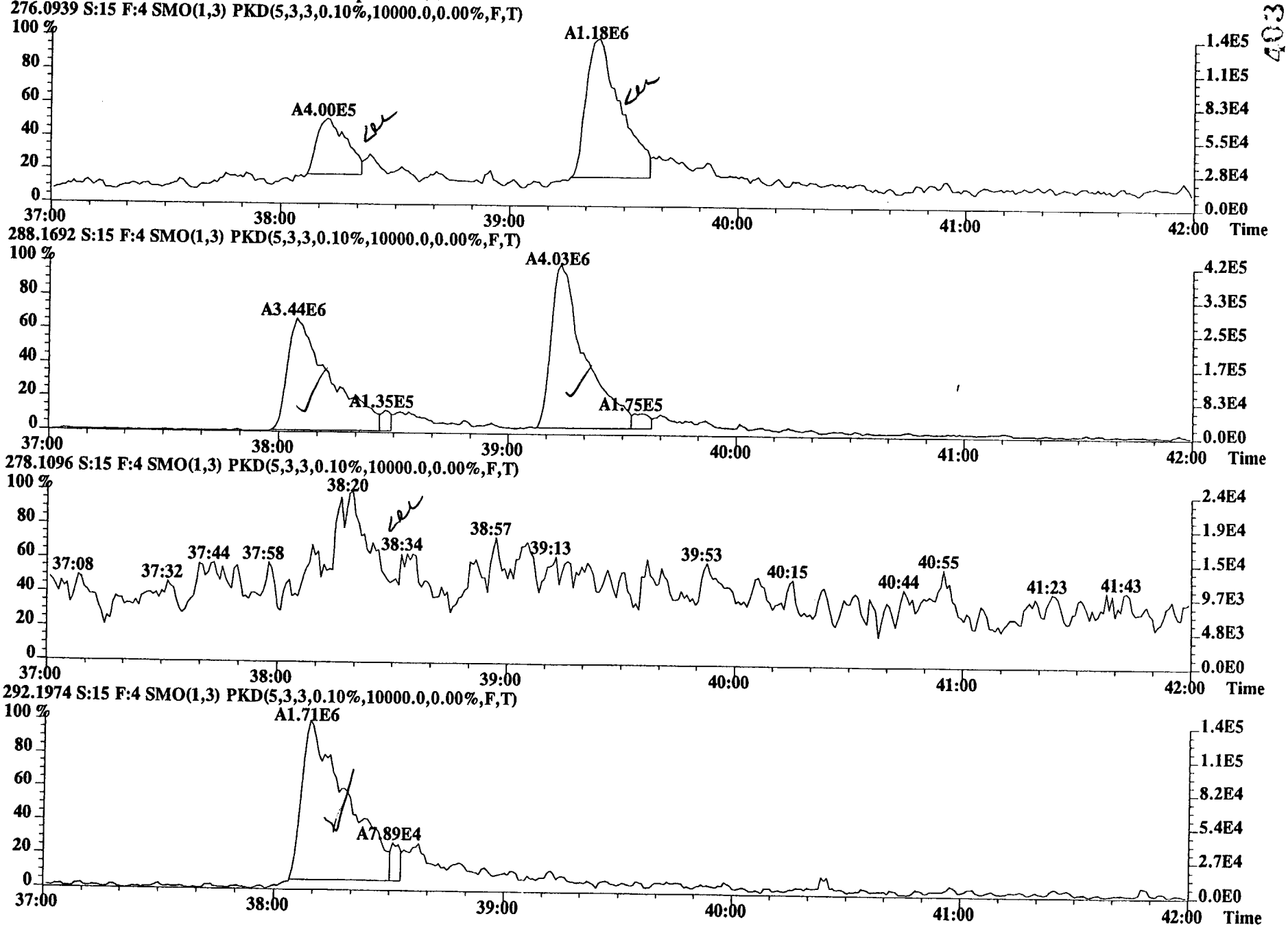


264.1692 S:15 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



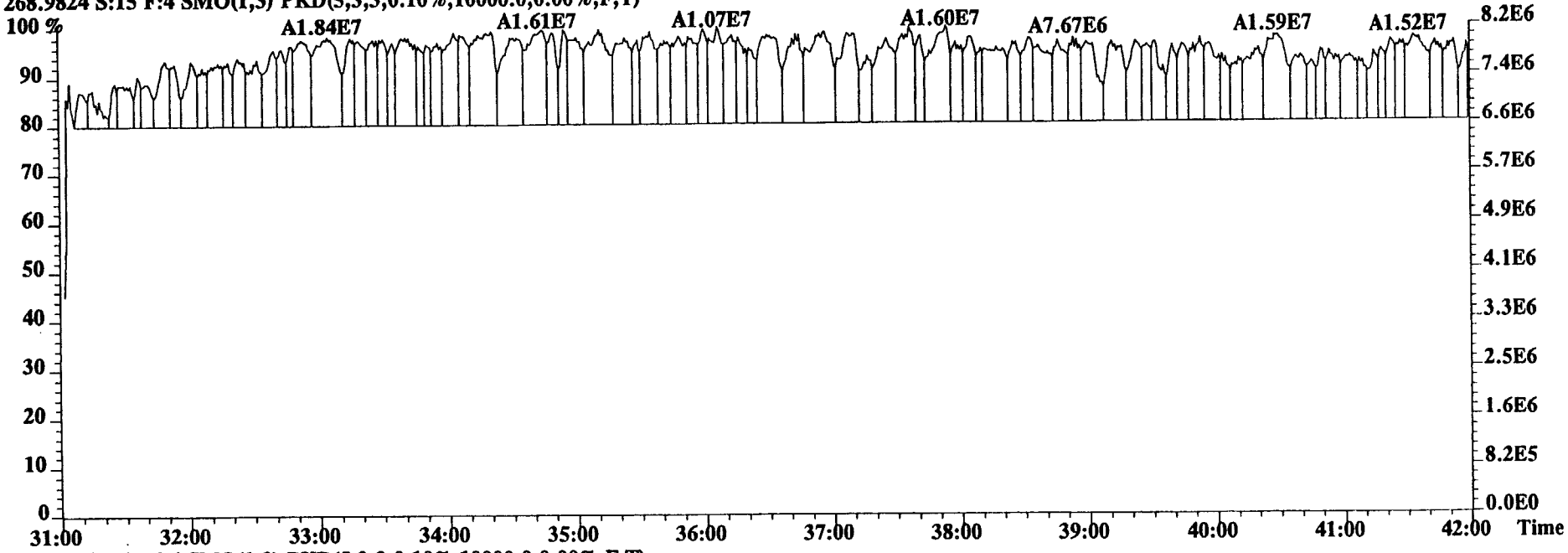
402

File:30OC98V4 #1-878 Acq:31-OCT-1998 04:11:55 GC EI+ Voltage SIR 70SE
Sample#15 Text:301802-12 :10X DIL. : : : Exp:PAHAIR

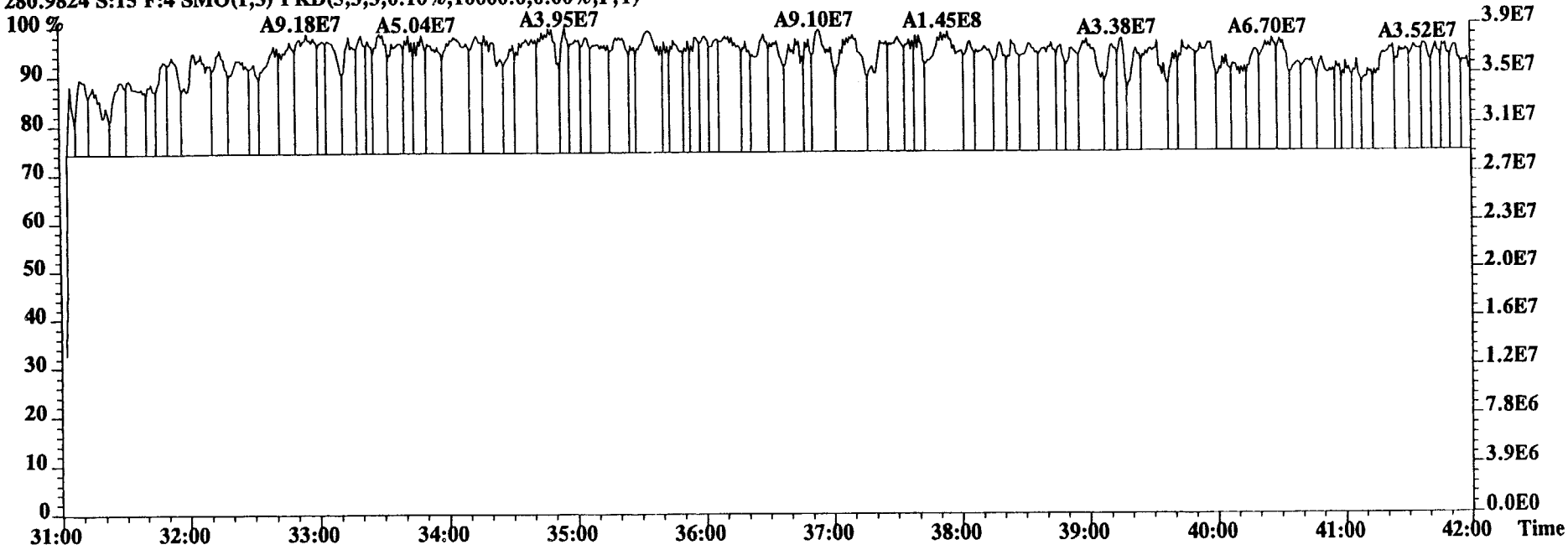


403

File:30OC98V4 #1-878 Acq:31-OCT-1998 04:11:55 GC EI+ Voltage SIR 70SE
Sample#15 Text:301802-12 :10X DIL. : : : Exp:PAHAIR
268.9824 S:15 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



280.9824 S:15 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



POLYNUCLEAR AROMATIC HYDROCARBONS
HIGH RESOLUTION GC/MS
Method HRGC/HRMS

Client Name: Pacific Environmental Services
Client ID: A-U-429-FB
Lab ID: 301802-0013-SA
Matrix: AIRTRAIN Sampled: 25 SEP 98 Received: 29 SEP 98
Authorized: 29 SEP 98 Prepared: 03 OCT 98 Analyzed: 31 OCT 98
Dilution Factor: 1.0

Parameter	Result	Units	Reporting Limit	Data Qualifiers
Naphthalene	980	ng/sample	--	B
2-Methylnaphthalene	ND	ng/sample	100	
Acenaphthylene	ND	ng/sample	100	
Acenaphthene	ND	ng/sample	100	
Fluorene	ND	ng/sample	100	
Phenanthrene	120	ng/sample	--	B
Anthracene	ND	ng/sample	100	
Fluoranthene	ND	ng/sample	100	
Pyrene	ND	ng/sample	100	
Benzo(a)anthracene	ND	ng/sample	100	
Chrysene	ND	ng/sample	100	
Benzo(b)fluoranthene	ND	ng/sample	100	
Benzo(k)fluoranthene	ND	ng/sample	100	
Benzo(e)pyrene	ND	ng/sample	100	
Benzo(a)pyrene	ND	ng/sample	100	
Perylene	ND	ng/sample	100	
Indeno(1,2,3-cd)pyrene	ND	ng/sample	100	
Dibenz(a,h)anthracene	ND	ng/sample	100	
Benzo(g,h,i)perylene	ND	ng/sample	100	

B = Compound is also detected in the blank.
ND = Not Detected

Reported By: Clark Pickell Approved By: Eric Redman

The cover letter is an integral part of this report.
Rev 230787

POLYNUCLEAR AROMATIC HYDROCARBONS
HIGH RESOLUTION GC/MS
Method HRGC/HRMS
(cont.)

Client Name: Pacific Environmental Services
Client ID: A-U-429-FB
Lab ID: 301802-0013-SA
Matrix: AIRTRAIN
Authorized: 29 SEP 98
Dilution Factor: 1.0

Sampled: 25 SEP 98
Prepared: 03 OCT 98

Received: 29 SEP 98
Analyzed: 31 OCT 98

Internal Standards	% Recovery	
Naphthalene-d8	48	m
Acenaphthylene-d8	63	
Acenaphthene-d10	66	
Fluorene-d10	64	
Phenanthrene-d10	67	
Fluoranthene-d10	83	
Pyrene-d10	80	
Benzo(a)anthracene-d12	61	
Perylene-d12	57	
Indeno(123-cd)pyrene-d12	73	
Chrysene-d12	106	
Benzo(b)fluoranthene-d12	81	
Benzo(k)fluoranthene-d12	89	
Benzo(a)pyrene-d12	65	
Dibenz(a,h)anthracene-d14	77	
Benzo(g,h,i)perylene-d12	73	

Field Surrogates	% Recovery
13C-Fluorene	98

m = Internal Standard recovery is outside method recovery goal.

Reported By: Clark Pickell

Approved By: Eric Redman

The cover letter is an integral part of this report.
Rev 230787

POLYNUCLEAR AROMATIC HYDROCARBONS
HIGH RESOLUTION GC/MS
Method HRGC/HRMS

Client Name: Pacific Environmental Services
Client ID: A-429-LB
Lab ID: 301802-0014-SA
Matrix: AIRTRAIN Sampled: 21 SEP 98 Received: 29 SEP 98
Authorized: 29 SEP 98 Prepared: 03 OCT 98 Analyzed: 31 OCT 98
Dilution Factor: 1.0

Parameter	Result	Units	Reporting Limit	Data Qualifiers
Naphthalene	840	ng/sample	--	B
2-Methylnaphthalene	ND	ng/sample	100	
Acenaphthylene	ND	ng/sample	100	
Acenaphthene	ND	ng/sample	100	
Fluorene	ND	ng/sample	100	
Phenanthrene	ND	ng/sample	100	
Anthracene	ND	ng/sample	100	
Fluoranthene	ND	ng/sample	100	
Pyrene	ND	ng/sample	100	
Benzo(a)anthracene	ND	ng/sample	100	
Chrysene	ND	ng/sample	100	
Benzo(b)fluoranthene	ND	ng/sample	100	
Benzo(k)fluoranthene	ND	ng/sample	100	
Benzo(e)pyrene	ND	ng/sample	100	
Benzo(a)pyrene	ND	ng/sample	100	
Perylene	ND	ng/sample	100	
Indeno(1,2,3-cd)pyrene	ND	ng/sample	100	
Dibenz(a,h)anthracene	ND	ng/sample	100	
Benzo(g,h,i)perylene	ND	ng/sample	100	

B = Compound is also detected in the blank.
ND = Not Detected

Reported By: Clark Pickell Approved By: Eric Redman

The cover letter is an integral part of this report.
Rev 230787

POLYNUCLEAR AROMATIC HYDROCARBONS
HIGH RESOLUTION GC/MS
Method HRGC/HRMS
(cont.)

Client Name: Pacific Environmental Services
Client ID: A-429-LB
Lab ID: 301802-0014-SA
Matrix: AIRTRAIN
Authorized: 29 SEP 98
Dilution Factor: 1.0

Sampled: 21 SEP 98
Prepared: 03 OCT 98

Received: 29 SEP 98
Analyzed: 31 OCT 98

Internal Standards	% Recovery
Naphthalene-d8	52
Acenaphthylene-d8	51
Acenaphthene-d10	57
Fluorene-d10	69
Phenanthrene-d10	77
Fluoranthene-d10	84
Pyrene-d10	82
Benzo(a)anthracene-d12	56
Perylene-d12	61
Indeno(123-cd)pyrene-d12	64
Chrysene-d12	106
Benzo(b)fluoranthene-d12	76
Benzo(k)fluoranthene-d12	87
Benzo(a)pyrene-d12	65
Dibenz(a,h)anthracene-d14	60
Benzo(g,h,i)perylene-d12	64

Field Surrogates	% Recovery
13C-Fluorene	101

Reported By: Clark Pickell

Approved By: Eric Redman

The cover letter is an integral part of this report.
Rev 230787

04-NOV-1998 06:31:30 PM Dioxin Furan Unknown RESULTS

Mass Spec : VG-4
GC Column : DB-5
Data file : 30OC98V4
Weight : 0.5

Results : 30OC98V4161.RES : PAHAIR.TRG
Date analyzed : 30-OCT-98
301802-13 :10X DIL. : : : Ex Cal : PAHAIR102998V4.R

Name	Total Response	Isotope Ratio	R. T. mm:ss	RRF	pg/ SAMP	Rec/ MDL
d10-2-Methylnaphthalene	6982280	1.00 Y	12: 28 Y	1.00	50.00	
d8-Naphthalene	7543540	1.00 Y	10: 12 Y	2.24	24.11	48 m
Naphthalene	90182800	1.00 Y	10: 16 Y	1.23	975.83	B
2-Methylnaphthalene	3341280	1.00 Y	12: 34 Y	0.56	<RL=100.00	
d8-Acenaphthylene	5337120	1.00 Y	15: 29 Y	1.21	31.49	63
Acenaphthylene	776366	1.00 Y	15: 31 Y	0.94	<RL=100.00	
d10-Acenaphthene	3454280	1.00 Y	16: 2 Y	0.74	33.22	66
Acenaphthene	3103040	1.00 Y	16: 9 Y	1.25	<RL=100.00	
d10-Anthracene	4145120	1.00 Y	20: 56 Y	1.00	50.00	
d10-Fluorene	3760600	1.00 Y	17: 42 Y	1.42	31.93	64
Fluorene	1032322	1.00 Y	17: 48 Y	1.16	<RL=100.00	
d10-Phenanthrene	7745400	1.00 Y	20: 46 Y	2.81	33.28	67
Phenanthrene	8542160	1.00 Y	20: 51 Y	0.89	123.29	B
Anthracene	* No Peak	0.00 N	21: 0 N	0.80	<RL=100.00	
d14-Terphenyl	8371620	1.00 Y	26: 1 Y	1.00	50.00	
d10-Fluoranthene	9841480	1.00 Y	24: 37 Y	1.41	41.67	83
Fluoranthene	5822140	1.00 Y	24: 40 Y	1.11	<RL=100.00	
d10-Pyrene	10117500	1.00 Y	25: 18 Y	1.52	39.80	80
Pyrene	3920480	1.00 Y	25: 21 Y	1.21	<RL=100.00	
d12-Benzo(a)anthracene	4606660	1.00 Y	29: 10 Y	0.90	30.57	61
Benzo(a)anthracene	470572	1.00 Y	29: 15 Y	1.20	<RL=100.00	
d12-Chrysene	11376840	1.00 Y	29: 16 Y	1.28	53.12	106
Chrysene	1856788	1.00 Y	29: 21 Y	1.08	<RL=100.00	
d12-Benzo(e)pyrene	24296200	1.00 Y	33: 22 Y	1.00	50.00	
d12-Benzo(b)fluoranthene	8959640	1.00 Y	32: 30 Y	0.45	40.63	81
Benzo(b)fluoranthene	3841940	1.00 Y	32: 36 Y	1.17	<RL=100.00	
d12-Benzo(k)fluoranthene	20509600	1.00 Y	32: 36 Y	0.95	44.52	89
Benzo(k)fluoranthene	3841940	1.00 Y	32: 39 Y	1.16	<RL=100.00	
d12-Benzo(a)pyrene	10607600	1.00 Y	33: 35 Y	0.68	32.26	65
Benzo(e)pyrene	2017800	1.00 Y	33: 28 Y	1.64	<RL=100.00	
Benzo(a)pyrene	829178	1.00 Y	33: 40 Y	1.07	<RL=100.00	
d12-Perylene	8739940	1.00 Y	33: 52 Y	0.63	28.54	57
Perylene	152913	1.00 Y	33: 56 Y	1.71	<RL=100.00	
d12-Indeno(123-cd)pyrene	7897080	1.00 Y	38: 5 Y	0.44	36.56	73
Indeno(123-cd)pyrene	94214	1.00 Y	38: 10 Y	0.62	<RL=100.00	
d14-Dibenz(ah)anthracene	4576220	1.00 Y	38: 9 Y	0.25	38.31	77
Dibenz(ah)anthracene	* No Peak	0.00 N	38: 15 N	1.40	<RL=100.00	
d12-Benzo(ghi)perylene	10277380	1.00 Y	39: 14 Y	0.58	36.48	73
Benzo(ghi)perylene	1417142	1.00 Y	39: 21 Y	1.02	<RL=100.00	
d10-Fluorene	3760600	1.00 Y	17: 42 Y	1.00	50.00	
13C-Fluorene	2991860	1.00 Y	17: 47 Y	0.81	49.11	98

409

11-4-98

0.5

98V4.RRF
Rec/
MDL

	3491140	3491140
48	3771770	3771770
B	45091400	45091400
100.00	1670640	1670640
63	2668560	2668560
00.00	388183	388183
66	1727140	1727140
00.00	1551520	1551520
	2072560	2072560
64	1880300	1880300
00.00	516161	516161
67	3872700	3872700
B	4271080	4271080
00.00	0	0
	4185810	4185810
83	4920740	4920740
00.00	2911070	2911070
80	5058750	5058750
00.00	1960240	1960240
61	2303330	2303330
00.00	235286	235286
106	5688420	5688420
100.00	928394	928394
	12148100	12148100
81	4479820	4479820
100.00	1920970	1920970
89	10254800	10254800
100.00	1920970	1920970
65	5303800	5303800
100.00	1008900	1008900
100.00	414589	414589
57	4369970	4369970
100.00	76457	76457
73	3948540	3948540
00.00	47107	47107
77	2288110	2288110
00.00	0	0
73	5138690	5138690
00.00	708571	708571

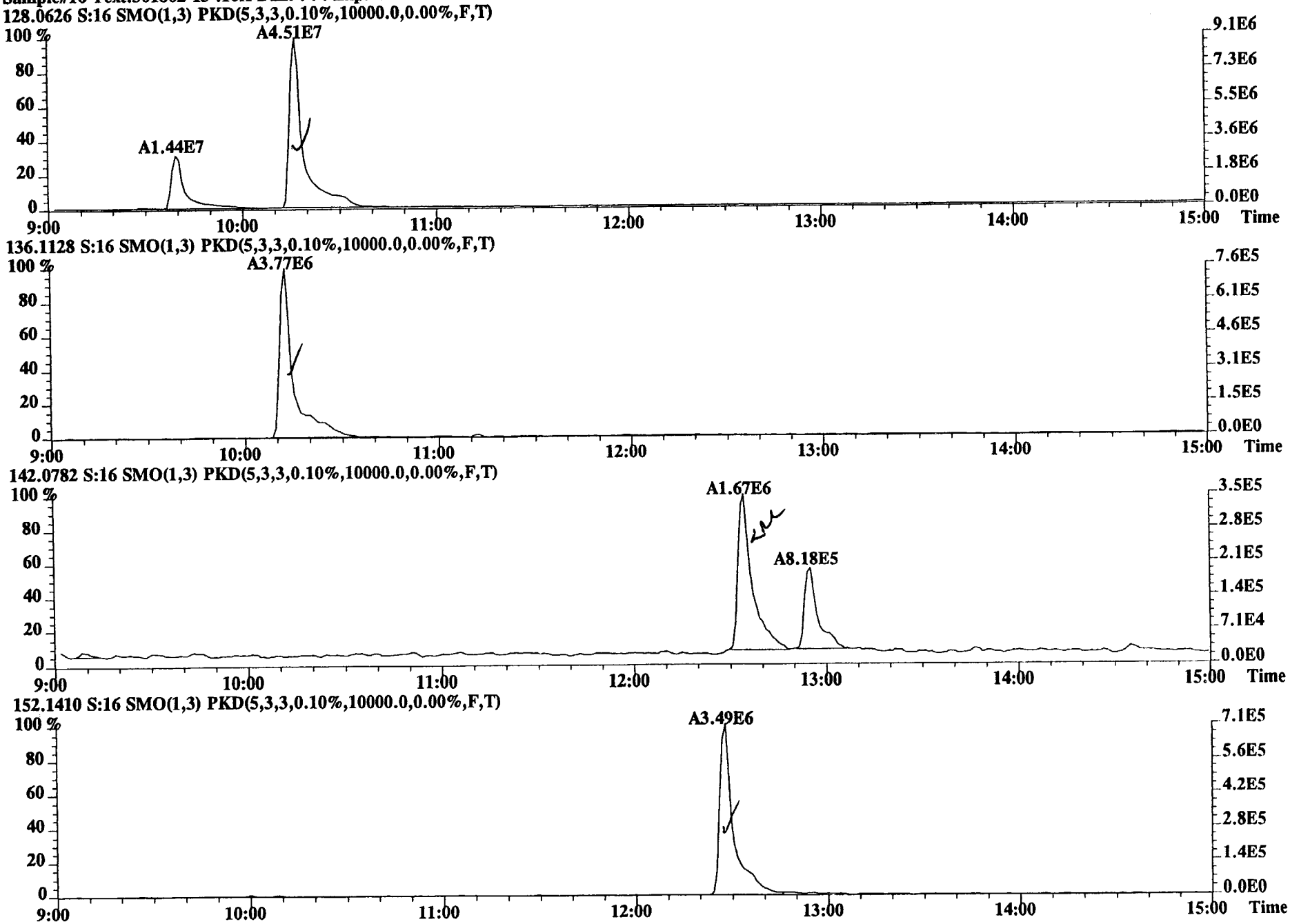
02-NOV-1998 09:15:56 AM Dioxin Furan Unknown RESULTS

Mass Spec : VG-4
GC Column : DB-5
Data file : 30OC98V4
Weight : 0.5

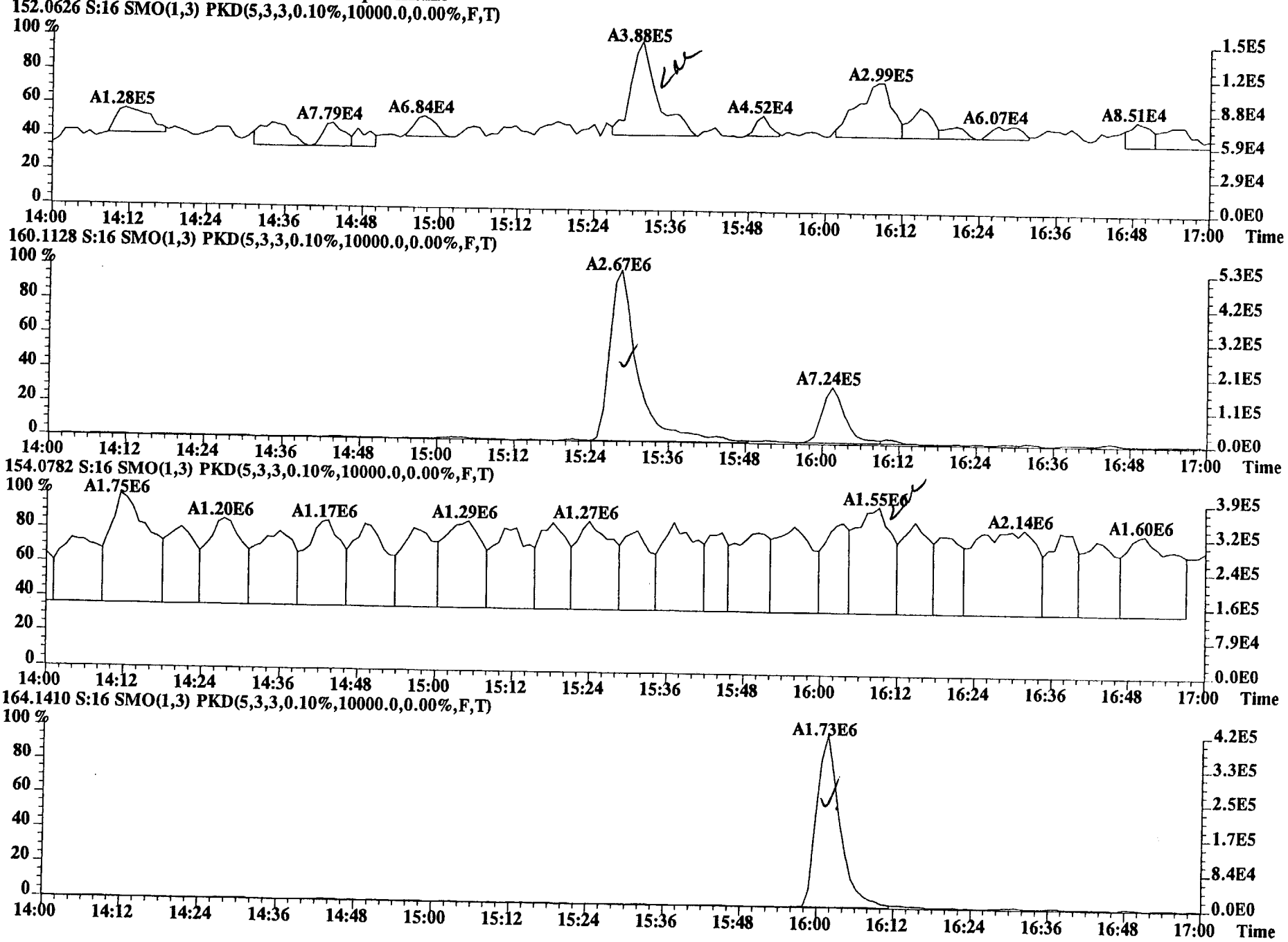
Results : 30OC98V4161.RES : PAHAIR.TRG
Date analyzed : 30-OCT-98
301802-13 :10X DIL. : : : Ex Cal : PAHAIR102998V4.R

Name	Total Response	Isotope Ratio	R. T. mm:ss	RRF	pg/ SAMP	Rec/ MDL
d10-2-Methylnaphthalene	6982280	1.00 Y	12: 28 Y	1.00	50.00	
d8-Naphthalene	7543540	1.00 Y	10: 12 Y	2.24	24.11	48
Naphthalene	90182800	1.00 Y	10: 16 Y	1.23	975.83	0.000
2-Methylnaphthalene	3341280	1.00 Y	12: 34 Y	0.56	79.02	0.000
d8-Acenaphthylene	5337120	1.00 Y	15: 29 Y	1.21	31.49	63
Acenaphthylene	776366	1.00 Y	15: 31 Y	0.94	15.41	0.000
d10-Acenaphthene	3454280	1.00 Y	16: 2 Y	0.74	33.22	66
Acenaphthene	3103040	1.00 Y	16: 9 Y	1.25	72.09	0.000
d10-Anthracene	4145120	1.00 Y	20: 56 Y	1.00	50.00	
d10-Fluorene	3760600	1.00 Y	17: 42 Y	1.42	31.93	64
Fluorene	1032322	1.00 Y	17: 48 Y	1.16	23.65	0.000
d10-Phenanthrene	7745400	1.00 Y	20: 46 Y	2.81	33.28	67
Phenanthrene	8542160	1.00 Y	20: 51 Y	0.89	123.29	0.000
Anthracene	* No Peak	0.00 N	21: 0 N	0.80	0.00	0.000
d14-Terphenyl	8371620	1.00 Y	26: 1 Y	1.00	50.00	
d10-Fluoranthene	9841480	1.00 Y	24: 37 Y	1.41	41.67	83
Fluoranthene	5822140	1.00 Y	24: 40 Y	1.11	53.21	0.000
d10-Pyrene	10117500	1.00 Y	25: 18 Y	1.52	39.80	80
Pyrene	3920480	1.00 Y	25: 21 Y	1.21	32.16	0.000
d12-Benzo(a)anthracene	4606660	1.00 Y	29: 10 Y	0.90	30.57	61
Benzo(a)anthracene	470572	1.00 Y	29: 15 Y	1.20	8.48	0.000
d12-Chrysene	11376840	1.00 Y	29: 16 Y	1.28	53.12	106
Chrysene	1856788	1.00 Y	29: 21 Y	1.08	15.06	0.000
d12-Benzo(e)pyrene	24296200	1.00 Y	33: 22 Y	1.00	50.00	
d12-Benzo(b)fluoranthene	8959640	1.00 Y	32: 30 Y	0.45	40.63	81
Benzo(b)fluoranthene	3841940	1.00 Y	32: 36 Y	1.17	36.74	0.000
d12-Benzo(k)fluoranthene	20509600	1.00 Y	32: 36 Y	0.95	44.52	89
Benzo(k)fluoranthene	3841940	1.00 Y	32: 36 Y	1.16	16.09	0.000
d12-Benzo(a)pyrene	10607600	1.00 Y	33: 35 Y	0.68	32.26	65
Benzo(e)pyrene	2017800	1.00 Y	33: 28 Y	1.64	11.59	0.000
Benzo(a)pyrene	829178	1.00 Y	33: 40 Y	1.07	7.29	0.000
d12-Perylene	8739940	1.00 Y	33: 52 Y	0.63	28.54	57
Perylene	152913	1.00 Y	33: 56 Y	1.71	1.02	0.000
d12-Indeno(123-cd)pyrene	7897080	1.00 Y	38: 5 Y	0.44	36.56	73
Indeno(123-cd)pyrene	94214	1.00 Y	38: 10 Y	0.62	1.92	0.000
d14-Dibenz(ah)anthracene	4576220	1.00 Y	38: 9 Y	0.25	38.31	77
Dibenz(ah)anthracene	* No Peak	0.00 N	38: 15 N	1.40	0.00	0.000
d12-Benzo(ghi)perylene	10277380	1.00 Y	39: 14 Y	0.58	36.48	73
Benzo(ghi)perylene	1417142	1.00 Y	39: 21 Y	1.02	13.57	0.000
d10-Fluorene	3760600	1.00 Y	17: 42 Y	1.42	5.45	11
13C-Fluorene	2991860	1.00 Y	17: 47 Y	1.00	79.56	0.000

File:30OC98V4 #1-510 Acq:31-OCT-1998 05:00:59 GC EI+ Voltage SIR 70SE
Sample#16 Text:301802-13 :10X DIL. : : : Exp:PAHAIR

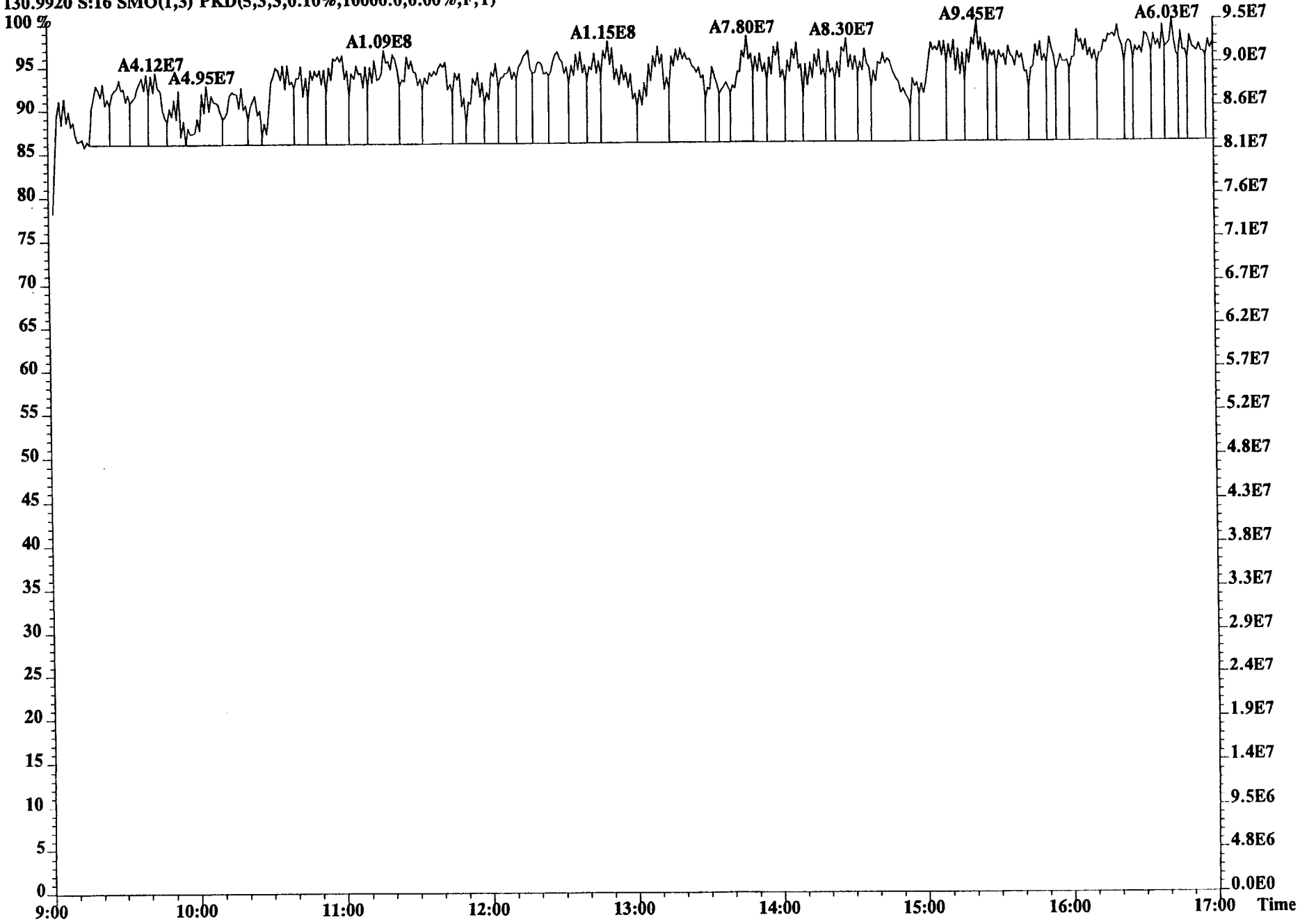


File:30OC98V4 #1-510 Acq:31-OCT-1998 05:00:59 GC EI+ Voltage SIR 70SE
Sample#16 Text:301802-13 :10X DIL. : : : Exp:PAHAIR

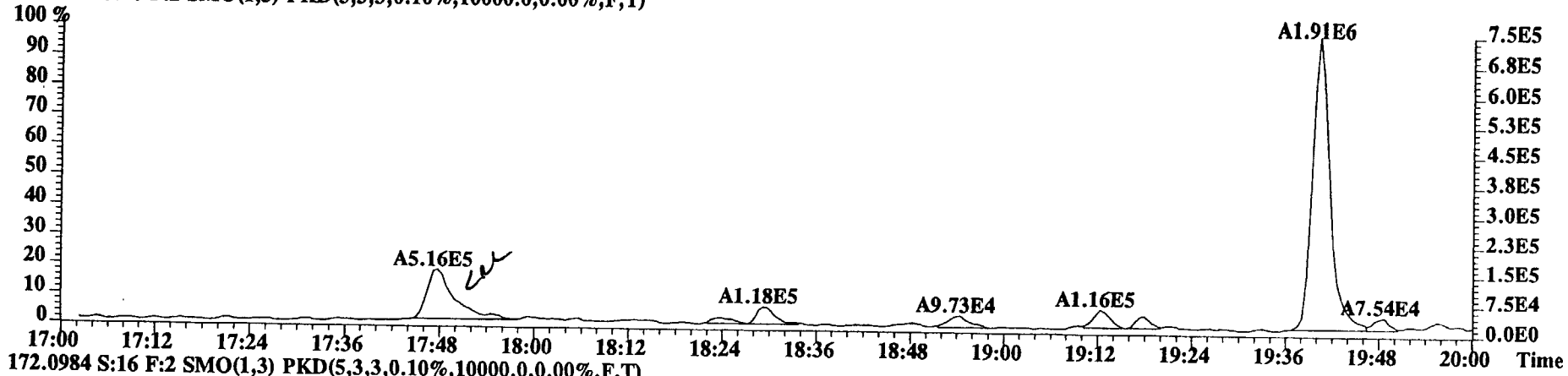


433

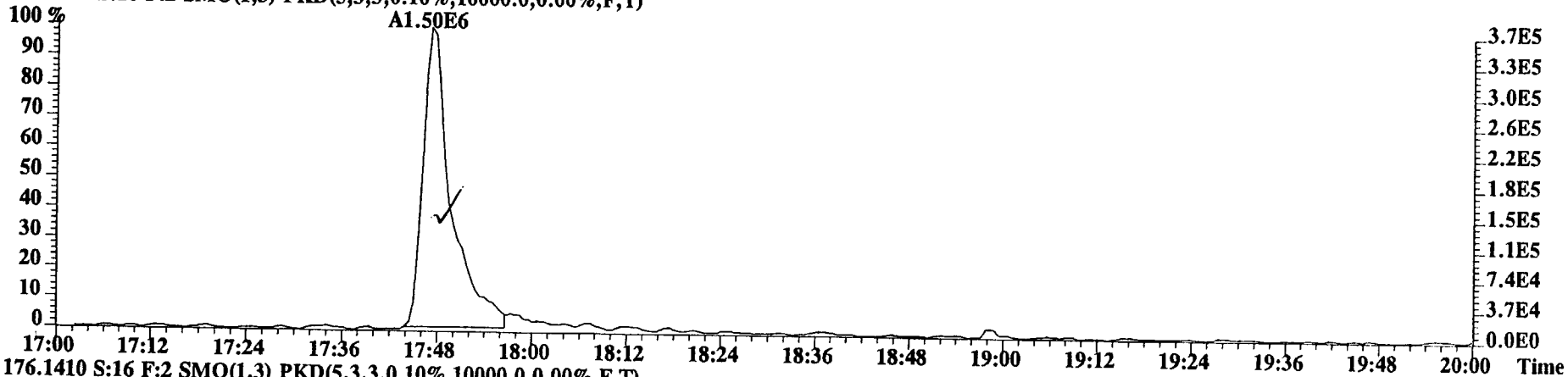
File:30OC98V4 #1-510 Acq:31-OCT-1998 05:00:59 GC EI+ Voltage SIR 70SE
Sample#16 Text:301802-13 :10X DIL. : : : Exp:PAHAIR
130.9920 S:16 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



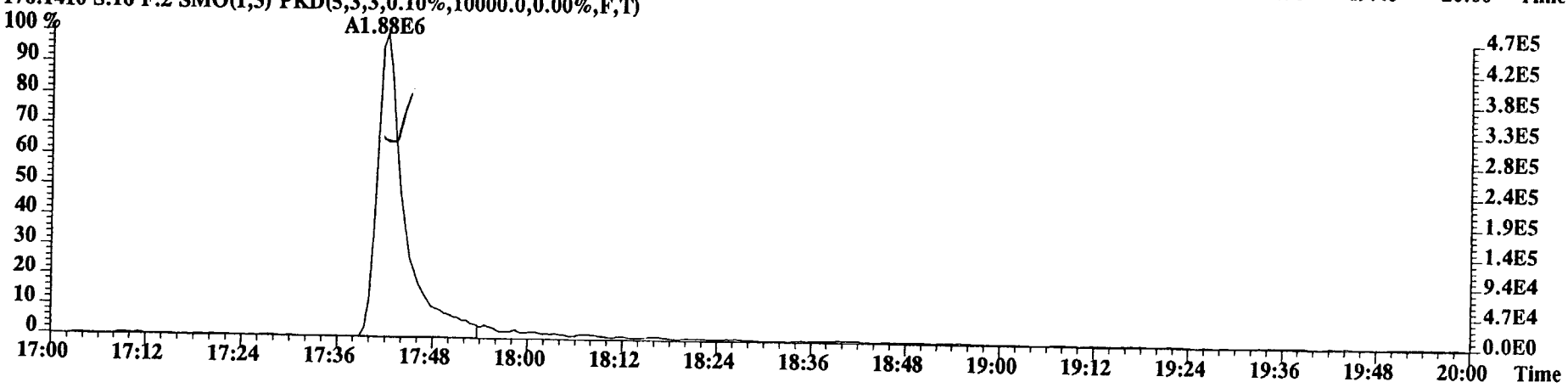
File:30OC98V4 #1-640 Acq:31-OCT-1998 05:00:59 GC EI+ Voltage SIR 70SE
Sample#16 Text:301802-13 :10X DIL. : : : Exp:PAHAIR
166.0798 S:16 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



172.0984 S:16 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

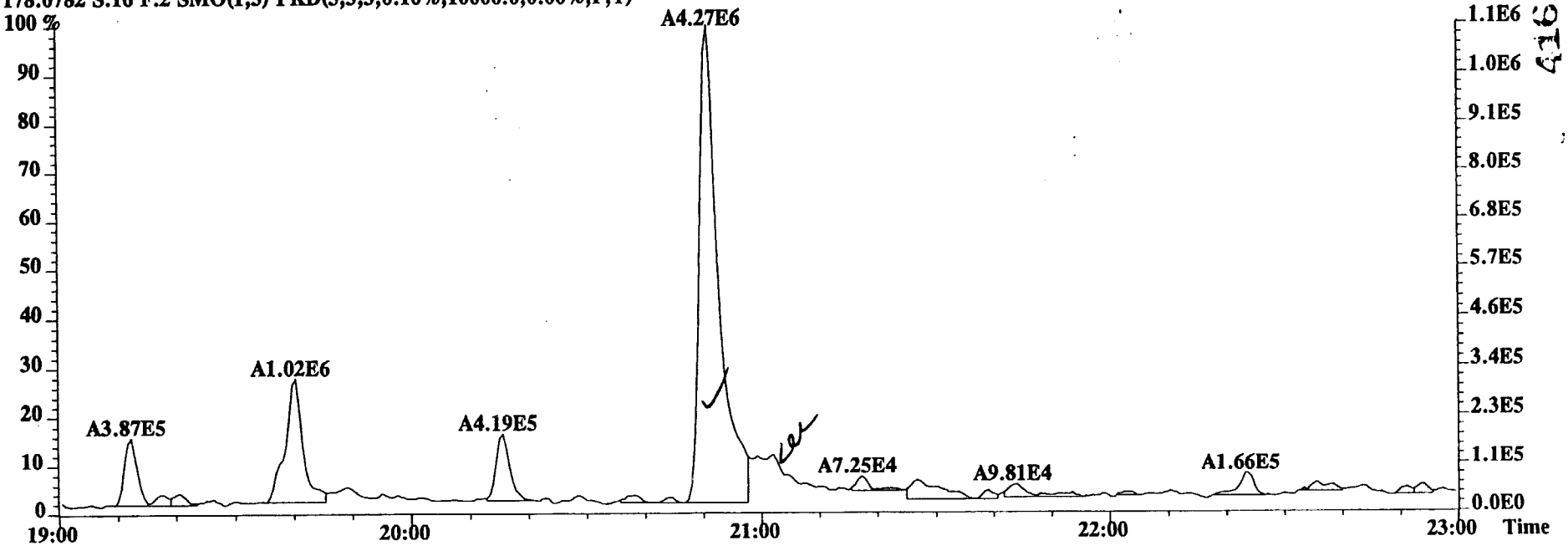


176.1410 S:16 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

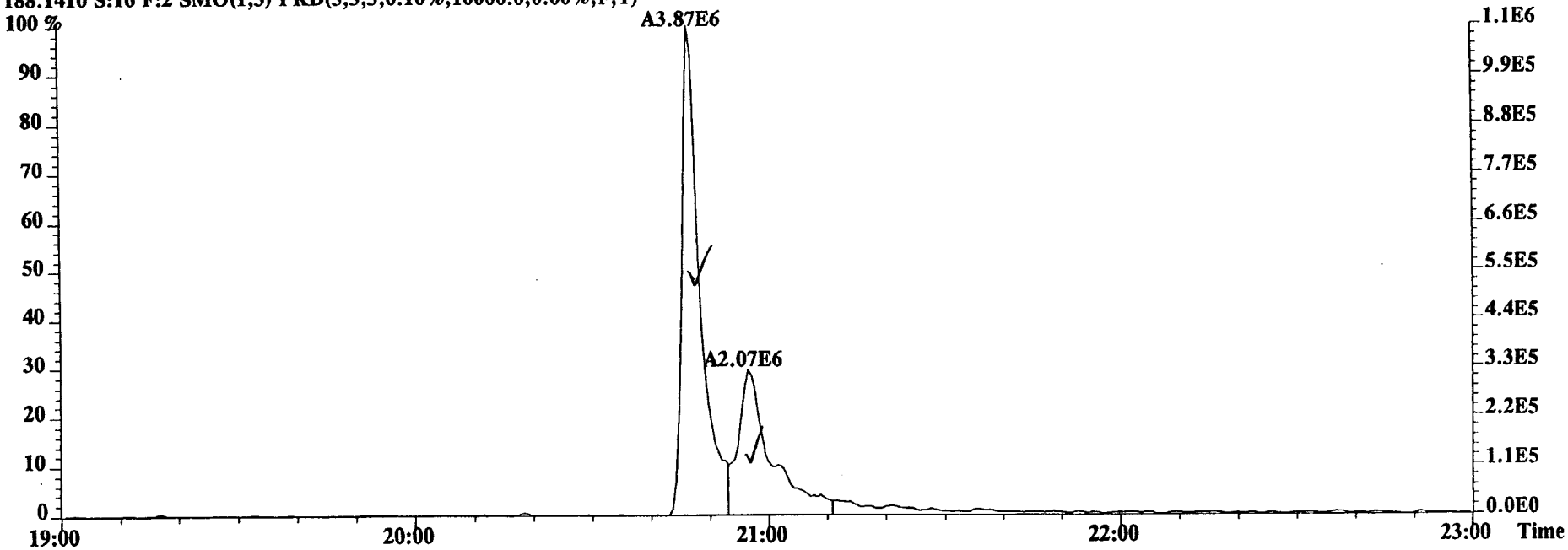


435

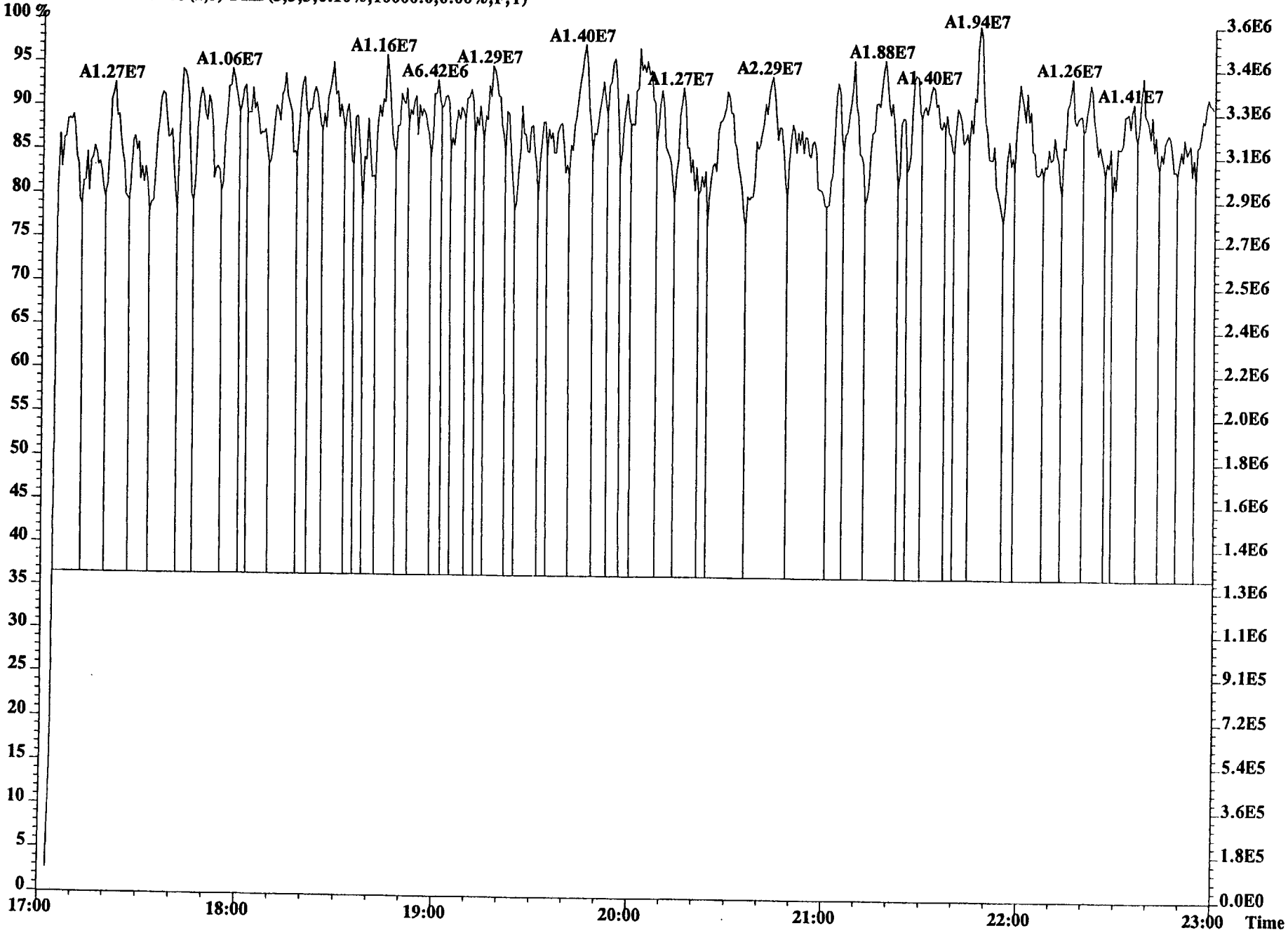
File:30OC98V4 #1-640 Acq:31-OCT-1998 05:00:59 GC EI+ Voltage SIR 70SE
Sample#16 Text:301802-13 :10X DIL. : : : Exp:PAHAIR
178.0782 S:16 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



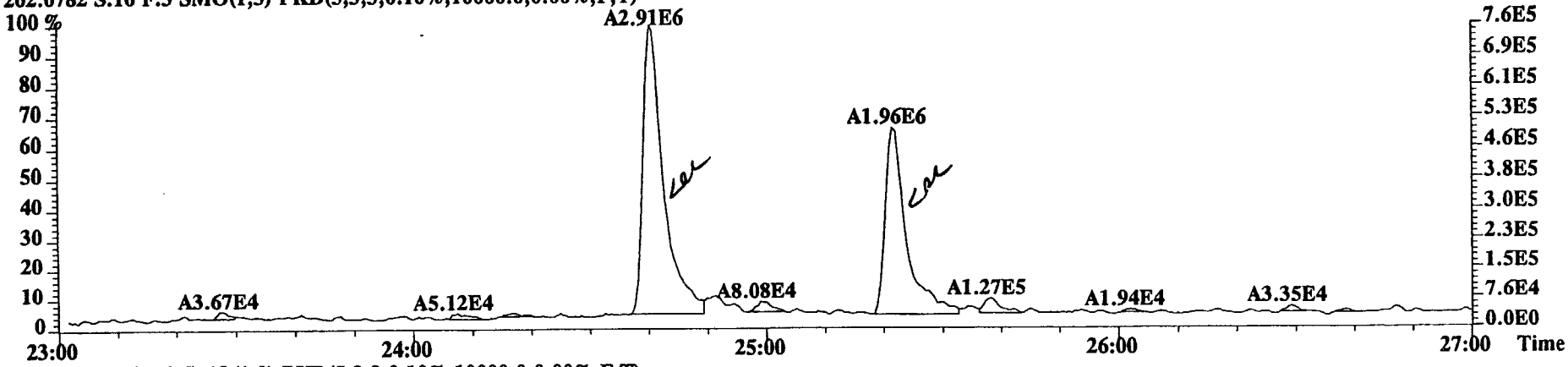
188.1410 S:16 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



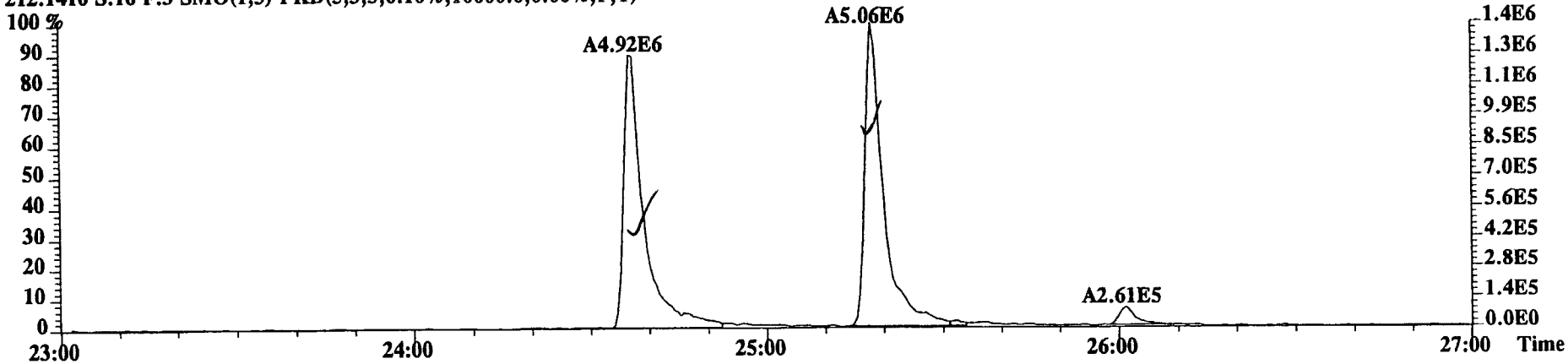
File:30OC98V4 #1-640 Acq:31-OCT-1998 05:00:59 GC EI+ Voltage SIR 70SE
Sample#16 Text:301802-13 :10X DIL. : : : Exp:PAHAIR
204.9888 S:16 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



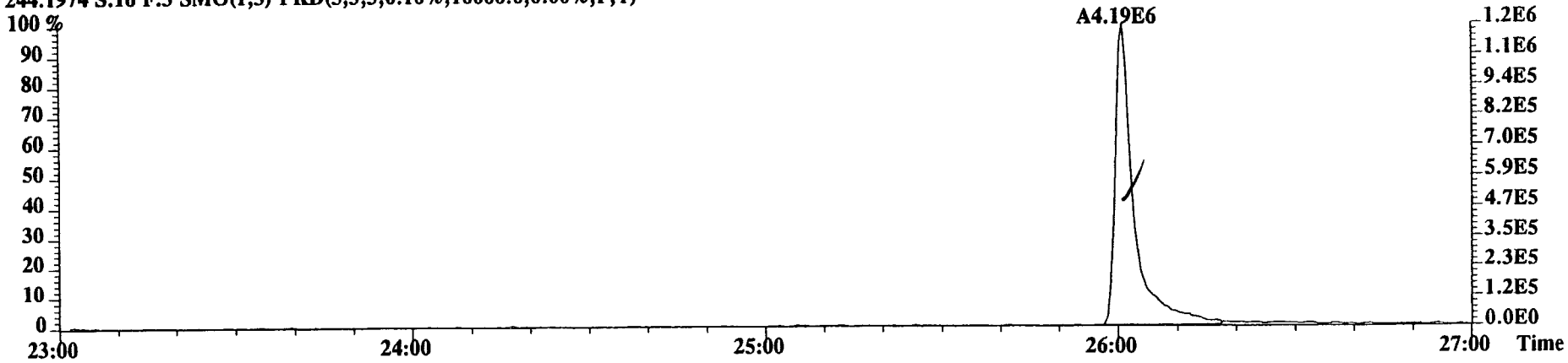
File:30OC98V4 #1-939 Acq:31-OCT-1998 05:00:59 GC EI+ Voltage SIR 70SE
Sample#16 Text:301802-13 :10X DIL. : : : Exp:PAHAIR
202.0782 S:16 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



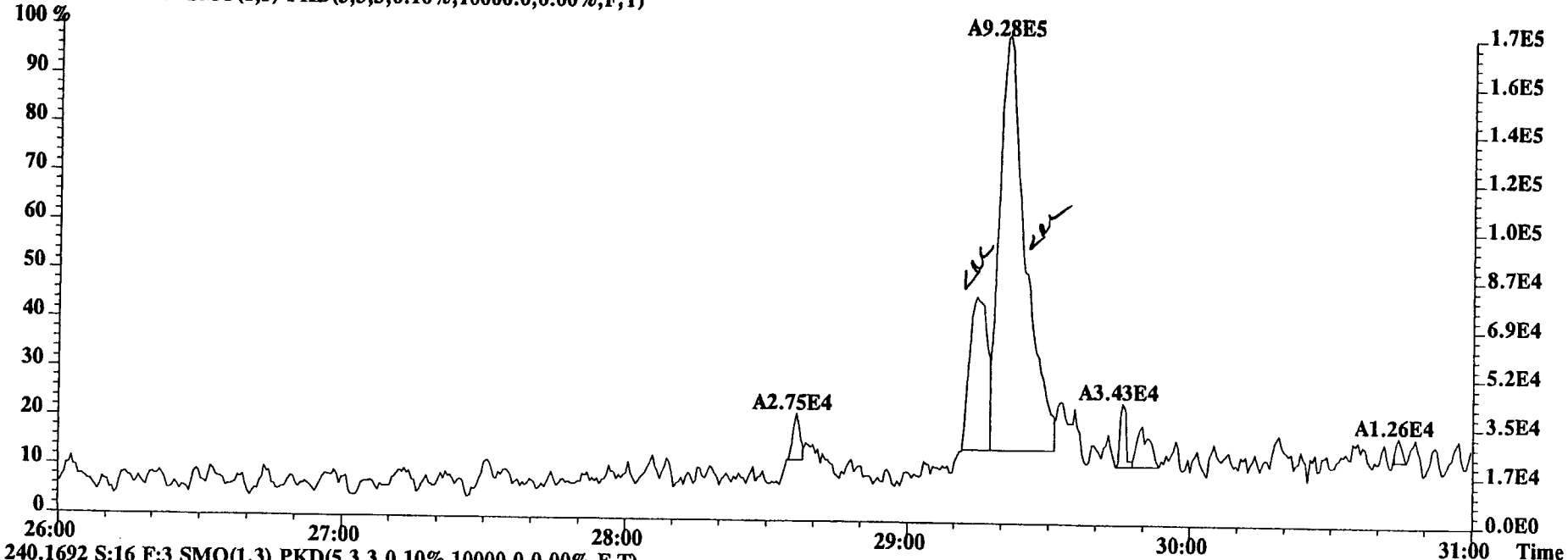
212.1410 S:16 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



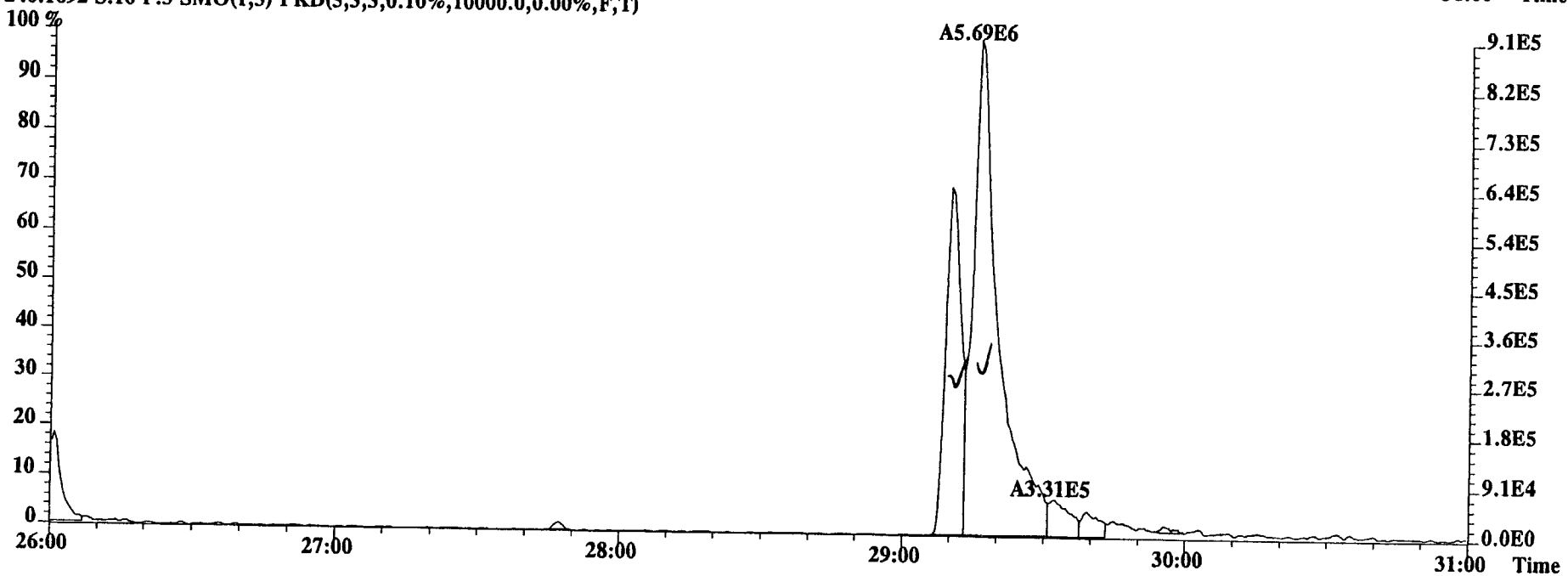
244.1974 S:16 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



File:30OC98V4 #1-939 Acq:31-OCT-1998 05:00:59 GC EI+ Voltage SIR 70SE
Sample#16 Text:301802-13 :10X DIL. : : : Exp:PAHAIR
228.0939 S:16 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

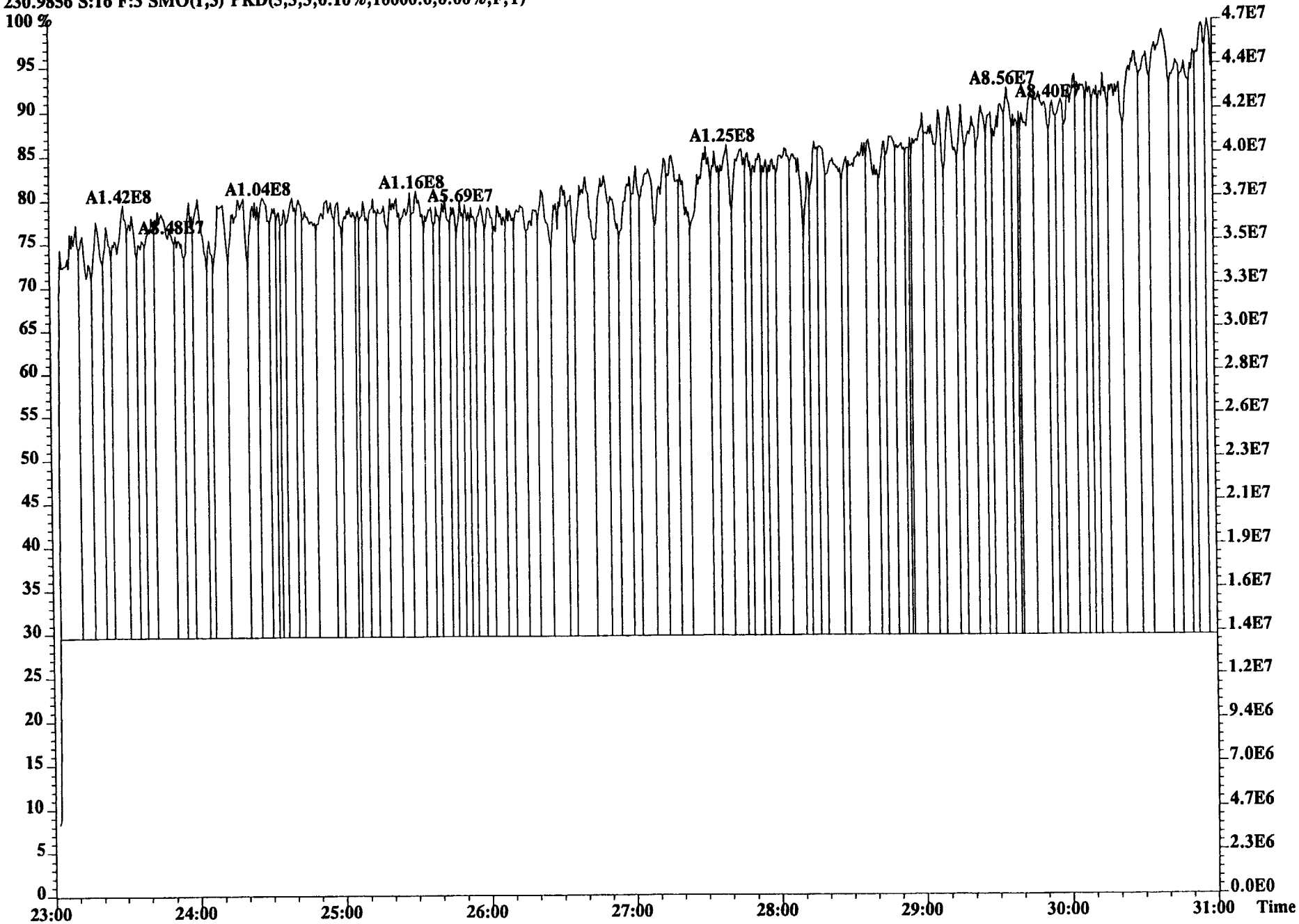


240.1692 S:16 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

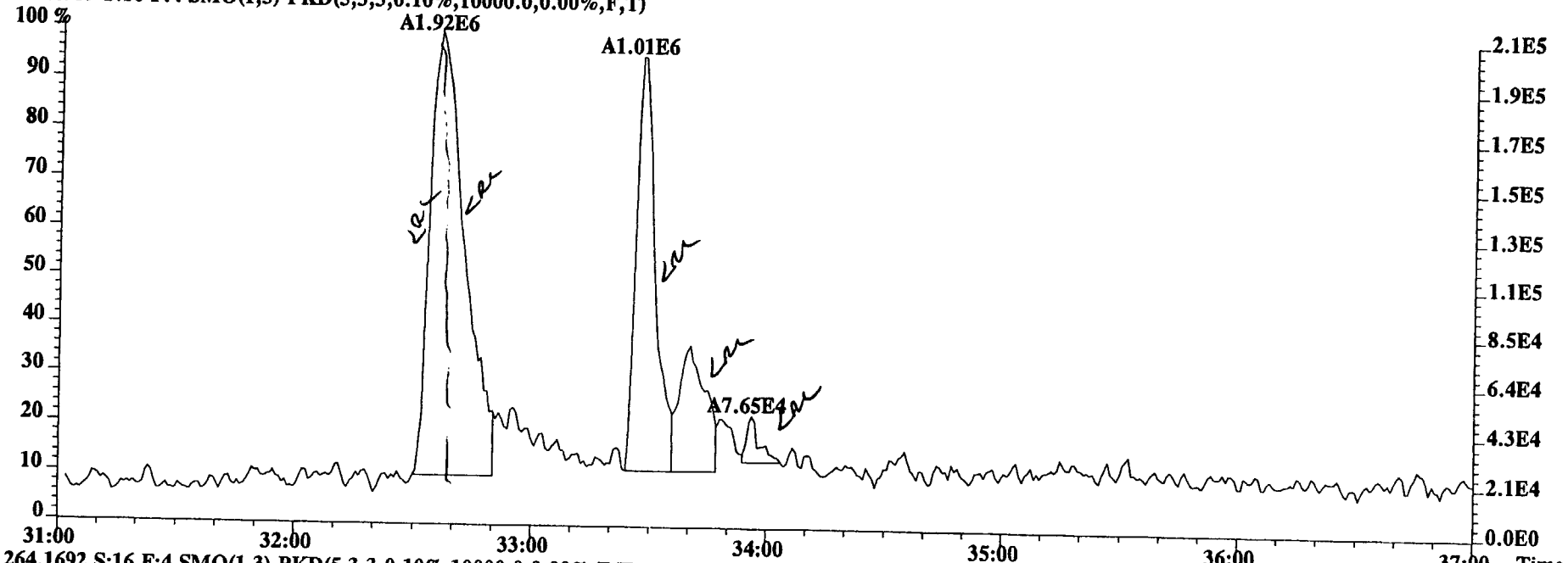


419

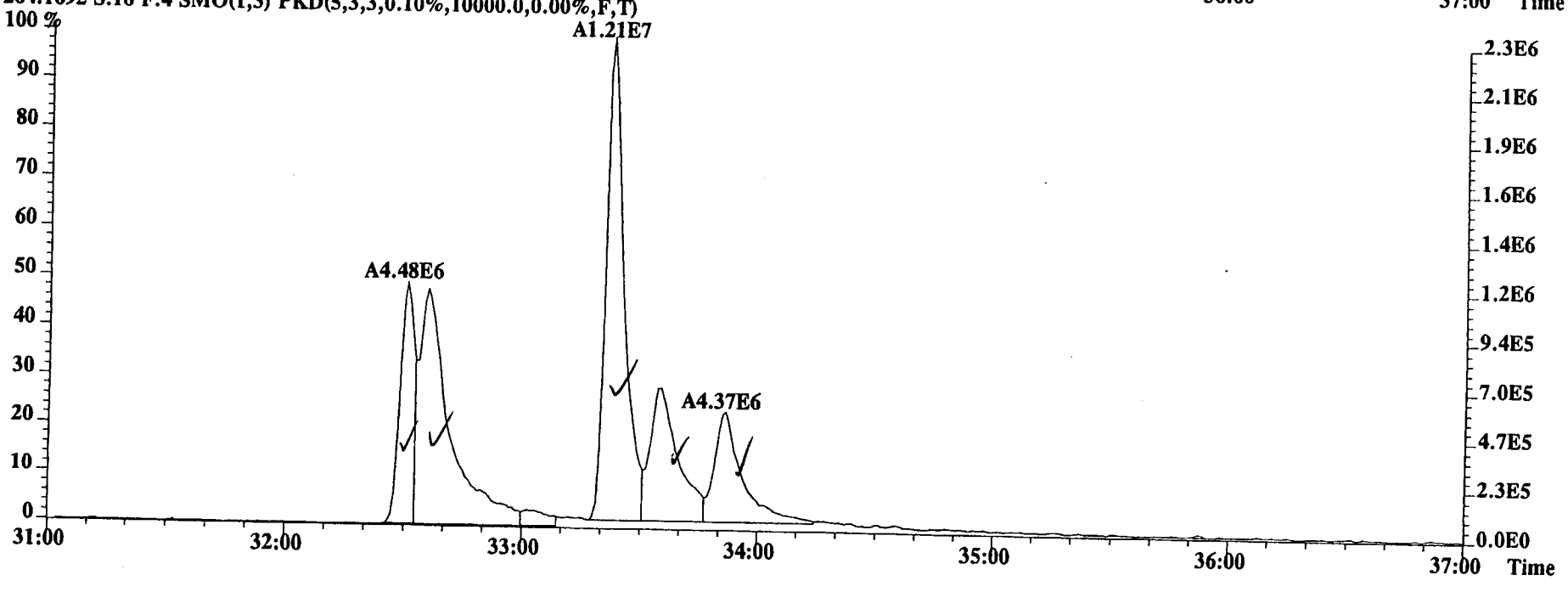
File:30OC98V4 #1-939 Acq:31-OCT-1998 05:00:59 GC EI+ Voltage SIR 70SE
Sample#16 Text:301802-13 :10X DIL. : : : Exp:PAHAIR
230.9856 S:16 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



File:30OC98V4 #1-878 Acq:31-OCT-1998 05:00:59 GC EI+ Voltage SIR 70SE
Sample#16 Text:301802-13 :10X DIL. : : : Exp:PAHAIR
252.0939 S:16 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

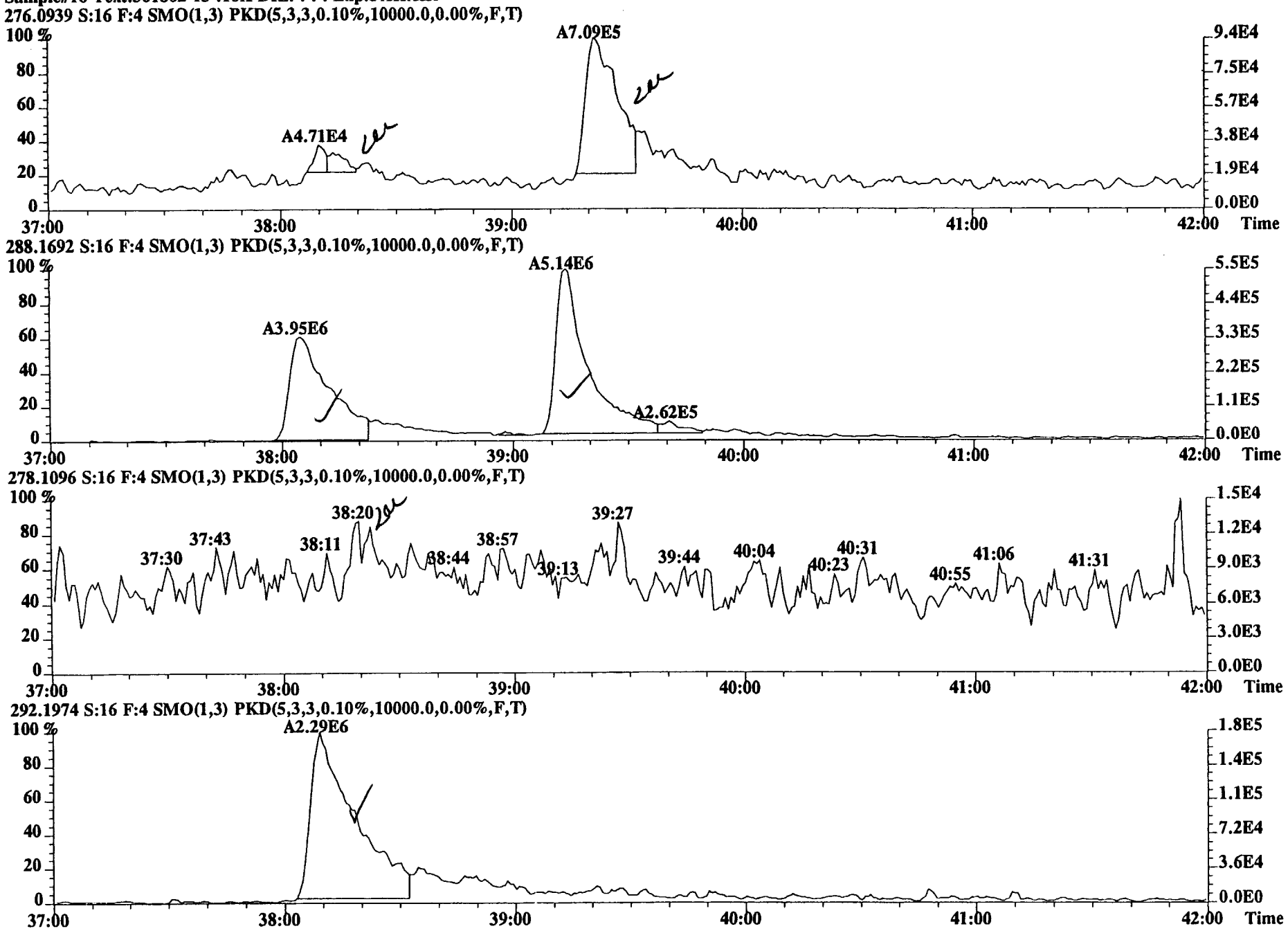


264.1692 S:16 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

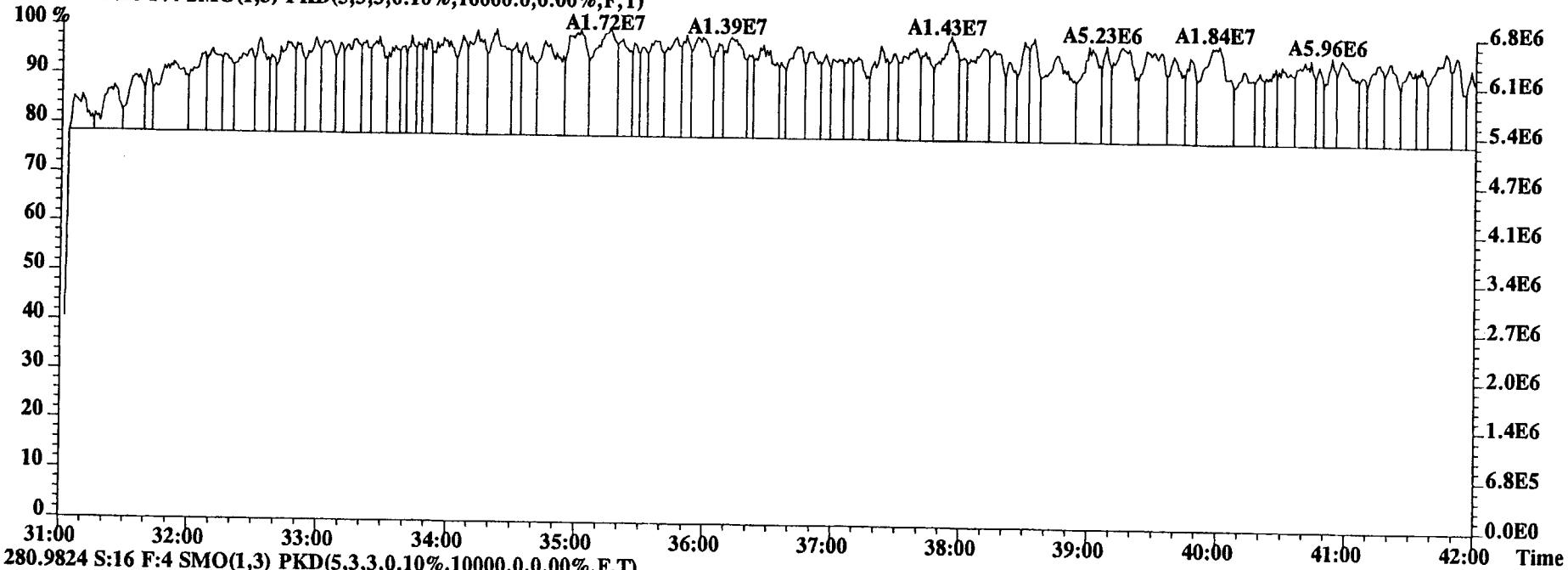


421

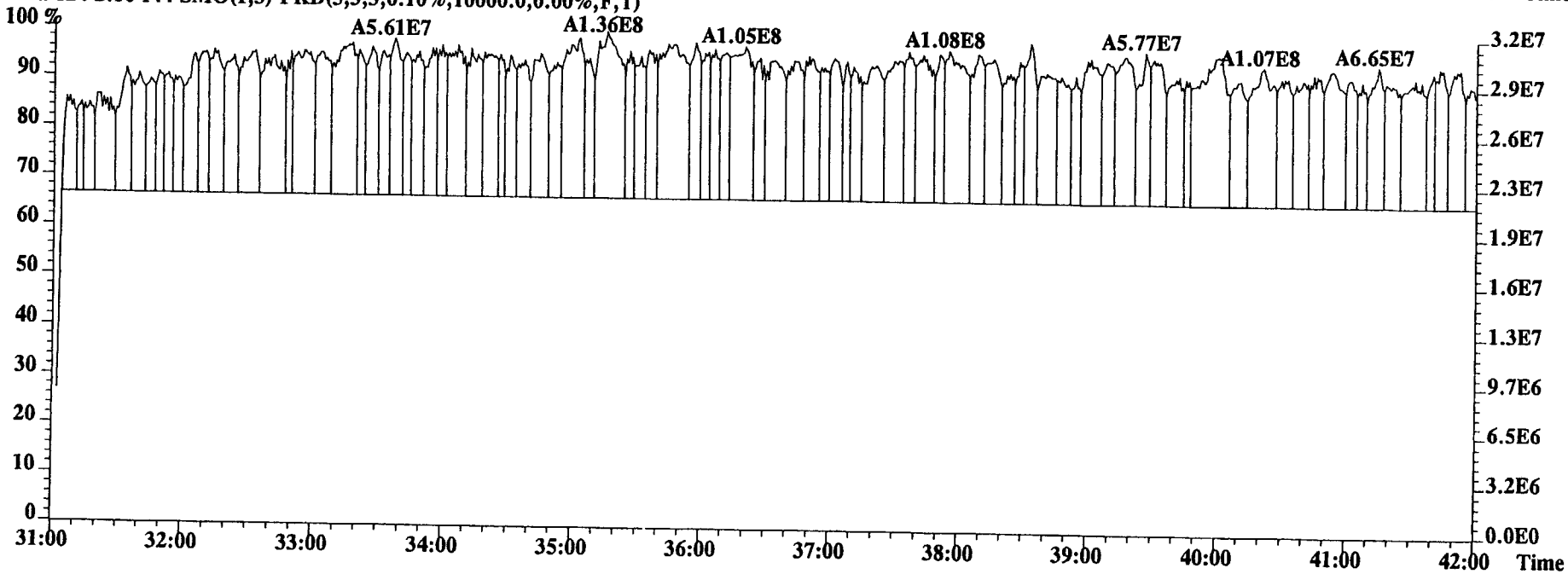
File:30OC98V4 #1-878 Acq:31-OCT-1998 05:00:59 GC EI+ Voltage SIR 70SE
Sample#16 Text:301802-13 :10X DIL. : : : Exp:PAHAIR



File:30OC98V4 #1-878 Acq:31-OCT-1998 05:00:59 GC EI+ Voltage SIR 70SE
Sample#16 Text:301802-13 :10X DIL. : : : Exp:PAHAIR
268.9824 S:16 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



280.9824 S:16 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



423

04-NOV-1998 06:39:37 PM Dioxin Furan Unknown RESULTS

Mass Spec : VG-4 Results : 30OC98V4171.RES : PAHAIR.TRG
GC Column : DB-5 Date analyzed : 30-OCT-98
Data file : 30OC98V4 301802-14 :10X DIL. : : : Ex Cal : PAHAIR102998V4.R
Weight : 0.5

Name	Total Response	Isotope Ratio		R. T. mm:ss		RRF	pg/ SAMP	Rec/ MDL
d10-2-Methylnaphthalene	5685740	1.00	Y	12: 28	Y	1.00	50.00	
d8-Naphthalene	6638940	1.00	Y	10: 12	Y	2.24	26.06	52
Naphthalene	68232000	1.00	Y	10: 16	Y	1.23	838.91	B
2-Methylnaphthalene	2281260	1.00	Y	12: 34	Y	0.56	<RL=100.00	
d8-Acenaphthylene	3503460	1.00	Y	15: 28	Y	1.21	25.38	51
Acenaphthylene	795420	1.00	Y	15: 31	Y	0.94	<RL=100.00	
d10-Acenaphthene	2401500	1.00	Y	16: 1	Y	0.74	28.36	57
Acenaphthene	2678860	1.00	Y	16: 8	Y	1.25	<RL=100.00	
d10-Anthracene	3069780	1.00	Y	20: 57	Y	1.00	50.00	
d10-Fluorene	3021600	1.00	Y	17: 43	Y	1.42	34.64	69
Fluorene	* No Peak	0.00	N	17: 49	N	1.16	<RL=100.00	
d10-Phenanthrene	6628280	1.00	Y	20: 47	Y	2.81	38.45	77
Phenanthrene	5920000	1.00	Y	20: 51	Y	0.89	<RL=100.00	
Anthracene	* No Peak	0.00	N	21: 1	N	0.80	<RL=100.00	
d14-Terphenyl	6833340	1.00	Y	26: 1	Y	1.00	50.00	
d10-Fluoranthene	8104240	1.00	Y	24: 37	Y	1.41	42.03	84
Fluoranthene	2461920	1.00	Y	24: 41	Y	1.11	<RL=100.00	
d10-Pyrene	8492000	1.00	Y	25: 18	Y	1.52	40.93	82
Pyrene	1667360	1.00	Y	25: 22	Y	1.21	<RL=100.00	
d12-Benzo(a)anthracene	3454960	1.00	Y	29: 11	Y	0.90	28.09	56
Benzo(a)anthracene	49906	1.00	Y	29: 18	Y	1.20	<RL=100.00	
d12-Chrysene	9265380	1.00	Y	29: 17	Y	1.28	53.00	106
Chrysene	111607	1.00	Y	29: 21	Y	1.08	<RL=100.00	
d12-Benzo(e)pyrene	22229200	1.00	Y	33: 22	Y	1.00	50.00	
d12-Benzo(b)fluoranthene	7676980	1.00	Y	32: 31	Y	0.45	38.05	76
Benzo(b)fluoranthene	272806	1.00	Y	32: 36	Y	1.17	<RL=100.00	
d12-Benzo(k)fluoranthene	18343580	1.00	Y	32: 36	Y	0.95	43.52	87
Benzo(k)fluoranthene	272806	1.00	Y	32: 36	Y	1.16	<RL=100.00	
d12-Benzo(a)pyrene	9845640	1.00	Y	33: 35	Y	0.68	32.73	65
Benzo(e)pyrene	321448	1.00	Y	33: 29	Y	1.64	<RL=100.00	
Benzo(a)pyrene	* No Peak	0.00	N	33: 38	N	1.07	<RL=100.00	
d12-Perylene	8587120	1.00	Y	33: 51	Y	0.63	30.65	61
Perylene	* No Peak	0.00	N	33: 55	N	1.71	<RL=100.00	
d12-Indeno(123-cd)pyrene	6284360	1.00	Y	38: 5	Y	0.44	31.80	64
Indeno(123-cd)pyrene	* No Peak	0.00	N	38: 8	N	0.62	<RL=100.00	
d14-Dibenz(ah)anthracene	3260000	1.00	Y	38: 5	Y	0.25	29.83	60
Dibenz(ah)anthracene	* No Peak	0.00	N	38: 15	N	1.40	<RL=100.00	
d12-Benzo(ghi)perylene	8282640	1.00	Y	39: 14	Y	0.58	32.14	64
Benzo(ghi)perylene	* No Peak	0.00	N	39: 21	N	1.02	<RL=100.00	
d10-Fluorene	3021600	1.00	Y	17: 43	Y	1.00	50.00	
13C-Fluorene	2471900	1.00	Y	17: 48	Y	0.81	50.50	101

11 4-98

0.5

98V4.RRF
Rec/
MDL

	2842870	2842870
52	3319470	3319470
B	34116000	34116000
100.00	1140630	1140630
51	1751730	1751730
100.00	397710	397710
57	1200750	1200750
100.00	1339430	1339430
	1534890	1534890
69	1510800	1510800
100.00	0	0
77	3314140	3314140
100.00	2960000	2960000
100.00	0	0
	3416670	3416670
84	4052120	4052120
100.00	1230960	1230960
82	4246000	4246000
100.00	833680	833680
56	1727480	1727480
100.00	24953	24953
106	4632690	4632690
100.00	55803	55803
	11114600	11114600
76	3838490	3838490
100.00	136403	136403
87	9171790	9171790
100.00	136403	136403
65	4922820	4922820
100.00	160724	160724
100.00	0	0
61	4293560	4293560
100.00	0	0
64	3142180	3142180
100.00	0	0
60	1630000	1630000
100.00	0	0
64	4141320	4141320
100.00	0	0

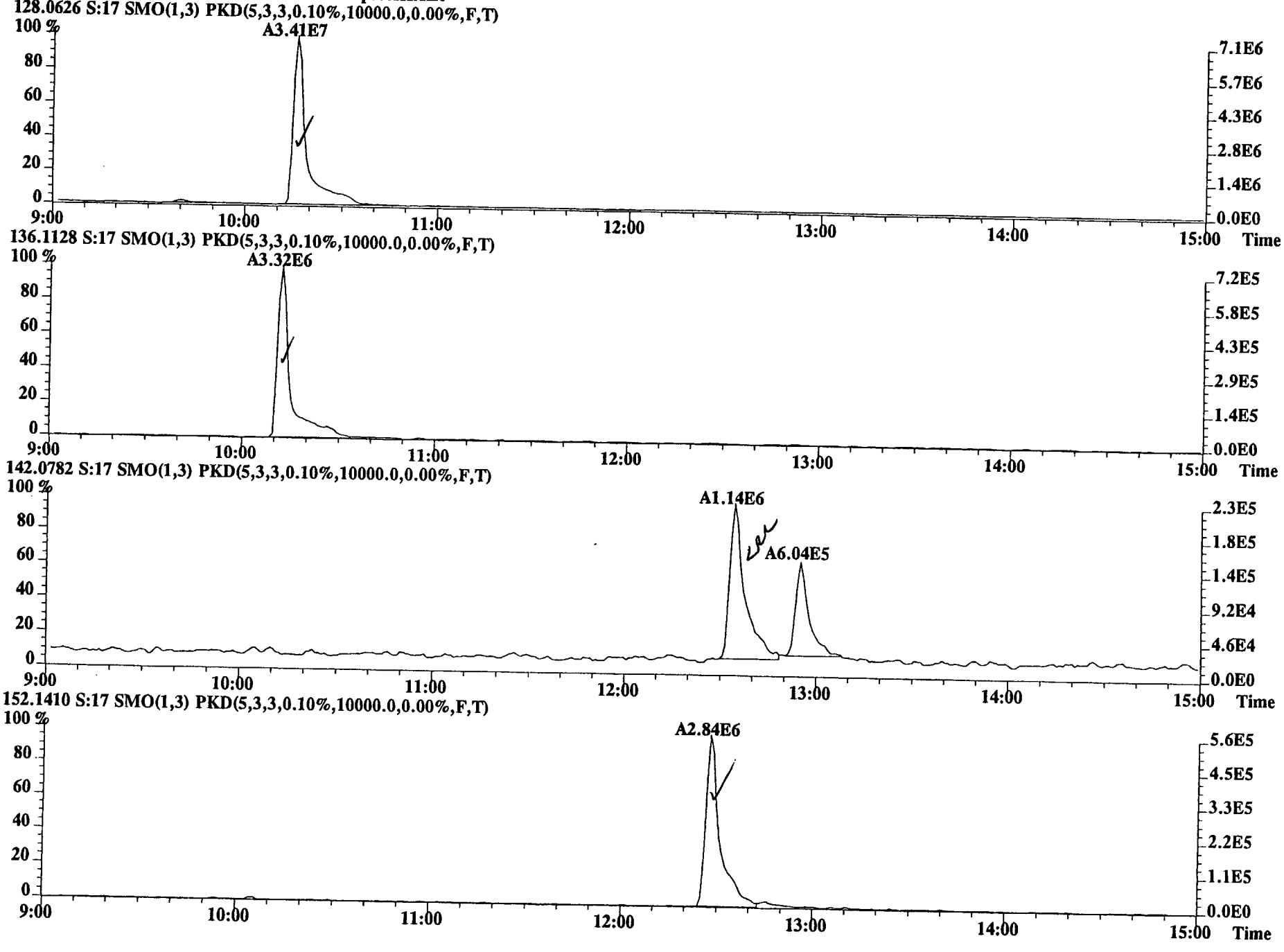
02-NOV-1998 09:19:24 AM Dioxin Furan Unknown RESULTS

Mass Spec : VG-4
GC Column : DB-5
Data file : 30OC98V4
Weight : 0.5

Results : 30OC98V4171.RES : PAHAIR.TRG
Date analyzed : 30-OCT-98
301802-14 :10X DIL. : : : Ex Cal : PAHAIR102998V4.R

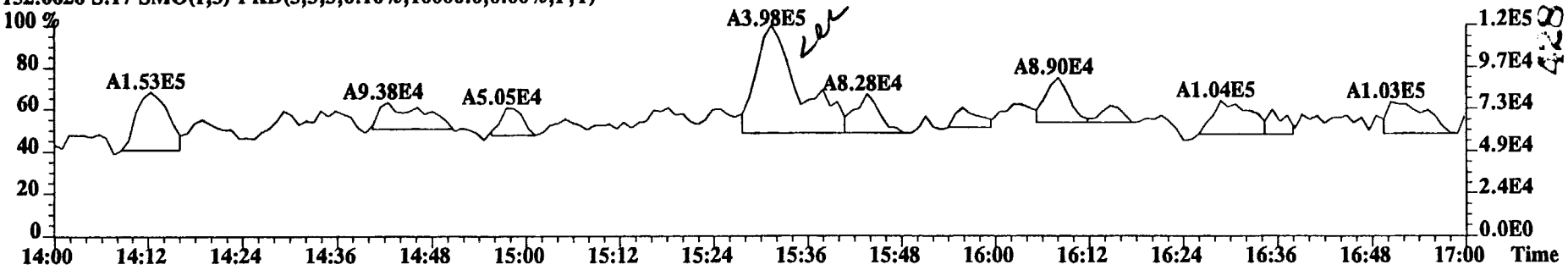
Name	Total Response	Isotope Ratio		R. T. mm:ss		RRF	pg/ SAMP	Rec/ MDL
d10-2-Methylnaphthalene	5685740	1.00	Y	12: 28	Y	1.00	50.00	
d8-Naphthalene	6638940	1.00	Y	10: 12	Y	2.24	26.06	52
Naphthalene	68232000	1.00	Y	10: 16	Y	1.23	838.91	0.000
2-Methylnaphthalene	2281260	1.00	Y	12: 34	Y	0.56	61.30	0.000
d8-Acenaphthylene	3503460	1.00	Y	15: 28	Y	1.21	25.38	51
Acenaphthylene	795420	1.00	Y	15: 31	Y	0.94	24.05	0.000
d10-Acenaphthene	2401500	1.00	Y	16: 1	Y	0.74	28.36	57
Acenaphthene	2678860	1.00	Y	16: 8	Y	1.25	89.52	0.000
d10-Anthracene	3069780	1.00	Y	20: 57	Y	1.00	50.00	
d10-Fluorene	3021600	1.00	Y	17: 43	Y	1.42	34.64	69
Fluorene	* No Peak	0.00	N	17: 49	N	1.16	0.00	0.000
d10-Phenanthrene	6628280	1.00	Y	20: 47	Y	2.81	38.45	77
Phenanthrene	6636760	1.00	Y	20: 51	Y	0.89	111.94	0.000
Anthracene	* No Peak	0.00	N	21: 1	N	0.80	0.00	0.000
d14-Terphenyl	6833340	1.00	Y	26: 1	Y	1.00	50.00	
d10-Fluoranthene	8104240	1.00	Y	24: 37	Y	1.41	42.03	84
Fluoranthene	2461920	1.00	Y	24: 41	Y	1.11	27.32	0.000
d10-Pyrene	8492000	1.00	Y	25: 18	Y	1.52	40.93	82
Pyrene	1667360	1.00	Y	25: 22	Y	1.21	16.29	0.000
d12-Benzo(a)anthracene	3454960	1.00	Y	29: 11	Y	0.90	28.09	56
Benzo(a)anthracene	49906	1.00	Y	29: 18	Y	1.20	1.20	0.000
d12-Chrysene	9265380	1.00	Y	29: 17	Y	1.28	53.00	106
Chrysene	111607	1.00	Y	29: 21	Y	1.08	1.11	0.000
d12-Benzo(e)pyrene	22229200	1.00	Y	33: 22	Y	1.00	50.00	
d12-Benzo(b)fluoranthene	7676980	1.00	Y	32: 31	Y	0.45	38.05	76
Benzo(b)fluoranthene	272806	1.00	Y	32: 36	Y	1.17	3.04	0.000
d12-Benzo(k)fluoranthene	18343580	1.00	Y	32: 36	Y	0.95	43.52	87
Benzo(k)fluoranthene	272806	1.00	Y	32: 36	Y	1.16	1.28	0.000
d12-Benzo(a)pyrene	9845640	1.00	Y	33: 35	Y	0.68	32.73	65
Benzo(e)pyrene	321448	1.00	Y	33: 29	Y	1.64	1.99	0.000
Benzo(a)pyrene	* No Peak	0.00	N	33: 38	N	1.07	0.00	0.000
d12-Perylene	8587120	1.00	Y	33: 51	Y	0.63	30.65	61
Perylene	* No Peak	0.00	N	33: 55	N	1.71	0.00	0.000
d12-Indeno(123-cd)pyrene	6284360	1.00	Y	38: 5	Y	0.44	31.80	64
Indeno(123-cd)pyrene	* No Peak	0.00	N	38: 8	N	0.62	0.00	0.000
d14-Dibenz(ah)anthracene	* No Peak	0.00	N	38: 5	Y	0.25	0.00	0
Dibenz(ah)anthracene	* No Peak	0.00	N	38: 15	N	1.40	*NoINoIs	
d12-Benzo(ghi)perylene	8282640	1.00	Y	39: 14	Y	0.58	32.14	64
Benzo(ghi)perylene	* No Peak	0.00	N	39: 21	N	1.02	0.00	0.000
d10-Fluorene	3021600	1.00	Y	17: 43	Y	1.42	4.78	10
13C-Fluorene	2471900	1.00	Y	17: 48	Y	1.00	81.81	0.000

File:30OC98V4 #1-510 Acq:31-OCT-1998 05:50:00 GC EI+ Voltage SIR 70SE
Sample#17 Text:301802-14 :10X DIL. : : : Exp:PAHAIR

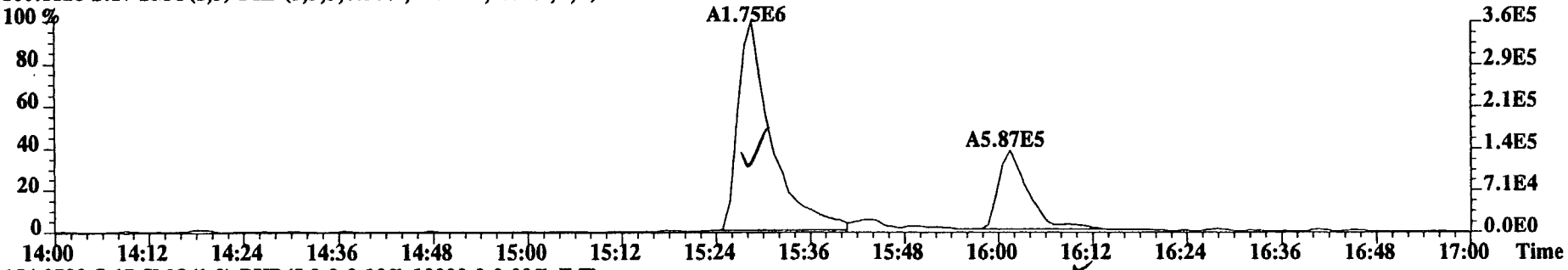


427

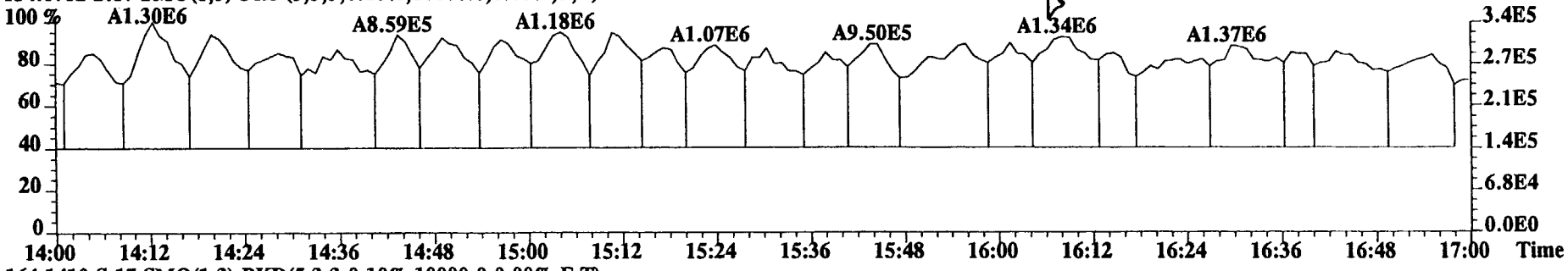
File:30OC98V4 #1-510 Acq:31-OCT-1998 05:50:00 GC EI+ Voltage SIR 70SE
Sample#17 Text:301802-14 :10X DIL. : : : Exp:PAHAIR
152.0626 S:17 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



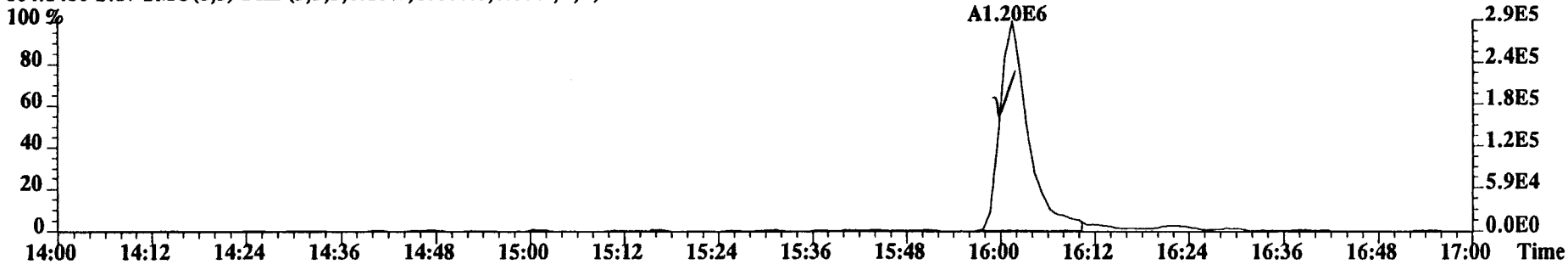
160.1128 S:17 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



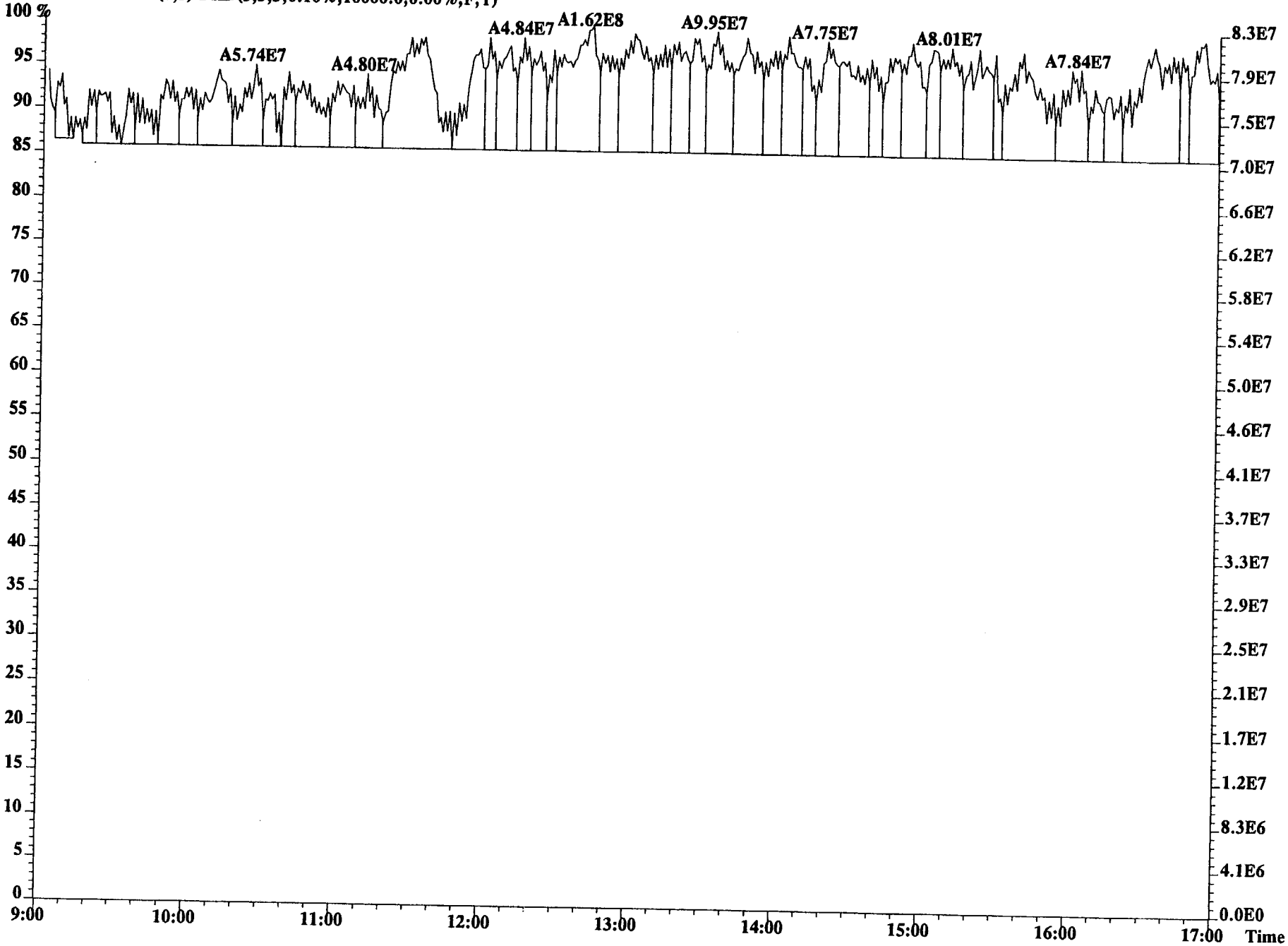
154.0782 S:17 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



164.1410 S:17 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

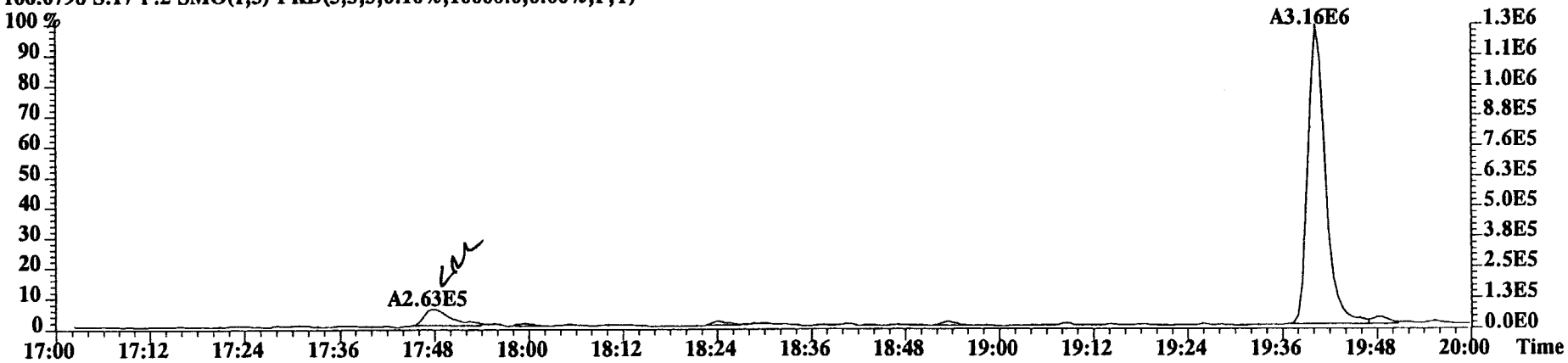


File:30OC98V4 #1-510 Acq:31-OCT-1998 05:50:00 GC EI+ Voltage SIR 70SE
Sample#17 Text:301802-14 :10X DIL. : : : Exp:PAHAIR
130.9920 S:17 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

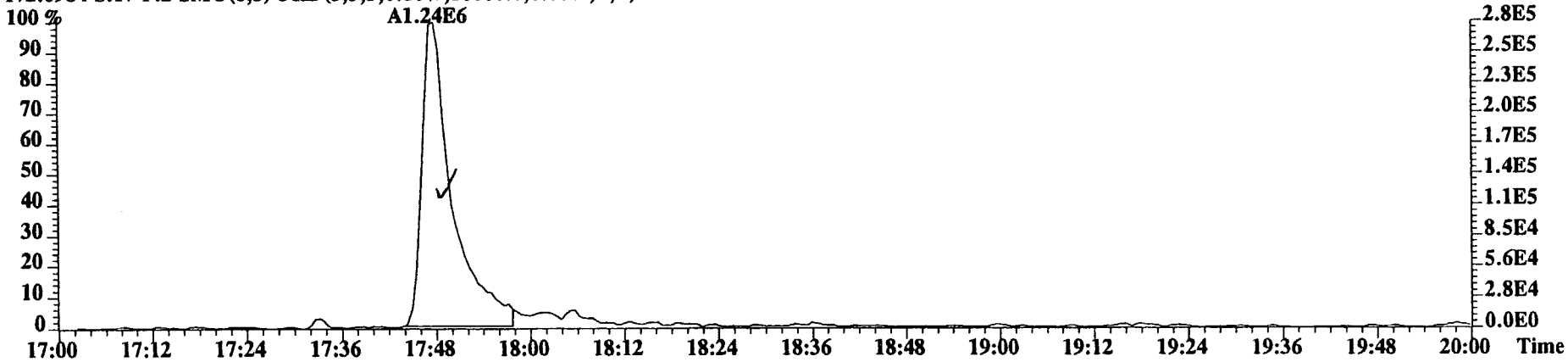


429

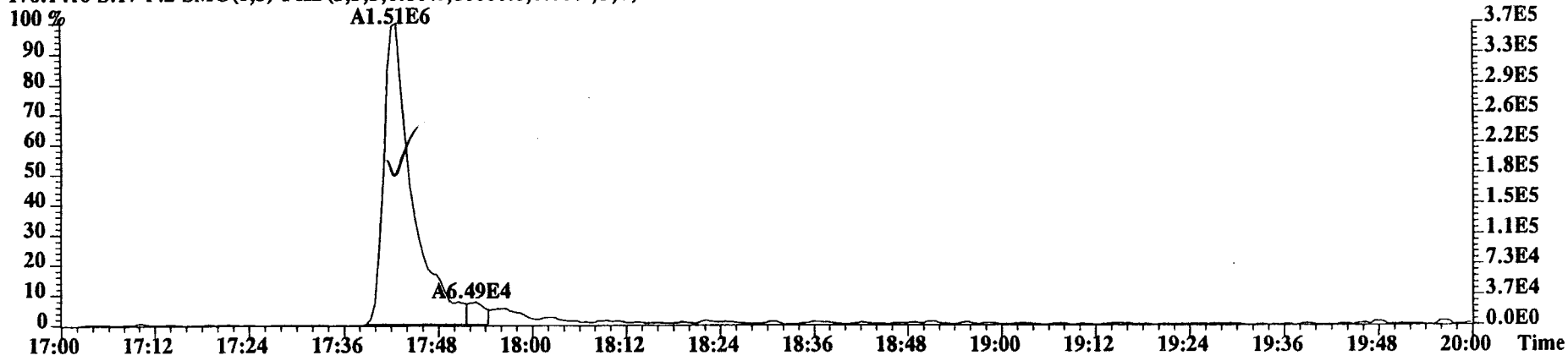
File:30OC98V4 #1-640 Acq:31-OCT-1998 05:50:00 GC EI+ Voltage SIR 70SE
Sample#17 Text:301802-14 :10X DIL. : : : Exp:PAHAIR
166.0798 S:17 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



172.0984 S:17 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

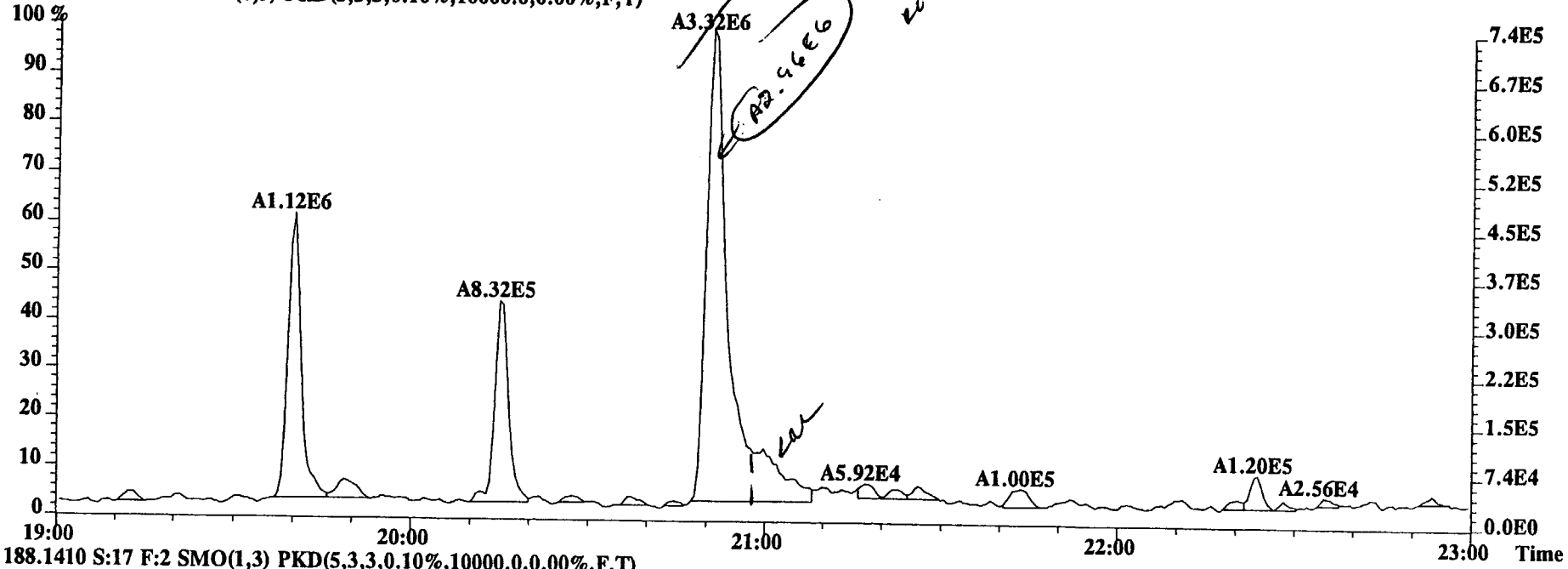


176.1410 S:17 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

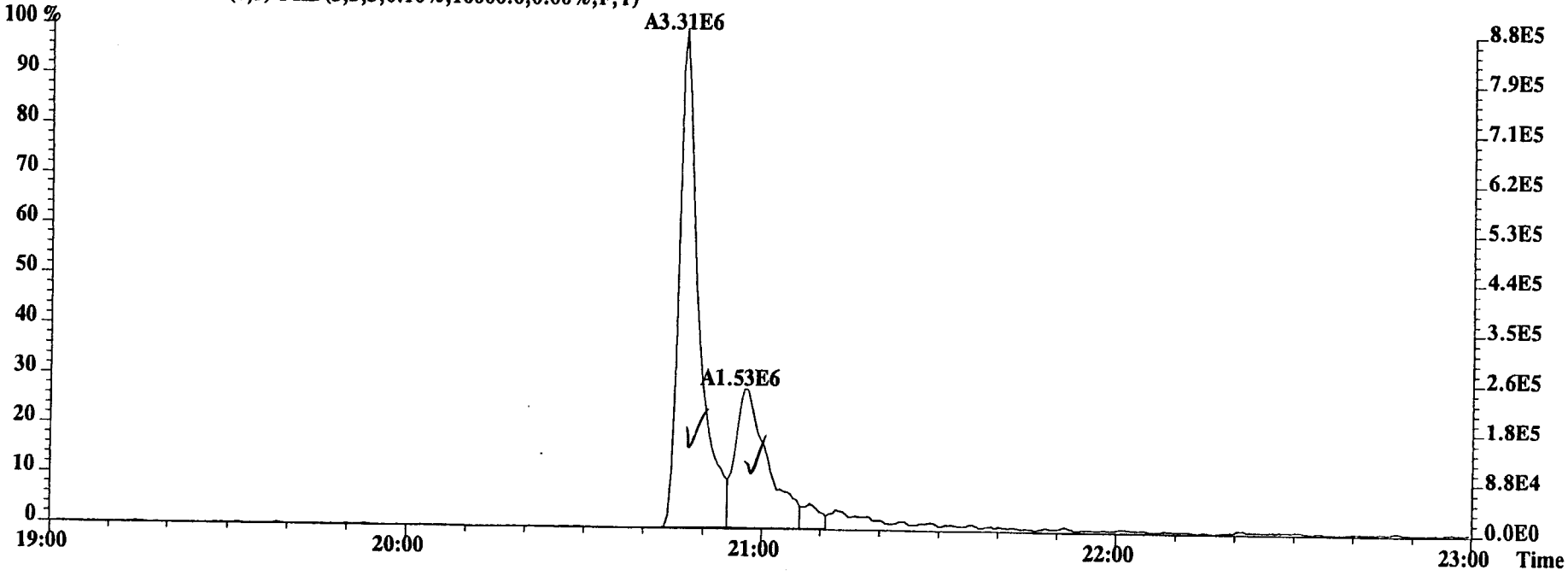


430

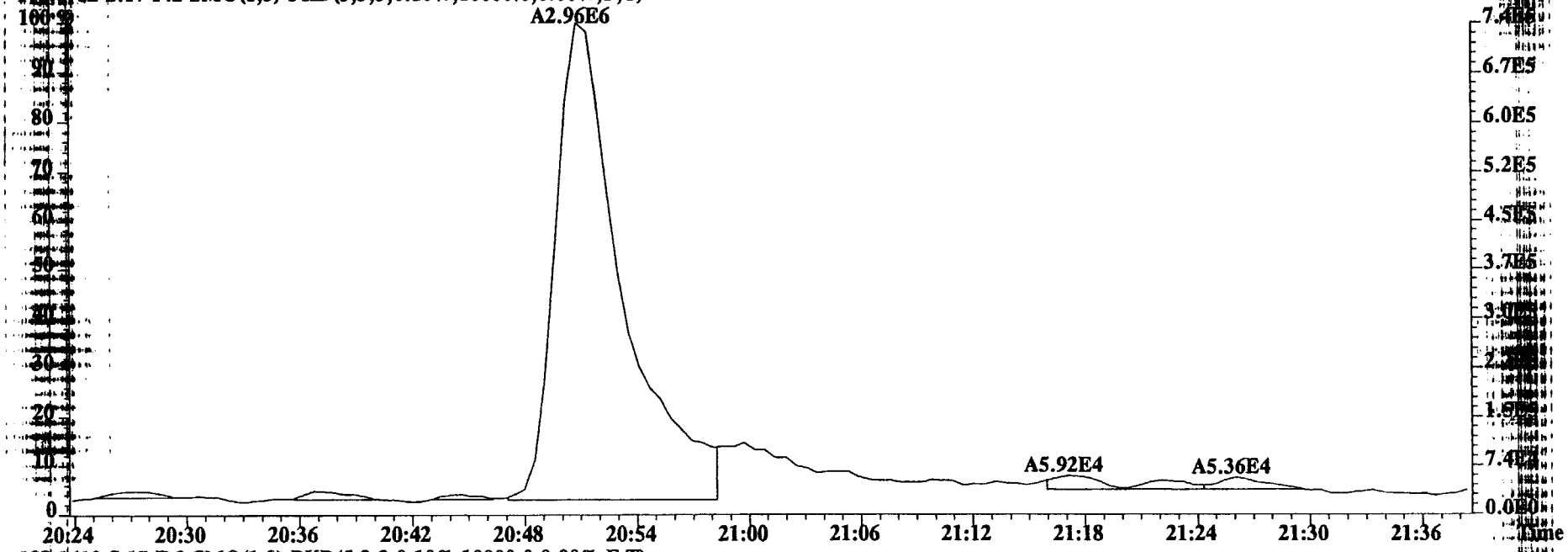
File:30OC98V4 #1-640 Acq:31-OCT-1998 05:50:00 GC EI+ Voltage SIR 70SE
Sample#17 Text:301802-14 :10X DIL. : : : Exp:PAHAIR
178.0782 S:17 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



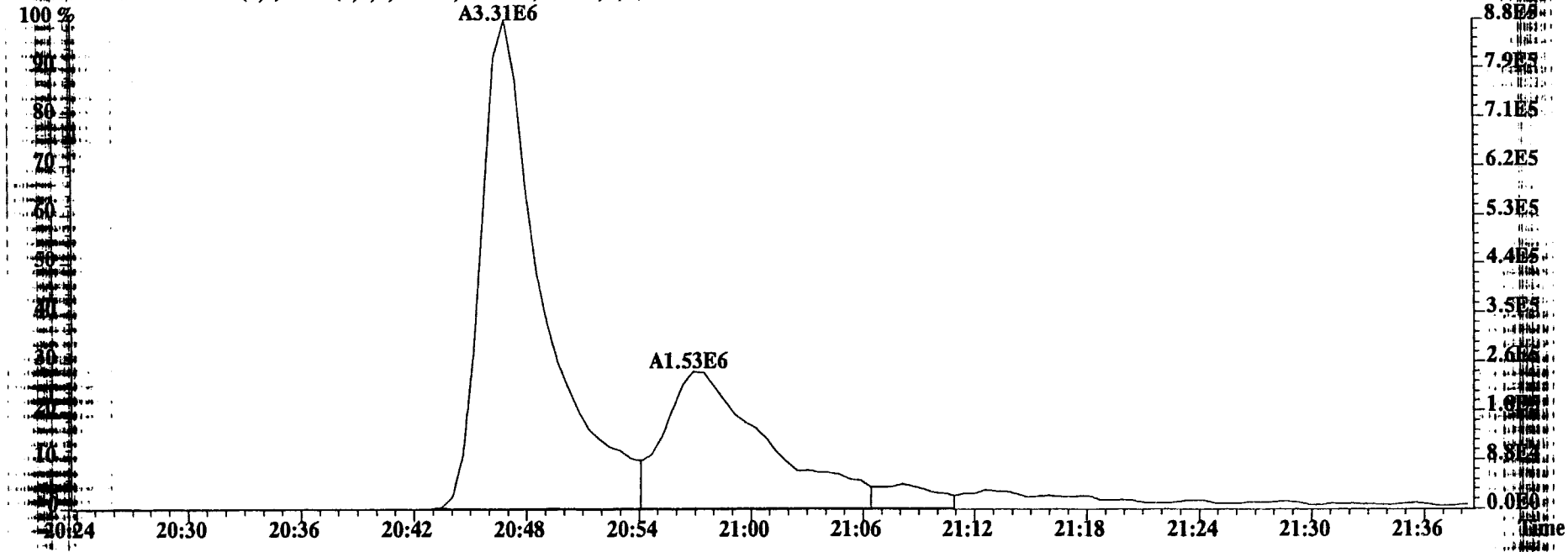
188.1410 S:17 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



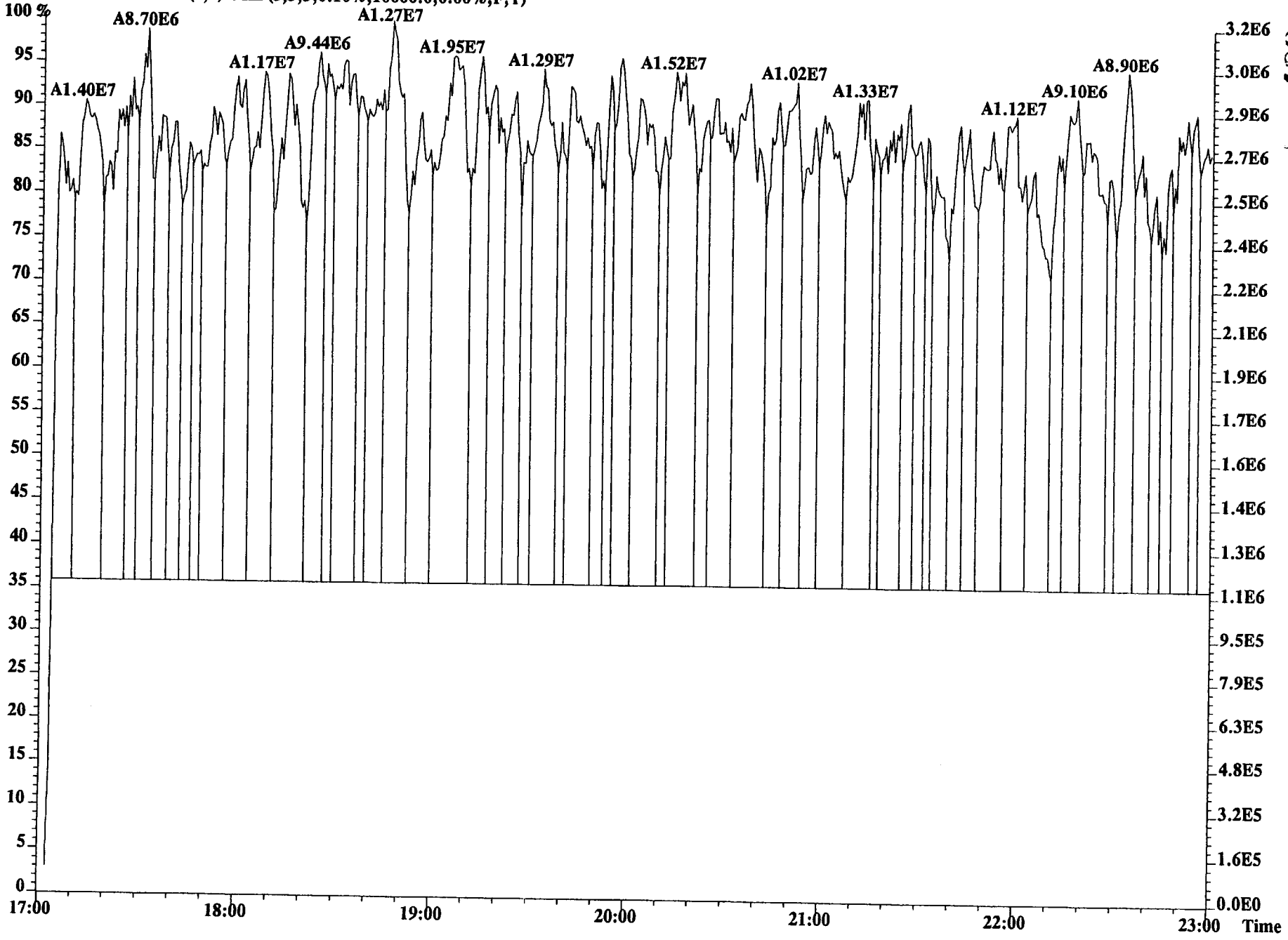
File:30OC98V4 #1-640 Acq:31-OCT-1998 05:50:00 GC EI+ Voltage SIR 70SE
Sample#17 Text:301802-14 :10X DIL. : : : Exp:PAHAIR
178.0782 S:17 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



188.1410 S:17 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

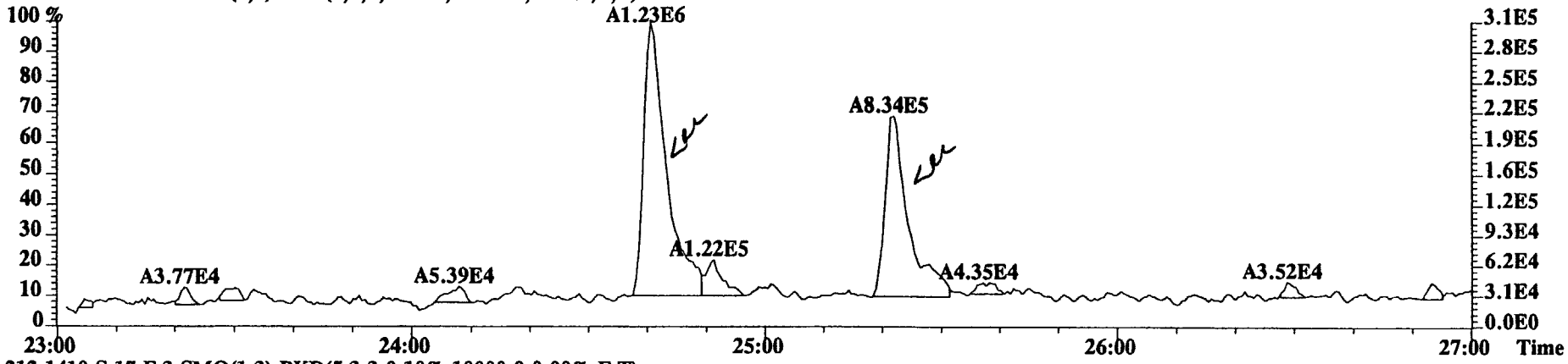


File:30OC98V4 #1-640 Acq:31-OCT-1998 05:50:00 GC EI+ Voltage SIR 70SE
Sample#17 Text:301802-14 :10X DIL. : : : Exp:PAHAIR
204.9888 S:17 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

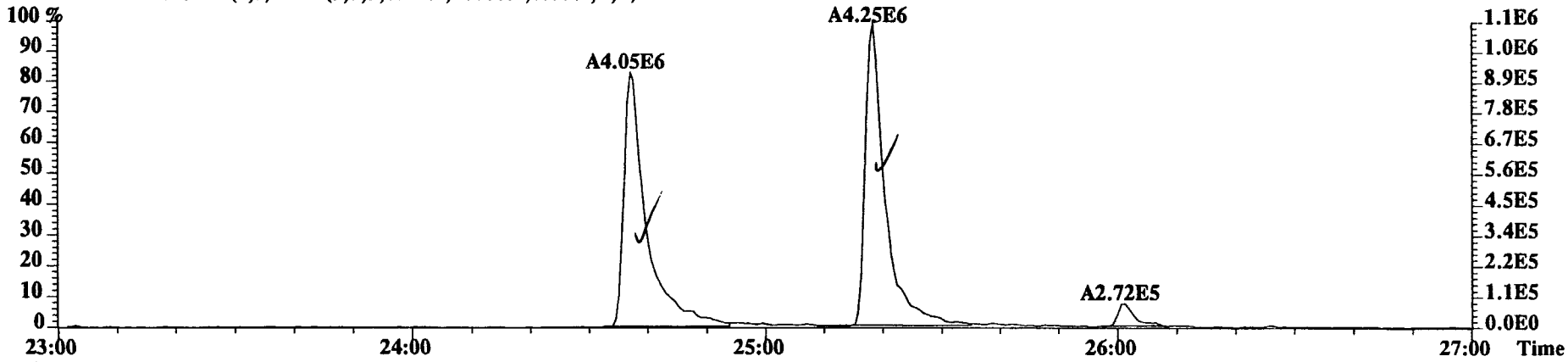


433

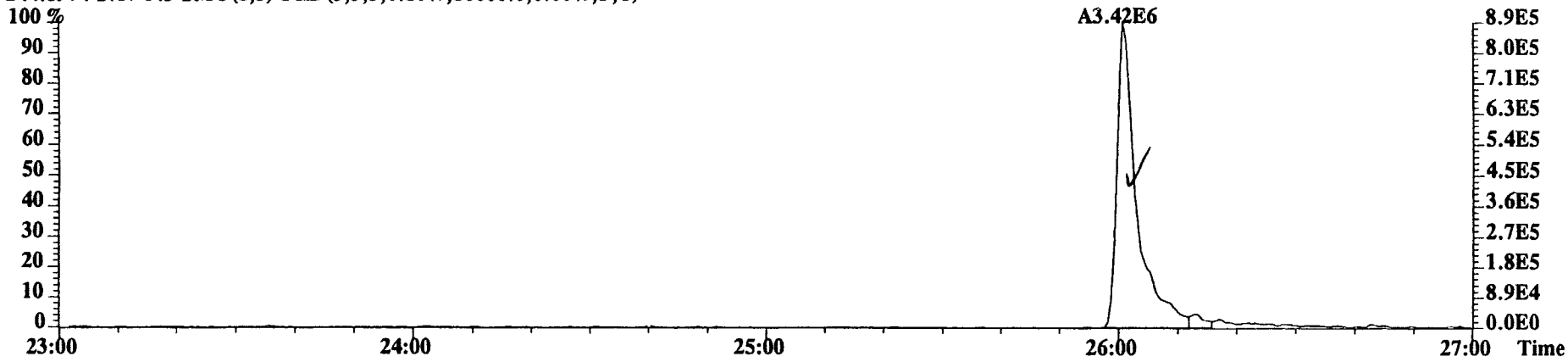
File:30OC98V4 #1-939 Acq:31-OCT-1998 05:50:00 GC EI+ Voltage SIR 70SE
Sample#17 Text:301802-14 :10X DIL. : : : Exp:PAHAIR
202.0782 S:17 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



212.1410 S:17 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

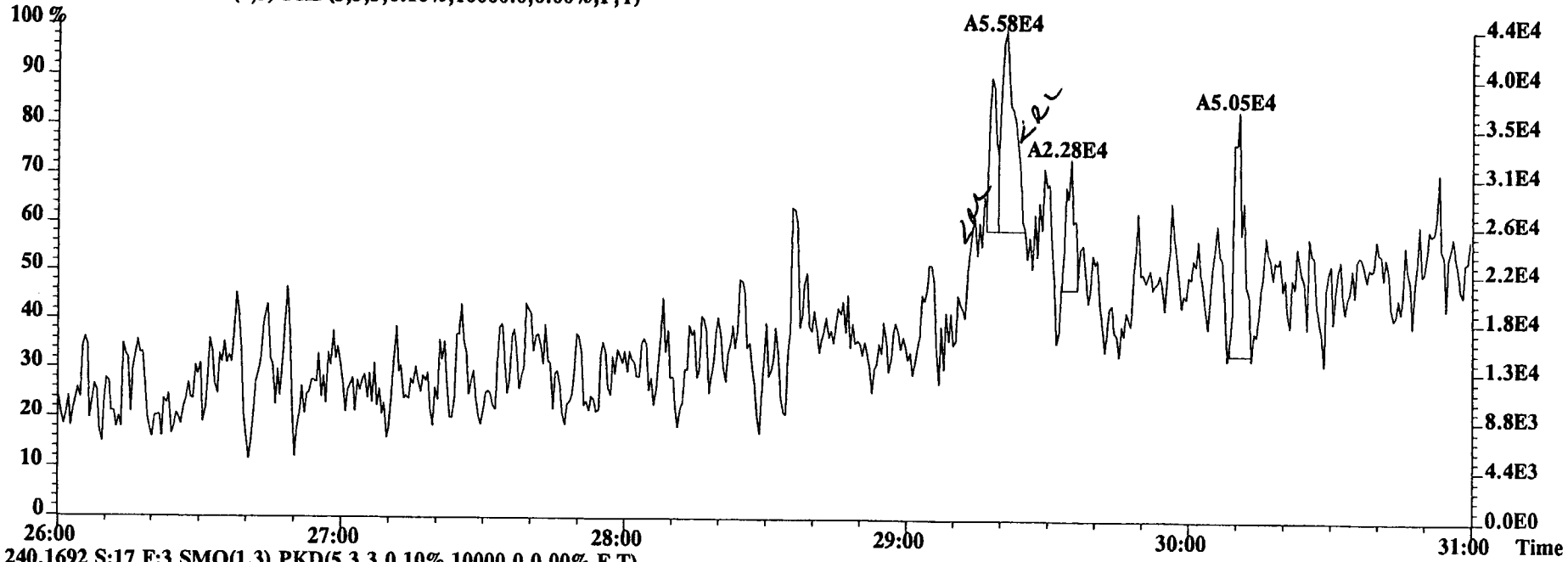


244.1974 S:17 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

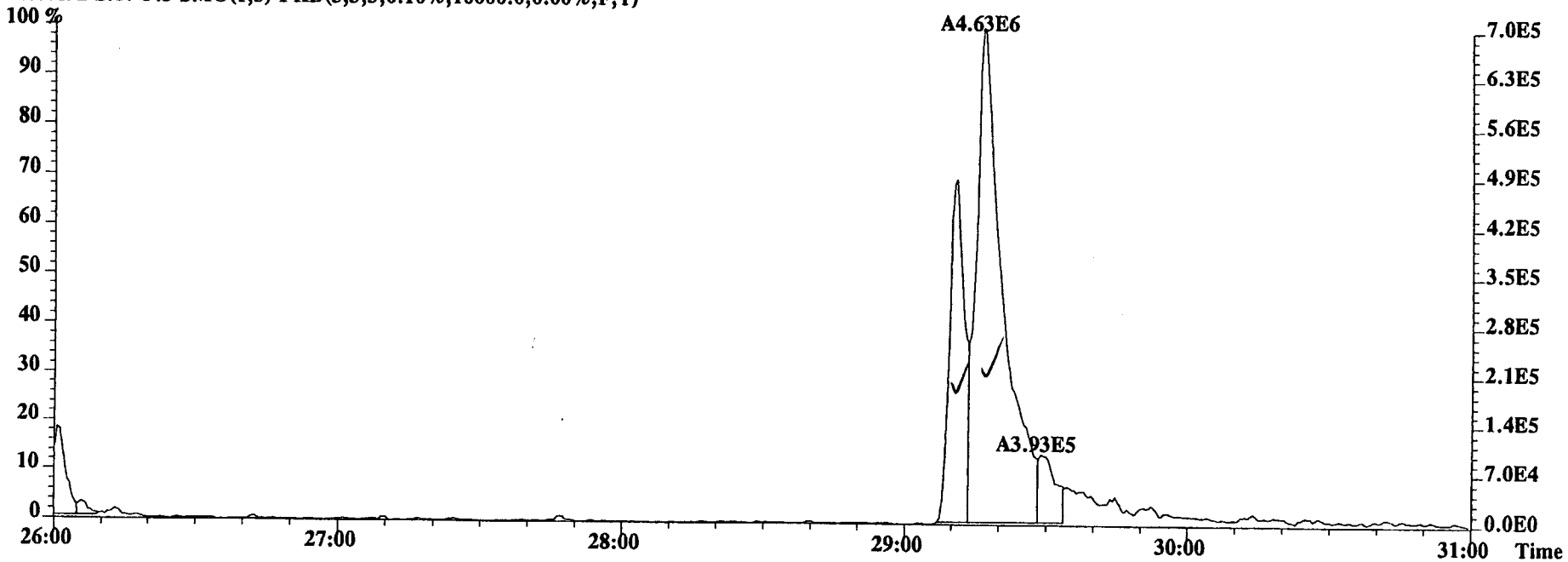


434

File:30OC98V4 #1-939 Acq:31-OCT-1998 05:50:00 GC EI+ Voltage SIR 70SE
Sample#17 Text:301802-14 :10X DIL. : : : Exp:PAHAIR
228.0939 S:17 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

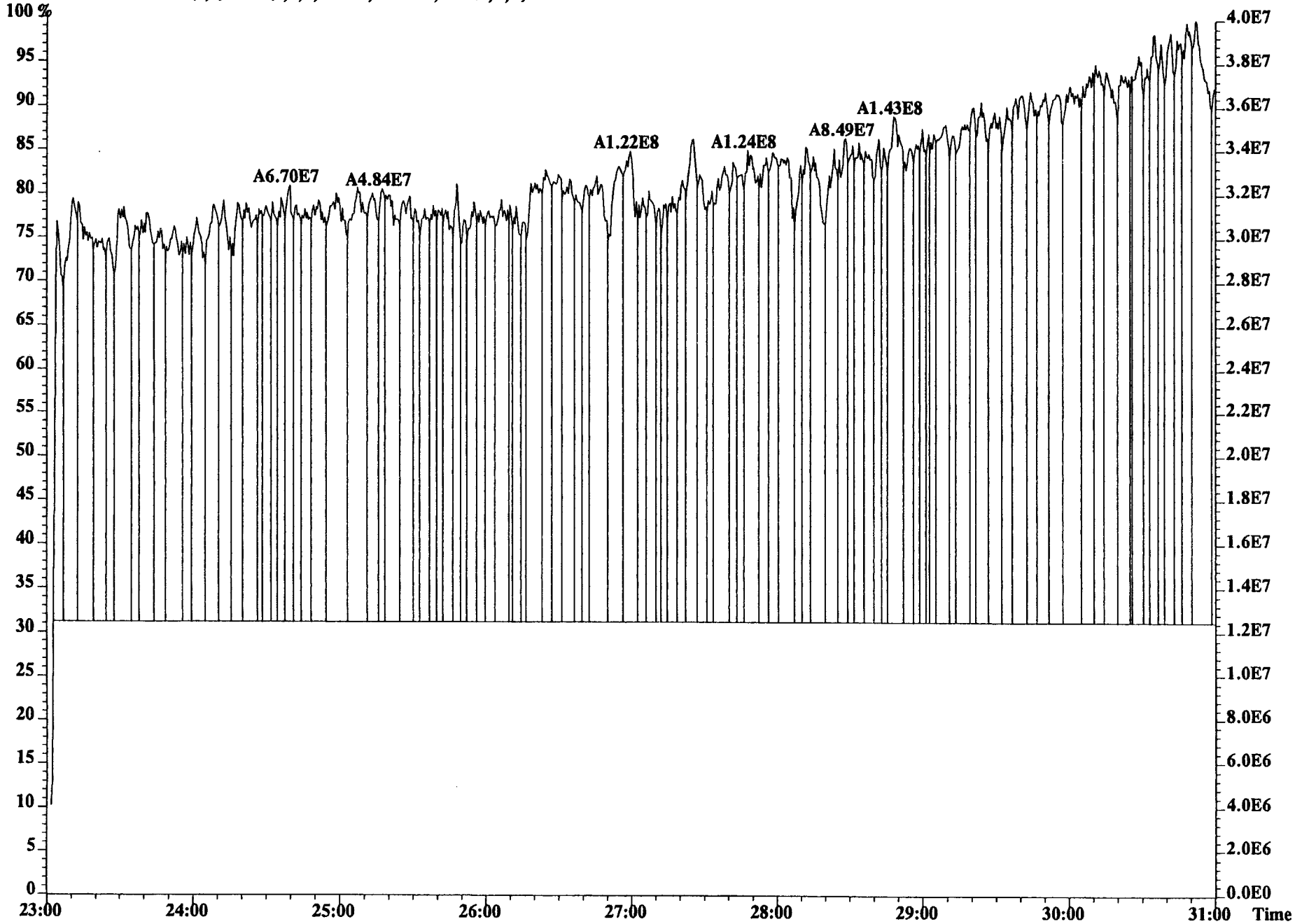


240.1692 S:17 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

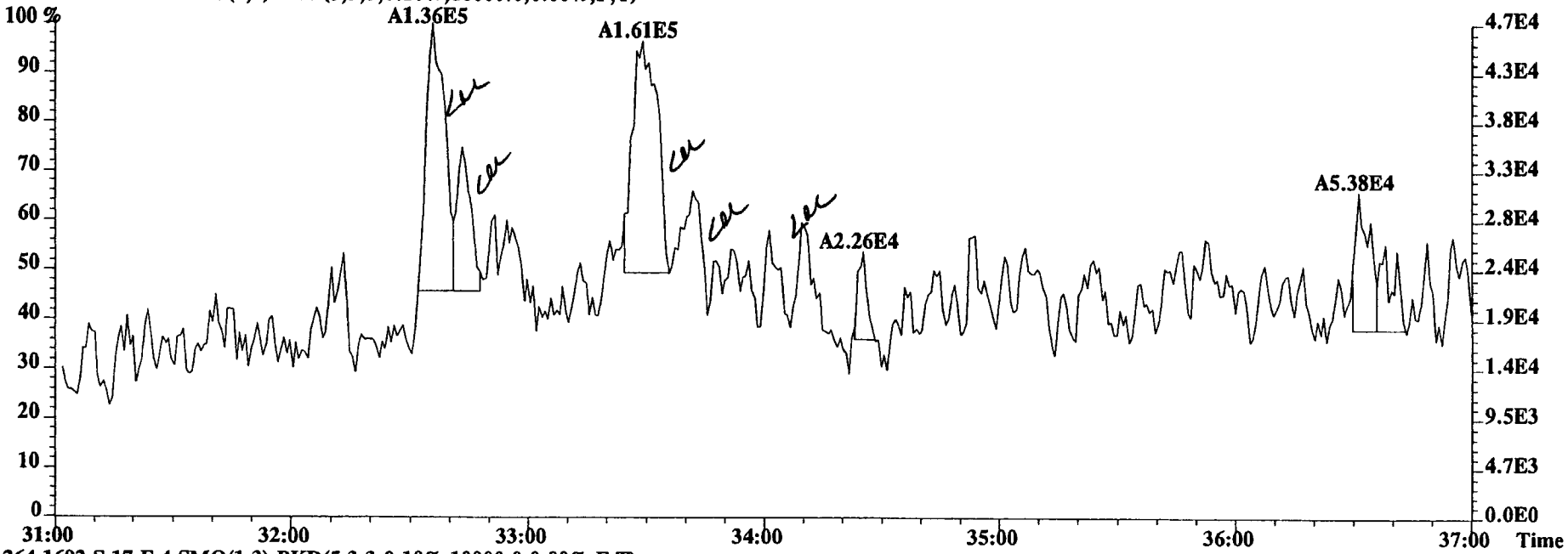


435

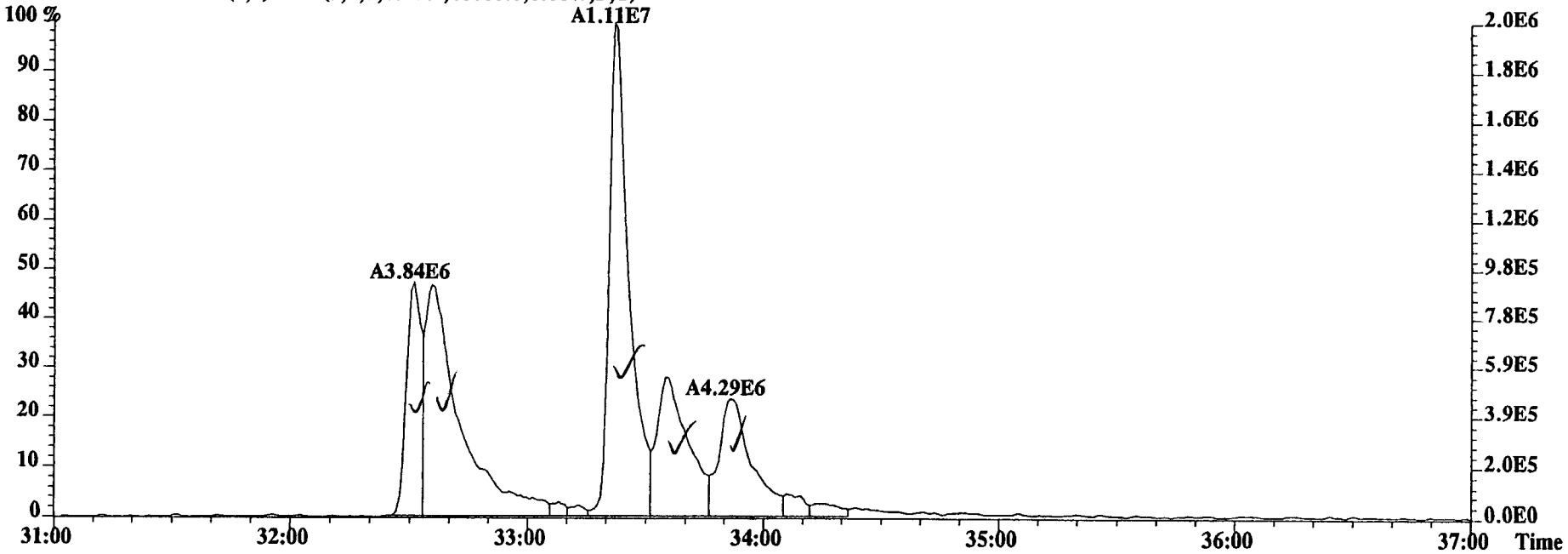
File:30OC98V4 #1-939 Acq:31-OCT-1998 05:50:00 GC EI+ Voltage SIR 70SE
Sample#17 Text:301802-14 :10X DIL. : : : Exp:PAHAIR
230.9856 S:17 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



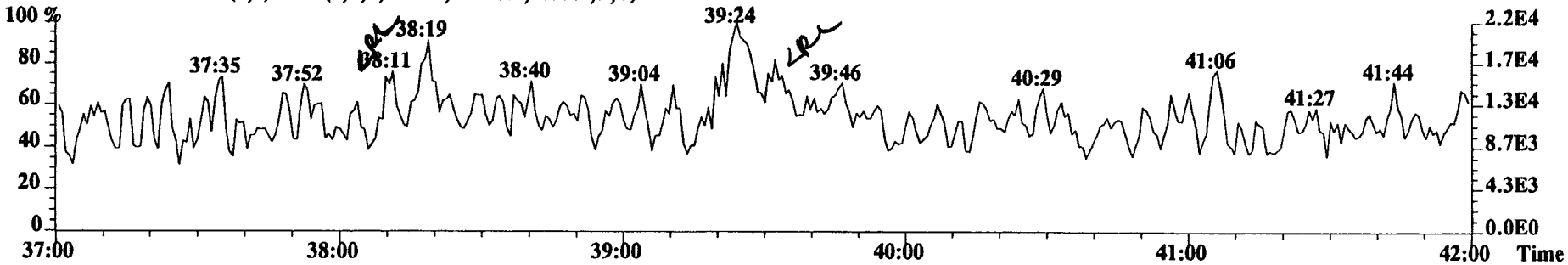
File:30OC98V4 #1-878 Acq:31-OCT-1998 05:50:00 GC EI+ Voltage SIR 70SE
Sample#17 Text:301802-14 :10X DIL. : : : Exp:PAHAIR
252.0939 S:17 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



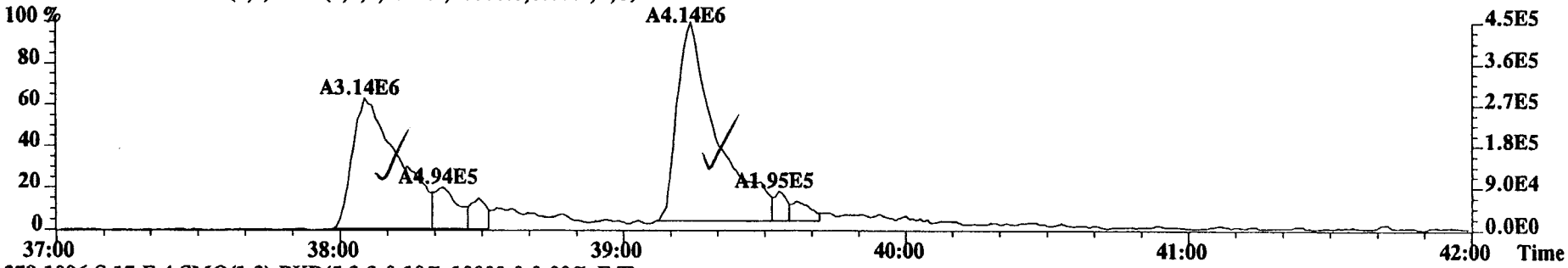
264.1692 S:17 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



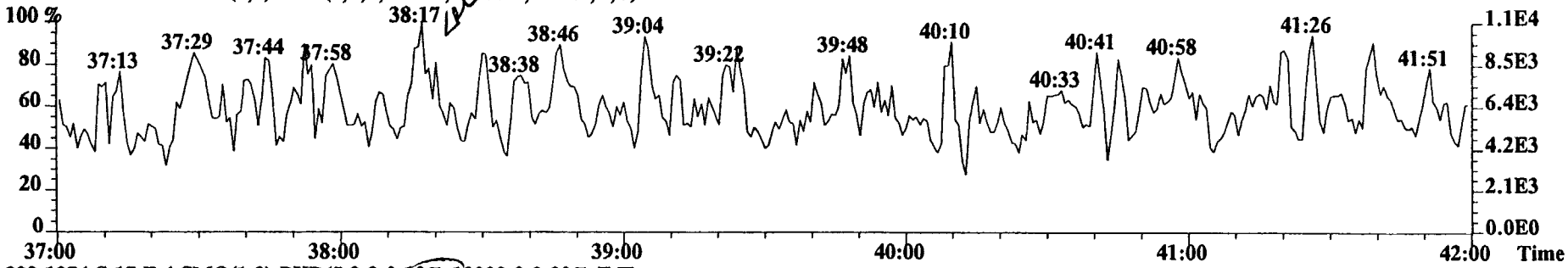
File:30OC98V4 #1-878 Acq:31-OCT-1998 05:50:00 GC EI+ Voltage SIR 70SE
Sample#17 Text:301802-14 :10X DIL. : : : Exp:PAHAIR
276.0939 S:17 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



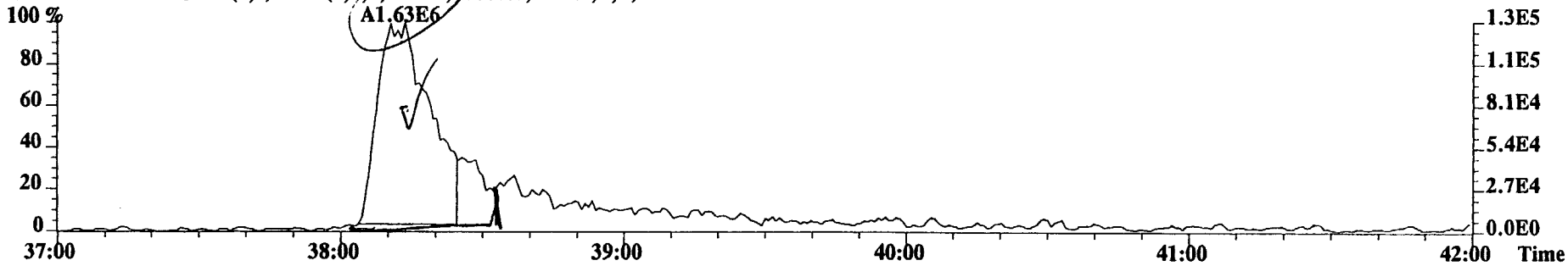
288.1692 S:17 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



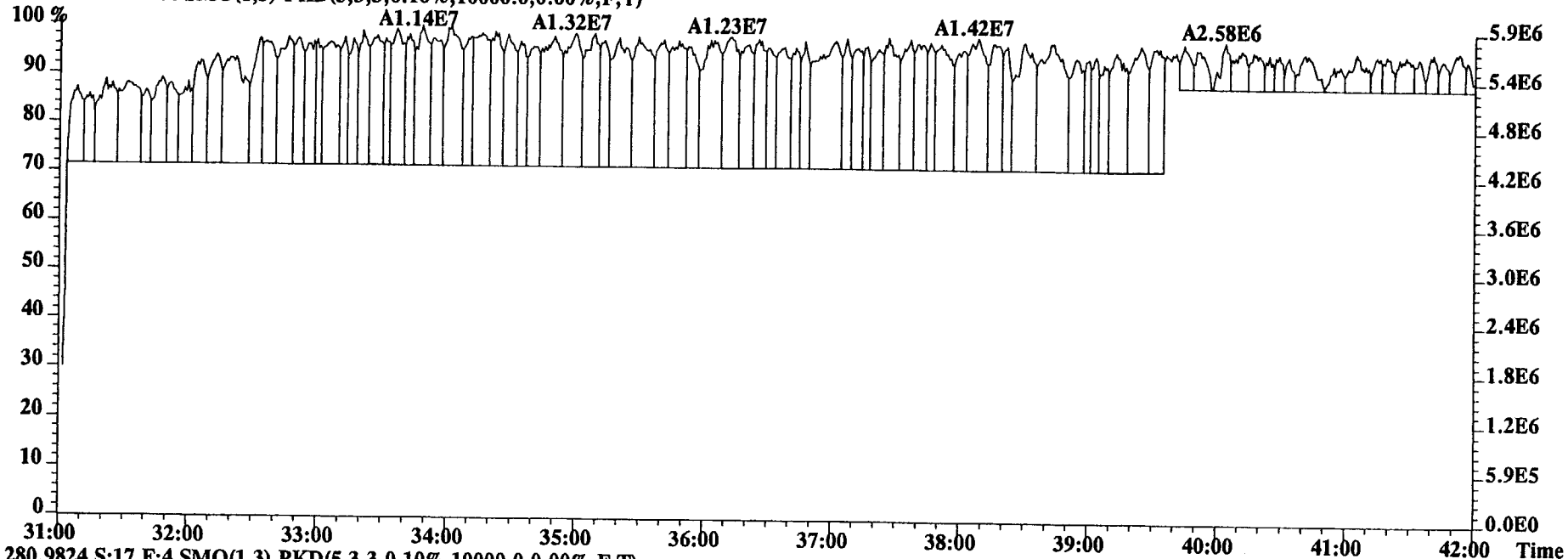
278.1096 S:17 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



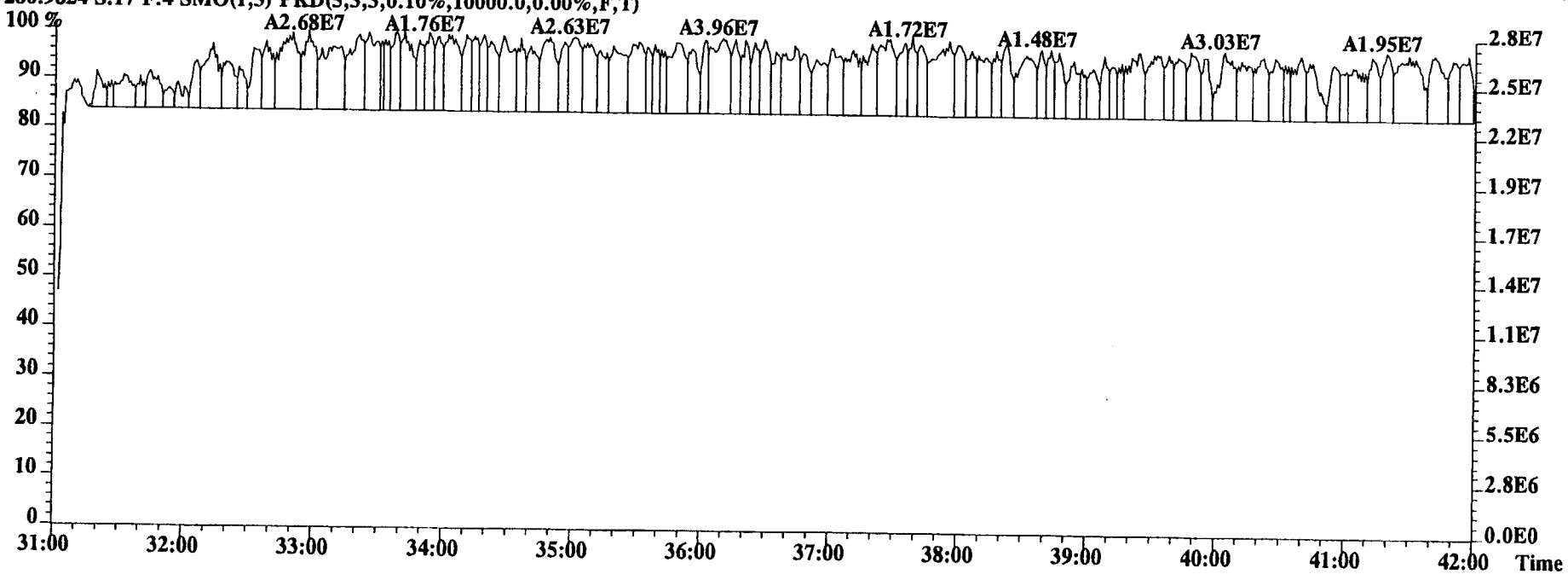
292.1974 S:17 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



File:30OC98V4 #1-878 Acq:31-OCT-1998 05:50:00 GC EI+ Voltage SIR 70SE
Sample#17 Text:301802-14 :10X DIL. : : : Exp:PAHAIR
268.9824 S:17 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



280.9824 S:17 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



Laboratory Control Sample

LABORATORY CONTROL SAMPLE REPORT
Advanced Technology Group - High Resolution
Project: 301802

Category: PAH-HR-AIR PAH by HRGC/HRMS
Test: PAH-HR-AIR
Matrix: AIR
QC Lot: 03 OCT 98-A QC Run: 02 NOV 98-A
Concentration Units: ng/sample

Analyte	Concentration Spiked	Concentration Measured	Accuracy(%) LCS	Accuracy(%) Limits	
Naphthalene	100	90	90	50-150	B
2-Methylnaphthalene	100	100	103	50-150	B
Acenaphthylene	100	100	102	50-150	
Acenaphthene	100	92	92	50-150	
Fluorene	100	77	77	50-150	a
Phenanthrene	100	81	81	50-150	B
Anthracene	100	78	78	50-150	
Fluoranthene	100	80	80	50-150	
Pyrene	100	64	64	50-150	
Benzo(a)anthracene	100	87	87	50-150	
Chrysene	100	77	77	50-150	
Benzo(b)fluoranthene	100	76	76	50-150	
Benzo(k)fluoranthene	100	66	66	50-150	
Benzo(e)pyrene	100	73	73	50-150	
Benzo(a)pyrene	100	68	68	50-150	
Perylene	100	79	79	50-150	
Indeno(1,2,3-cd)pyrene	100	90	90	50-150	
Dibenz(a,h)anthracene	100	76	76	50-150	
Benzo(g,h,i)perylene	100	88	88	50-150	
Naphthalene-d8	50	27	53	50-150	
Acenaphthylene-d8	50	31	63	50-150	
Acenaphthene-d10	50	31	61	50-150	
Fluorene-d10	50	28	55	50-150	
Phenanthrene-d10	50	38	75	50-150	
Fluoranthene-d10	50	24	48	50-150	#
Pyrene-d10	50	26	52	50-150	
Benzo(a)anthracene-d12	50	31	62	50-150	
Chrysene-d12	50	43	85	50-150	
Benzo(b)fluoranthene-d12	50	36	71	50-150	
Benzo(k)fluoranthene-d12	50	44	88	50-150	
Benzo(a)pyrene-d12	50	45	91	50-150	
Perylene-d12	50	32	65	50-150	
Indeno(123-cd)pyrene-d12	50	59	117	50-150	
Dibenz(a,h)anthracene-d14	50	56	112	50-150	
Benzo(g,h,i)perylene-d12	50	54	109	50-150	

# = Outside of control limits.
a = See narrative.
B = Compound is also detected in the blank.

441

Calculations are performed before rounding to avoid round-off errors in calculated results.

04-NOV-1998 12:45:51 PM Dioxin Furan Unknown RESULTS

Mass Spec : VG-4 Results : 02NO98V4041.RES : PAHAIR.TRG
GC Column : DB-5 Date analyzed : 02-NOV-98
Data file : 02NO98V4 301802-1LC LCS : 0. Ex Cal : PAHAIR102998V4.R
Weight : 0.5

Name	Total Response	Isotope Ratio	R. T. mm:ss	RRF	ng/ TRAIN	Rec/ MDL
d10-2-Methylnaphthalene	89598000	1.00 Y	12: 27 Y	1.00	50.00	
d8-Naphthalene	107117000	1.00 Y	10: 12 Y	2.24	26.68	53
Naphthalene	118374400	1.00 Y	10: 16 Y	1.23	90.20	B
2-Methylnaphthalene	61891400	1.00 Y	12: 34 Y	0.56	103.08	B
d8-Acenaphthylene	68496200	1.00 Y	15: 28 Y	1.21	31.49	63
Acenaphthylene	65663400	1.00 Y	15: 30 Y	0.94	101.55	
d10-Acenaphthene	40966600	1.00 Y	16: 1 Y	0.74	30.70	61
Acenaphthene	46770000	1.00 Y	16: 8 Y	1.25	91.62	
d10-Anthracene	58228800	1.00 Y	20: 55 Y	1.00	50.00	
d10-Fluorene	41693800	1.00 Y	17: 41 Y	1.42	25.20	50
Fluorene	14768940	1.00 Y	17: 47 Y	1.16	-	SEE RI
d10-Phenanthrene	122660000	1.00 Y	20: 46 Y	2.81	37.51	75
Phenanthrene	89036600	1.00 Y	20: 50 Y	0.89	81.15	B
Anthracene	76921400	1.00 Y	20: 58 Y	0.80	78.35	
d14-Terphenyl	153815400	1.00 Y	26: 0 Y	1.00	50.00	
d10-Fluoranthene	104468400	1.00 Y	24: 36 Y	1.41	24.07	48
Fluoranthene	92516200	1.00 Y	24: 40 Y	1.11	79.66	
d10-Pyrene	122108200	1.00 Y	25: 17 Y	1.52	26.15	52
Pyrene	94184600	1.00 Y	25: 21 Y	1.21	64.01	
d12-Benzo(a)anthracene	85849400	1.00 Y	29: 8 Y	0.90	31.01	62
Benzo(a)anthracene	89463200	1.00 Y	29: 12 Y	1.20	86.52	
d12-Chrysene	167547800	1.00 Y	29: 15 Y	1.28	42.58	85
Chrysene	139077000	1.00 Y	29: 20 Y	1.08	76.58	
d12-Benzo(e)pyrene	196315600	1.00 Y	33: 21 Y	1.00	50.00	
d12-Benzo(b)fluoranthene	63555600	1.00 Y	32: 28 Y	0.45	35.67	71
Benzo(b)fluoranthene	56218200	1.00 Y	32: 33 Y	1.17	75.78	
d12-Benzo(k)fluoranthene	163542600	1.00 Y	32: 34 Y	0.95	43.94	88
Benzo(k)fluoranthene	126261400	1.00 Y	32: 37 Y	1.16	66.32	
d12-Benzo(a)pyrene	120445000	1.00 Y	33: 32 Y	0.68	45.33	91
Benzo(e)pyrene	144201000	1.00 Y	33: 26 Y	1.64	72.97	
Benzo(a)pyrene	87870600	1.00 Y	33: 37 Y	1.07	68.06	
d12-Perylene	80068200	1.00 Y	33: 49 Y	0.63	32.36	65
Perylene	109039400	1.00 Y	33: 55 Y	1.71	79.47	
d12-Indeno(123-cd)pyrene	102411400	1.00 Y	38: 0 Y	0.44	58.68	117
Indeno(123-cd)pyrene	57000000	1.00 Y	38: 7 Y	0.62	89.63	
d14-Dibenz(ah)anthracene	53816800	1.00 Y	38: 5 Y	0.25	55.76	112
Dibenz(ah)anthracene	57461000	1.00 Y	38: 14 Y	1.40	76.07	
d12-Benzo(ghi)perylene	123655400	1.00 Y	39: 12 Y	0.58	54.33	109
Benzo(ghi)perylene	110815600	1.00 Y	39: 21 Y	1.02	88.20	

11-4-98

0.5

98V4.RRF
Rec/
MDL

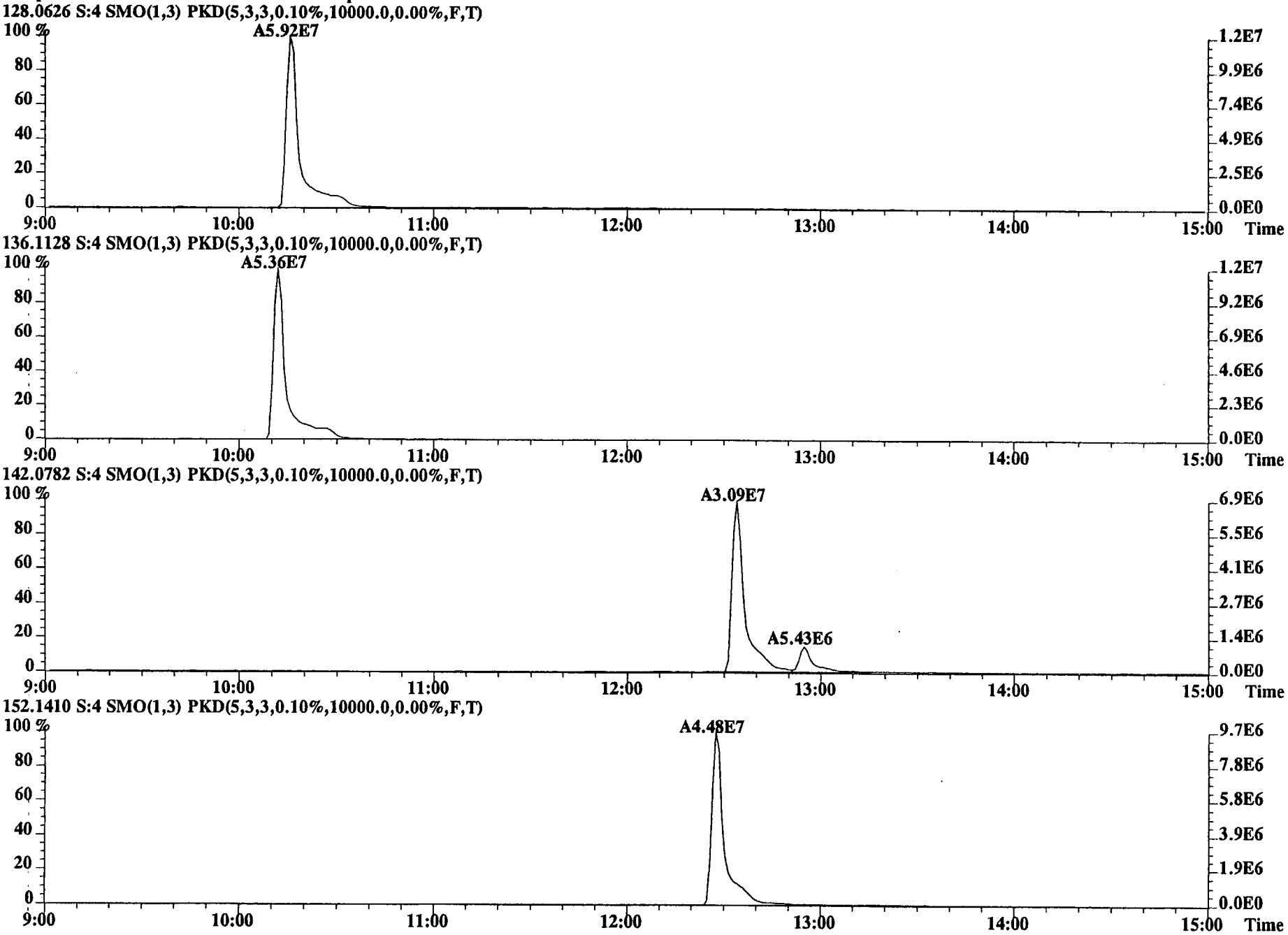
	44799000	44799000
53	53558500	53558500
B	59187200	59187200
B	30945700	30945700
63	34248100	34248100
	32831700	32831700
61	20483300	20483300
	23385000	23385000
	29114400	29114400
50	20846900	20846900
SEE	7384470	7384470
RI		
75	61330000	61330000
B	44518300	44518300
	38460700	38460700
	76907700	76907700
48	52234200	52234200
	46258100	46258100
52	61054100	61054100
	47092300	47092300
62	42924700	42924700
	44731600	44731600
85	83773900	83773900
	69538500	69538500
	98157800	98157800
71	31777800	31777800
	28109100	28109100
88	81771300	81771300
	63130700	63130700
91	60222500	60222500
	72100500	72100500
	43935300	43935300
65	40034100	40034100
	54519700	54519700
117	51205700	51205700
	28500000	28500000
112	26908400	26908400
	28730500	28730500
109	61827700	61827700
	55407800	55407800

03-NOV-1998 08:11:46 AM 429AIR Unknown RESULTS

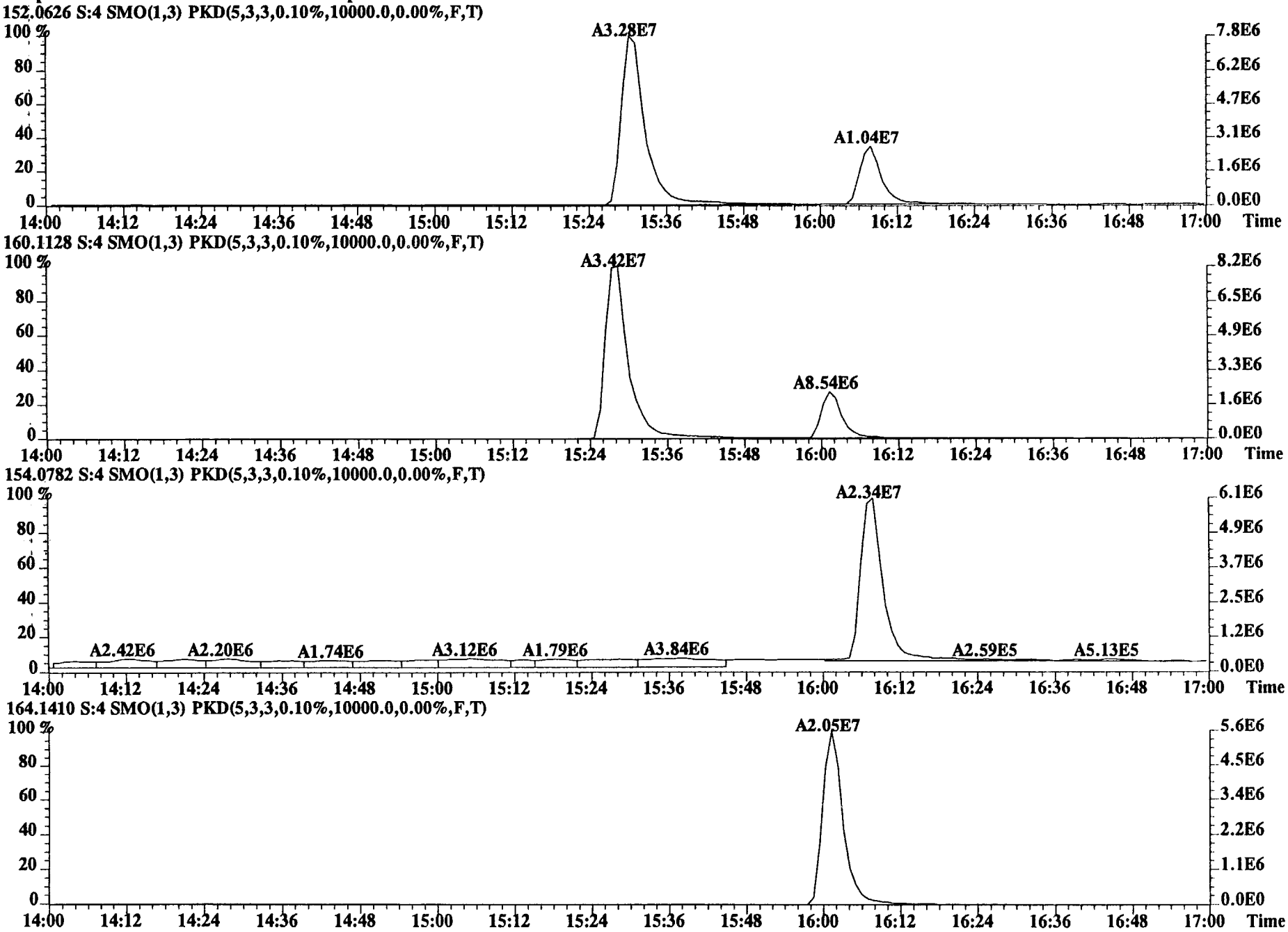
Mass Spec : VG-4 Results : 02NO98V4041.RES : PAHAIR.TRG
GC Column : DB-5 Date analyzed : 02-NOV-98
Data file : 02NO98V4 301802-1LC :LCS : : : :0. Ex Cal : PAHAIR102998V4.R
Weight : 0.5

Name	Total Response	Isotope Ratio		R. T. mm:ss		RRF	ng/ TRAIN	Rec/ MDL
d10-2-Methylnaphthalene	89598000	1.00	Y	12: 27	Y	1.00	50.00	
d8-Naphthalene	107117000	1.00	Y	10: 12	Y	2.24	26.68	53
Naphthalene	118374400	1.00	Y	10: 16	Y	1.23	90.20	0.000
2-Methylnaphthalene	61891400	1.00	Y	12: 34	Y	0.56	103.08	0.000
d8-Acenaphthylene	68496200	1.00	Y	15: 28	Y	1.21	31.49	63
Acenaphthylene	65663400	1.00	Y	15: 30	Y	0.94	101.55	0.000
d10-Acenaphthene	40966600	1.00	Y	16: 1	Y	0.74	30.70	61
Acenaphthene	46770000	1.00	Y	16: 8	Y	1.25	91.62	0.000
d10-Anthracene	58228800	1.00	Y	20: 55	Y	1.00	50.00	
d10-Fluorene	41693800	1.00	Y	17: 41	Y	1.42	25.20	50
Fluorene	14768940	1.00	Y	17: 47	Y	1.16	30.52	0.000
d10-Phenanthrene	122660000	1.00	Y	20: 46	Y	2.81	37.51	75
Phenanthrene	89036600	1.00	Y	20: 50	Y	0.89	81.15	0.000
Anthracene	76921400	1.00	Y	20: 58	Y	0.80	78.35	0.000
d14-Terphenyl	153815400	1.00	Y	26: 0	Y	1.00	50.00	
d10-Fluoranthene	104468400	1.00	Y	24: 36	Y	1.41	24.07	48
Fluoranthene	92516200	1.00	Y	24: 40	Y	1.11	79.66	0.000
d10-Pyrene	122108200	1.00	Y	25: 17	Y	1.52	26.15	52
Pyrene	94184600	1.00	Y	25: 21	Y	1.21	64.01	0.000
d12-Benzo(a)anthracene	85849400	1.00	Y	29: 8	Y	0.90	31.01	62
Benzo(a)anthracene	89463200	1.00	Y	29: 12	Y	1.20	86.52	0.000
d12-Chrysene	167547800	1.00	Y	29: 15	Y	1.28	42.58	85
Chrysene	139077000	1.00	Y	29: 20	Y	1.08	76.58	0.000
d12-Benzo(e)pyrene	196315600	1.00	Y	33: 21	Y	1.00	50.00	
d12-Benzo(b)fluoranthene	63555600	1.00	Y	32: 28	Y	0.45	35.67	71
Benzo(b)fluoranthene	56218200	1.00	Y	32: 33	Y	1.17	75.78	0.000
d12-Benzo(k)fluoranthene	163542600	1.00	Y	32: 34	Y	0.95	43.94	88
Benzo(k)fluoranthene	126261400	1.00	Y	32: 37	Y	1.16	66.32	0.000
d12-Benzo(a)pyrene	120445000	1.00	Y	33: 32	Y	0.68	45.33	91
Benzo(e)pyrene	144201000	1.00	Y	33: 26	Y	1.64	72.97	0.000
Benzo(a)pyrene	87870600	1.00	Y	33: 37	Y	1.07	68.06	0.000
d12-Perylene	80068200	1.00	Y	33: 49	Y	0.63	32.36	65
Perylene	109039400	1.00	Y	33: 55	Y	1.71	79.47	0.000
d12-Indeno(123-cd)pyrene	102411400	1.00	Y	38: 0	Y	0.44	58.68	117
Indeno(123-cd)pyrene	88304000	1.00	Y	38: 7	Y	0.62	138.86	0.000
d14-Dibenz(ah)anthracene	53816800	1.00	Y	38: 5	Y	0.25	55.76	112
Dibenz(ah)anthracene	57461000	1.00	Y	38: 14	Y	1.40	76.07	0.000
d12-Benzo(ghi)perylene	123655400	1.00	Y	39: 12	Y	0.58	54.33	109
Benzo(ghi)perylene	110815600	1.00	Y	39: 21	Y	1.02	88.20	0.000
d10-Fluorene	41693800	1.00	Y	17: 41	Y	1.42	7.47	15
13C-Fluorene	117709	1.00	Y	17: 42	Y	1.00	0.28	0.000

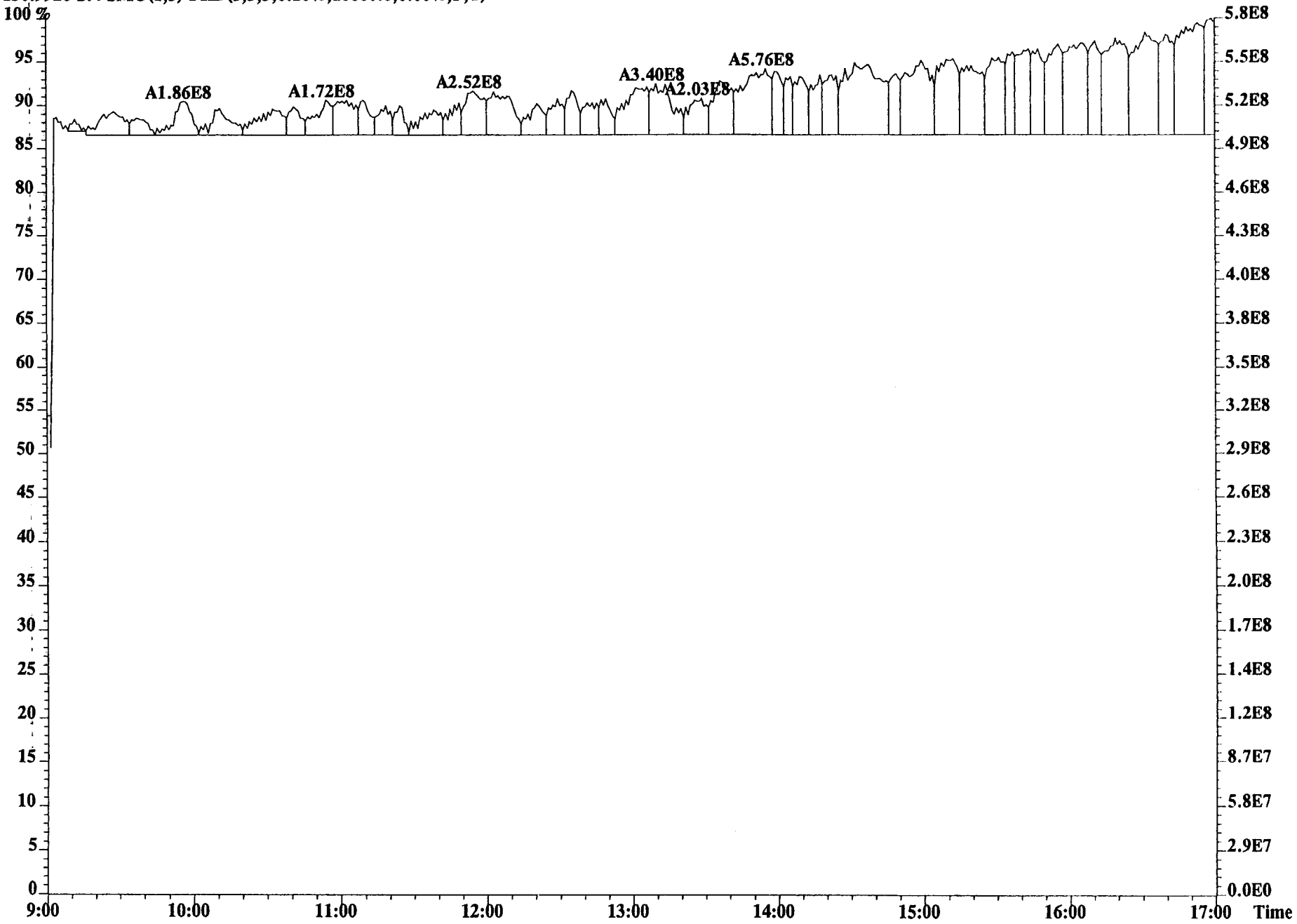
File:02NO98V4 #1-510 Acq: 2-NOV-1998 15:40:28 GC EI+ Voltage SIR 70SE
Sample#4 Text:301802-1LC :LCS : : : :0. Exp:PAHAIR



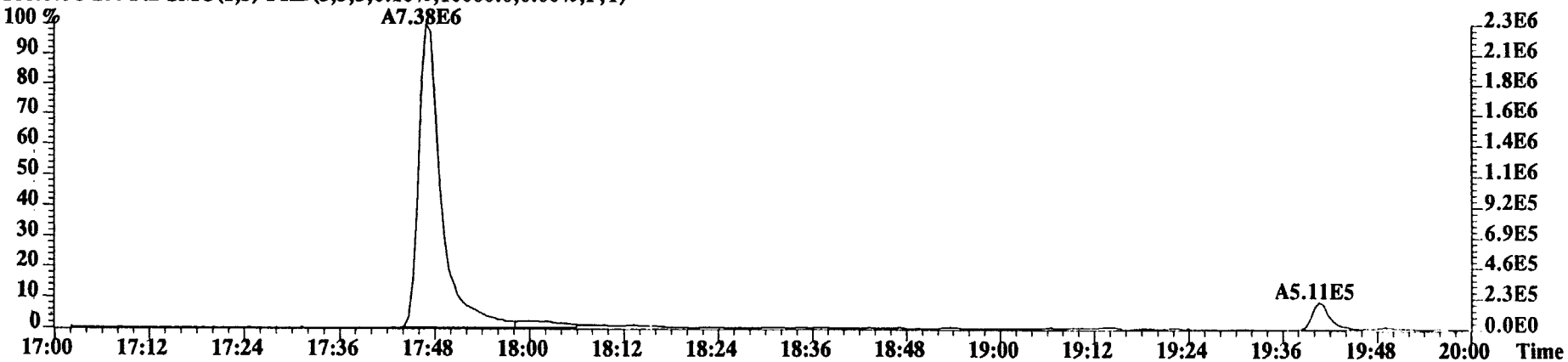
File:02NO98V4 #1-510 Acq: 2-NOV-1998 15:40:28 GC EI+ Voltage SIR 70SE
Sample#4 Text:301802-1LC :LCS : : : :0. Exp:PAHAIR



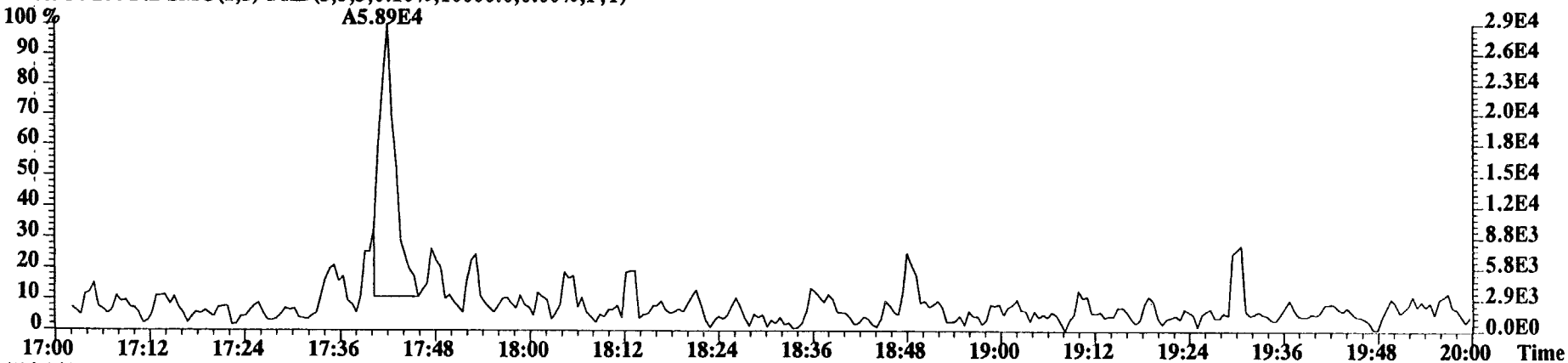
File:02NO98V4 #1-510 Acq: 2-NOV-1998 15:40:28 GC EI+ Voltage SIR 70SE
Sample#4 Text:301802-1LC :LCS : : : :0. Exp:PAHAIR
130.9920 S:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



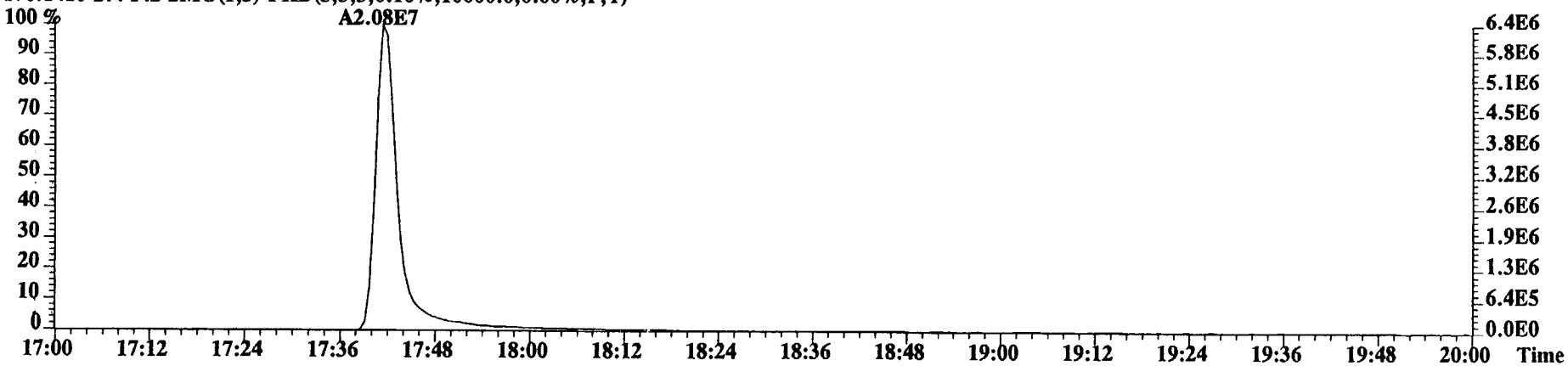
File:02NO98V4 #1-641 Acq: 2-NOV-1998 15:40:28 GC EI+ Voltage SIR 70SE
Sample#4 Text:301802-1LC :LCS : : : :0. Exp:PAHAIR
166.0798 S:4 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



172.0984 S:4 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

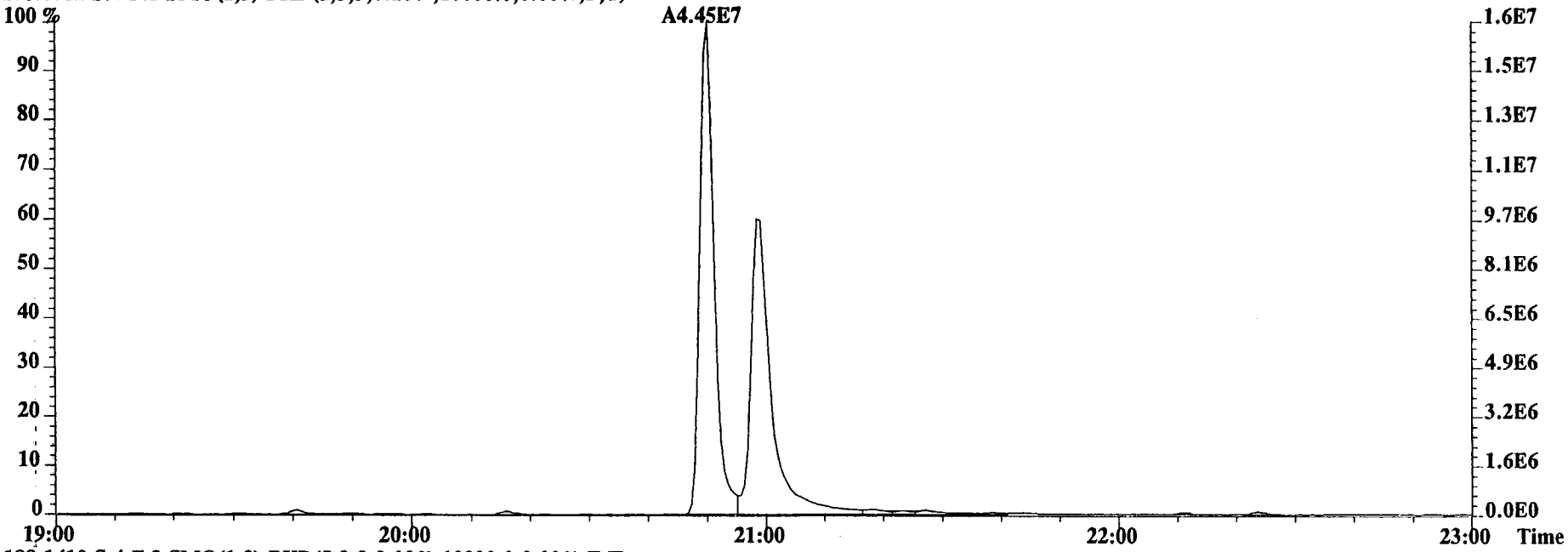


176.1410 S:4 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

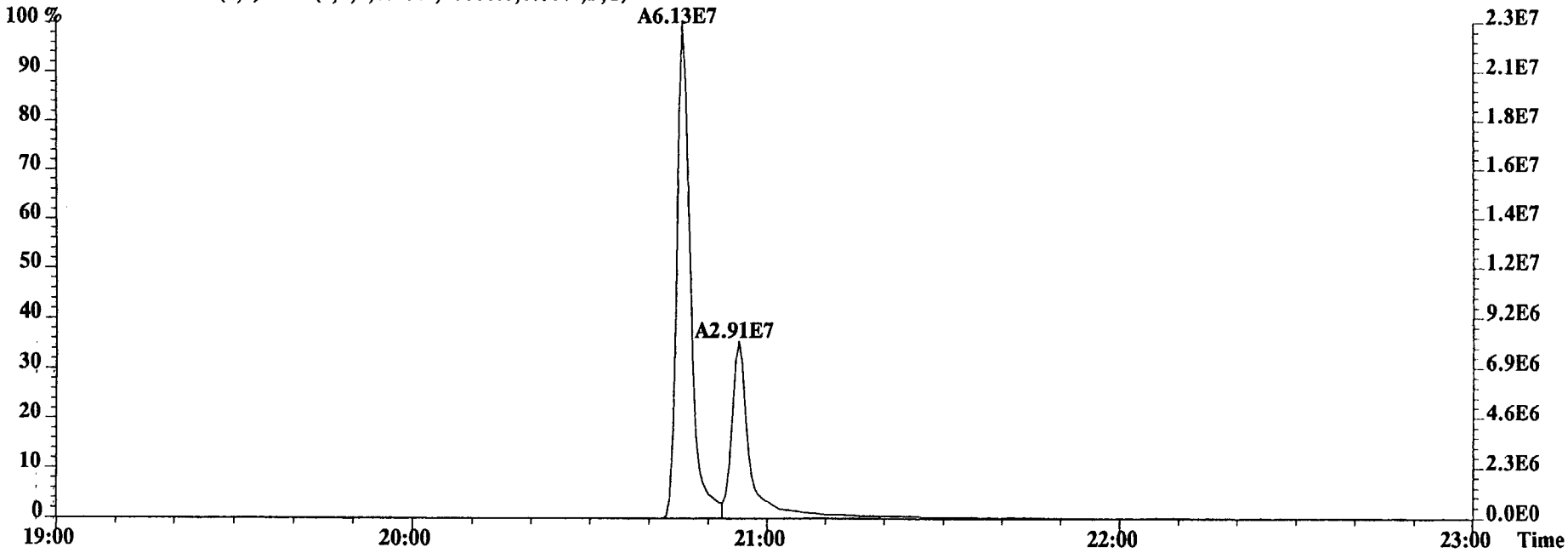


448

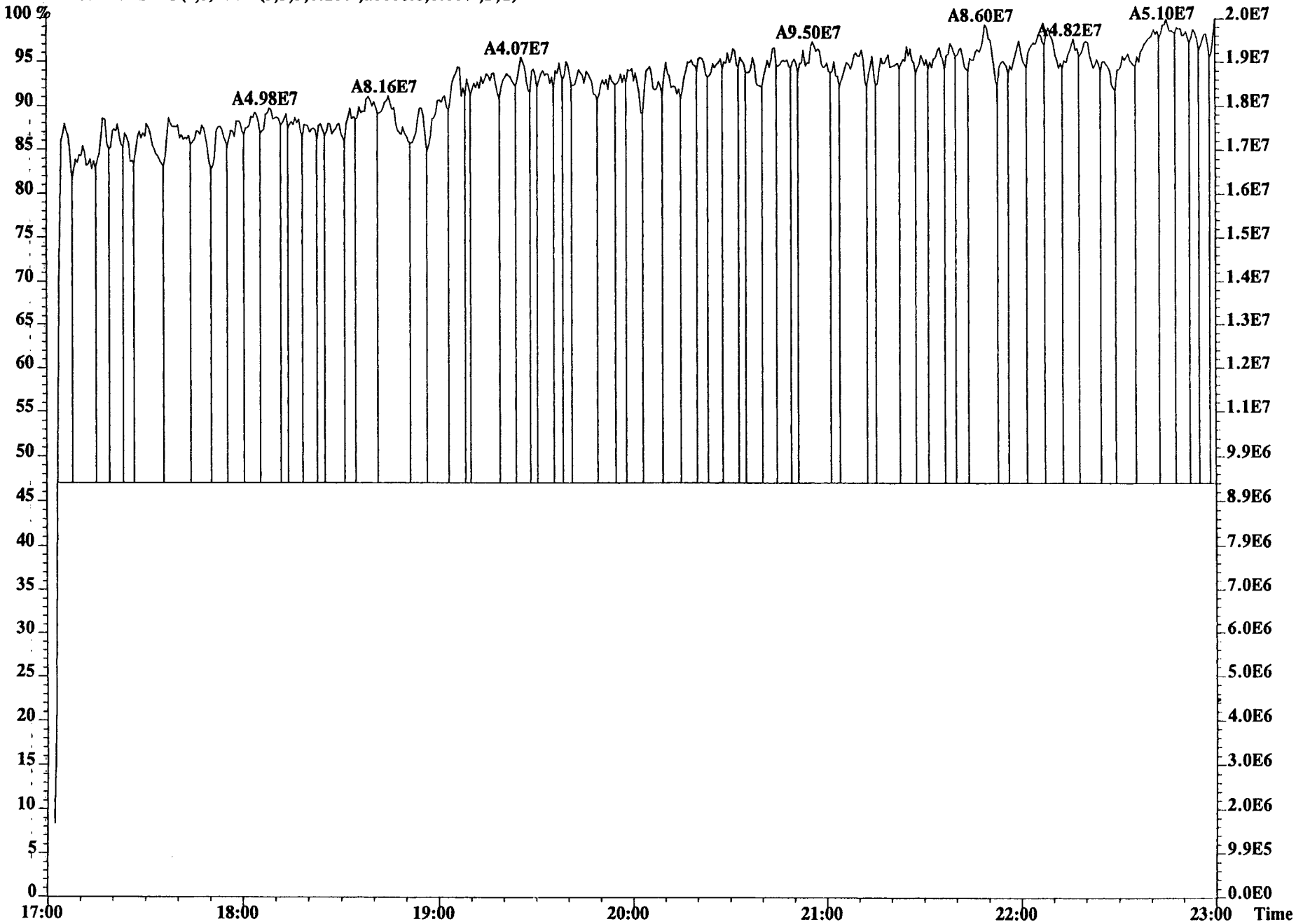
File:02NO98V4 #1-641 Acq: 2-NOV-1998 15:40:28 GC EI+ Voltage SIR 70SE
Sample#4 Text:301802-1LC :LCS : : : :0. Exp:PAHAIR
178.0782 S:4 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



188.1410 S:4 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

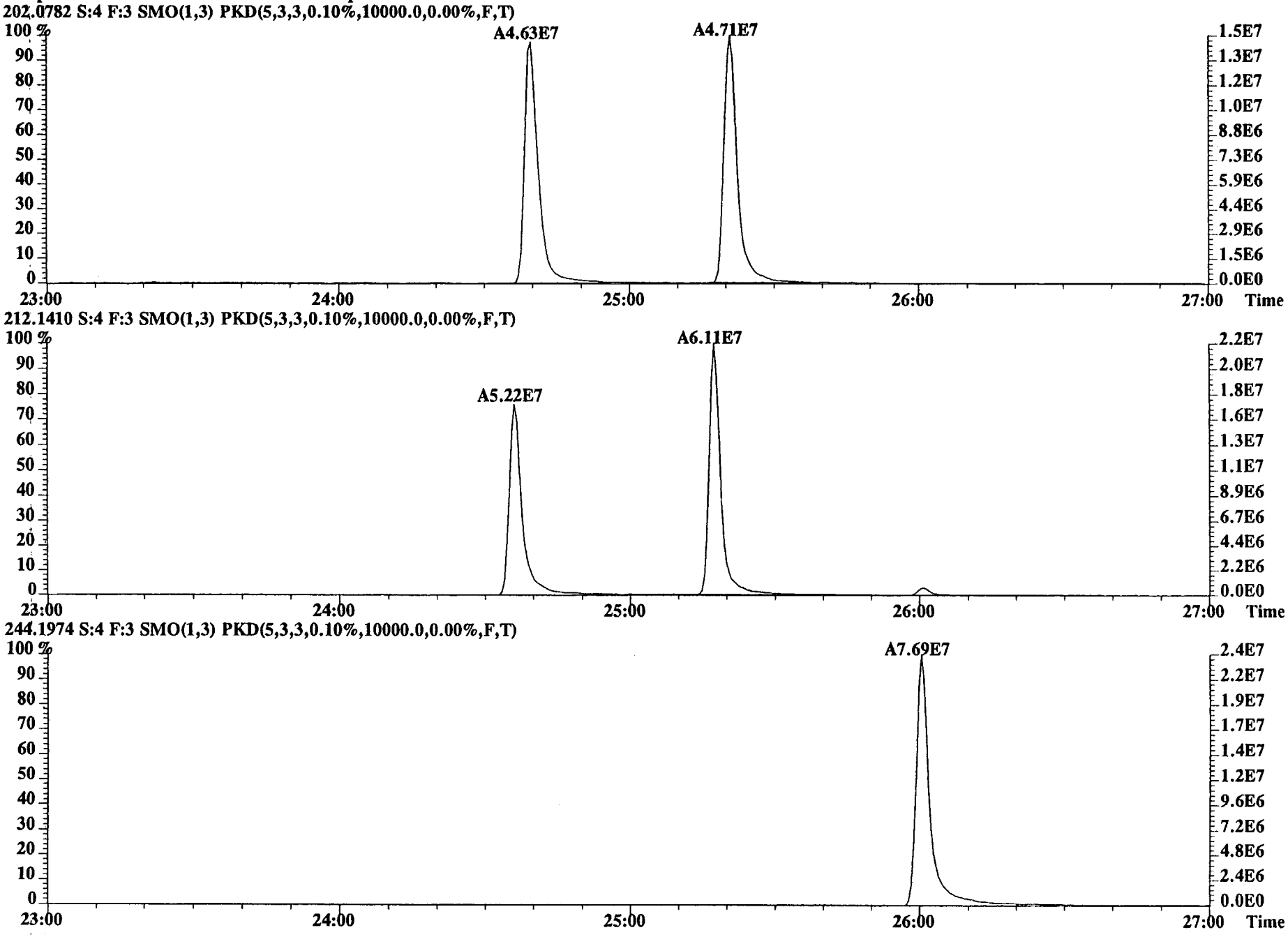


File:02NO98V4 #1-641 Acq: 2-NOV-1998 15:40:28 GC EI+ Voltage SIR 70SE
Sample#4 Text:301802-1LC :LCS : : : :0. Exp:PAHAIR
204.9888 S:4 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



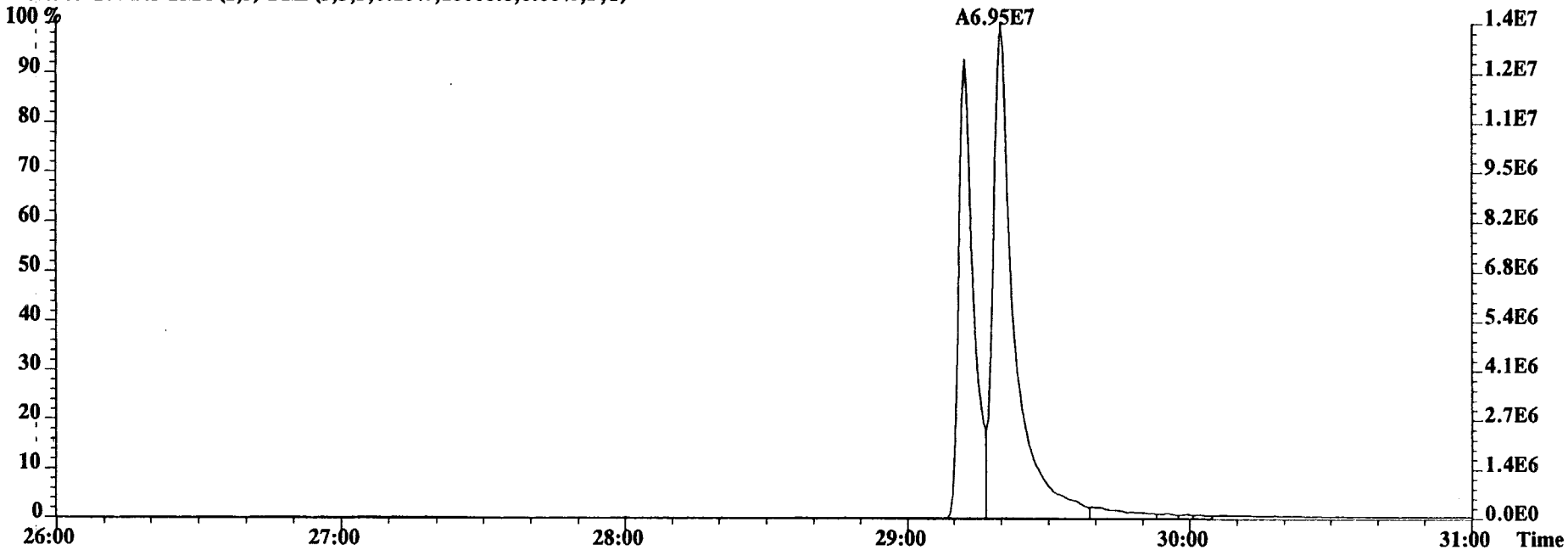
450

File:02NO98V4 #1-938 Acq: 2-NOV-1998 15:40:28 GC EI+ Voltage SIR 70SE
Sample#4 Text:301802-1LC :LCS : : : :0. Exp:PAHAIR

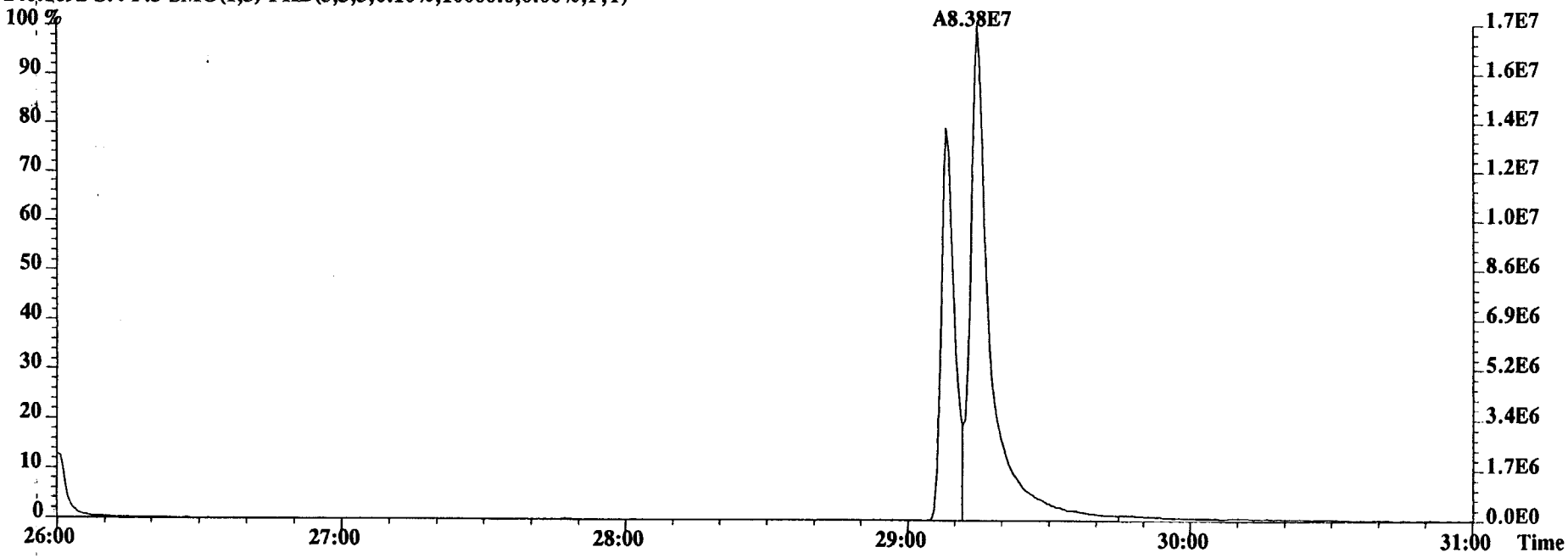


451

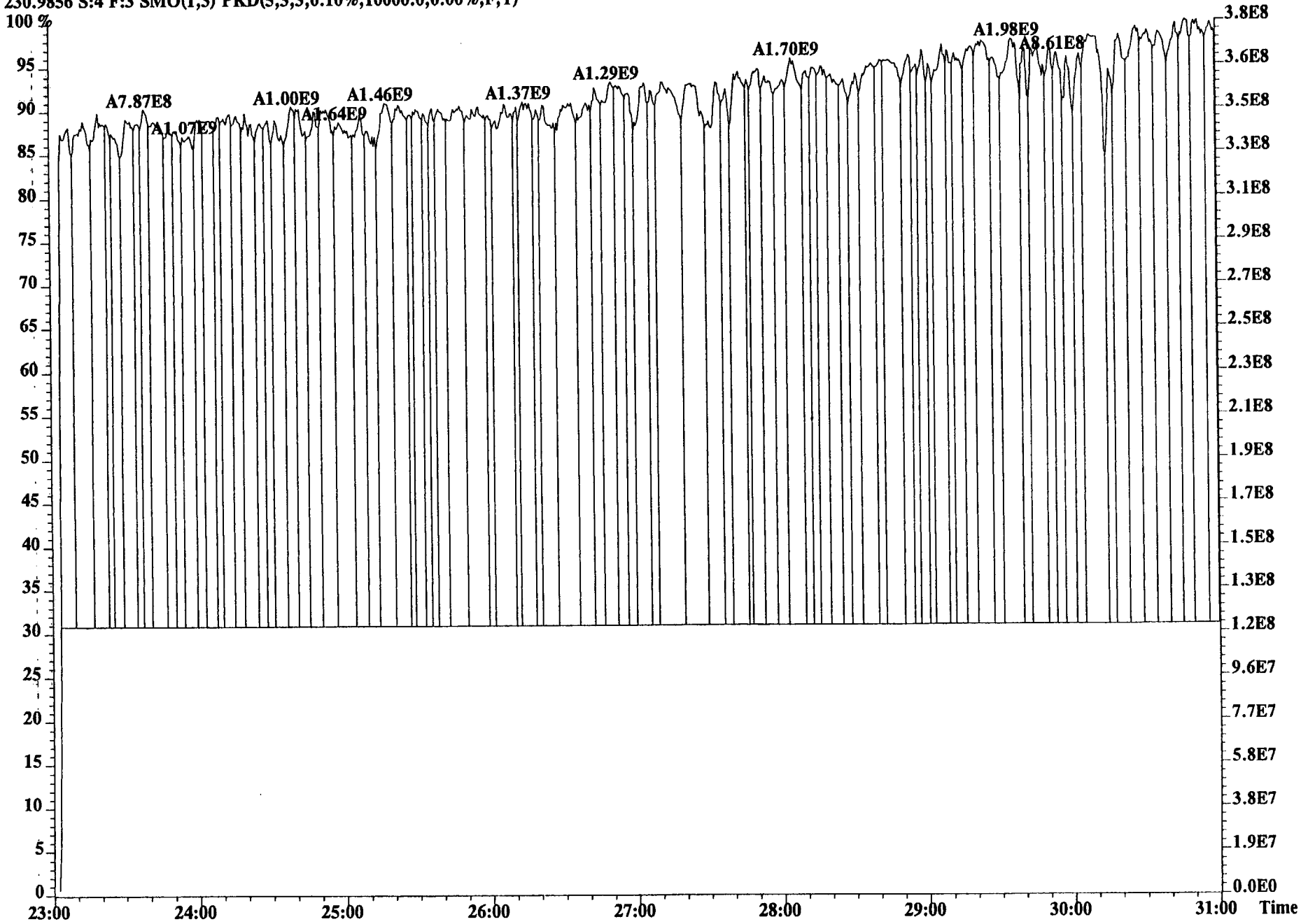
File:02NO98V4 #1-938 Acq: 2-NOV-1998 15:40:28 GC EI+ Voltage SIR 70SE
Sample#4 Text:301802-1LC :LCS : : : :0. Exp:PAHAIR
228.0939 S:4 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



240.1692 S:4 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

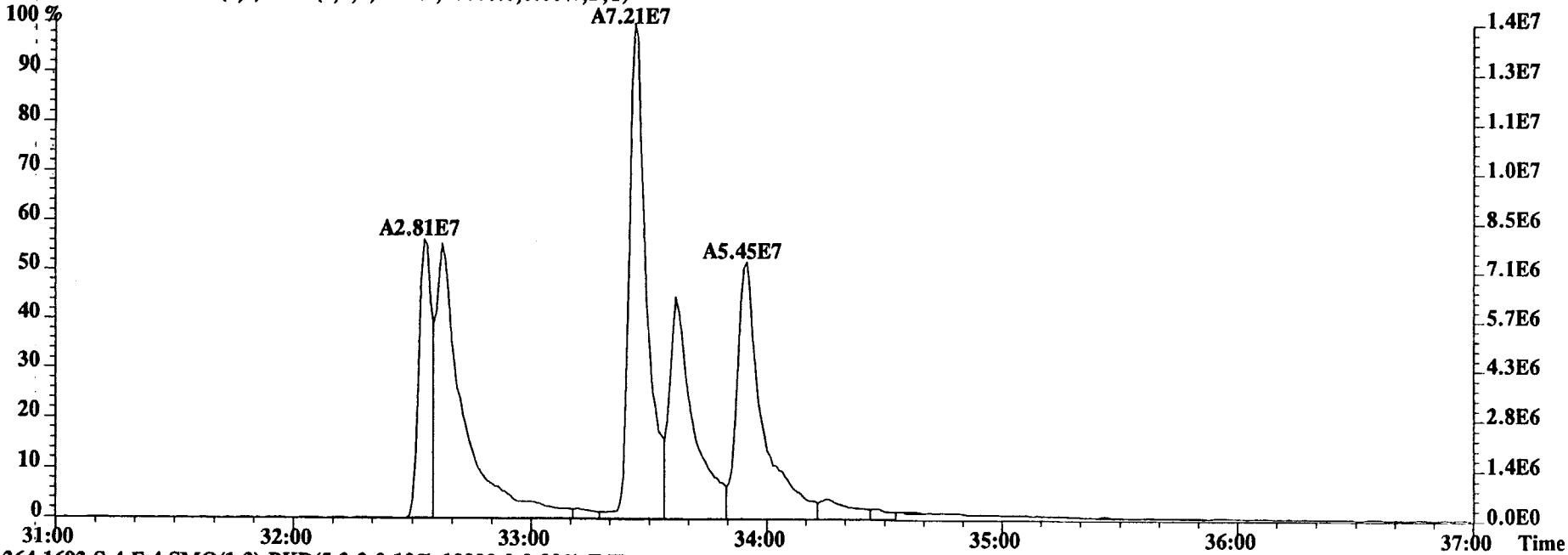


File:02NO98V4 #1-938 Acq: 2-NOV-1998 15:40:28 GC EI+ Voltage SIR 70SE
Sample#4 Text:301802-1LC :LCS : : : :0. Exp:PAHAIR
230.9856 S:4 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

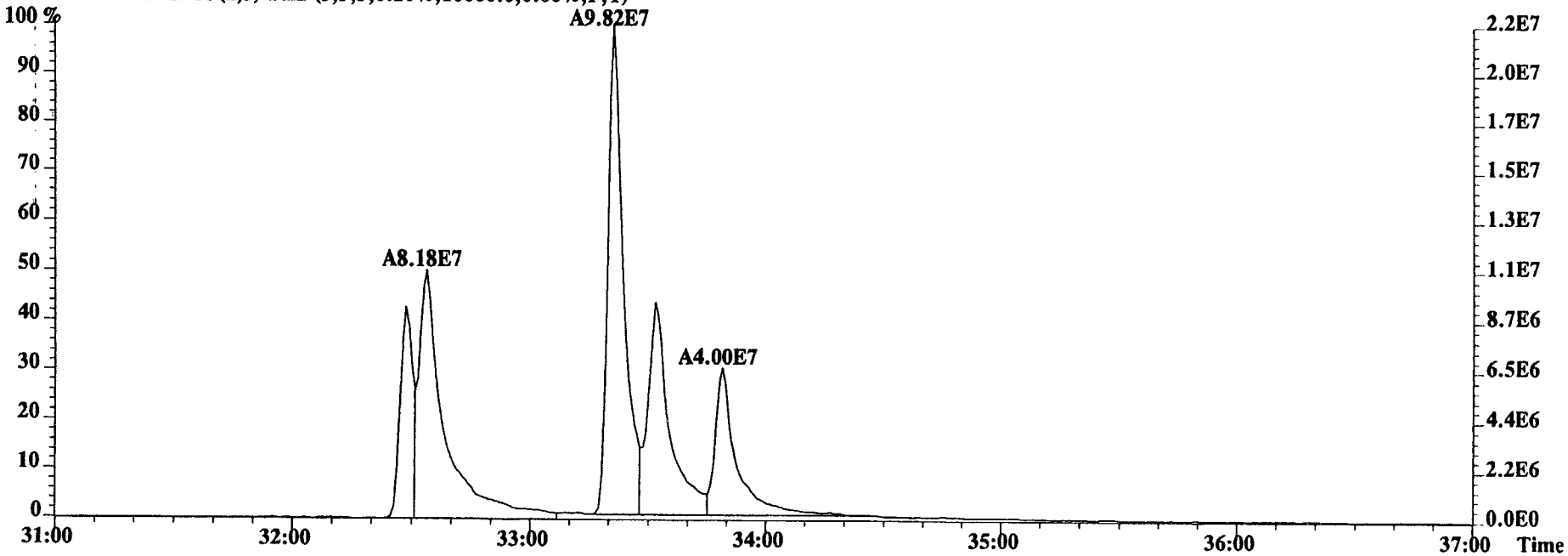


453

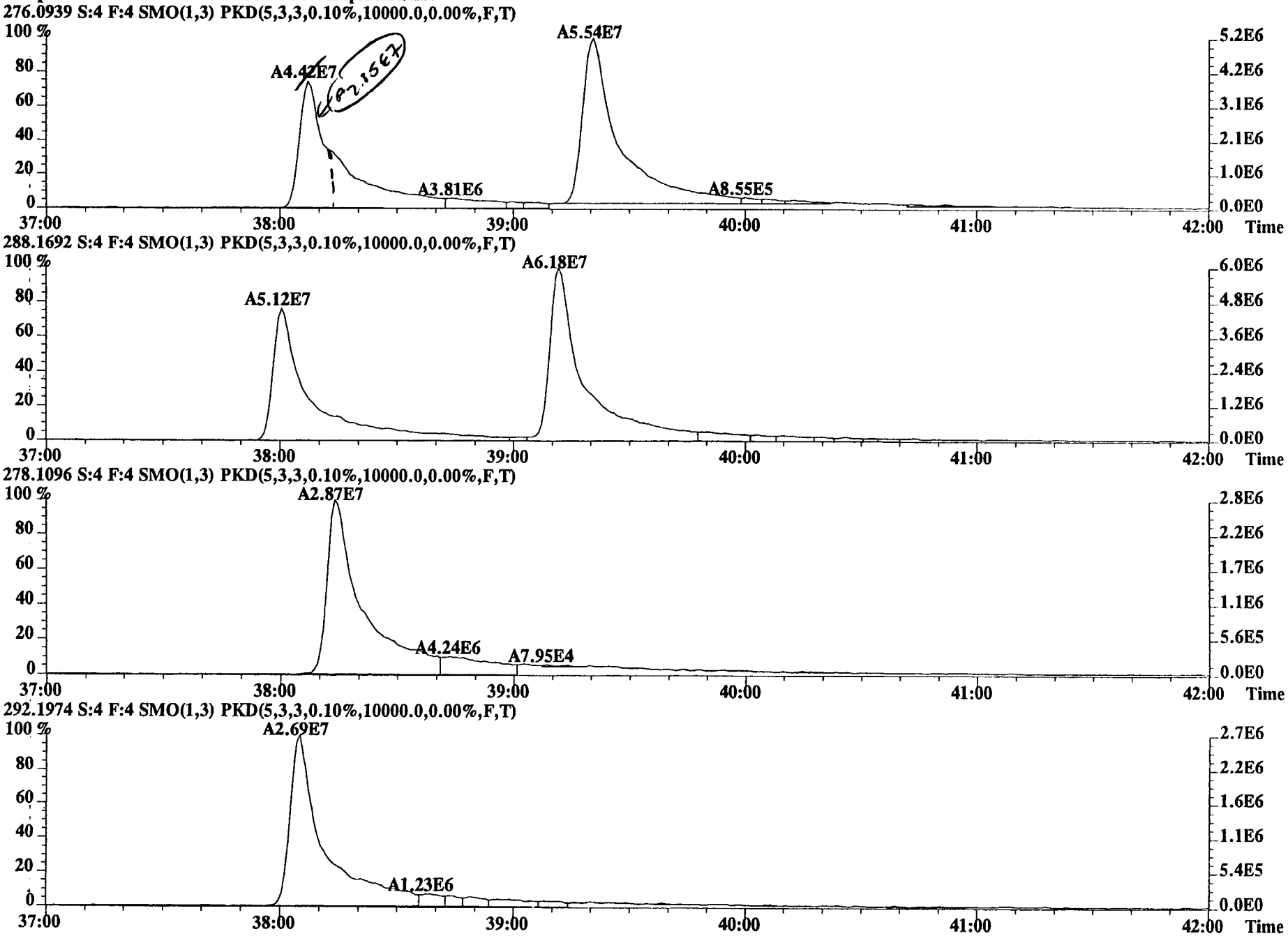
File:02NO98V4 #1-878 Acq: 2-NOV-1998 15:40:28 GC EI+ Voltage SIR 70SE
Sample#4 Text:301802-1LC :LCS : : : :0. Exp:PAHAIR
252.0939 S:4 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



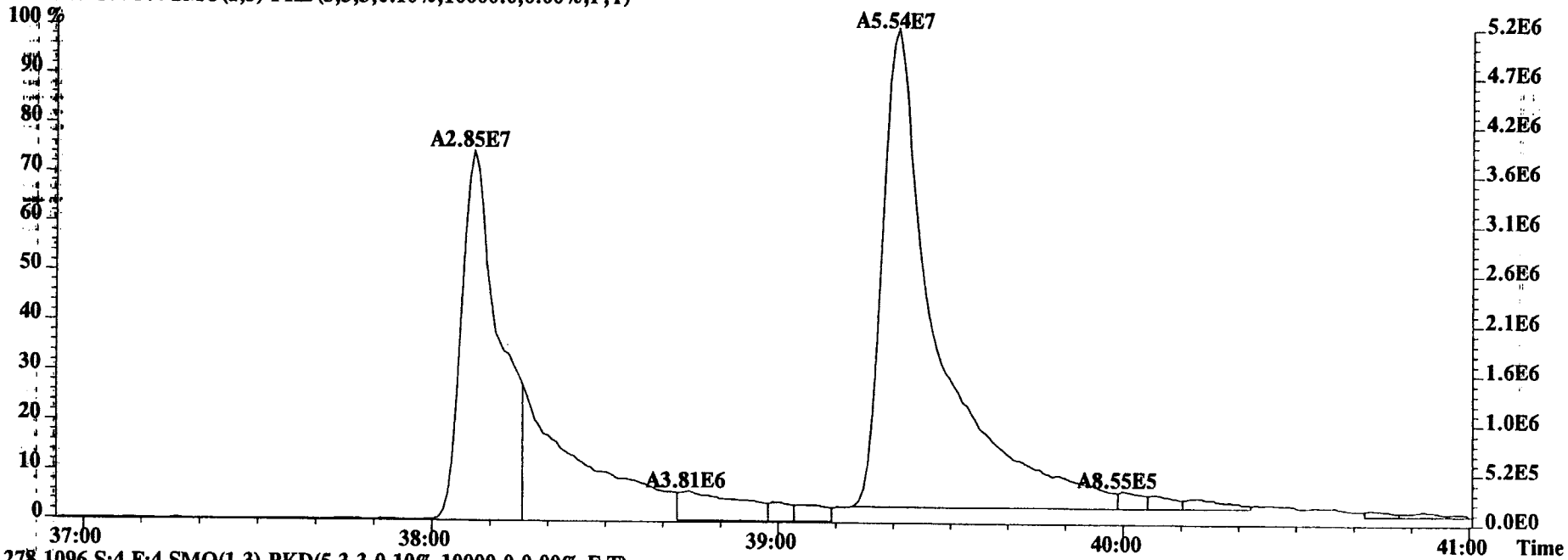
264.1692 S:4 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



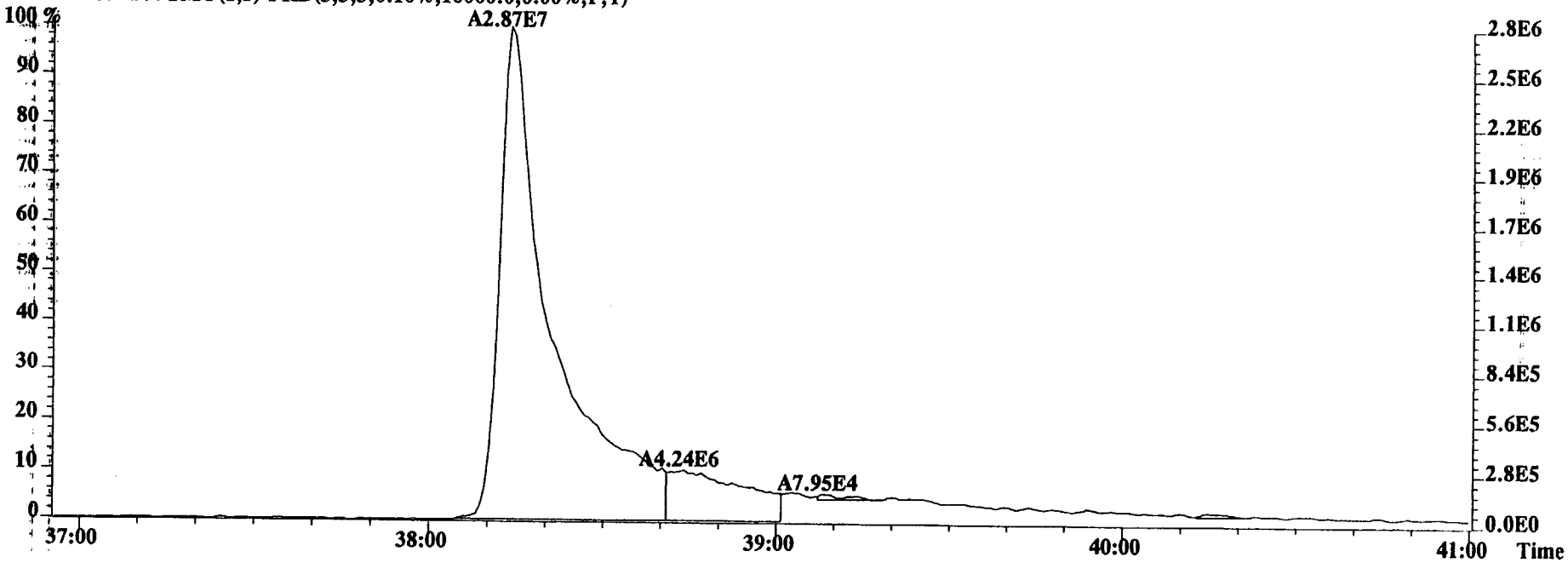
File:02NO98V4 #1-878 Acq: 2-NOV-1998 15:40:28 GC EI+ Voltage SIR 70SE
Sample#4 Text:301802-1LC :LCS : : : :0. Exp:PAHAIR



File:02NO98V4 #1-878 Acq: 2-NOV-1998 15:40:28 GC EI+ Voltage SIR 70SE
Sample#4 Text:301802-1LC :LCS : : : :0. Exp:PAHAIR
276.0939 S:4 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

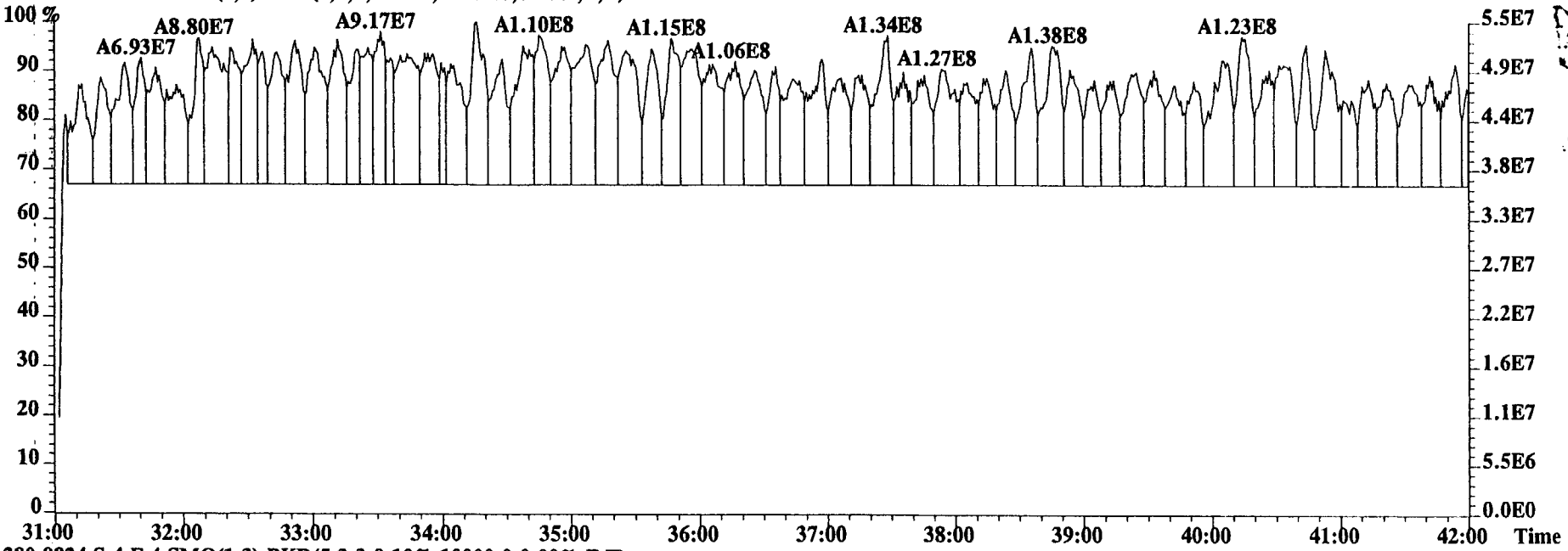


278.1096 S:4 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

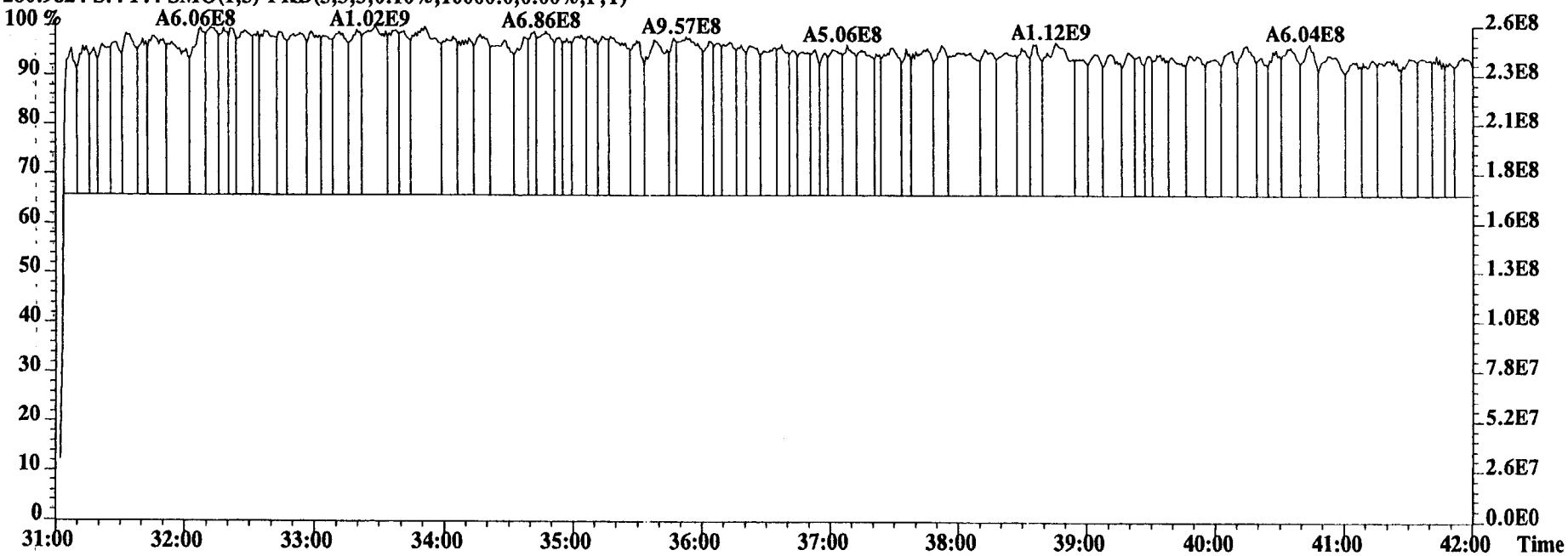


456

File:02NO98V4 #1-878 Acq: 2-NOV-1998 15:40:28 GC EI+ Voltage SIR 70SE
Sample#4 Text:301802-1LC :LCS : : : :0. Exp:PAHAIR
268.9824 S:4 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



280.9824 S:4 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



04-NOV-1998 12:49:26 PM Dioxin Furan Unknown RESULTS

Mass Spec : VG-4 Results : 03NO98V4041.RES : PAHAIR.TRG
GC Column : DB-5 Date analyzed : 03-NOV-98
Data file : 03NO98V4 301802-1LC LCS : 0 Ex Cal : PAHAIR102998V4.R
Weight : 0.5

Name	Total Response	Isotope Ratio	R. T. mm:ss	RRF	ng/ TRAIN	Rec/ MDL
d10-Anthracene	23399000	1.00 Y	20: 54 Y	1.00	50.00	
d10-Fluorene	18381380	1.00 Y	17: 41 Y	1.42	27.64	55
Fluorene	16485420	1.00 Y	17: 47 Y	1.16	77.28	

11-4-98
CP

	0.5	
98V4.RRF Rec/ MDL		
	11699500	11699500
55	9190690	9190690
	8242710	8242710

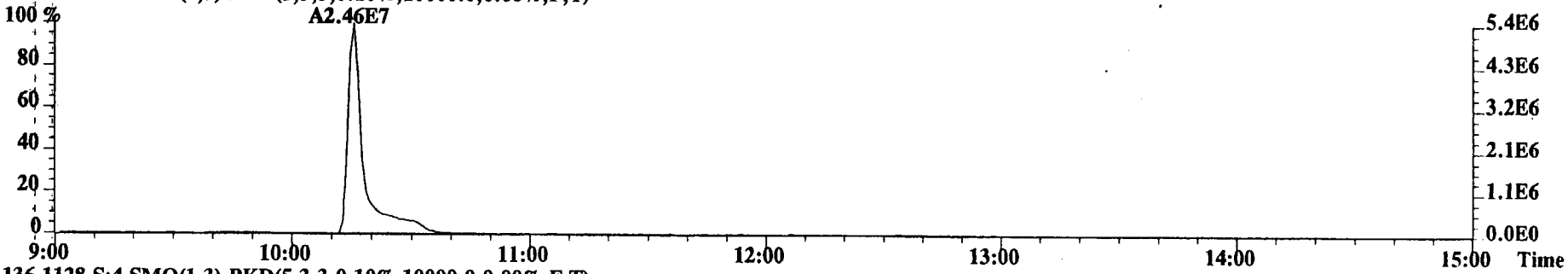
03-NOV-1998 02:32:51 PM 429AIR Unknown RESULTS

Mass Spec : VG-4 Results : 03NO98V4041.RES : PAHAIR.TRG
GC Column : DB-5 Date analyzed : 03-NOV-98
Data file : 03NO98V4 301802-1LC :LCS : : : :0. Ex Cal : PAHAIR102998V4.R
Weight : 0.5

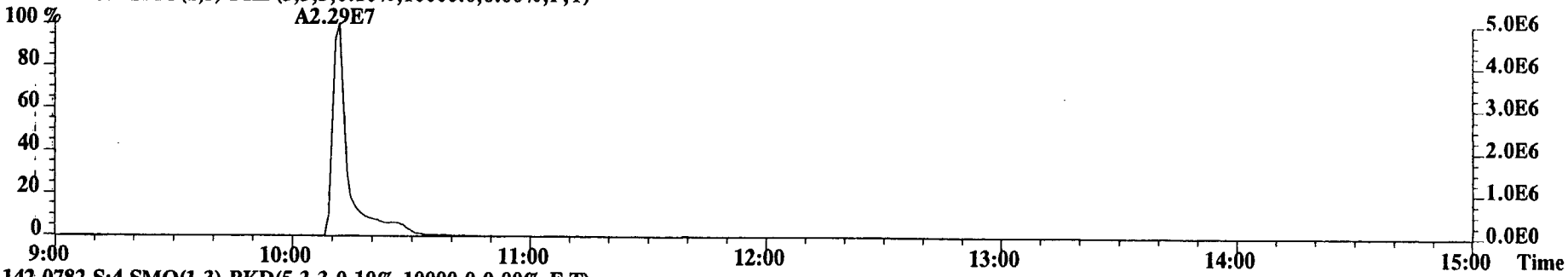
Name	Total Response	Isotope Ratio	R. T. mm:ss	RRF	ng/ TRAIN	Rec/ MDL
d10-2-Methylnaphthalene	37412400	1.00 Y	12: 27 Y	1.00	50.00	
d8-Naphthalene	45879400	1.00 Y	10: 12 Y	2.24	27.36	55
Naphthalene	49271800	1.00 Y	10: 16 Y	1.23	87.66	0.000
2-Methylnaphthalene	24274600	1.00 Y	12: 34 Y	0.56	94.39	0.000
d8-Acenaphthylene	31094800	1.00 Y	15: 27 Y	1.21	34.24	68
Acenaphthylene	27737000	1.00 Y	15: 30 Y	0.94	94.49	0.000
d10-Acenaphthene	18919580	1.00 Y	16: 1 Y	0.74	33.96	68
Acenaphthene	18287420	1.00 Y	16: 7 Y	1.25	77.57	0.000
d10-Anthracene	23399000	1.00 Y	20: 54 Y	1.00	50.00	
d10-Fluorene	18381380	1.00 Y	17: 41 Y	1.42	27.64	55
Fluorene	16485420	1.00 Y	17: 47 Y	1.16	77.28	0.000
d10-Phenanthrene	50645000	1.00 Y	20: 45 Y	2.81	38.55	77
Phenanthrene	39571800	1.00 Y	20: 49 Y	0.89	87.35	0.000
Anthracene	31133200	1.00 Y	20: 58 Y	0.80	76.80	0.000
d14-Terphenyl	52179400	1.00 Y	26: 0 Y	1.00	50.00	
d10-Fluoranthene	44489600	1.00 Y	24: 36 Y	1.41	30.22	60
Fluoranthene	44720600	1.00 Y	24: 39 Y	1.11	90.41	0.000
d10-Pyrene	46858200	1.00 Y	25: 17 Y	1.52	29.58	59
Pyrene	48076200	1.00 Y	25: 20 Y	1.21	85.14	0.000
d12-Benzo(a)anthracene	19295560	1.00 Y	29: 8 Y	0.90	20.54	41
Benzo(a)anthracene	21313600	1.00 Y	29: 12 Y	1.20	91.70	0.000
d12-Chrysene	46687000	1.00 Y	29: 14 Y	1.28	34.97	70
Chrysene	39673800	1.00 Y	29: 20 Y	1.08	78.40	0.000
d12-Benzo(e)pyrene	48654800	1.00 Y	33: 20 Y	1.00	50.00	
d12-Benzo(b)fluoranthene	14420380	1.00 Y	32: 28 Y	0.45	32.65	65
Benzo(b)fluoranthene	13157600	1.00 Y	32: 33 Y	1.17	78.17	0.000
d12-Benzo(k)fluoranthene	36534000	1.00 Y	32: 33 Y	0.95	39.60	79
Benzo(k)fluoranthene	38188200	1.00 Y	32: 37 Y	1.16	89.79	0.000
d12-Benzo(a)pyrene	32661600	1.00 Y	33: 31 Y	0.68	49.60	99
Benzo(e)pyrene	41321000	1.00 Y	33: 26 Y	1.64	77.10	0.000
Benzo(a)pyrene	26617200	1.00 Y	33: 36 Y	1.07	76.02	0.000
d12-Perylene	22493800	1.00 Y	33: 48 Y	0.63	36.68	73
Perylene	31782200	1.00 Y	33: 54 Y	1.71	82.45	0.000
d12-Indeno(123-cd)pyrene	16088940	1.00 Y	37: 59 Y	0.44	37.19	74
Indeno(123-cd)pyrene	15325920	1.00 Y	38: 6 Y	0.62	153.40	0.000
d14-Dibenz(ah)anthracene	6846840	1.00 Y	38: 3 Y	0.25	28.62	57
Dibenz(ah)anthracene	9119460	1.00 Y	38: 13 Y	1.40	94.90	0.000
d12-Benzo(ghi)perylene	19645600	1.00 Y	39: 10 Y	0.58	34.83	70
Benzo(ghi)perylene	21834400	1.00 Y	39: 19 Y	1.02	109.39	0.000
d10-Fluorene	18381380	1.00 Y	17: 41 Y	1.42	13.29	27
13C-Fluorene	* No Peak	0.00 N	17: 46 N	1.00	0.00	0.000

File:03NO98V4 #1-510 Acq: 3-NOV-1998 13:08:10 GC EI+ Voltage SIR 70SE
Sample#4 Text:301802-1LC :LCS : : : :0. Exp:PAHAIR

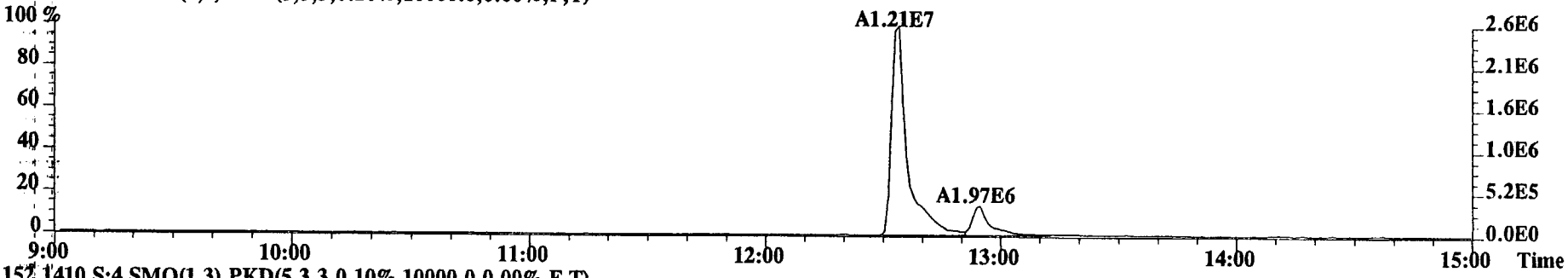
128.0626 S:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



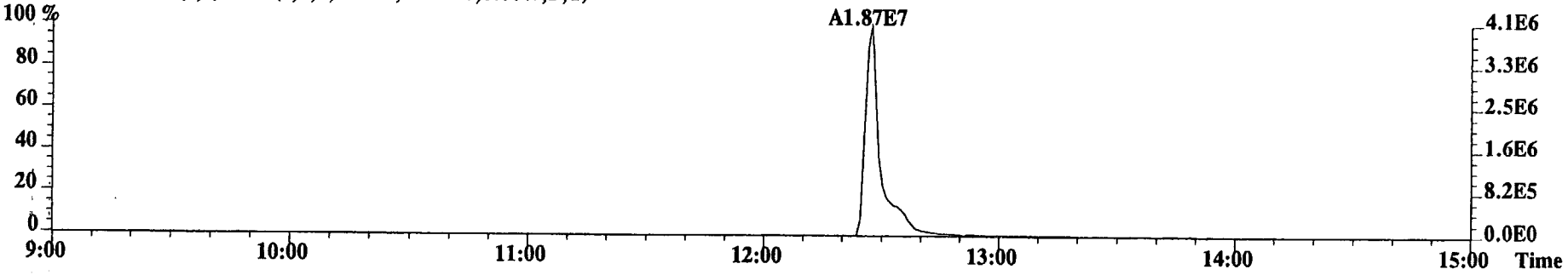
136.1128 S:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



142.0782 S:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

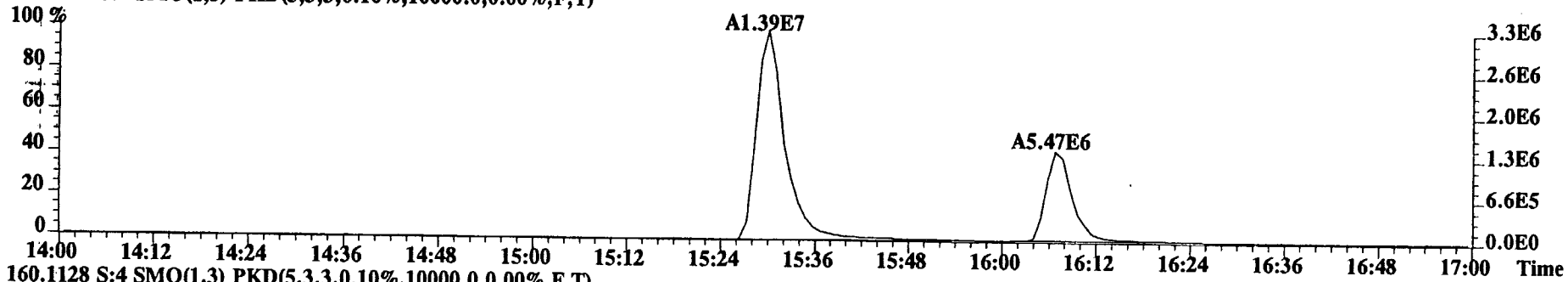


152.1410 S:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

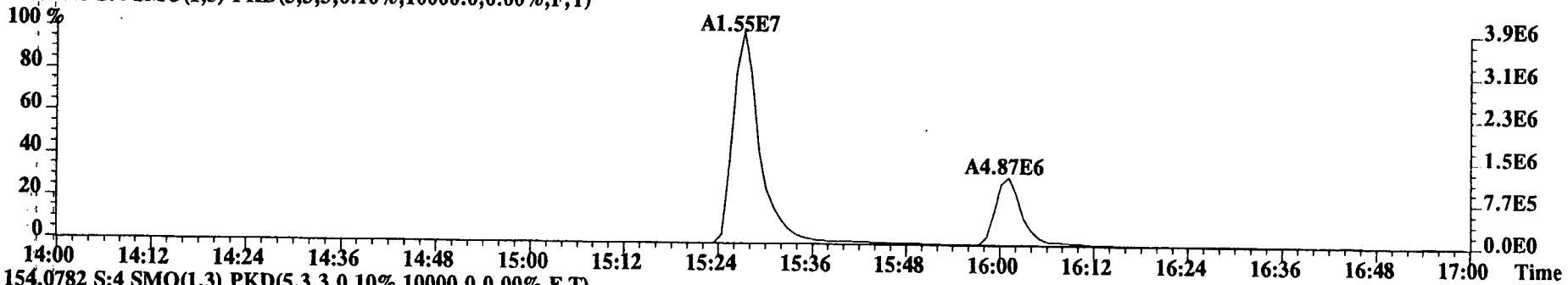


File:03NO98V4 #1-510 Acq: 3-NOV-1998 13:08:10 GC EI+ Voltage SIR 70SE
Sample#4 Text:301802-1LC :LCS : : : :0. Exp:PAHAIR

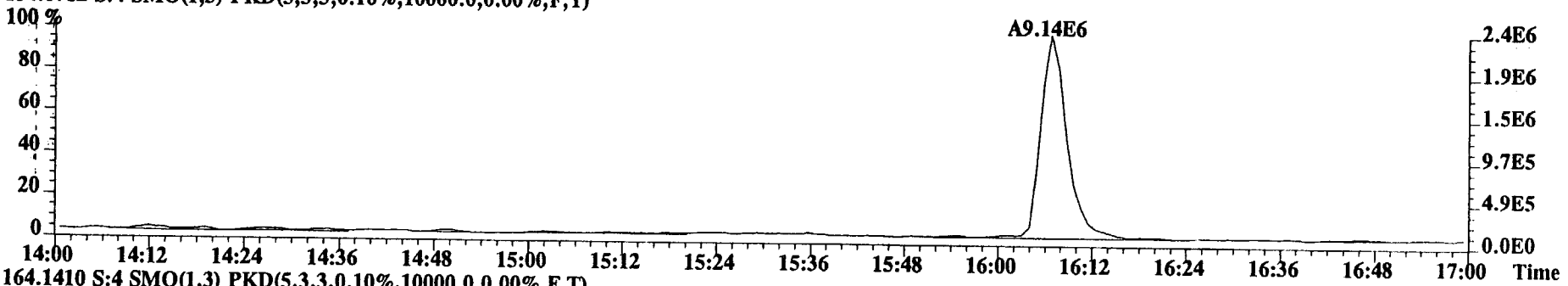
152.0626 S:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



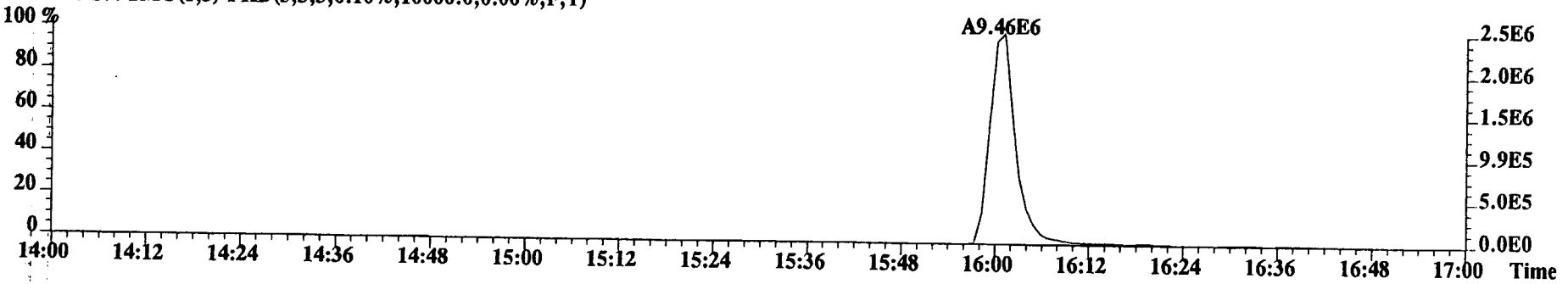
160.1128 S:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



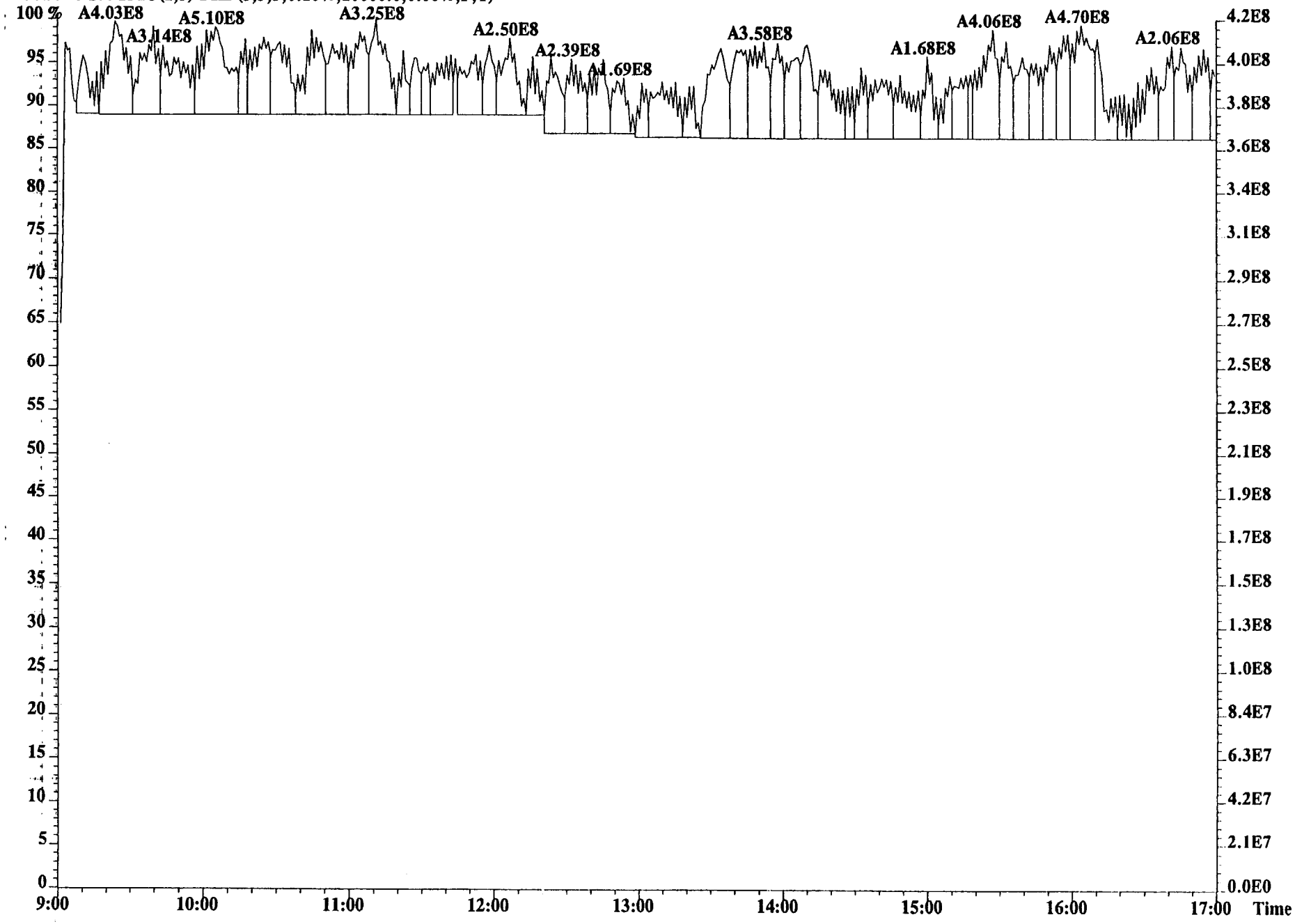
154.0782 S:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



164.1410 S:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

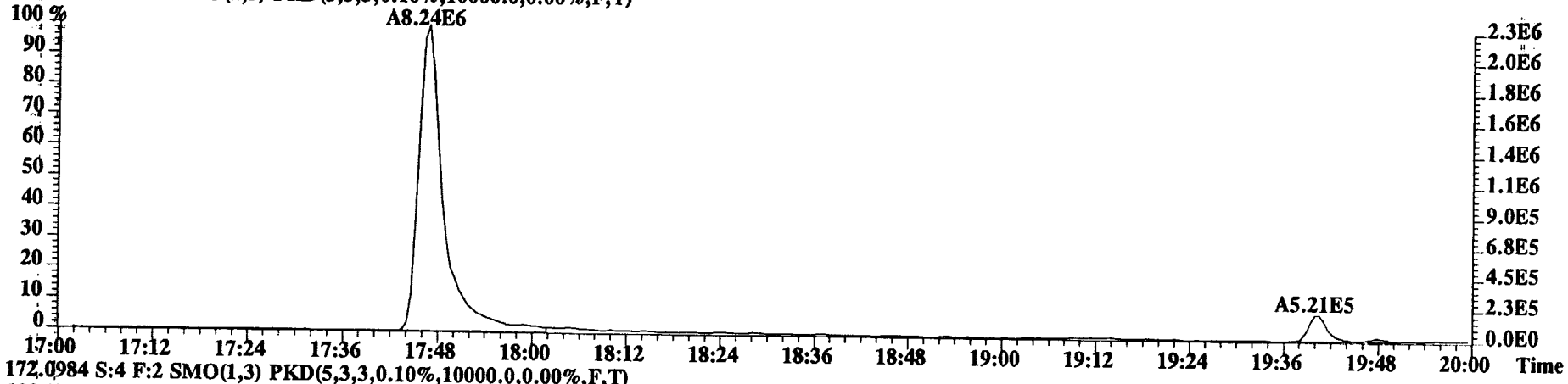


File:03NO98V4 #1-510 Acq: 3-NOV-1998 13:08:10 GC EI+ Voltage SIR 70SE
Sample#4 Text:301802-1LC :LCS : : : :0. Exp:PAHAIR
130.9920 S:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

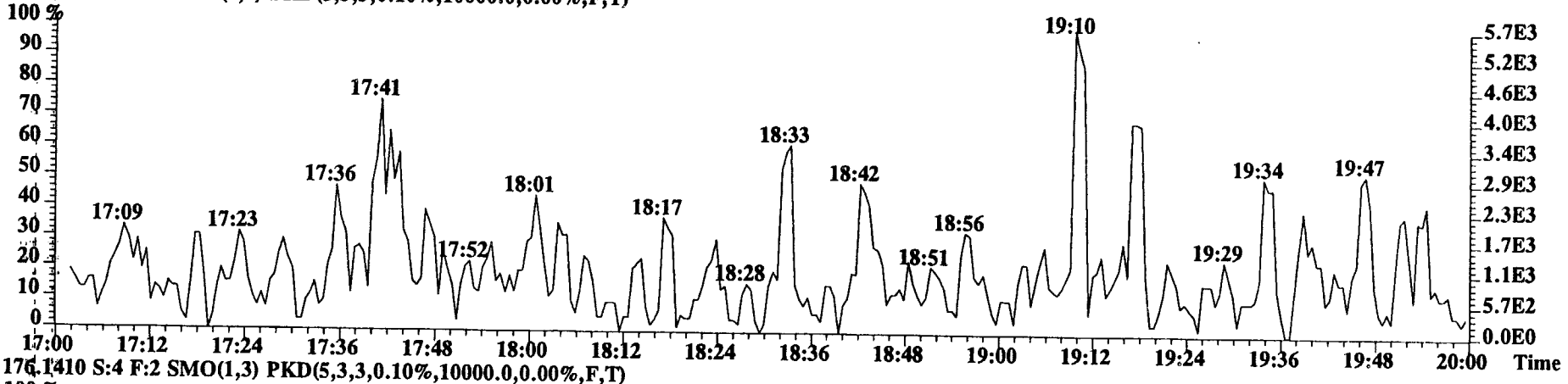


463

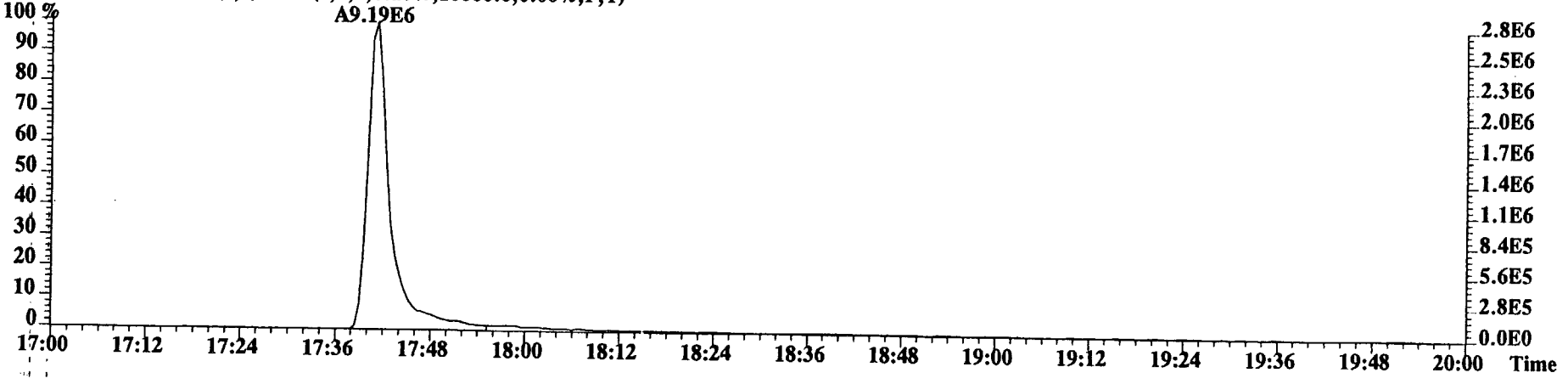
File:03NO98V4 #1-641 Acq: 3-NOV-1998 13:08:10 GC EI+ Voltage SIR 70SE
Sample#4 Text:301802-1LC :LCS : : : :0. Exp:PAHAIR
166.0798 S:4 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



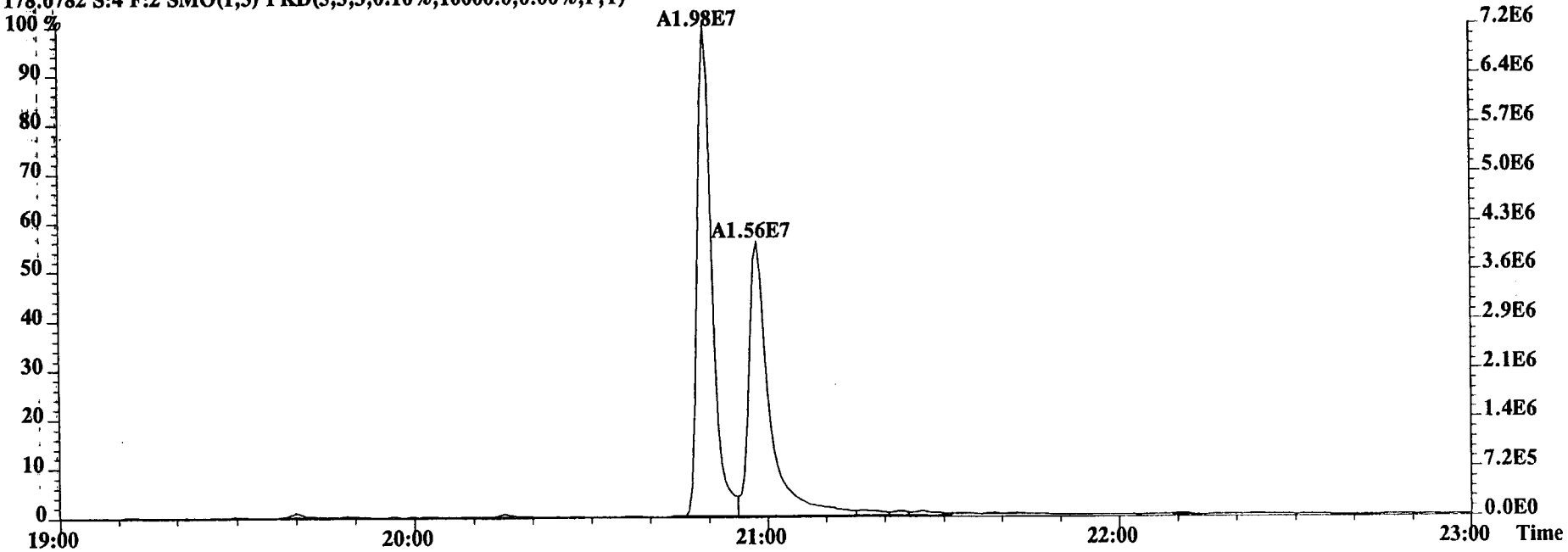
172.0984 S:4 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



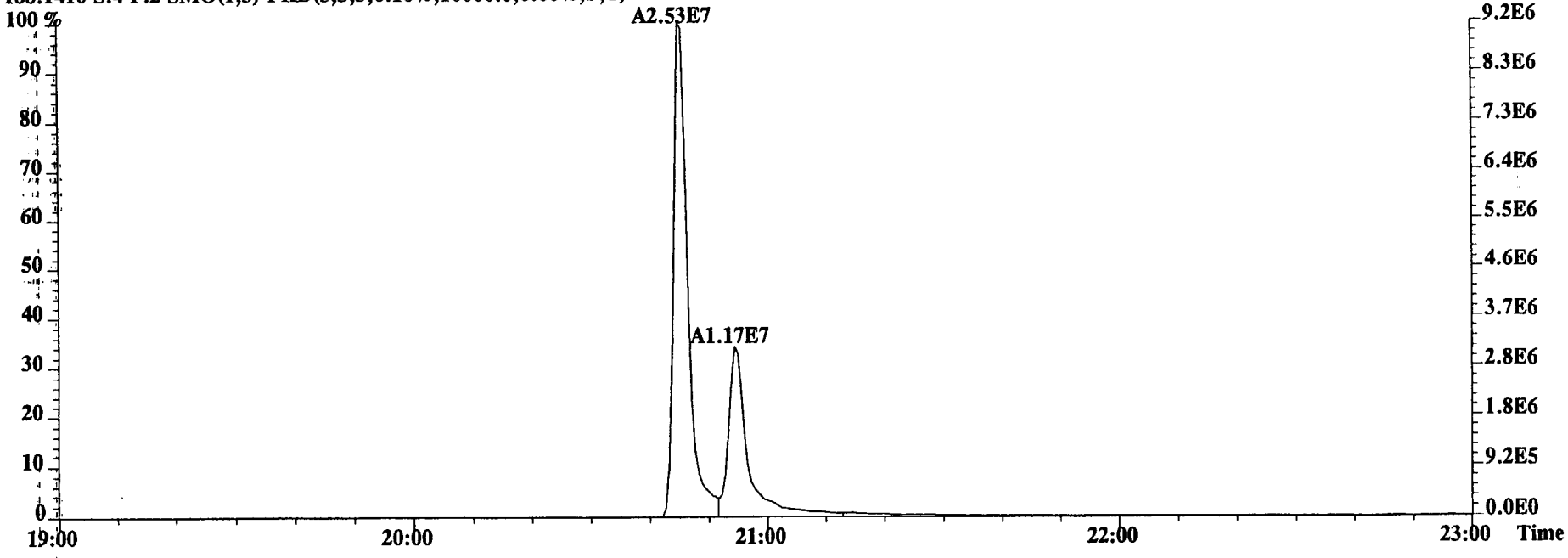
176.1410 S:4 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



File:03NO98V4 #1-641 Acq: 3-NOV-1998 13:08:10 GC EI+ Voltage SIR 70SE
Sample#4 Text:301802-1LC :LCS : : : :0. Exp:PAHAIR
178.0782 S:4 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

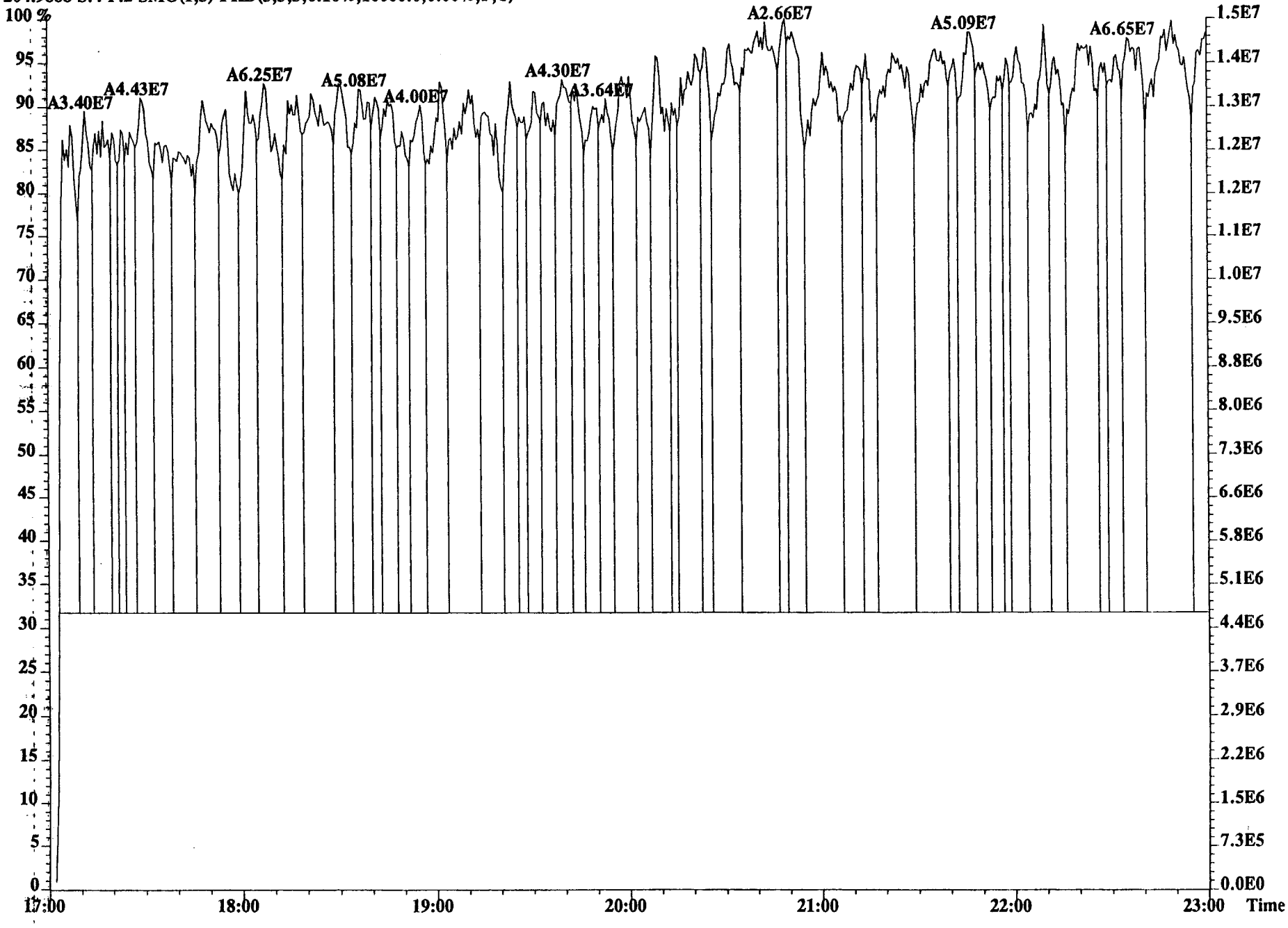


188.1410 S:4 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

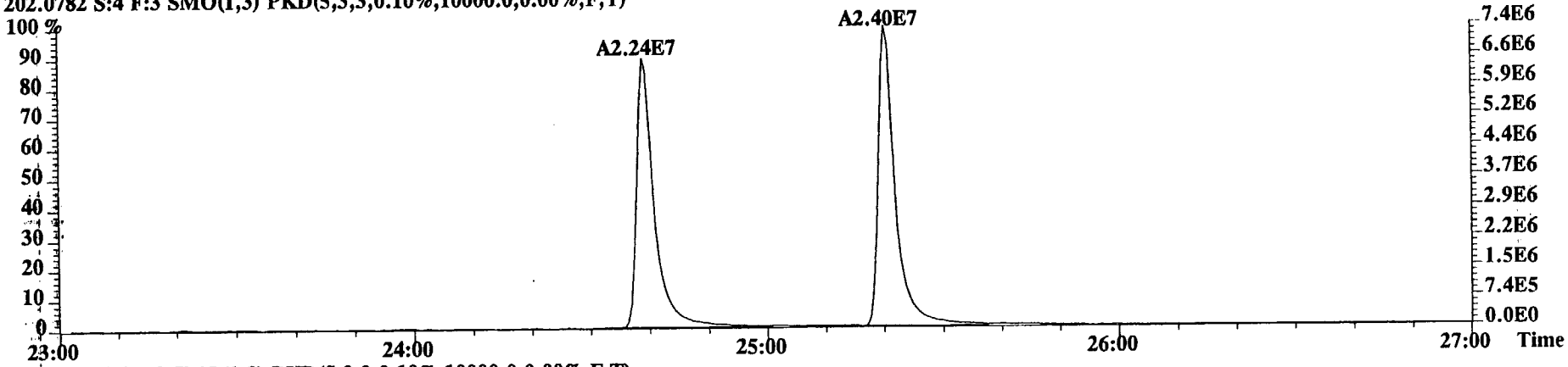


465

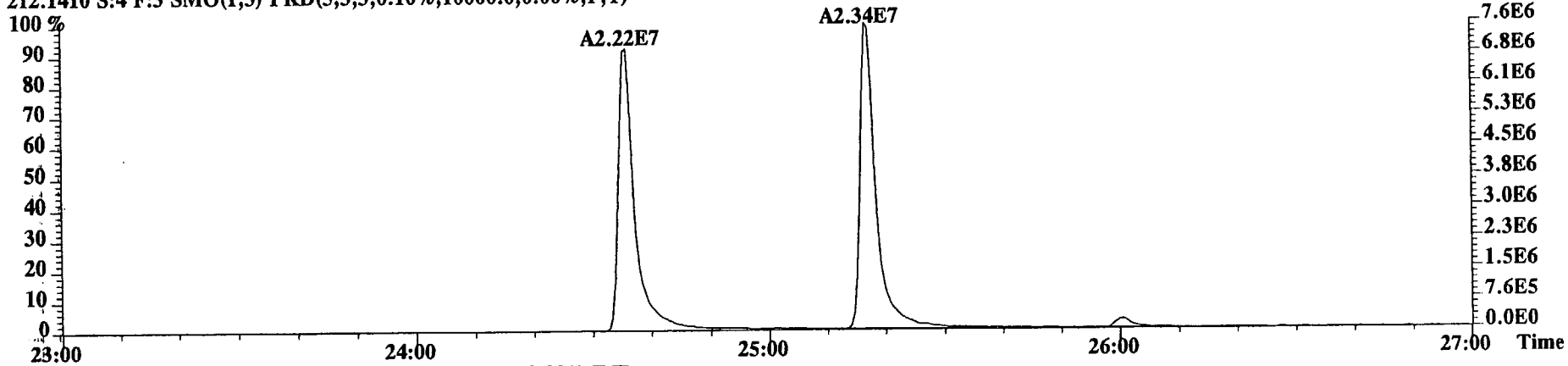
File:03NO98V4 #1-641 Acq: 3-NOV-1998 13:08:10 GC EI+ Voltage SIR 70SE
Sample#4 Text:301802-1LC :LCS : : : :0. Exp:PAHAIR
204.9888 S:4 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



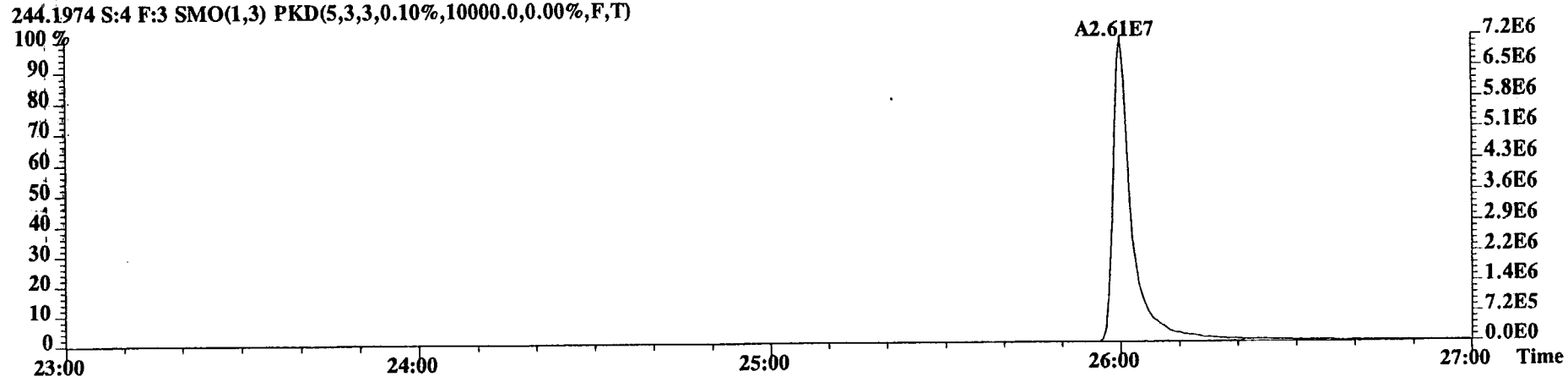
File:03NO98V4 #1-938 Acq: 3-NOV-1998 13:08:10 GC EI+ Voltage SIR 70SE
Sample#4 Text:301802-1LC :LCS : : : :0. Exp:PAHAIR
202.0782 S:4 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



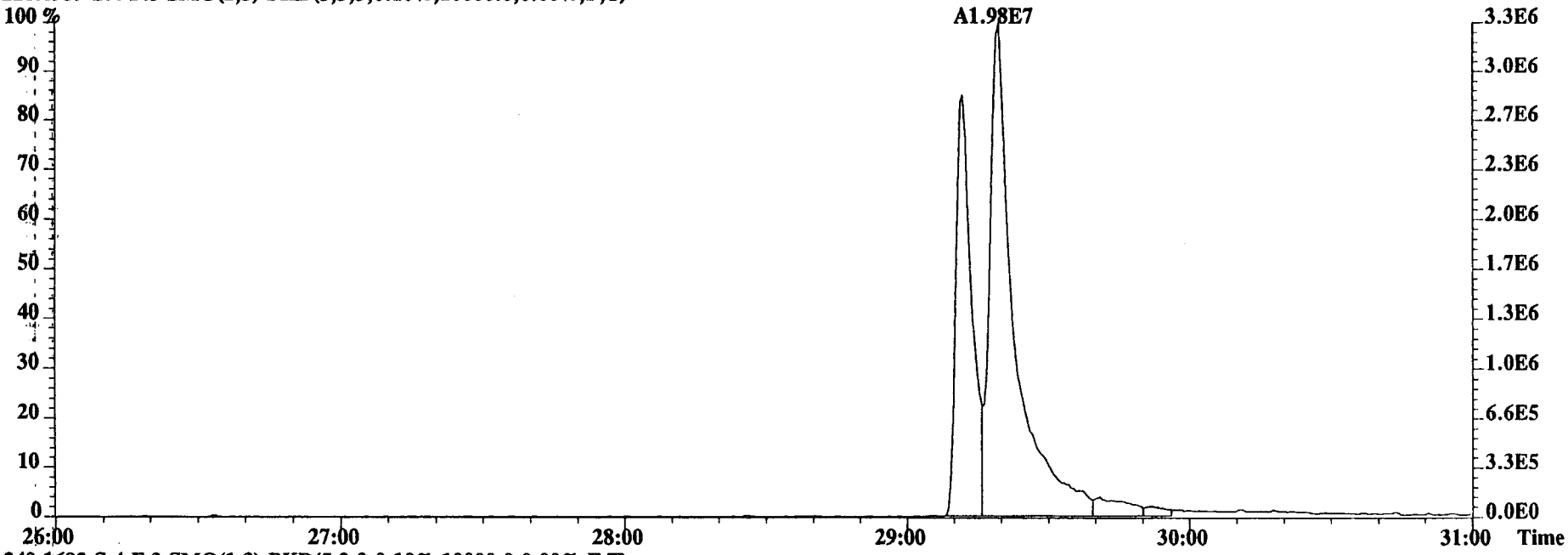
212.1410 S:4 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



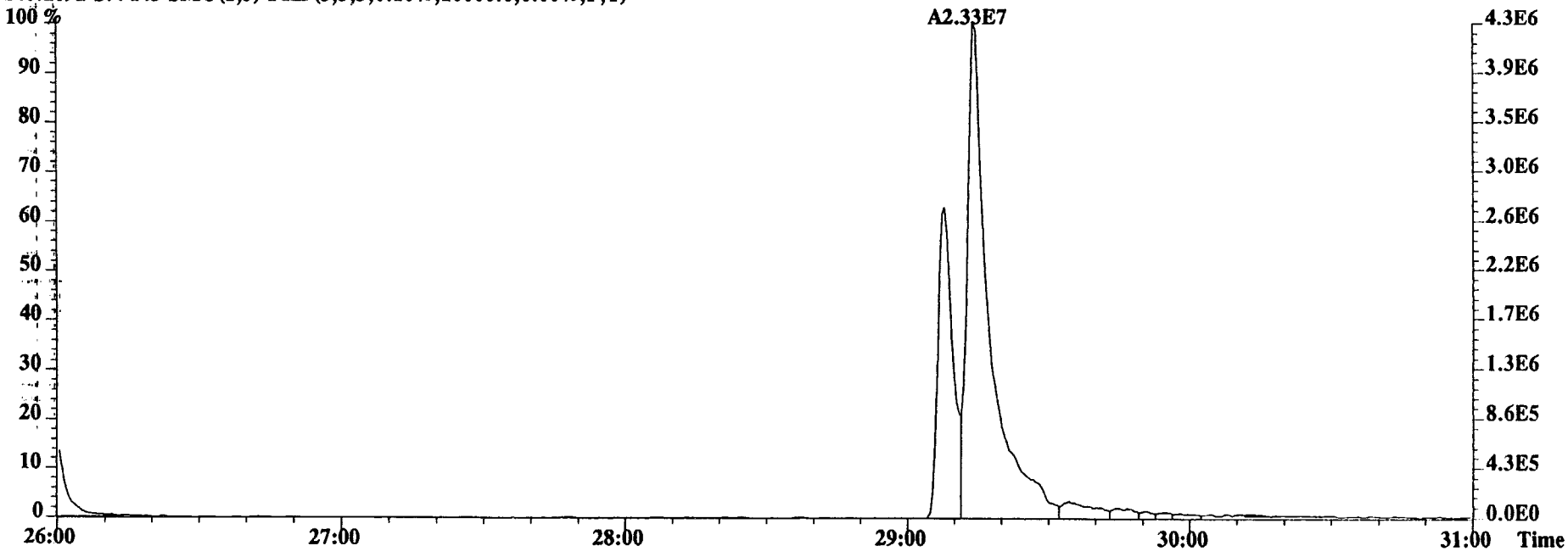
244.1974 S:4 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



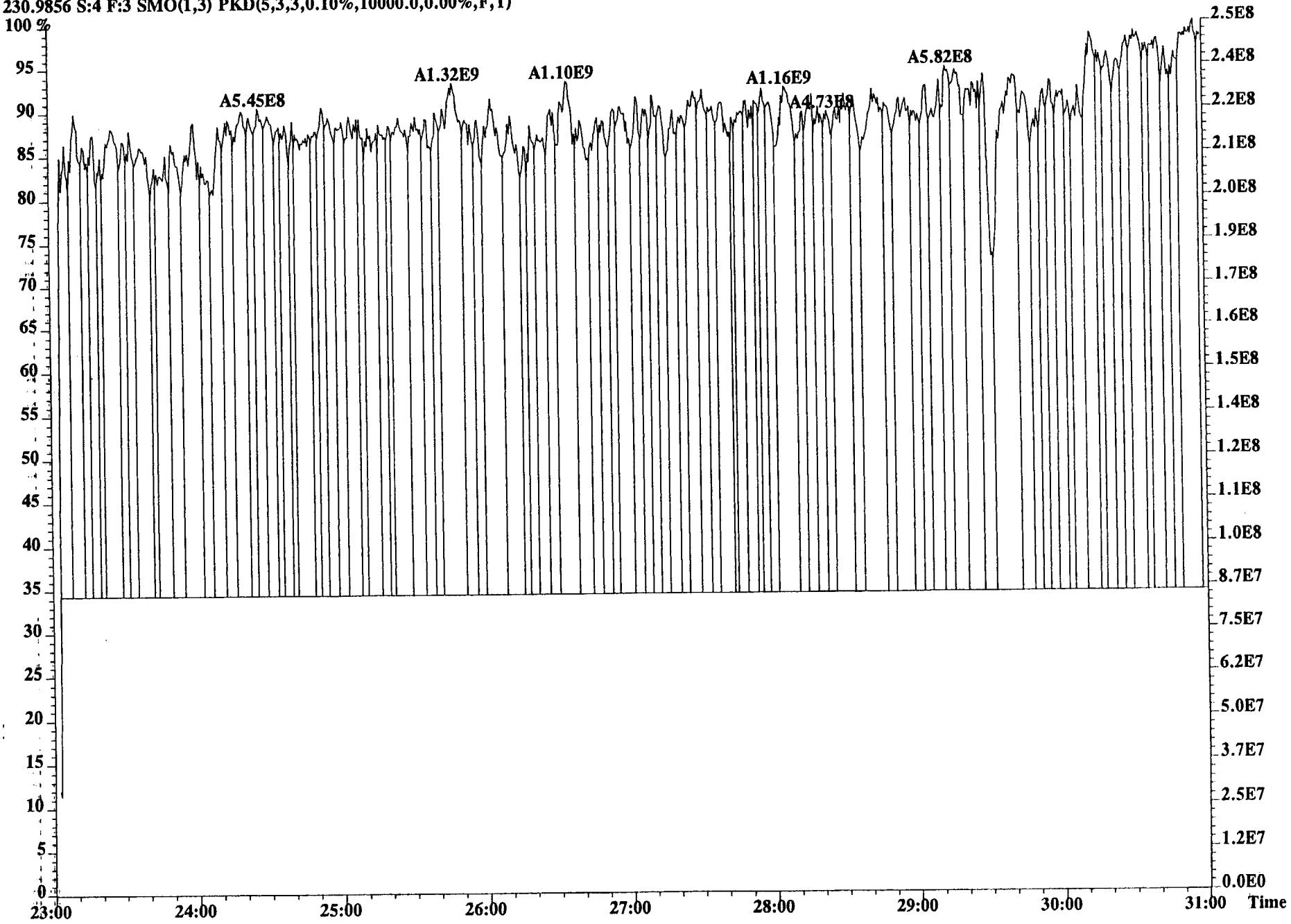
File:03NO98V4 #1-938 Acq: 3-NOV-1998 13:08:10 GC EI+ Voltage SIR 70SE
Sample#4 Text:301802-1LC :LCS : : : :0. Exp:PAHAIR
228.0939 S:4 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



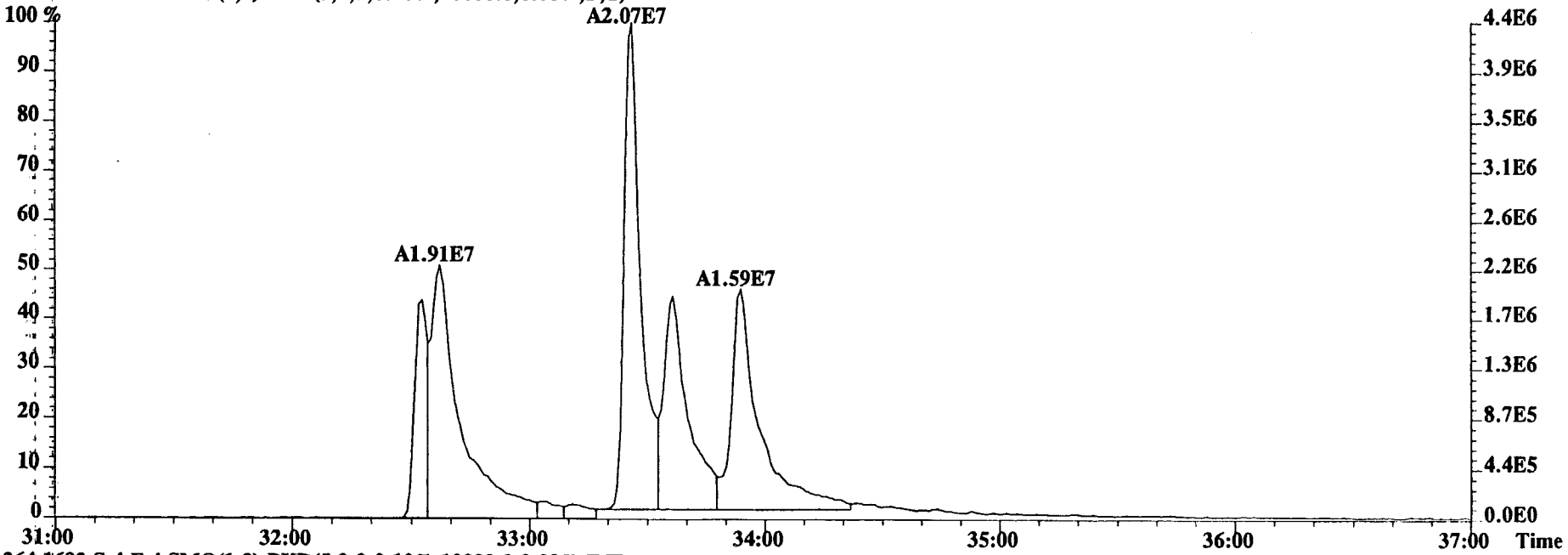
240.1692 S:4 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



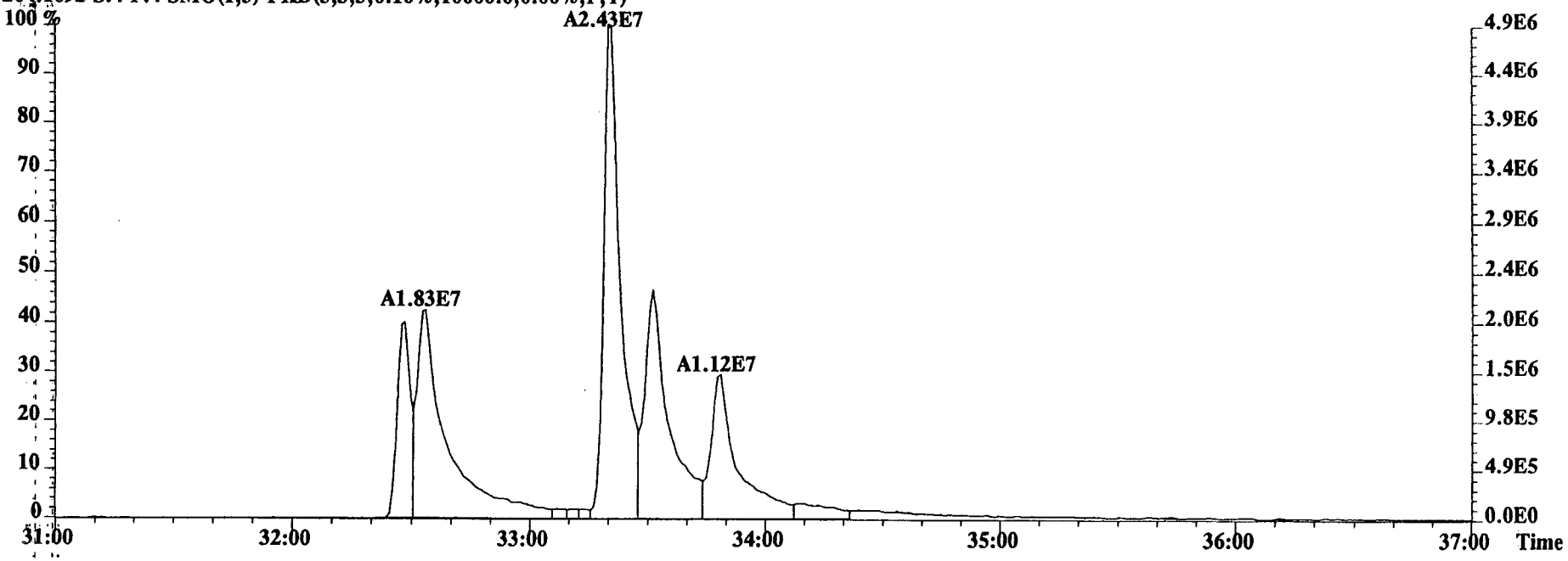
File:03NO98V4 #1-938 Acq: 3-NOV-1998 13:08:10 GC EI+ Voltage SIR 70SE
Sample#4 Text:301802-1LC :LCS : : : :0. Exp:PAHAIR
230.9856 S:4 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



File:03NO98V4 #1-878 Acq: 3-NOV-1998 13:08:10 GC EI+ Voltage SIR 70SE
Sample#4 Text:301802-1LC :LCS : : : :0. Exp:PAHAIR
252.0939 S:4 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

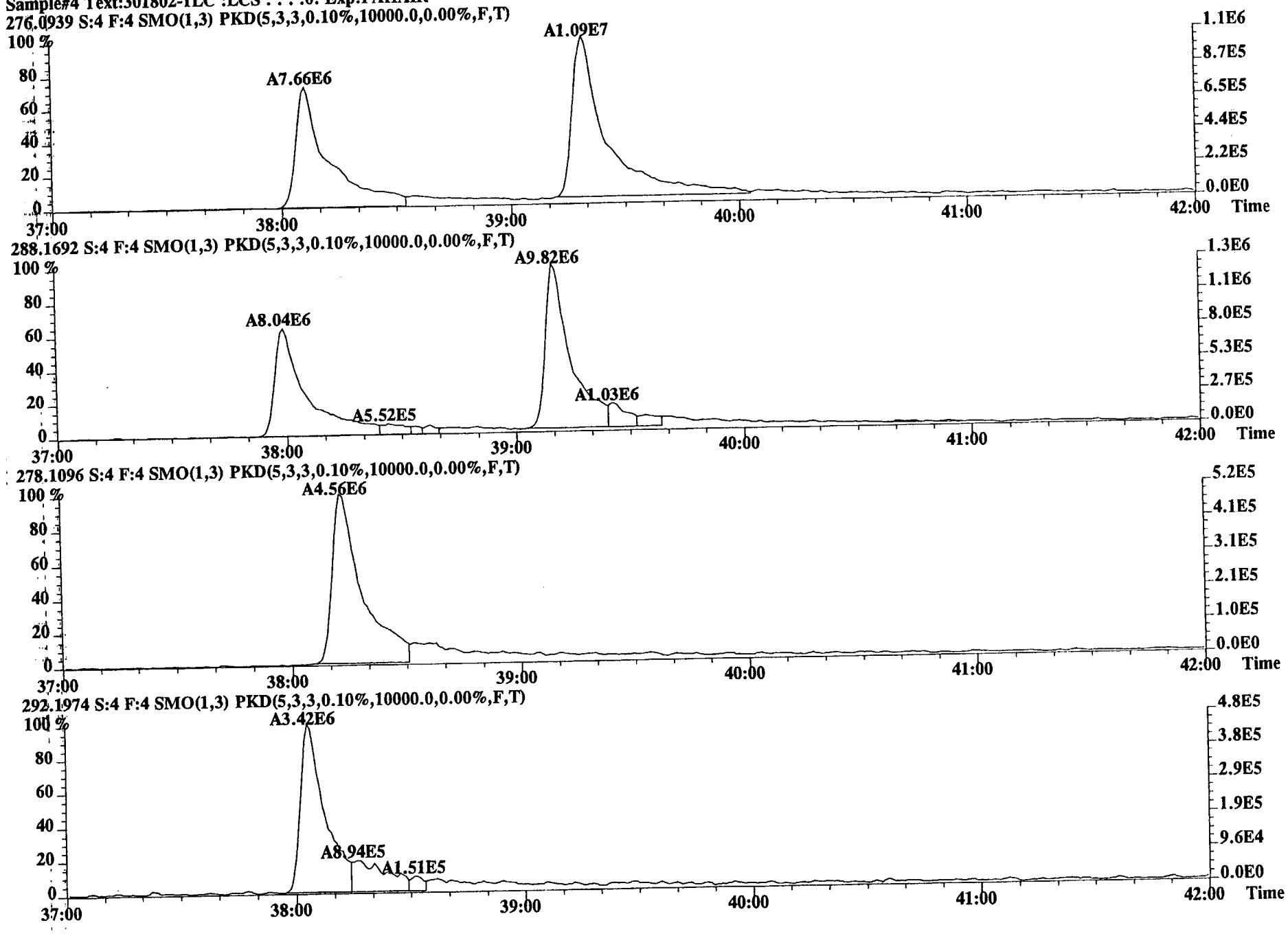


264.1692 S:4 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

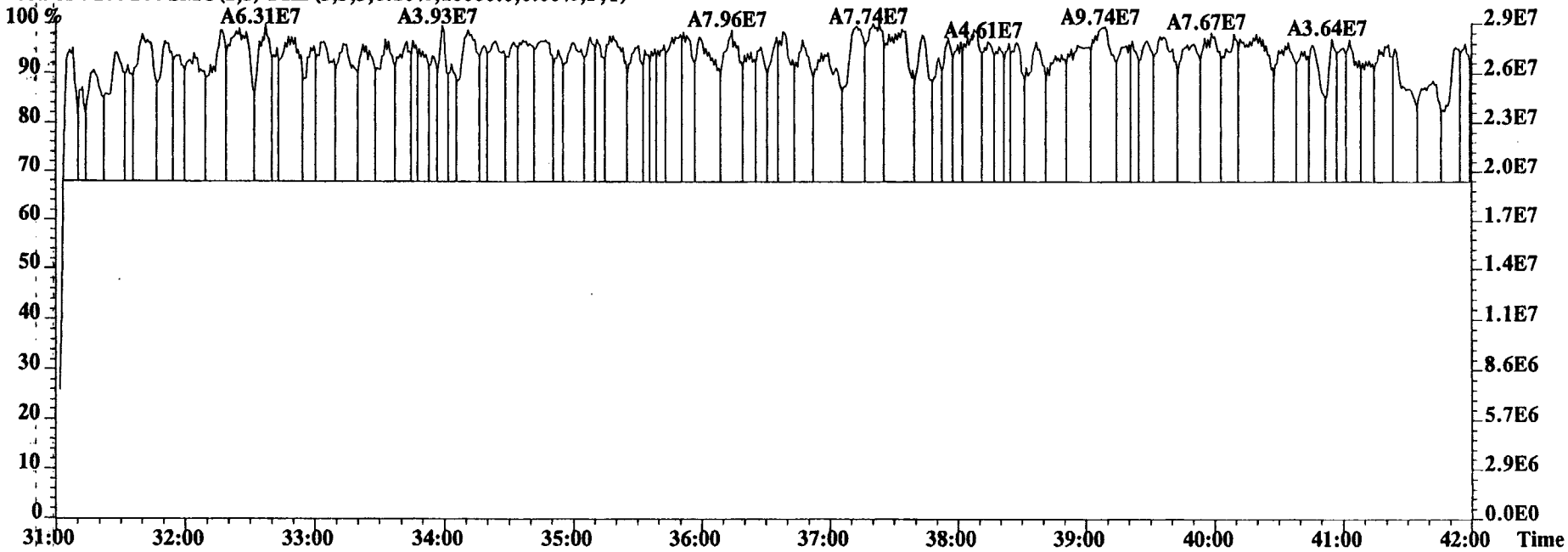


470

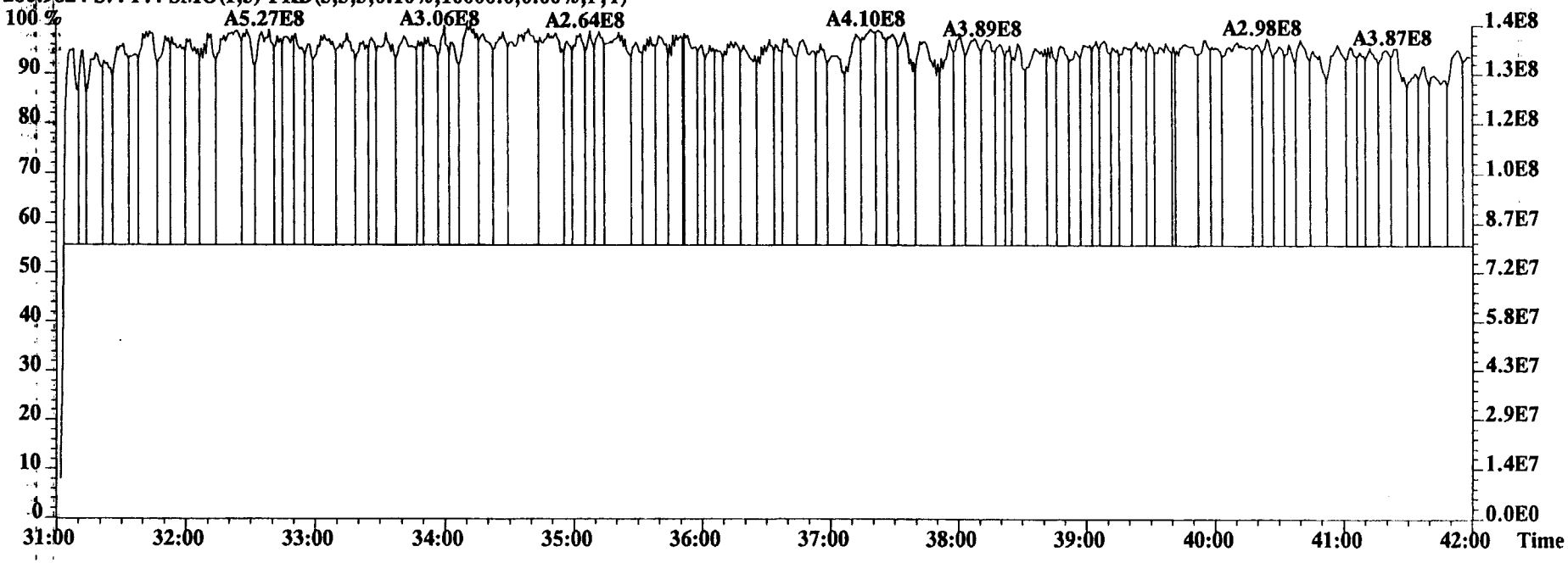
File:03NO98V4 #1-878 Acq: 3-NOV-1998 13:08:10 GC EI+ Voltage SIR 70SE
Sample#4 Text:301802-1LC :LCS : : : :0. Exp:PAHAIR



File:03NO98V4 #1-878 Acq: 3-NOV-1998 13:08:10 GC EI+ Voltage SIR 70SE
Sample#4 Text:301802-1LC :LCS : : : :0. Exp:PAHAIR
268.9824 S:4 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



280.9824 S:4 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



Initial Calibration

Quanterra
Environmental Services

QUANTERRA INCORPORATED

West Sacramento

Initial Calibration Checklist
High Resolution

D14-Terphenyl=RS

ICAL ID ~~PAHXAIR102998V4.RRF~~ → PAHAIR102998V4.RRF Method ID 429-AIR

D12Benzo(e)Pyrene = RS

Column ID DB-5 Instrument ID VG-4

STD ID's 265-04A,B,D,E,956-64 Multiplier Setting 350

Analyzed By SMA Date Analyzed 10-29-98

Prepared By SMA/AM Date Prepared 10-30-98

Reviewed By Jeri Stone Date Reviewed 11/3/98

ANALYSIS OF ICAL	INITIATED	REVIEWED
Curve summary present?	✓	✓
CS1-CS5, CPSM, solvent blank present?	✓/NA	✓/NA
Copy of logfile present?	✓	✓
CPSM Blow-up/Static resolution check present?	NA/✓	NA/✓
Target file RT's correct?	✓	✓
%RSD ~~RR~~Fs within method-specified limits?	✓	✓
Signal-to-noise criteria met?	✓	✓
Isotopic ratios within limits?	NA	NA
High point free of saturation?	✓	✓
Chromatographic windows correct?	✓	✓
CPSM valley < 25%?	NA	NA
Manual reintegrations checked and hardcopies included?	✓	✓

COMMENTS: The curve was processed twice because the d14-Terphenyl Rs peak saturated in the solid train and liquid fraction samples. Using d12 Benzo(e)Pyrene as Recovery St instead of d14 Terphenyl.

*Method 8290: %RSD ≤ 20% for natives, ≤ 30% for labelled analytes; S/N ≥ 10
Method 1613A: %CV ≤ 35% (See Table 7, Method 1613A); S/N ≥ 10
Method 23: %RSD ≤ values specified in Table 5, Method 23; S/N > 2.5
PAH: %RSD ≤ 30% for natives and labelled compounds; S/N ≥ 10
PCB: %RSD ≤ 25% for natives, ≤ 30% for labelled compounds; S/N ≥ 2.5
NCASI 551: %RSD ≤ 20% for natives and labelled compounds; ≥ 5
DBD/DBF: %RSD ≤ 30% for natives and labelled compounds; S/N ≥ 10

QA-384 NE 2/97

02-NOV-1998 07:31:36 AM

Mass Spec : VG-4
GC Column : DB-5
265-04A,B,D,E,956-64

Mult.: 350

Dioxin Furan CALIBRATION TABLE

File name : PAHAIR102998V4.RRF
Date analyzed : 29-OCT-98

(RS = d14 - Terphenyl)

INITIAL CALIBRATION CURVE

		Mean	S.D.	%RSD	1	2	3	4	5	6	7	8	9	10
d8-Naphthalene	Amount				100.00	100.00	100.00	100.00	100.00					
	RF				185.11	205.87	228.31	244.46	256.61					
	RRF	2.24	0.289	12.900	1.85	2.06	2.28	2.44	2.57					
Naphthalene	Amount				10.00	50.00	100.00	200.00	500.00					
	RF				13.76	61.93	113.47	231.43	609.70					
	RRF	1.23	0.094	7.707	1.38	1.24	1.13	1.16	1.22					
2-Methylnaphthalene	Amount				10.00	50.00	100.00	200.00	500.00					
	RF				6.91	29.85	51.39	97.93	255.67					
	RRF	0.56	0.084	14.909	0.69	0.60	0.51	0.49	0.51					
d8-Acenaphthylene	Amount				100.00	100.00	100.00	100.00	100.00					
	RF				131.95	128.38	114.60	122.45	109.50					
	RRF	1.21	0.093	7.696	1.32	1.28	1.15	1.22	1.10					
Acenaphthylene	Amount				10.00	50.00	100.00	200.00	500.00					
	RF				9.55	48.30	90.68	178.19	500.84					
	RRF	0.94	0.045	4.773	0.95	0.97	0.91	0.89	1.00					
d10-Acenaphthene	Amount				100.00	100.00	100.00	100.00	100.00					
	RF				83.11	77.72	76.15	77.96	57.36					
	RRF	0.74	0.099	13.310	0.83	0.78	0.76	0.78	0.57					
Acenaphthene	Amount				10.00	50.00	100.00	200.00	500.00					
	RF				10.98	62.63	151.76	215.88	641.50					
	RRF	1.25	0.177	14.178	1.10	1.25	1.52	1.08	1.28					
d10-Fluorene	Amount				100.00	100.00	100.00	100.00	100.00					
	RF				153.24	135.78	140.61	141.09	139.72					
	RRF	1.42	0.066	4.625	1.53	1.36	1.41	1.41	1.40					
Fluorene	Amount				10.00	50.00	100.00	200.00	500.00					
	RF				8.53	58.18	117.21	249.15	684.13					
	RRF	1.16	0.191	16.420	0.85	1.16	1.17	1.25	1.37					
d10-Phenanthrene	Amount				100.00	100.00	100.00	100.00	100.00					
	RF				308.98	263.63	276.27	272.04	282.87					
	RRF	2.81	0.173	6.145	3.09	2.64	2.76	2.72	2.83					
Phenanthrene	Amount				10.00	50.00	100.00	200.00	500.00					
	RF				9.70	46.13	81.87	168.14	460.23					
	RRF	0.89	0.063	7.028	0.97	0.92	0.82	0.84	0.92					
Anthracene	Amount				10.00	50.00	100.00	200.00	500.00					
	RF				8.13	42.20	77.06	153.96	402.42					
	RRF	0.80	0.031	3.901	0.81	0.84	0.77	0.77	0.80					
d10-Fluoranthene	Amount				100.00	100.00	100.00	100.00	100.00					
	RF				118.94	136.07	145.72	150.34	154.31					
	RRF	1.41	0.141	10.009	1.19	1.36	1.46	1.50	1.54					
Fluoranthene	Amount				10.00	50.00	100.00	200.00	500.00					
	RF				14.14	55.12	99.77	200.49	521.18					
	RRF	1.11	0.174	15.653	1.41	1.10	1.00	1.00	1.04					
d10-Pyrene	Amount				100.00	100.00	100.00	100.00	100.00					
	RF				129.03	143.24	158.81	161.45	166.55					
	RRF	1.52	0.154	10.160	1.29	1.43	1.59	1.61	1.67					
Pyrene	Amount				10.00	50.00	100.00	200.00	500.00					
	RF				16.74	59.11	104.58	204.18	551.22					
	RRF	1.21	0.269	22.353	1.67	1.18	1.05	1.02	1.10					

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Dioxin Furan CALIBRATION TABLE

Mass Spec : VG-4
GC Column : DB-5
265-04A,B,D,E,956-64

File name : PAHAIR102998V4.RRF
Date analyzed : 29-OCT-98

INITIAL CALIBRATION CURVE

Mult.: 350

		Mean	S.D.	%RSD	1	2	3	4	5	6	7	8	9	10
d12-Benzo(a)anthracene	Amount				100.00	100.00	100.00	100.00	100.00					
	RF				68.20	70.96	127.65	89.95	93.26					
	RRF	0.90	0.238	26.446	0.68	0.71	1.28	0.90	0.93					
Benzo(a)anthracene	Amount				10.00	50.00	100.00	200.00	500.00					
	RF				11.85	64.84	102.61	234.26	671.78					
	RRF	1.20	0.124	10.269	1.18	1.30	1.03	1.17	1.34					
d12-Chrysene	Amount				100.00	100.00	100.00	100.00	100.00					
	RF				109.94	119.85	127.65	136.79	145.35					
	RRF	1.28	0.139	10.855	1.10	1.20	1.28	1.37	1.45					
Chrysene	Amount				10.00	50.00	100.00	200.00	500.00					
	RF				10.44	56.47	102.61	215.75	571.04					
	RRF	1.08	0.051	4.716	1.04	1.13	1.03	1.08	1.14					
d12-Benzo(b)fluoranthene	Amount				100.00	100.00	100.00	100.00	100.00					
	RF				41.05	45.84	49.22	45.10	45.72					
	RRF	0.45	0.029	6.414	0.41	0.46	0.49	0.45	0.46					
Benzo(b)fluoranthene	Amount				10.00	50.00	100.00	200.00	500.00					
	RF				12.56	61.73	95.82	228.66	622.27					
	RRF	1.17	0.125	10.717	1.26	1.23	0.96	1.14	1.24					
d12-Benzo(k)fluoranthene	Amount				100.00	100.00	100.00	100.00	100.00					
	RF				91.66	94.95	96.52	94.09	96.82					
	RRF	0.95	0.021	2.203	0.92	0.95	0.97	0.94	0.97					
Benzo(k)fluoranthene	Amount				10.00	50.00	100.00	200.00	500.00					
	RF				12.71	63.16	119.14	210.18	522.11					
	RRF	1.16	0.111	9.525	1.27	1.26	1.19	1.05	1.04					
d12-Benzo(a)pyrene	Amount				100.00	100.00	100.00	100.00	100.00					
	RF				65.24	66.86	69.56	67.87	68.82					
	RRF	0.68	0.017	2.504	0.65	0.67	0.70	0.68	0.69					
Benzo(e)pyrene	Amount				10.00	50.00	100.00	200.00	500.00					
	RF				18.05	89.03	157.16	302.58	767.23					
	RRF	1.64	0.140	8.557	1.80	1.78	1.57	1.51	1.53					
Benzo(a)pyrene	Amount				10.00	50.00	100.00	200.00	500.00					
	RF				11.71	60.46	102.44	200.46	476.32					
	RRF	1.07	0.112	10.437	1.17	1.21	1.02	1.00	0.95					
d12-Perylene	Amount				100.00	100.00	100.00	100.00	100.00					
	RF				64.89	58.55	68.21	62.00	61.45					
	RRF	0.63	0.037	5.829	0.65	0.59	0.68	0.62	0.61					
Perylene	Amount				10.00	50.00	100.00	200.00	500.00					
	RF				16.93	98.08	162.24	324.02	835.41					
	RRF	1.71	0.142	8.297	1.69	1.96	1.62	1.62	1.67					
d12-Indeno(123-cd)pyrene	Amount				100.00	100.00	100.00	100.00	100.00					
	RF				44.86	44.54	44.08	43.39	45.40					
	RRF	0.44	0.008	1.722	0.45	0.45	0.44	0.43	0.45					
Indeno(123-cd)pyrene	Amount				10.00	50.00	100.00	200.00	500.00					
	RF				5.85	35.13	60.26	127.89	287.53					
	RRF	0.62	0.052	8.352	0.59	0.70	0.60	0.64	0.58					
d14-Dibenz(ah)anthracene	Amount				100.00	100.00	100.00	100.00	100.00					
	RF				20.73	24.39	25.35	26.10	26.33					
	RRF	0.25	0.023	9.286	0.21	0.24	0.25	0.26	0.26					

02-NOV-1998 07:31:43 AM

Mass Spec : VG-4
GC Column : DB-5
265-04A,B,D,E,956-64

Mult.: 350

Dioxin Furan CALIBRATION TABLE

File name : PAHAIR102998V4.RRF
Date analyzed : 29-OCT-98

INITIAL CALIBRATION CURVE

		Mean	S.D.	%RSD	1	2	3	4	5	6	7	8	9	10
Dibenz(ah)anthracene	Amount				10.00	50.00	100.00	200.00	500.00					
	RF				12.92	69.25	143.15	281.33	751.34					
	RRF	1.40	0.077	5.452	1.29	1.38	1.43	1.41	1.50					
d12-Benzo(ghi)perylene	Amount				100.00	100.00	100.00	100.00	100.00					
	RF				59.24	54.17	59.73	58.78	57.94					
	RRF	0.58	0.022	3.838	0.59	0.54	0.60	0.59	0.58					
Benzo(ghi)perylene	Amount				10.00	50.00	100.00	200.00	500.00					
	RF				8.58	51.44	109.18	211.25	522.58					
	RRF	1.02	0.091	8.984	0.86	1.03	1.09	1.06	1.05					
	Amount				0	0	0	0	0					
	RF													
	RRF	0	0	0										

02-NOV-1998 07:15:45 AM Dioxin Furan Ical RESULTS

Mass Spec : VG-4 Results : 29OC98V4011.RES : PAHAIRCAL1.TRG
GC Column : DB-5 Date analyzed : 29-OCT-98
Data file : 29OC98V4 ST1029 :CS-1 :265-04A : : Ex
Weight : 1

Name	Total Response	Isotope Ratio	R. T. mm:ss	RRF	pg	Rec/ MDL
d10-2-Methylnaphthalene	148835400	1.00 Y	12: 28 Y	-1.00	100.00	
d8-Naphthalene	275504000	1.00 Y	10: 13 Y	1.85	100.00	
Naphthalene	37899400	1.00 Y	10: 17 Y	1.38	10.00	0.000
2-Methylnaphthalene	19033020	1.00 Y	12: 35 Y	0.69	10.00	0.000
d8-Acenaphthylene	196391000	1.00 Y	15: 28 Y	1.32	100.00	
Acenaphthylene	18748260	1.00 Y	15: 31 Y	0.95	10.00	0.000
d10-Acenaphthene	123692800	1.00 Y	16: 2 Y	0.83	100.00	
Acenaphthene	13580000	1.00 Y	16: 9 Y	1.10	10.00	0.000
d10-Anthracene	101404200	1.00 Y	20: 56 Y	0.00	100.00	
d10-Fluorene	155386800	1.00 Y	17: 42 Y	1.53	100.00	
Fluorene	13251380	1.00 Y	17: 48 Y	0.85	10.00	0.000
d10-Phenanthrene	313320000	1.00 Y	20: 47 Y	3.09	100.00	
Phenanthrene	30392400	1.00 Y	20: 51 Y	0.97	10.00	0.000
Anthracene	25466000	1.00 Y	20: 59 Y	0.81	10.00	0.000
d14-Terphenyl	252508000	1.00 Y	26: 1 Y	-1.00	100.00	
d10-Fluoranthene	300334000	1.00 Y	24: 37 Y	1.19	100.00	
Fluoranthene	42464400	1.00 Y	24: 41 Y	1.41	10.00	0.000
d10-Pyrene	325812000	1.00 Y	25: 19 Y	1.29	100.00	
Pyrene	54540800	1.00 Y	25: 22 Y	1.67	10.00	0.000
d12-Benzo(a)anthracene	172200000	1.00 Y	29: 9 Y	0.68	100.00	
Benzo(a)anthracene	20400000	1.00 Y	29: 14 Y	1.18	10.00	0.000
d12-Chrysene	277600000	1.00 Y	29: 16 Y	1.10	100.00	
Chrysene	28968600	1.00 Y	29: 22 Y	1.04	10.00	0.000
d12-Benzo(e)pyrene	365008000	1.00 Y	33: 23 Y	0.00	100.00	
d12-Benzo(b)fluoranthene	149834000	1.00 Y	32: 31 Y	0.41	100.00	
Benzo(b)fluoranthene	18813720	1.00 Y	32: 35 Y	1.26	10.00	0.000
d12-Benzo(k)fluoranthene	334554000	1.00 Y	32: 36 Y	0.92	100.00	
Benzo(k)fluoranthene	42523000	1.00 Y	32: 40 Y	1.27	10.00	0.000
d12-Benzo(a)pyrene	238134000	1.00 Y	33: 34 Y	0.65	100.00	
Benzo(e)pyrene	42973400	1.00 Y	33: 29 Y	1.80	10.00	0.000
Benzo(a)pyrene	27895800	1.00 Y	33: 40 Y	1.17	10.00	0.000
d12-Perylene	236860000	1.00 Y	33: 51 Y	0.65	100.00	
Perylene	40100200	1.00 Y	33: 57 Y	1.69	10.00	0.000
d12-Indeno(123-cd)pyrene	163754400	1.00 Y	38: 4 Y	0.45	100.00	
Indeno(123-cd)pyrene	9580000	1.00 Y	38: 11 Y	0.59	10.00	0.000
d14-Dibenz(ah)anthracene	75669400	1.00 Y	38: 8 Y	0.21	100.00	
Dibenz(ah)anthracene	9775940	1.00 Y	38: 18 Y	1.29	10.00	0.000
d12-Benzo(ghi)perylene	216222000	1.00 Y	39: 16 Y	0.59	100.00	
Benzo(ghi)perylene	18553180	1.00 Y	39: 24 Y	0.86	10.00	0.000
d10-Fluorene						
13C-Fluorene						

02-NOV-1998 07:21:36 AM Dioxin Furan Ical RESULTS

Mass Spec : VG-4
GC Column : DB-5
Data file : 29OC98V4
Weight : 1

Results : 29OC98V4021.RES : PAHAIRCAL2.TRG
Date analyzed : 29-OCT-98
ST1029A :CS-2 :265-04B : Ex

Name	Total Response	Isotope Ratio	R. T. mm:ss	RRF	pg	Rec/ MDL
d10-2-Methylnaphthalene	144594000	1.00 Y	12: 29 Y	0.00	100.00	
d8-Naphthalene	297670000	1.00 Y	10: 13 Y	2.06	100.00	
Naphthalene	184351200	1.00 Y	10: 18 Y	1.24	50.00	0.000
2-Methylnaphthalene	88865000	1.00 Y	12: 35 Y	0.60	50.00	0.000
d8-Acenaphthylene	185629600	1.00 Y	15: 29 Y	1.28	100.00	
Acenaphthylene	89660600	1.00 Y	15: 31 Y	0.97	50.00	0.000
d10-Acenaphthene	112381800	1.00 Y	16: 3 Y	0.78	100.00	
Acenaphthene	70386000	1.00 Y	16: 9 Y	1.25	50.00	0.000
d10-Anthracene	124663000	1.00 Y	20: 56 Y	0.00	100.00	
d10-Fluorene	169272600	1.00 Y	17: 42 Y	1.36	100.00	
Fluorene	98489600	1.00 Y	17: 48 Y	1.16	50.00	0.000
d10-Phenanthrene	328644000	1.00 Y	20: 46 Y	2.64	100.00	
Phenanthrene	151615400	1.00 Y	20: 51 Y	0.92	50.00	0.000
Anthracene	138689600	1.00 Y	21: 0 Y	0.84	50.00	0.000
d14-Terphenyl	262974000	1.00 Y	26: 1 Y	-1.00	100.00	
d10-Fluoranthene	357818000	1.00 Y	24: 37 Y	1.36	100.00	
Fluoranthene	197230800	1.00 Y	24: 41 Y	1.10	50.00	0.000
d10-Pyrene	376684000	1.00 Y	25: 19 Y	1.43	100.00	
Pyrene	222652000	1.00 Y	25: 22 Y	1.18	50.00	0.000
d12-Benzo(a)anthracene	186600000	1.00 Y	29: 9 Y	0.71	100.00	
Benzo(a)anthracene	121000000	1.00 Y	29: 14 Y	1.30	50.00	0.000
d12-Chrysene	315180000	1.00 Y	29: 16 Y	1.20	100.00	
Chrysene	177982400	1.00 Y	29: 21 Y	1.13	50.00	0.000
d12-Benzo(e)pyrene	405140000	1.00 Y	33: 23 Y	0.00	100.00	
d12-Benzo(b)fluoranthene	185717200	1.00 Y	32: 30 Y	0.46	100.00	
Benzo(b)fluoranthene	114642400	1.00 Y	32: 35 Y	1.23	50.00	0.000
d12-Benzo(k)fluoranthene	384662000	1.00 Y	32: 35 Y	0.95	100.00	
Benzo(k)fluoranthene	242954000	1.00 Y	32: 39 Y	1.26	50.00	0.000
d12-Benzo(a)pyrene	270860000	1.00 Y	33: 34 Y	0.67	100.00	
Benzo(e)pyrene	241154000	1.00 Y	33: 28 Y	1.78	50.00	0.000
Benzo(a)pyrene	163755600	1.00 Y	33: 39 Y	1.21	50.00	0.000
d12-Perylene	237192000	1.00 Y	33: 51 Y	0.59	100.00	
Perylene	232648000	1.00 Y	33: 56 Y	1.96	50.00	0.000
d12-Indeno(123-cd)pyrene	180449600	1.00 Y	38: 3 Y	0.45	100.00	
Indeno(123-cd)pyrene	63400000	1.00 Y	38: 11 Y	0.70	50.00	0.000
d14-Dibenz(ah)anthracene	98818400	1.00 Y	38: 8 Y	0.24	100.00	
Dibenz(ah)anthracene	68429800	1.00 Y	38: 17 Y	1.38	50.00	0.000
d12-Benzo(ghi)perylene	219460000	1.00 Y	39: 15 Y	0.54	100.00	
Benzo(ghi)perylene	112888400	1.00 Y	39: 23 Y	1.03	50.00	0.000
d10-Fluorene						
13C-Fluorene						

02-NOV-1998 07:24:53 AM Dioxin Furan Ical RESULTS

Mass Spec : VG-4 Results : 29OC98V4031.RES : PAHAIRCAL3.TRG
GC Column : DB-5 Date analyzed : 29-OCT-98
Data file : 29OC98V4 ST1029B :CS-3 :956-64 : : Ex
Weight : 1

Name	Total Response	Isotope Ratio	R. T. mm:ss	RRF	pg	Rec/ MDL
d10-2-Methylnaphthalene	114074600	1.00 Y	12: 29 Y	0.00	100.00	
d8-Naphthalene	260448000	1.00 Y	10: 14 Y	2.28	100.00	
Naphthalene	295542000	1.00 Y	10: 18 Y	1.13	100.00	0.000
2-Methylnaphthalene	133833200	1.00 Y	12: 35 Y	0.51	100.00	0.000
d8-Acenaphthylene	130728800	1.00 Y	15: 29 Y	1.15	100.00	
Acenaphthylene	118542800	1.00 Y	15: 32 Y	0.91	100.00	0.000
d10-Acenaphthene	86872800	1.00 Y	16: 2 Y	0.76	100.00	
Acenaphthene	131835000	1.00 Y	16: 9 Y	1.52	100.00	0.000
d10-Anthracene	105259600	1.00 Y	20: 56 Y	0.00	100.00	
d10-Fluorene	148006200	1.00 Y	17: 42 Y	1.41	100.00	
Fluorene	173478200	1.00 Y	17: 48 Y	1.17	100.00	0.000
d10-Phenanthrene	290800000	1.00 Y	20: 47 Y	2.76	100.00	
Phenanthrene	238078000	1.00 Y	20: 51 Y	0.82	100.00	0.000
Anthracene	224086000	1.00 Y	21: 0 Y	0.77	100.00	0.000
d14-Terphenyl	209112000	1.00 Y	26: 2 Y	0.00	100.00	
d10-Fluoranthene	304722000	1.00 Y	24: 37 Y	1.46	100.00	
Fluoranthene	304036000	1.00 Y	24: 41 Y	1.00	100.00	0.000
d10-Pyrene	332100000	1.00 Y	25: 19 Y	1.59	100.00	
Pyrene	347310000	1.00 Y	25: 22 Y	1.05	100.00	0.000
d12-Benzo(a)anthracene	165200000	1.00 Y	29: 10 Y	0.79	100.00	
Benzo(a)anthracene	191600000	1.00 Y	29: 14 Y	1.16	100.00	0.000
d12-Chrysene	266934000	1.00 Y	29: 16 Y	1.28	100.00	
Chrysene	273900000	1.00 Y	29: 21 Y	1.03	100.00	0.000
d12-Benzo(e)pyrene	378748000	1.00 Y	33: 23 Y	1.00	100.00	
d12-Benzo(b)fluoranthene	186411000	1.00 Y	32: 30 Y	0.49	100.00	
Benzo(b)fluoranthene	178619200	1.00 Y	32: 34 Y	0.96	100.00	0.000
d12-Benzo(k)fluoranthene	365566000	1.00 Y	32: 35 Y	0.97	100.00	
Benzo(k)fluoranthene	435526000	1.00 Y	32: 40 Y	1.19	100.00	0.000
d12-Benzo(a)pyrene	263446000	1.00 Y	33: 34 Y	0.70	100.00	
Benzo(e)pyrene	414020000	1.00 Y	33: 28 Y	1.57	100.00	0.000
Benzo(a)pyrene	269874000	1.00 Y	33: 39 Y	1.02	100.00	0.000
d12-Perylene	258348000	1.00 Y	33: 50 Y	0.68	100.00	
Perylene	419148000	1.00 Y	33: 56 Y	1.62	100.00	0.000
d12-Indeno(123-cd)pyrene	166952200	1.00 Y	38: 3 Y	0.44	100.00	
Indeno(123-cd)pyrene	100600000	1.00 Y	38: 10 Y	0.60	100.00	0.000
d14-Dibenz(ah)anthracene	96020800	1.00 Y	38: 7 Y	0.25	100.00	
Dibenz(ah)anthracene	137450400	1.00 Y	38: 17 Y	1.43	100.00	0.000
d12-Benzo(ghi)perylene	226218000	1.00 Y	39: 15 Y	0.60	100.00	
Benzo(ghi)perylene	246996000	1.00 Y	39: 24 Y	1.09	100.00	0.000
d10-Fluorene						
13C-Fluorene						

02-NOV-1998 07:27:43 AM Dioxin Furan Ical RESULTS

Mass Spec : VG-4
GC Column : DB-5
Data file : 29OC98V4
Weight : 1

Results : 29OC98V4041.RES : PAHAIRCAL4.TRG
Date analyzed : 29-OCT-98
ST1029C :CS-4 :265-04D : Ex

Name	Total Response	Isotope Ratio	R. T. mm:ss	RRF	pg	Rec/ MDL
d10-2-Methylnaphthalene	110362600	1.00 Y	12: 29 Y	0.00	100.00	
d8-Naphthalene	269792000	1.00 Y	10: 13 Y	2.44	100.00	
Naphthalene	624376000	1.00 Y	10: 17 Y	1.16	200.00	0.000
2-Methylnaphthalene	264208000	1.00 Y	12: 36 Y	0.49	200.00	0.000
d8-Acenaphthylene	135138000	1.00 Y	15: 29 Y	1.22	100.00	
Acenaphthylene	240808000	1.00 Y	15: 32 Y	0.89	200.00	0.000
d10-Acenaphthene	86040200	1.00 Y	16: 3 Y	0.78	100.00	
Acenaphthene	185743400	1.00 Y	16: 8 Y	1.08	200.00	0.000
d10-Anthracene	115226400	1.00 Y	20: 56 Y	0.00	100.00	
d10-Fluorene	162568800	1.00 Y	17: 43 Y	1.41	100.00	
Fluorene	405042000	1.00 Y	17: 48 Y	1.25	200.00	0.000
d10-Phenanthrene	313460000	1.00 Y	20: 46 Y	2.72	100.00	
Phenanthrene	527064000	1.00 Y	20: 51 Y	0.84	200.00	0.000
Anthracene	482604000	1.00 Y	21: 0 Y	0.77	200.00	0.000
d14-Terphenyl	215450000	1.00 Y	26: 1 Y	-1.00	100.00	
d10-Fluoranthene	323902000	1.00 Y	24: 37 Y	1.50	100.00	
Fluoranthene	649384000	1.00 Y	24: 41 Y	1.00	200.00	0.000
d10-Pyrene	347844000	1.00 Y	25: 18 Y	1.61	100.00	
Pyrene	710224000	1.00 Y	25: 22 Y	1.02	200.00	0.000
d12-Benzo(a)anthracene	193800000	1.00 Y	29: 9 Y	0.90	100.00	
Benzo(a)anthracene	454000000	1.00 Y	29: 14 Y	1.17	200.00	0.000
d12-Chrysene	294720000	1.00 Y	29: 16 Y	1.37	100.00	
Chrysene	635846000	1.00 Y	29: 21 Y	1.08	200.00	0.000
d12-Benzo(e)pyrene	486608000	1.00 Y	33: 23 Y	0.00	100.00	
d12-Benzo(b)fluoranthene	219440000	1.00 Y	32: 30 Y	0.45	100.00	
Benzo(b)fluoranthene	501770000	1.00 Y	32: 35 Y	1.14	200.00	0.000
d12-Benzo(k)fluoranthene	457832000	1.00 Y	32: 35 Y	0.94	100.00	
Benzo(k)fluoranthene	962282000	1.00 Y	32: 39 Y	1.05	200.00	0.000
d12-Benzo(a)pyrene	330262000	1.00 Y	33: 33 Y	0.68	100.00	
Benzo(e)pyrene	999302000	1.00 Y	33: 28 Y	1.51	200.00	0.000
Benzo(a)pyrene	662030000	1.00 Y	33: 38 Y	1.00	200.00	0.000
d12-Perylene	301714000	1.00 Y	33: 50 Y	0.62	100.00	
Perylene	977600000	1.00 Y	33: 56 Y	1.62	200.00	0.000
d12-Indeno(123-cd)pyrene	211120000	1.00 Y	38: 3 Y	0.43	100.00	
Indeno(123-cd)pyrene	270000000	1.00 Y	38: 9 Y	0.64	200.00	0.000
d14-Dibenz(ah)anthracene	127016600	1.00 Y	38: 7 Y	0.26	100.00	
Dibenz(ah)anthracene	357340000	1.00 Y	38: 16 Y	1.41	200.00	0.000
d12-Benzo(ghi)perylene	286042000	1.00 Y	39: 15 Y	0.59	100.00	
Benzo(ghi)perylene	604252000	1.00 Y	39: 23 Y	1.06	200.00	0.000
d10-Fluorene						
13C-Fluorene						

02-NOV-1998 07:30:42 AM Dioxin Furan Ical RESULTS

Mass Spec : VG-4 Results : 29OC98V4051.RES : PAHAIRCAL5.TRG
GC Column : DB-5 Date analyzed : 29-OCT-98
Data file : 29OC98V4 ST1029D :CS-5 :265-04E : Ex
Weight : 1

Name	Total Response	Isotope Ratio		R. T. mm:ss		RRF	pg	Rec/ MDL
d10-2-Methylnaphthalene	100692000	1.00	Y	12: 29	Y	0.00	100.00	
d8-Naphthalene	258386000	1.00	Y	10: 13	Y	2.57	100.00	
Naphthalene	1575386000	1.00	Y	10: 17	Y	1.22	500.00	0.000
2-Methylnaphthalene	660610000	1.00	Y	12: 35	Y	0.51	500.00	0.000
d8-Acenaphthylene	110257800	1.00	Y	15: 29	Y	1.10	100.00	
Acenaphthylene	552216000	1.00	Y	15: 32	Y	1.00	500.00	0.000
d10-Acenaphthene	57758000	1.00	Y	16: 3	Y	0.57	100.00	
Acenaphthene	370516000	1.00	Y	16: 8	Y	1.28	500.00	0.000
d10-Anthracene	108354400	1.00	Y	20: 56	Y	0.00	100.00	
d10-Fluorene	151395800	1.00	Y	17: 43	Y	1.40	100.00	
Fluorene	1035738000	1.00	Y	17: 48	Y	1.37	500.00	0.000
d10-Phenanthrene	306504000	1.00	Y	20: 46	Y	2.83	100.00	
Phenanthrene	1410624000	1.00	Y	20: 51	Y	0.92	500.00	0.000
Anthracene	1233428000	1.00	Y	20: 59	Y	0.80	500.00	0.000
d14-Terphenyl	209728000	1.00	Y	26: 1	Y	-1.00	100.00	
d10-Fluoranthene	323622000	1.00	Y	24: 37	Y	1.54	100.00	
Fluoranthene	1686640000	1.00	Y	24: 40	Y	1.04	500.00	0.000
d10-Pyrene	349310000	1.00	Y	25: 18	Y	1.67	100.00	
Pyrene	1925462000	1.00	Y	25: 22	Y	1.10	500.00	0.000
d12-Benzo(a)anthracene	195600000	1.00	Y	29: 9	Y	0.93	100.00	
Benzo(a)anthracene	1314000000	1.00	Y	29: 14	Y	1.34	500.00	0.000
d12-Chrysene	304846000	1.00	Y	29: 15	Y	1.45	100.00	
Chrysene	1740792000	1.00	Y	29: 20	Y	1.14	500.00	0.000
d12-Benzo(e)pyrene	502582000	1.00	Y	33: 23	Y	0.00	100.00	
d12-Benzo(b)fluoranthene	229792000	1.00	Y	32: 30	Y	0.46	100.00	
Benzo(b)fluoranthene	1429934000	1.00	Y	32: 35	Y	1.24	500.00	0.000
d12-Benzo(k)fluoranthene	486600000	1.00	Y	32: 35	Y	0.97	100.00	
Benzo(k)fluoranthene	2540580000	1.00	Y	32: 39	Y	1.04	500.00	0.000
d12-Benzo(a)pyrene	345868000	1.00	Y	33: 33	Y	0.69	100.00	
Benzo(e)pyrene	2653600000	1.00	Y	33: 28	Y	1.53	500.00	0.000
Benzo(a)pyrene	1647428000	1.00	Y	33: 38	Y	0.95	500.00	0.000
d12-Perylene	308836000	1.00	Y	33: 50	Y	0.61	100.00	
Perylene	2580040000	1.00	Y	33: 56	Y	1.67	500.00	0.000
d12-Indeno(123-cd)pyrene	228154000	1.00	Y	38: 3	Y	0.45	100.00	
Indeno(123-cd)pyrene	656000000	1.00	Y	38: 9	Y	0.58	500.00	0.000
d14-Dibenz(ah)anthracene	132353000	1.00	Y	38: 6	Y	0.26	100.00	
Dibenz(ah)anthracene	994422000	1.00	Y	38: 16	Y	1.50	500.00	0.000
d12-Benzo(ghi)perylene	291198000	1.00	Y	39: 14	Y	0.58	100.00	
Benzo(ghi)perylene	1521730000	1.00	Y	39: 22	Y	1.05	500.00	0.000
d10-Fluorene								
13C-Fluorene								

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FILE	SAMP No. (1)	LAB. SAMP No	CUSTOMER ID	CLEAN UP 1 (SDS)	CLEAN UP 2 (D2)	TYPE (1)	CONCn.
290C98V4	1	ST1029	CS-1	265-04A			1
290C98V4	2	ST1029A	CS-2	265-04B			1
290C98V4	3	ST1029B	CS-3	956-64			1
290C98V4	4	ST1029C	CS-4	265-04D			1
290C98V4	5	ST1029D	CS-5	265-04E			1
290C98V4	6	SB1029A	Solvent Blank	C-8			1
290C98V4	7	ST1029E	CS-3	956-64			1
290C98V4	8	SB1029B	Solvent Blank	C-8			1
290C98V4	9	302050-1MB	METHOD BLANK	AIR	PAH	VSE-25	0.333
290C98V4	10	302050-1LC	LCS				0.333
290C98V4	11	302050-1BA	METHOD BLANK				0.333
290C98V4	12	302050-1LA	LCS				0.333
290C98V4	13	302050-2	CLXTP				0.333
290C98V4	14	302050-4	CLXTR				0.333
290C98V4	15	302050-6	CLXTW				0.333
290C98V4	16	302050-8	CLXVO				0.333
290C98V4	17	302050-1	CLXTM				0.333
290C98V4	18	302050-3	CLXTQ				0.333
290C98V4	19	302050-5	CLXTV				0.333
290C98V4	20	302050-7	CLXTX				0.333
290C98V4	21	301802-1	10X DIL.	AIR	PAH	VSE-26	0.50
290C98V4	22	301802-2	10X DIL.				0.50
290C98V4	23	301802-3	10X DIL.				0.50
290C98V4	24	SB1029C	Solvent Blank	C-8			1
290C98V4	25	ST1029F	CS-3	956-64			1
290C98V4	26	SB1029D	Solvent Blank	C-8			1
290C98V4	27	301802-1MB	METHOD BLANK	AIR	PAH	VSE-26	0.50
290C98V4	28	301802-1LC	LCS				0.50
290C98V4	29	301802-4	10X DIL.				0.50
290C98V4	30	301802-5	10X DIL.				0.50
290C98V4	31	301802-6	10X DIL.				0.50
290C98V4	32	301802-7	10X DIL.				0.50
290C98V4	33	301802-8	10X DIL.				0.50
290C98V4	34	301802-9	10X DIL.				0.50
290C98V4	35	301802-10	10X DIL.				0.50
290C98V4	36	301802-11	10X DIL.				0.50
290C98V4	37	301802-12	10X DIL.				0.50
290C98V4	38	301802-13	10X DIL.				0.50
290C98V4	39	301802-14	10X DIL.				0.50
290C98V4	40	SB1029E	Solvent Blank	C-8			1
290C98V4	41						
290C98V4	42						
290C98V4	43						
290C98V4	44						
290C98V4	45						
290C98V4	46						
290C98V4	47						
290C98V4	48						
290C98V4	49						
290C98V4	50						

SMA, AM 10-29-98

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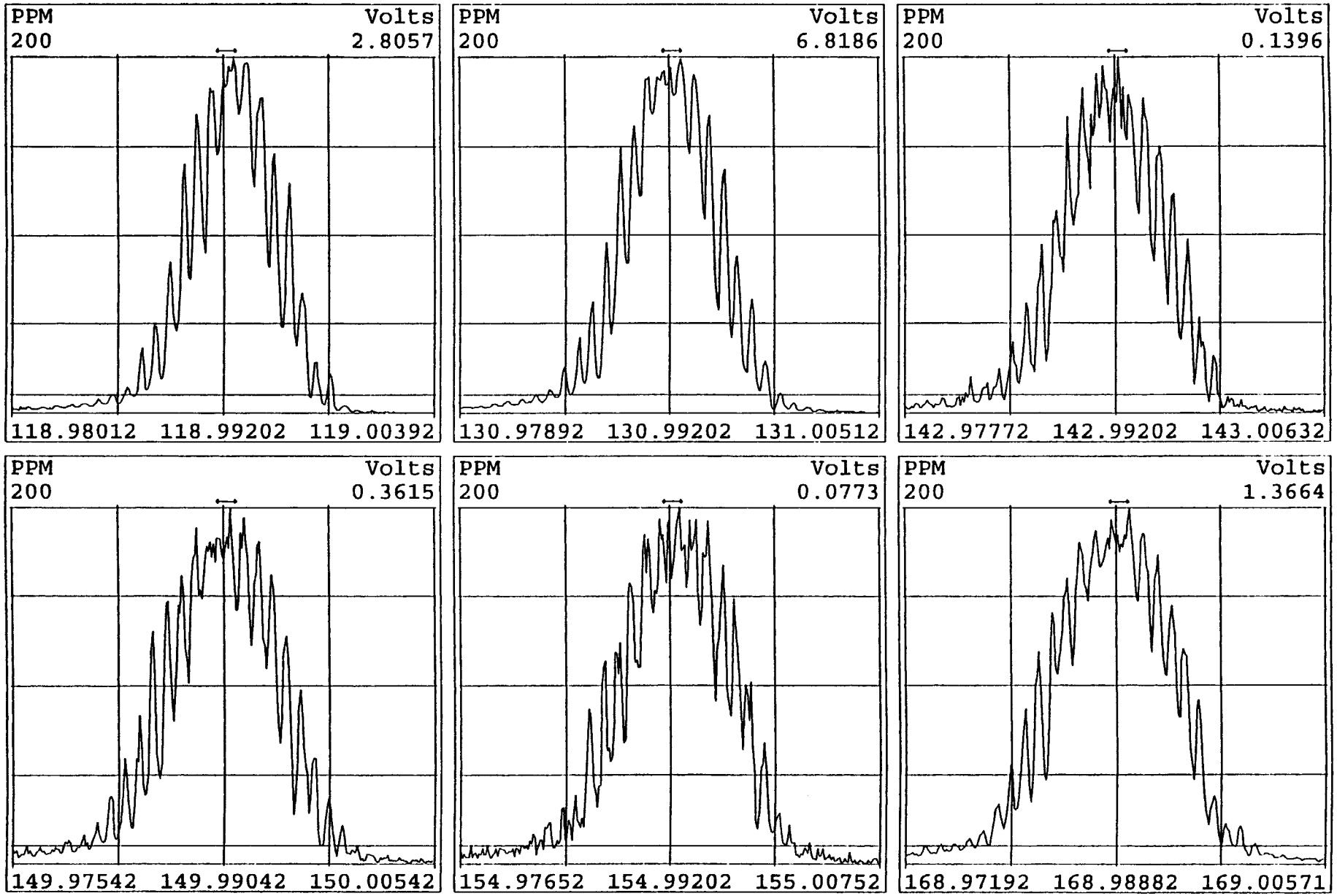
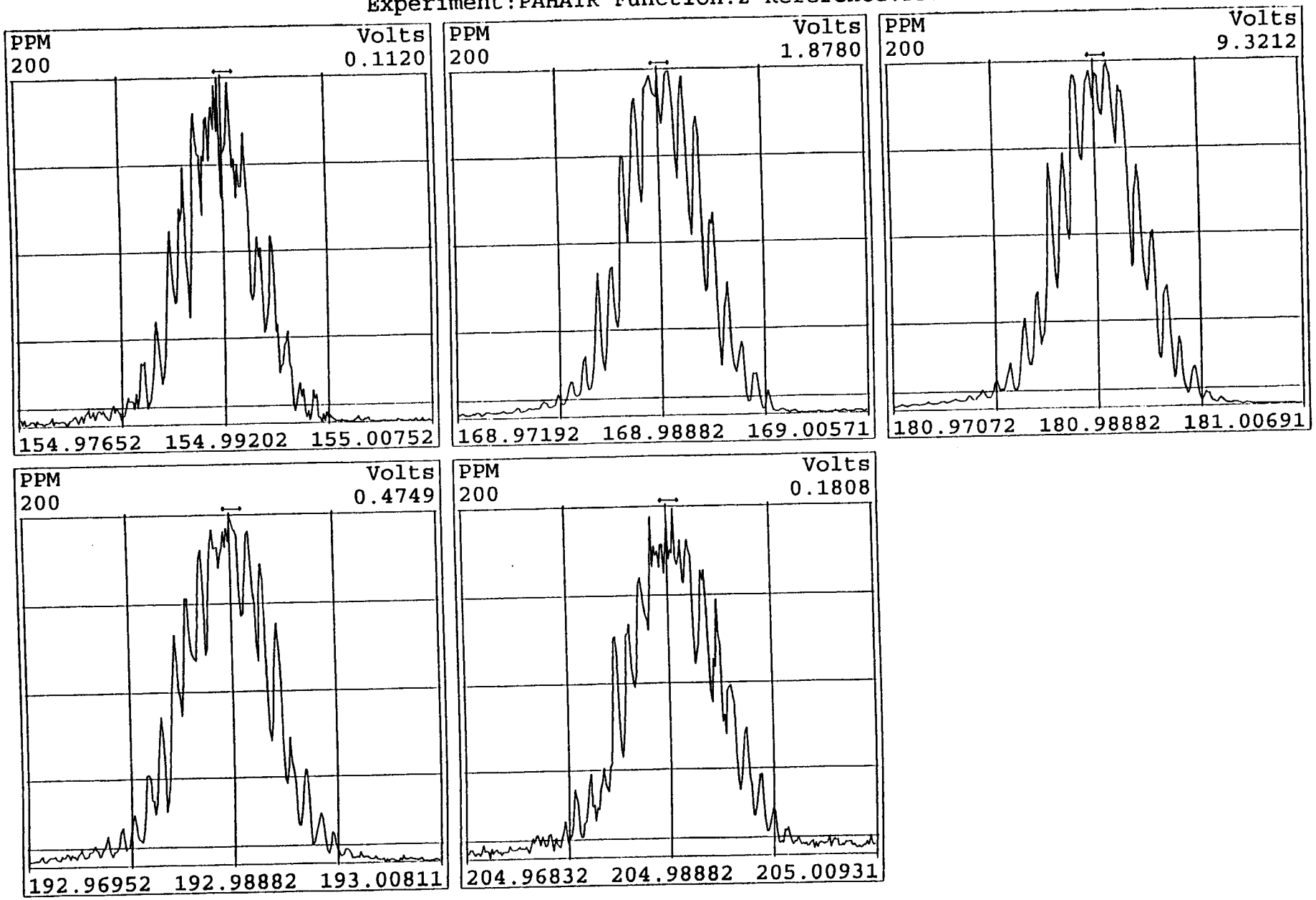
SM 10-30-

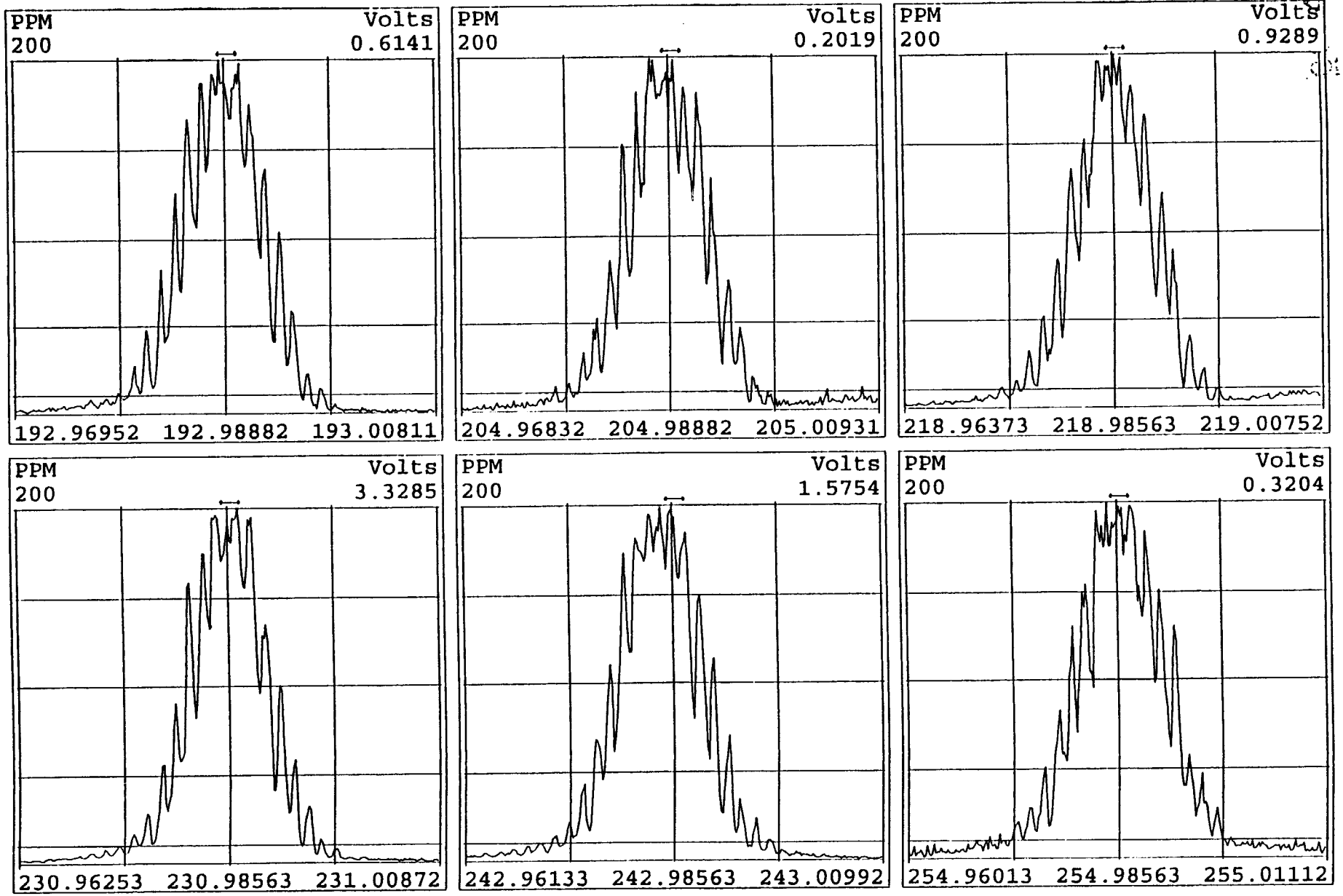
Peak Locate Examination:29-OCT-1998:15:23 File:29OC98V4
Experiment:PAHAIR Function:1 Reference:PFK



Peak Locate Examination:29-OCT-1998:15:23 File:29OC98V4
Experiment:PAHAIR Function:2 Reference:PFK

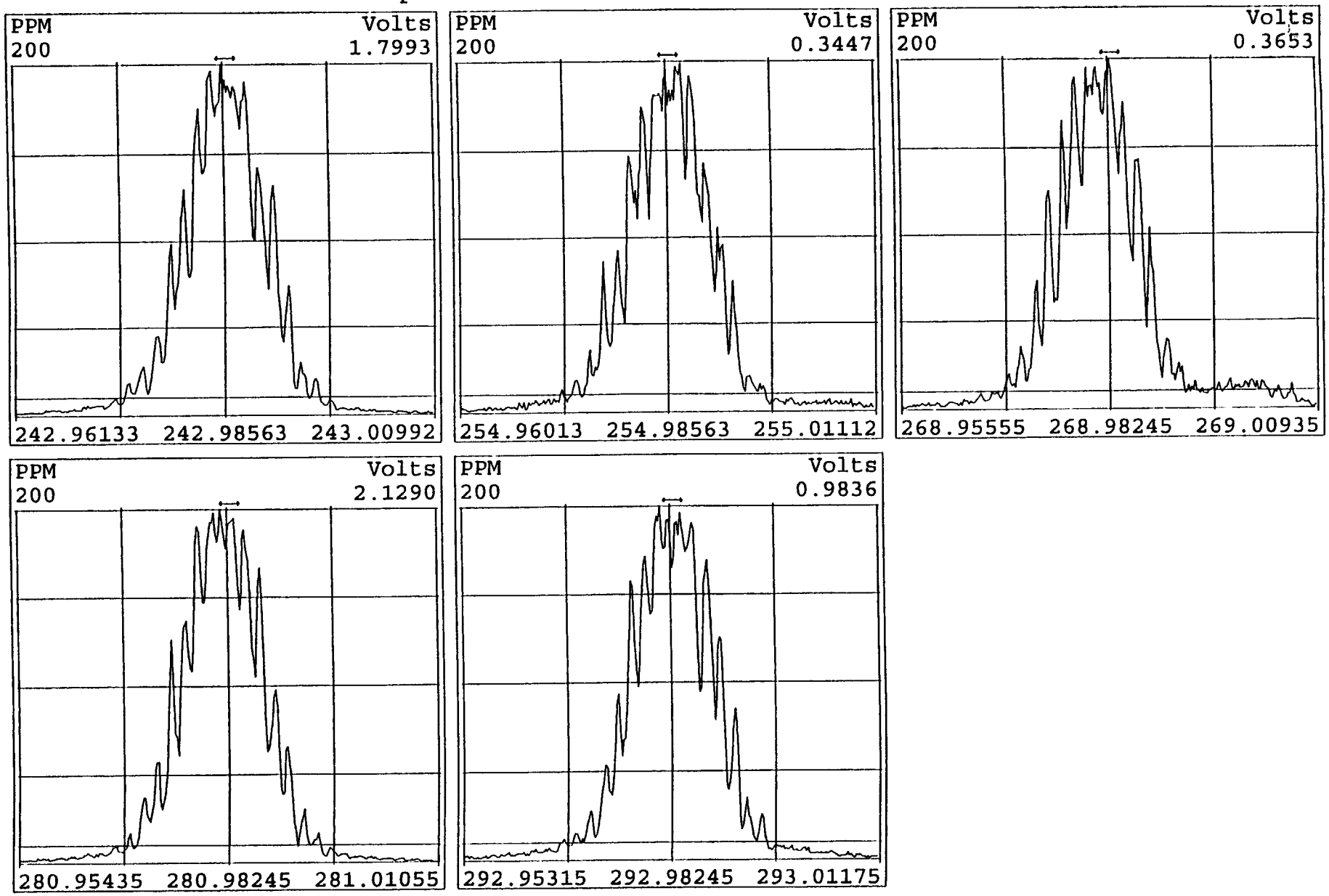


Peak Locate Examination:29-OCT-1998:15:24 File:29OC98V4
Experiment:PAHAIR Function:3 Reference:PFK

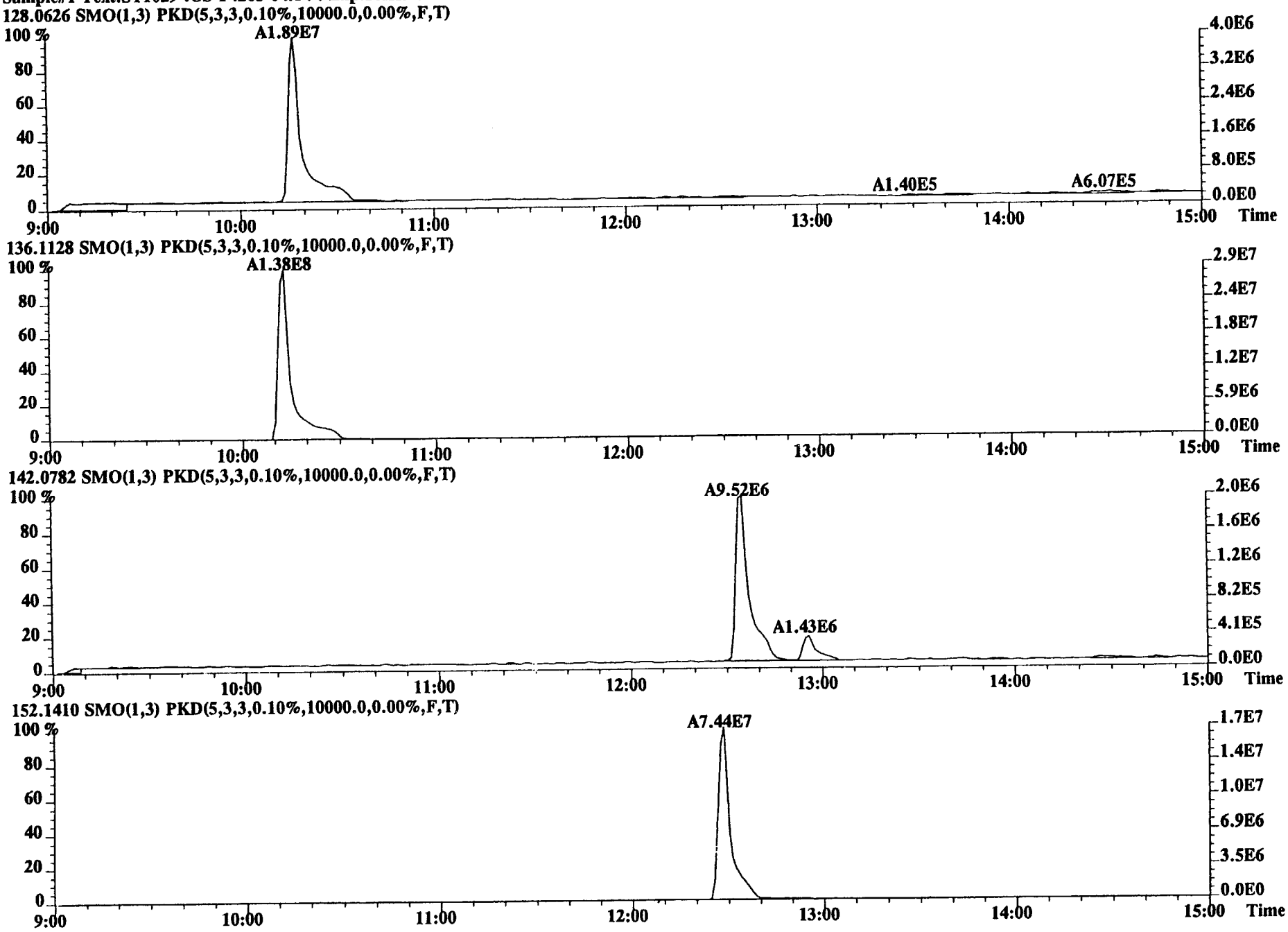


487

Peak Locate Examination:29-OCT-1998:15:26 File:29OC98V4
Experiment:PAHAIR Function:4 Reference:PFK

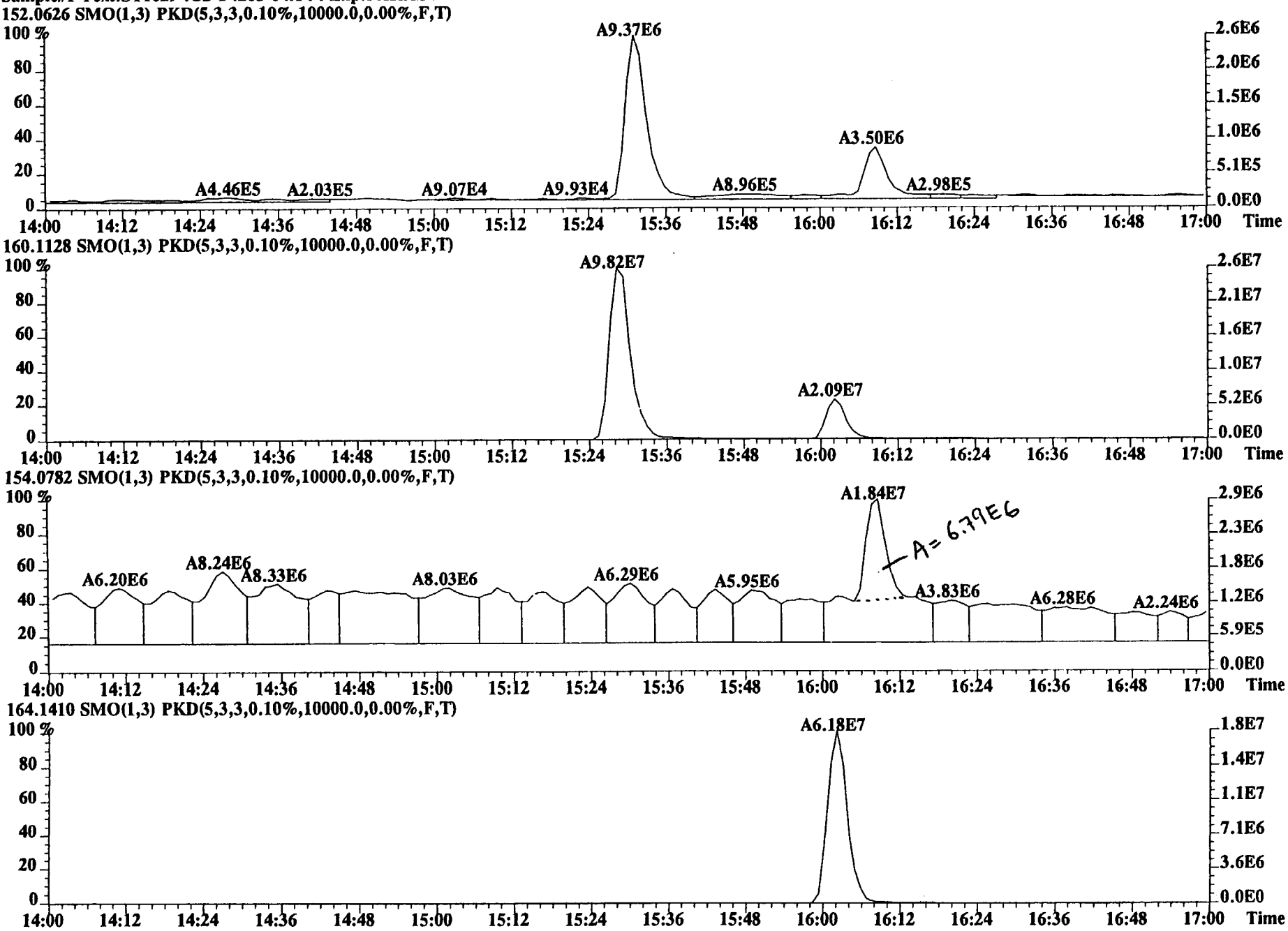


File:29OC98V4 #1-510 Acq:29-OCT-1998 15:27:18 GC EI+ Voltage SIR 70SE
Sample#1 Text:ST1029 :CS-1 :265-04A : : Exp:PAHAIR

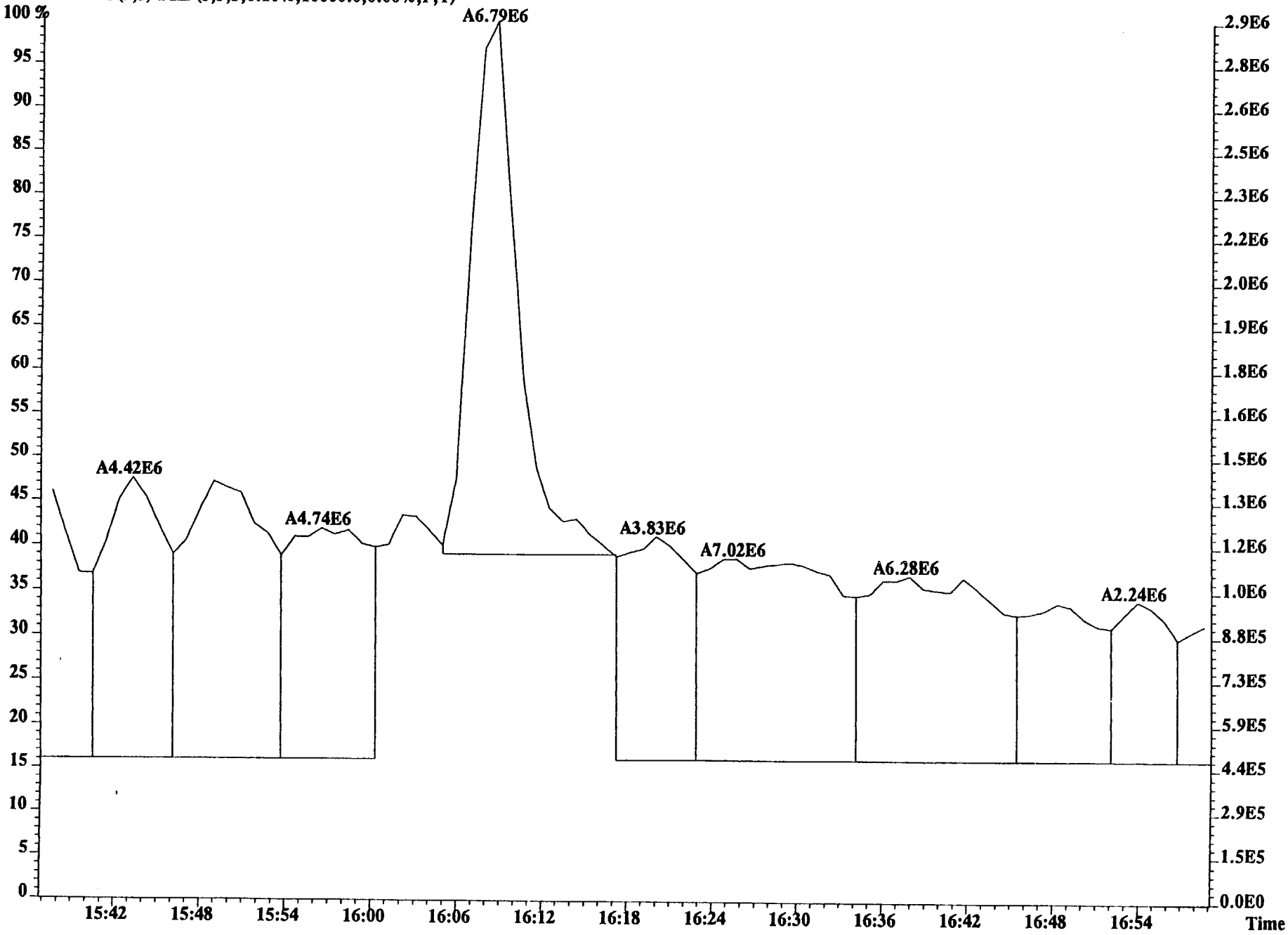


458

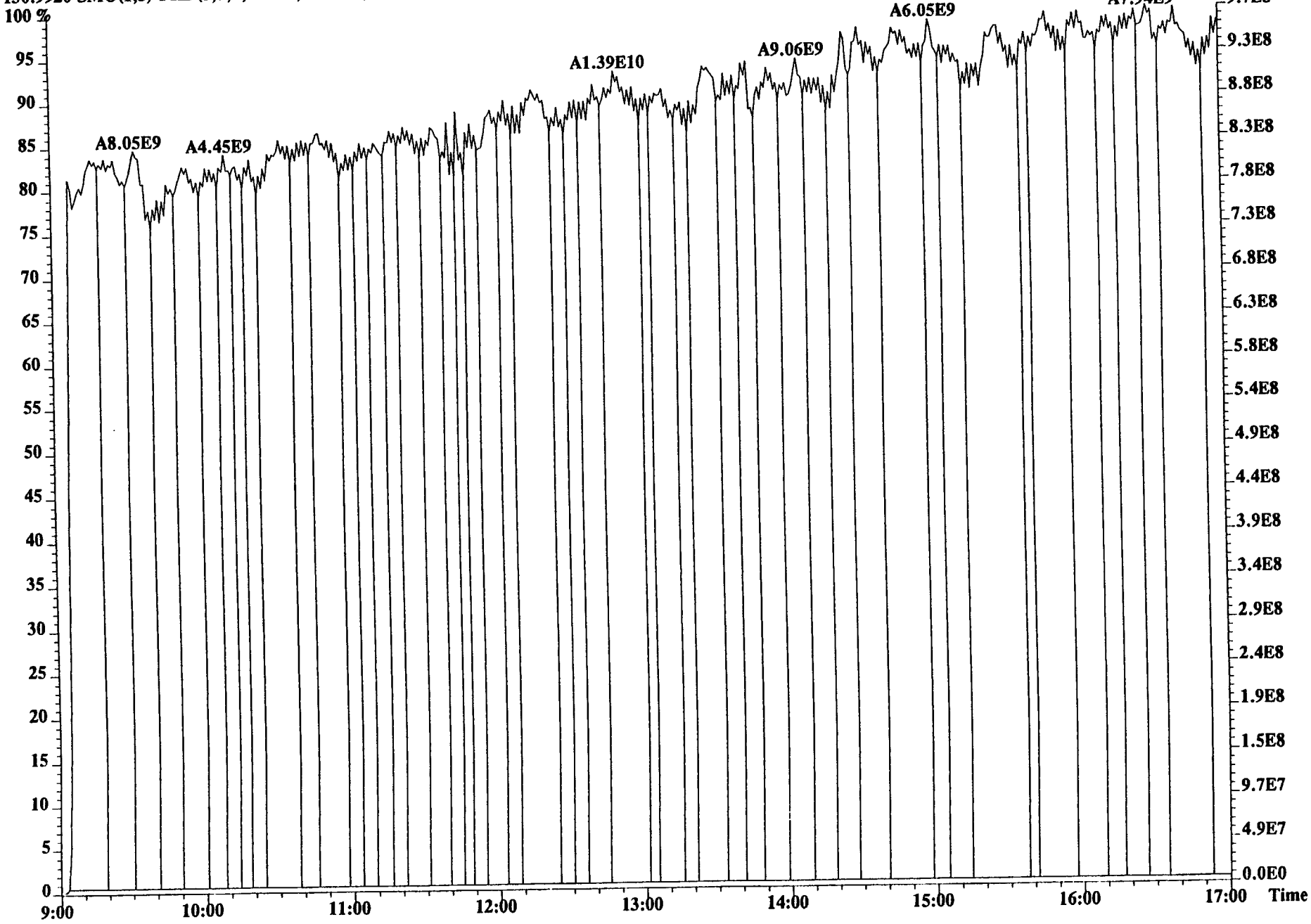
File:29OC98V4 #1-510 Acq:29-OCT-1998 15:27:18 GC EI+ Voltage SIR 70SE
Sample#1 Text:ST1029 :CS-1 :265-04A : : Exp:PAHAIR



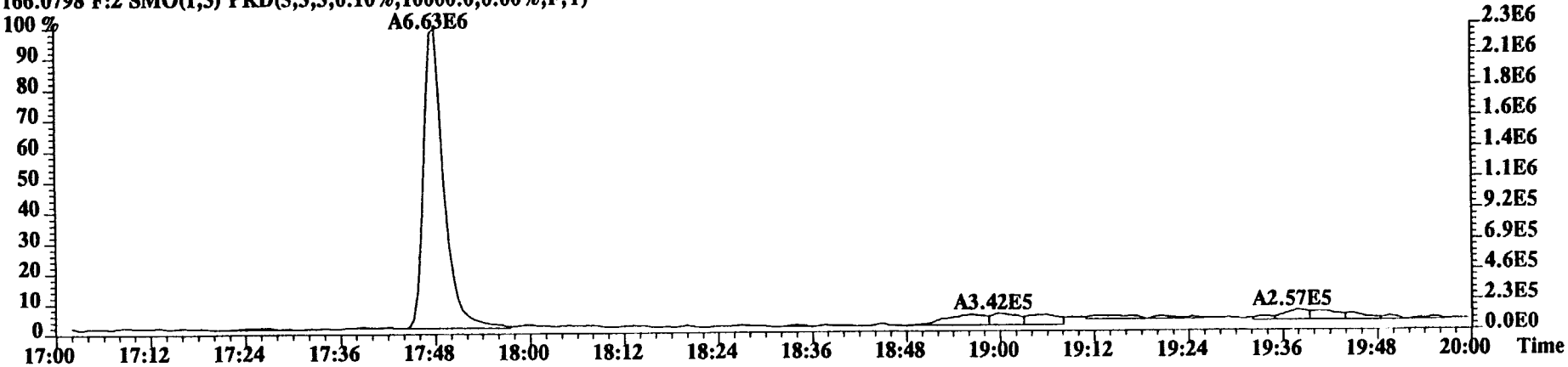
File:29OC98V4 #1-510 Acq:29-OCT-1998 15:27:18 GC EI+ Voltage SIR 70SE
Sample#1 Text:ST1029 :CS-1 :265-04A : : Exp:PAHAIR
154.0782 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



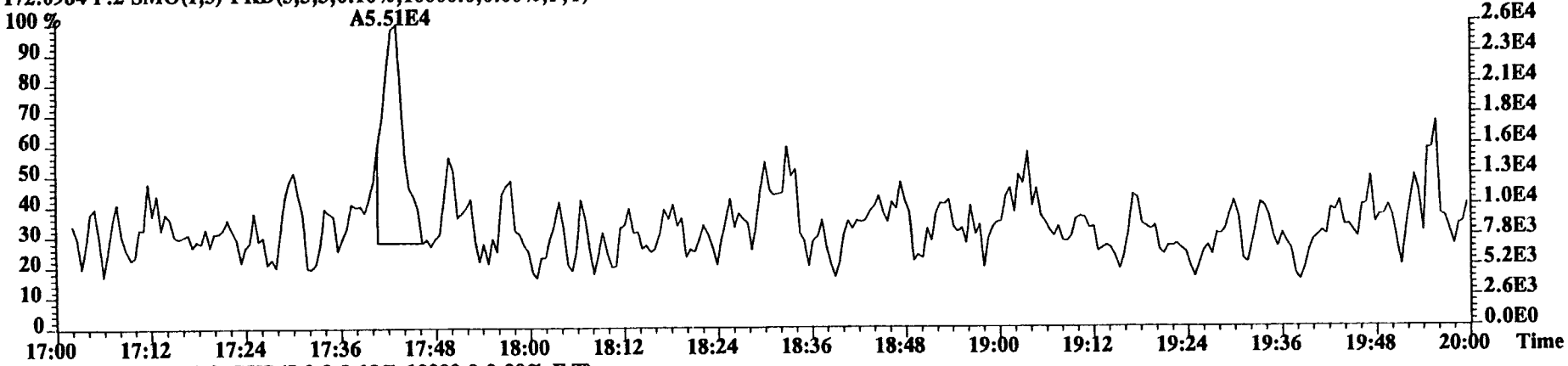
File:29OC98V4 #1-510 Acq:29-OCT-1998 15:27:18 GC EI+ Voltage SIR 70SE
Sample#1 Text:ST1029 :CS-1 :265-04A : : Exp:PAHAIR
130.9920 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



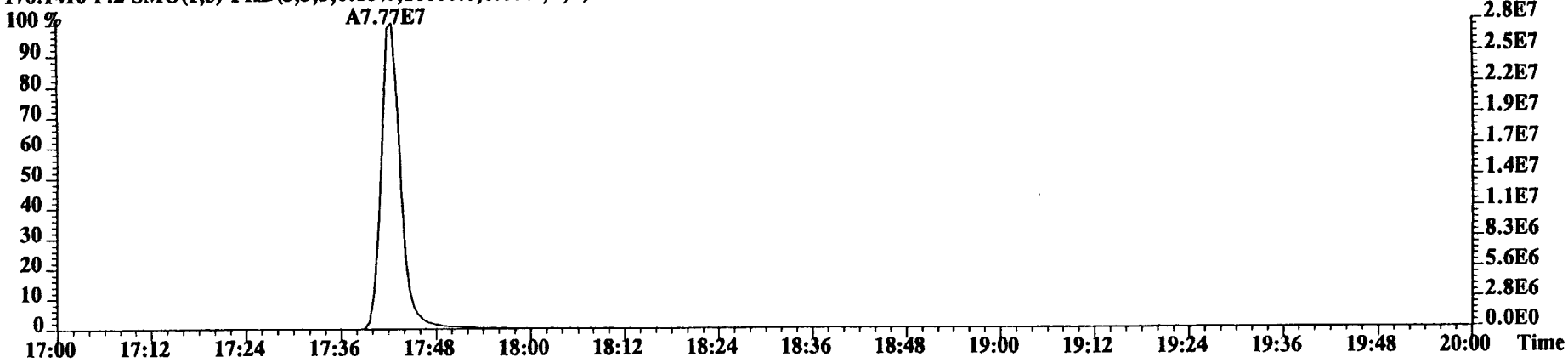
File:29OC98V4 #1-641 Acq:29-OCT-1998 15:27:18 GC EI+ Voltage SIR 70SE
Sample#1 Text:ST1029 :CS-1 :265-04A : : Exp:PAHAIR
166.0798 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



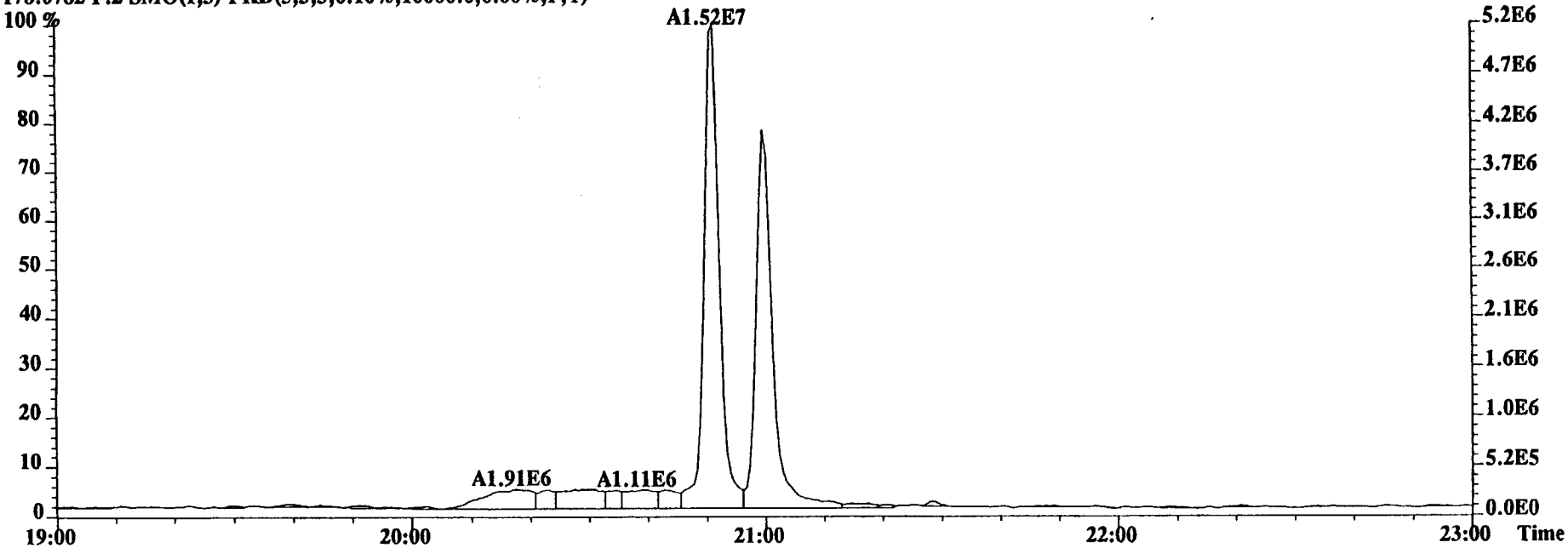
172.0984 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



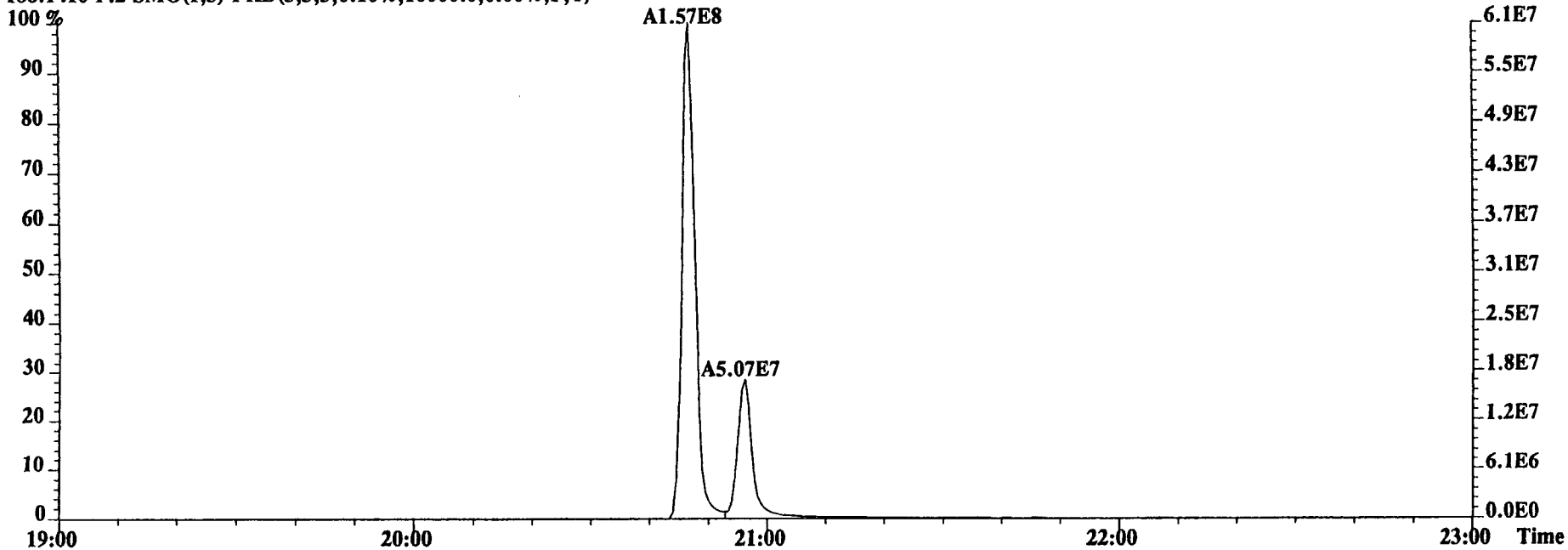
176.1410 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



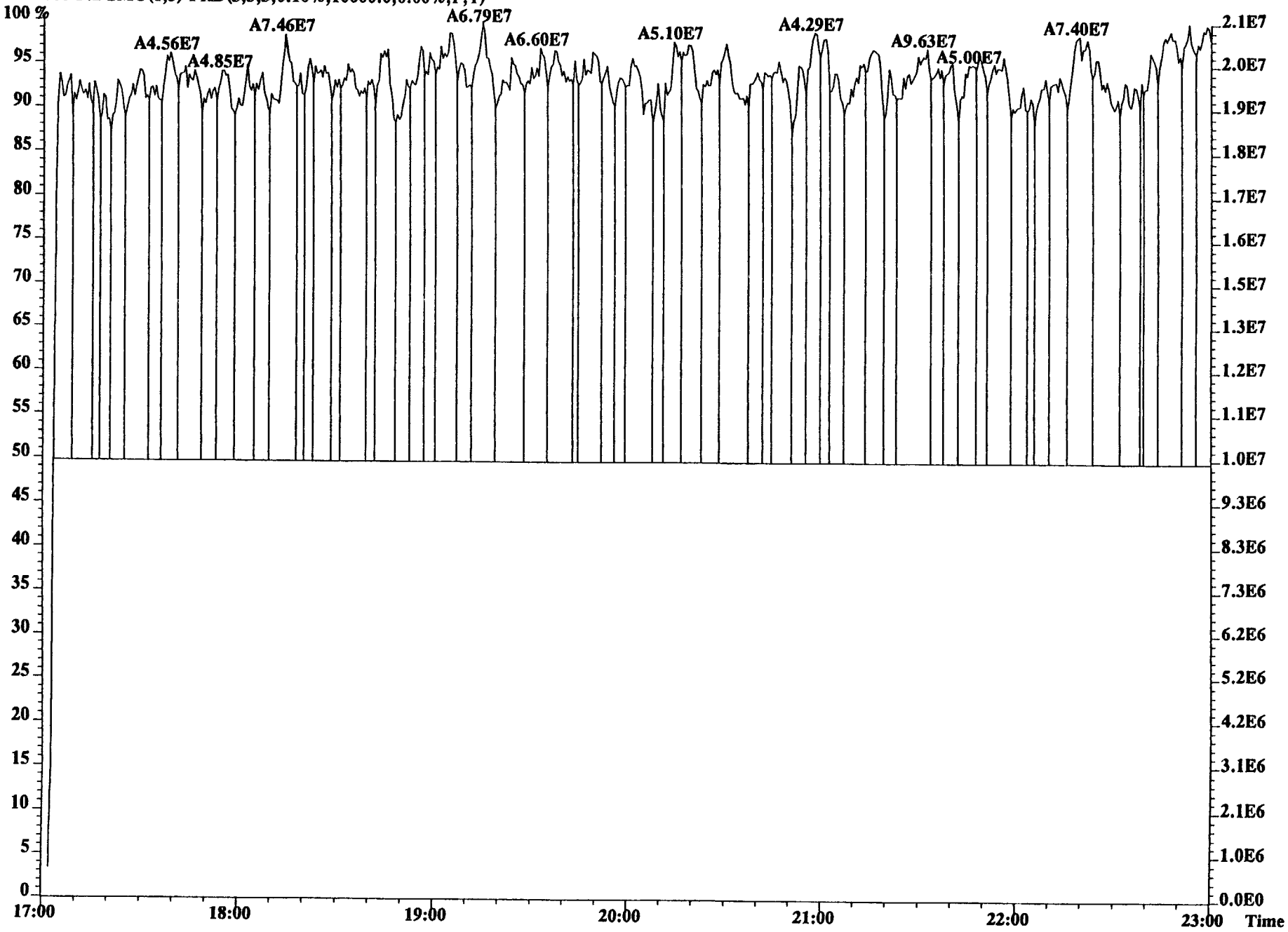
File:29OC98V4 #1-641 Acq:29-OCT-1998 15:27:18 GC EI+ Voltage SIR 70SE
Sample#1 Text:ST1029 :CS-1 :265-04A : : Exp:PAHAIR
178.0782 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



188.1410 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

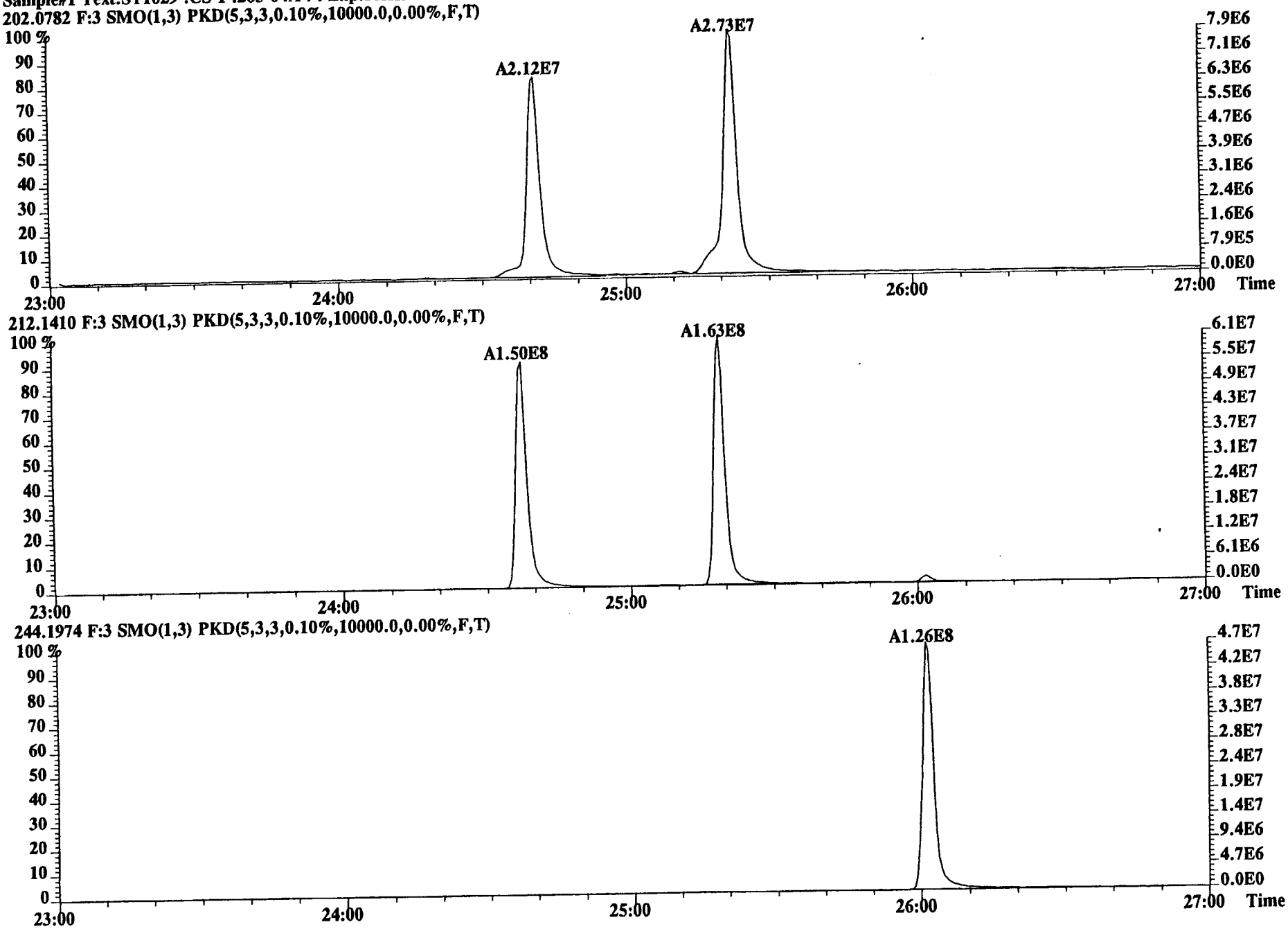


File:29OC98V4 #1-641 Acq:29-OCT-1998 15:27:18 GC EI+ Voltage SIR 70SE
Sample#1 Text:ST1029 :CS-1 :265-04A : : Exp:PAHAIR
204.9888 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

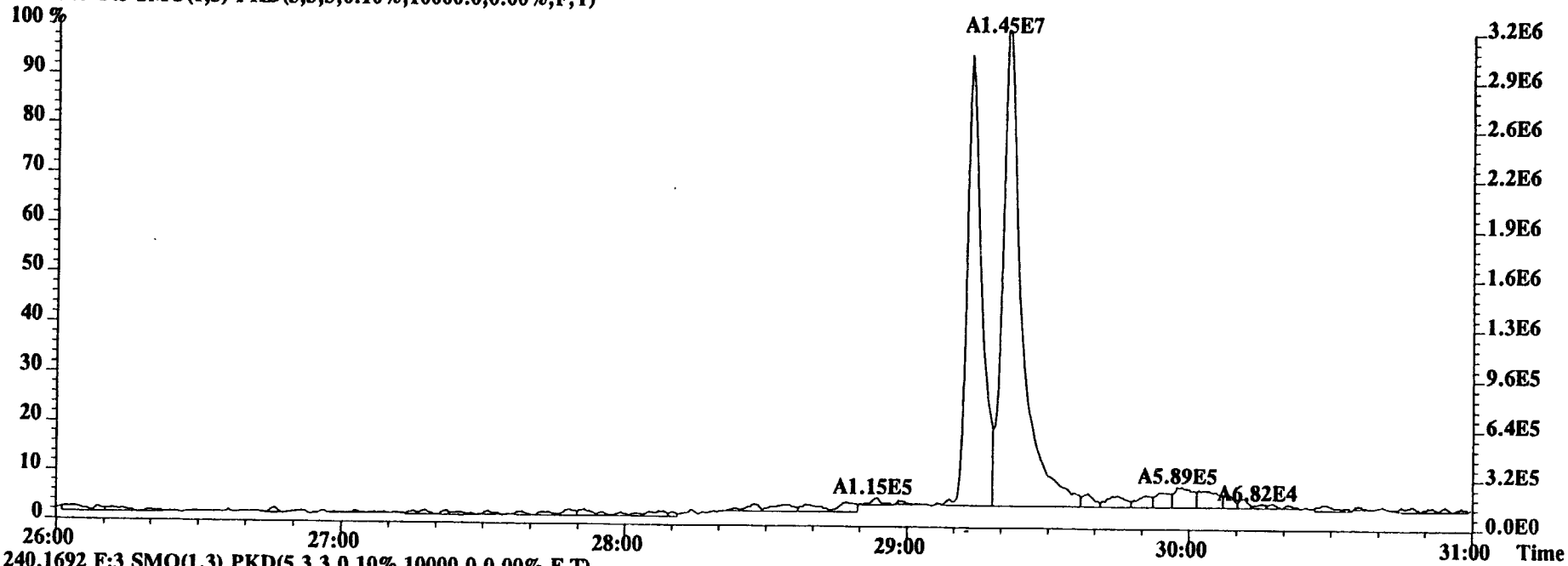


494

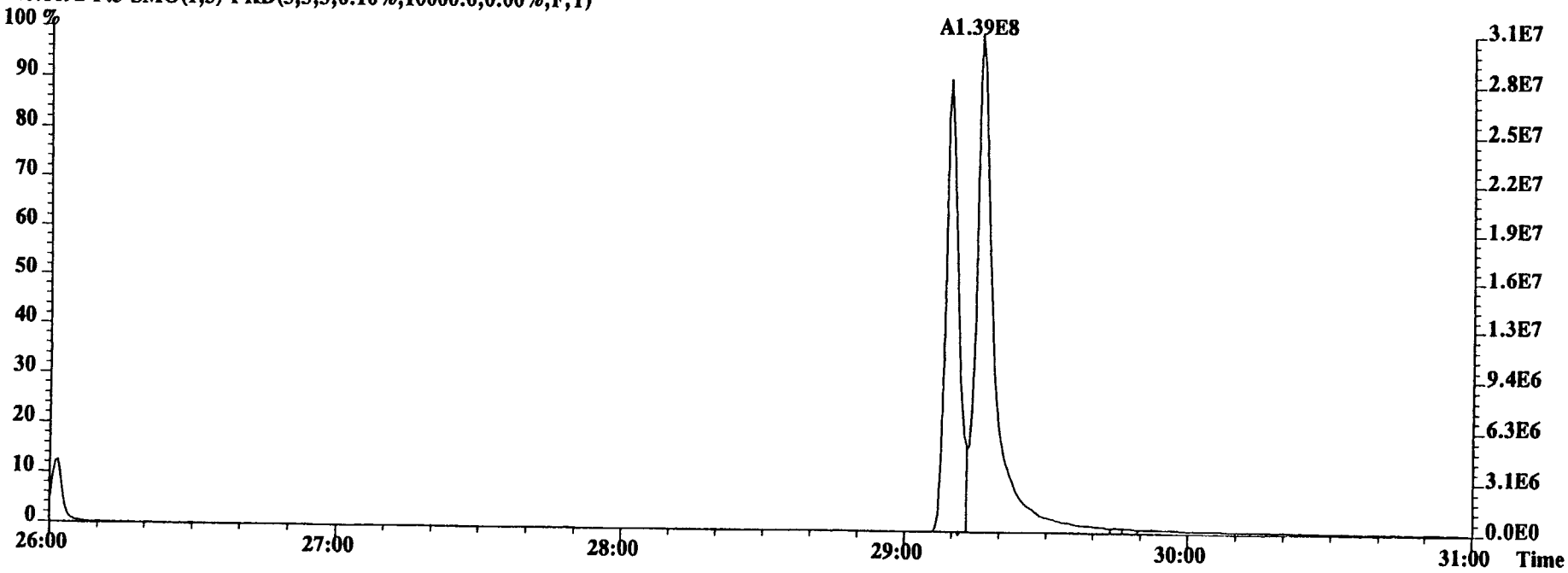
File:29OC98V4 #1-938 Acq:29-OCT-1998 15:27:18 GC EI+ Voltage SIR 70SE
Sample#1 Text:ST1029 :CS-1 :265-04A : : Exp:PAHAIR



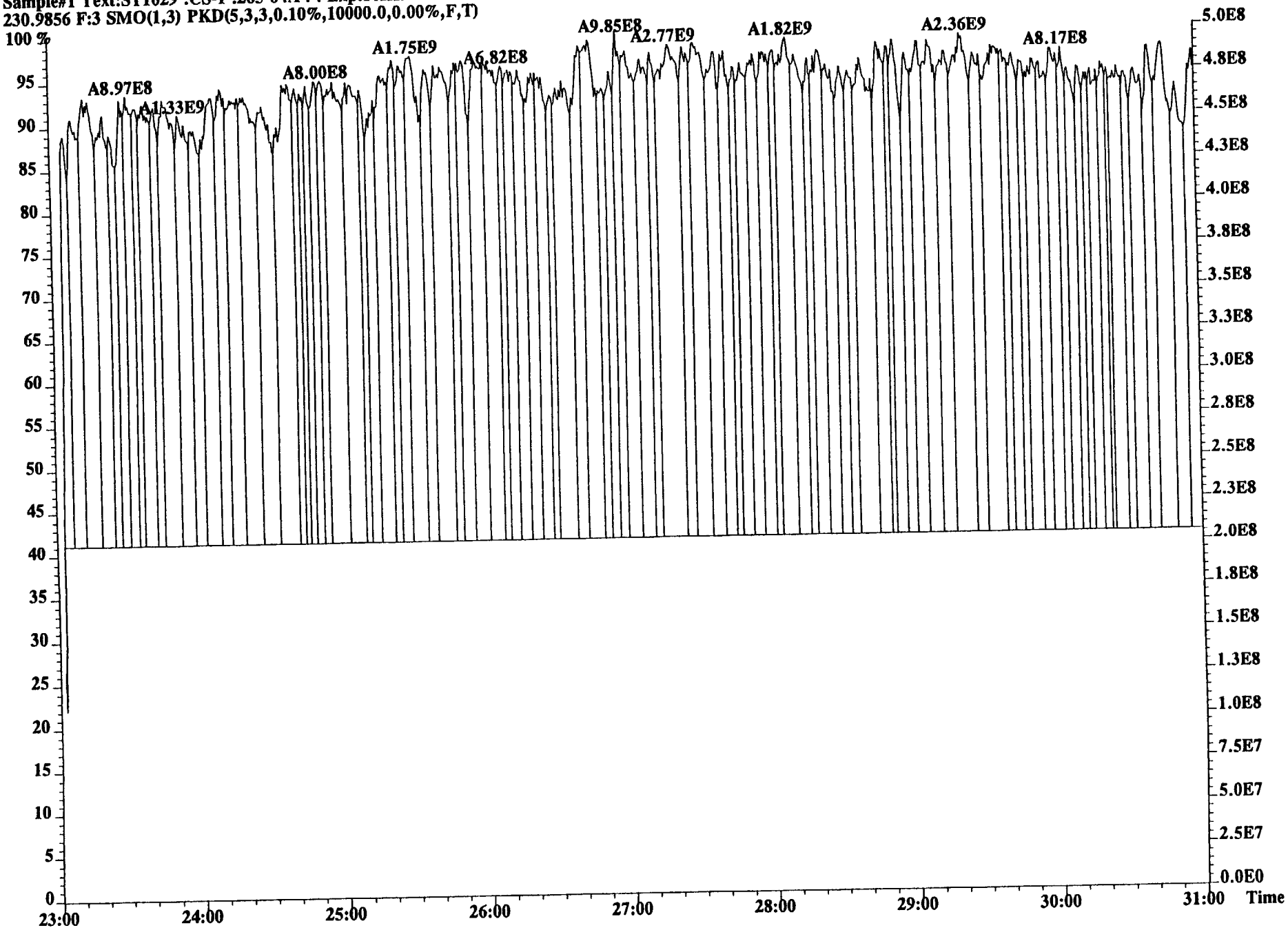
File:29OC98V4 #1-938 Acq:29-OCT-1998 15:27:18 GC EI+ Voltage SIR 70SE
Sample#1 Text:ST1029 :CS-1 :265-04A : : Exp:PAHAIR
228.0939 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



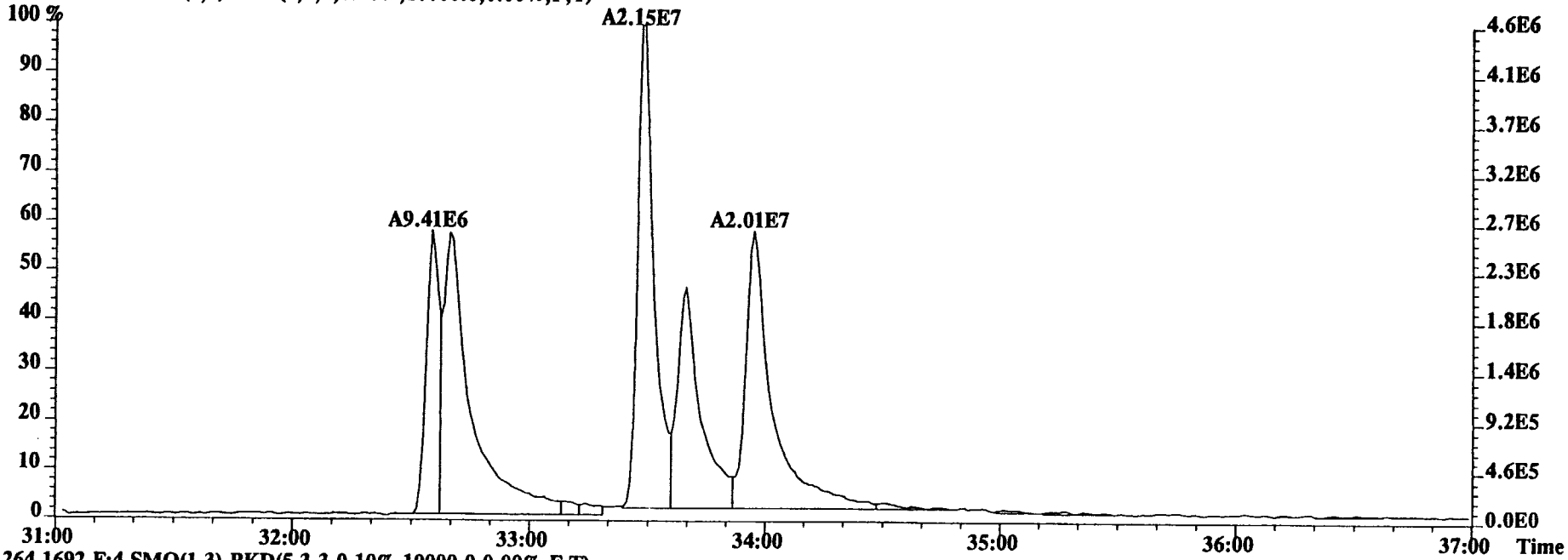
240.1692 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



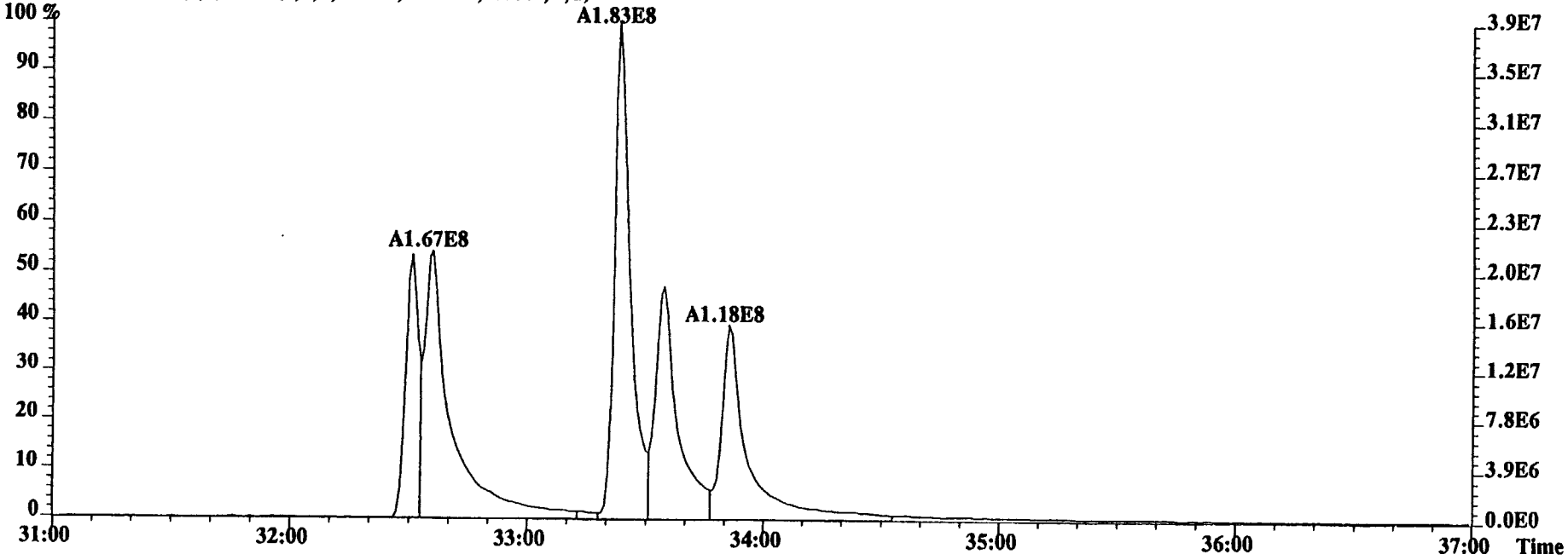
File:29OC98V4 #1-938 Acq:29-OCT-1998 15:27:18 GC EI+ Voltage SIR 70SE
Sample#1 Text:ST1029 :CS-1 :265-04A : : Exp:PAHAIR
230.9856 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



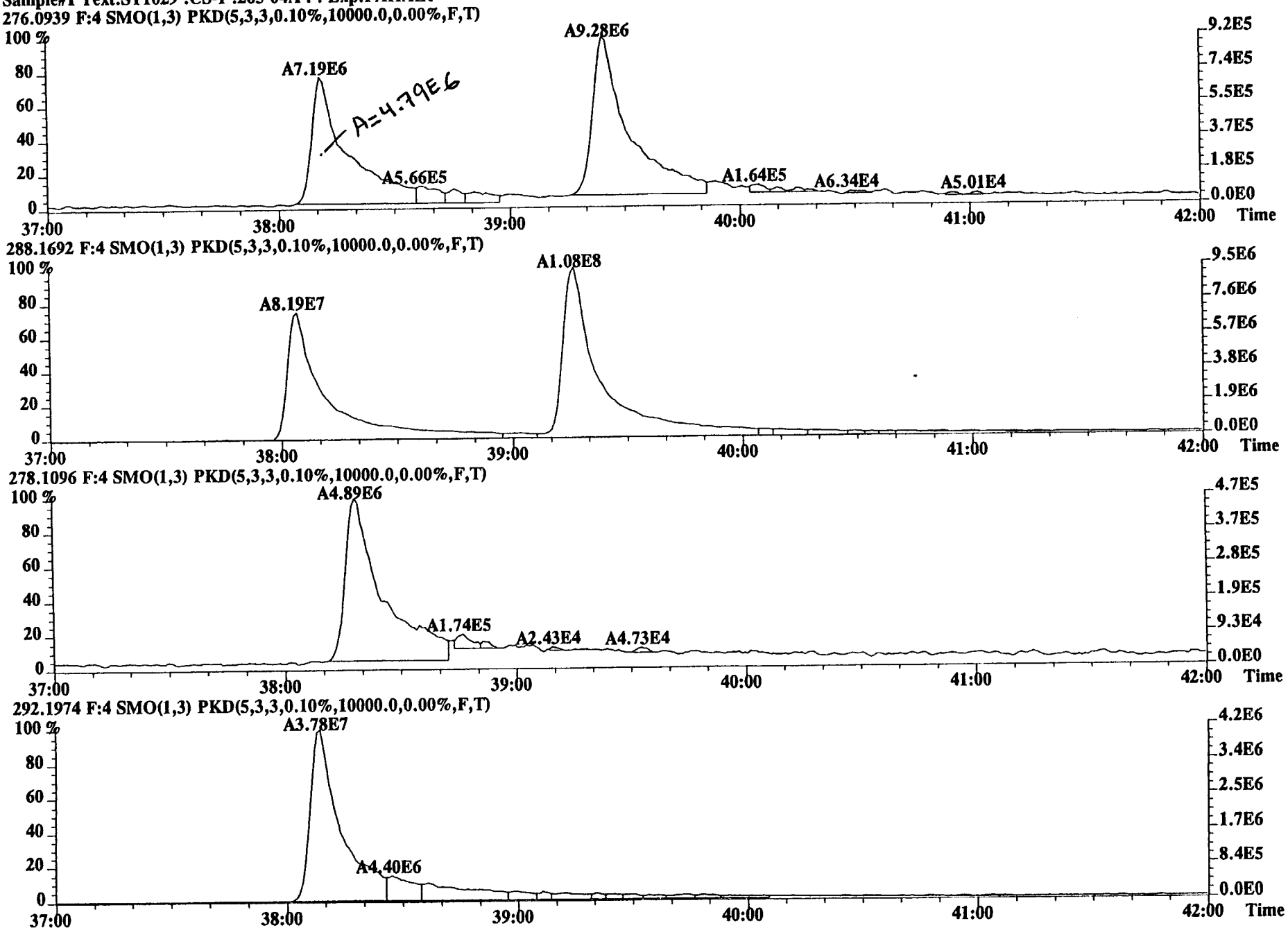
File:29OC98V4 #1-878 Acq:29-OCT-1998 15:27:18 GC EI+ Voltage SIR 70SE
Sample#1 Text:ST1029 :CS-1 :265-04A : : Exp:PAHAIR
252.0939 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



264.1692 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

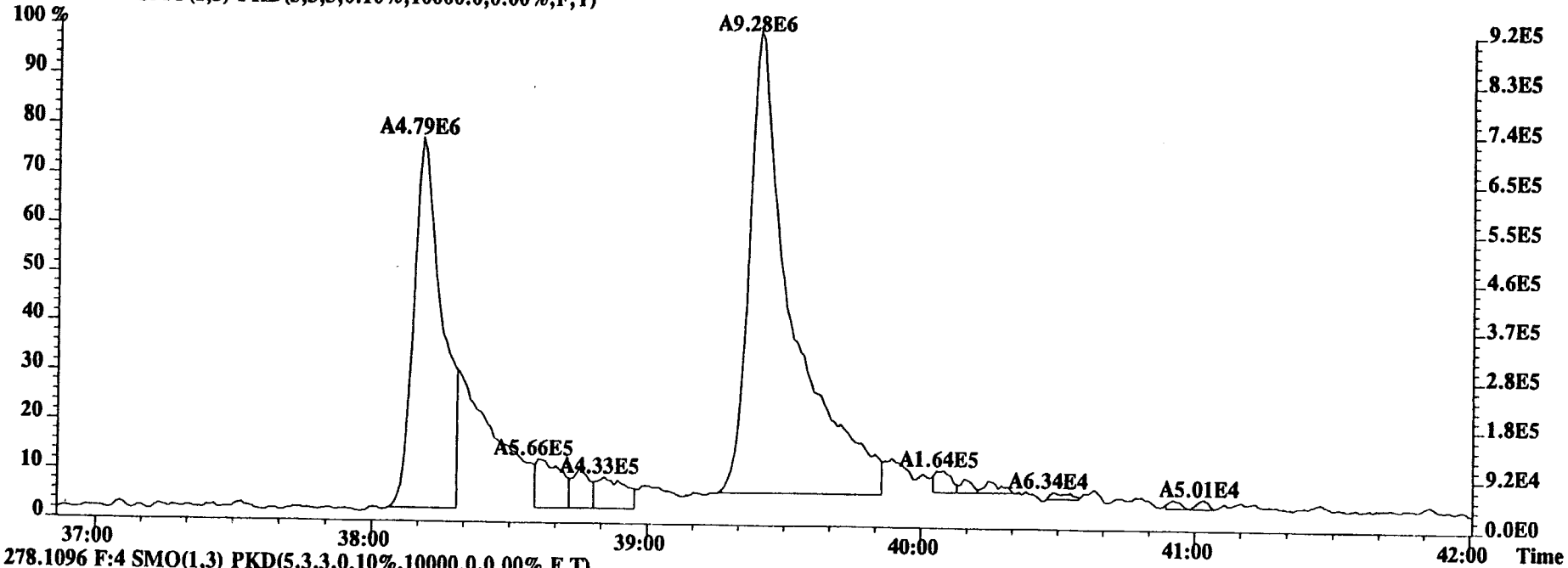


File:29OC98V4 #1-878 Acq:29-OCT-1998 15:27:18 GC EI+ Voltage SIR 70SE
Sample#1 Text:ST1029 :CS-1 :265-04A : : Exp:PAHAIR

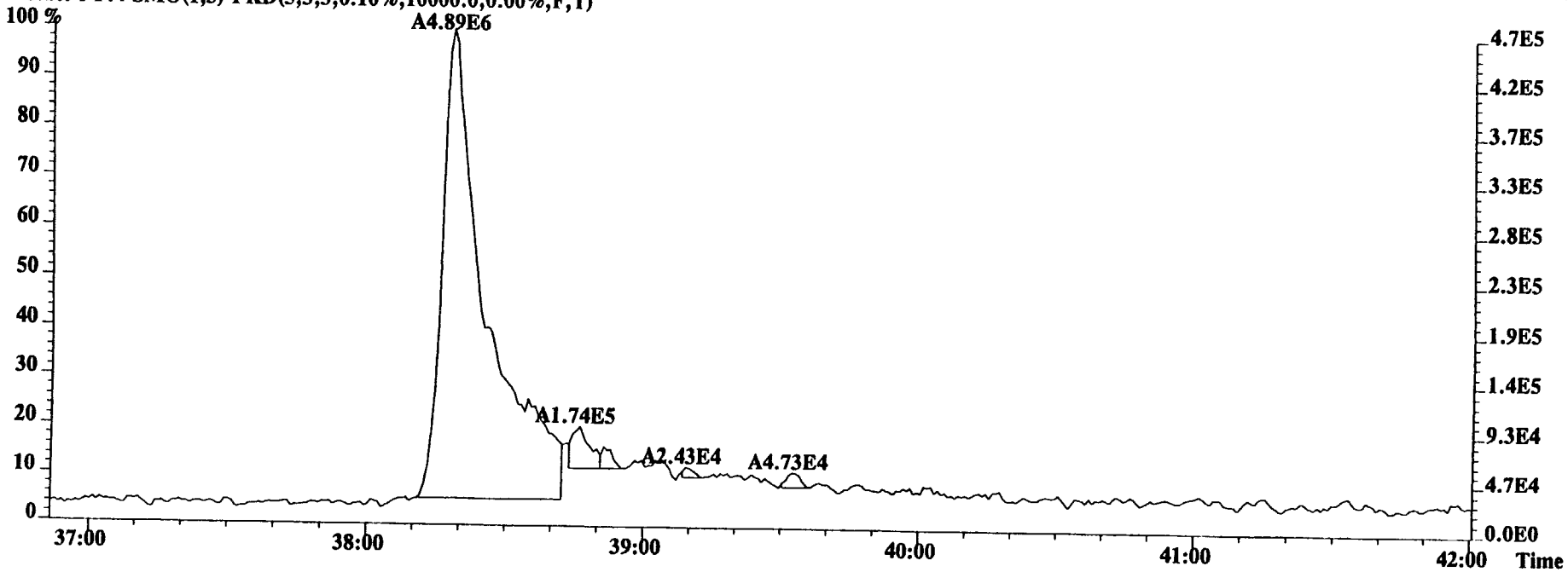


499

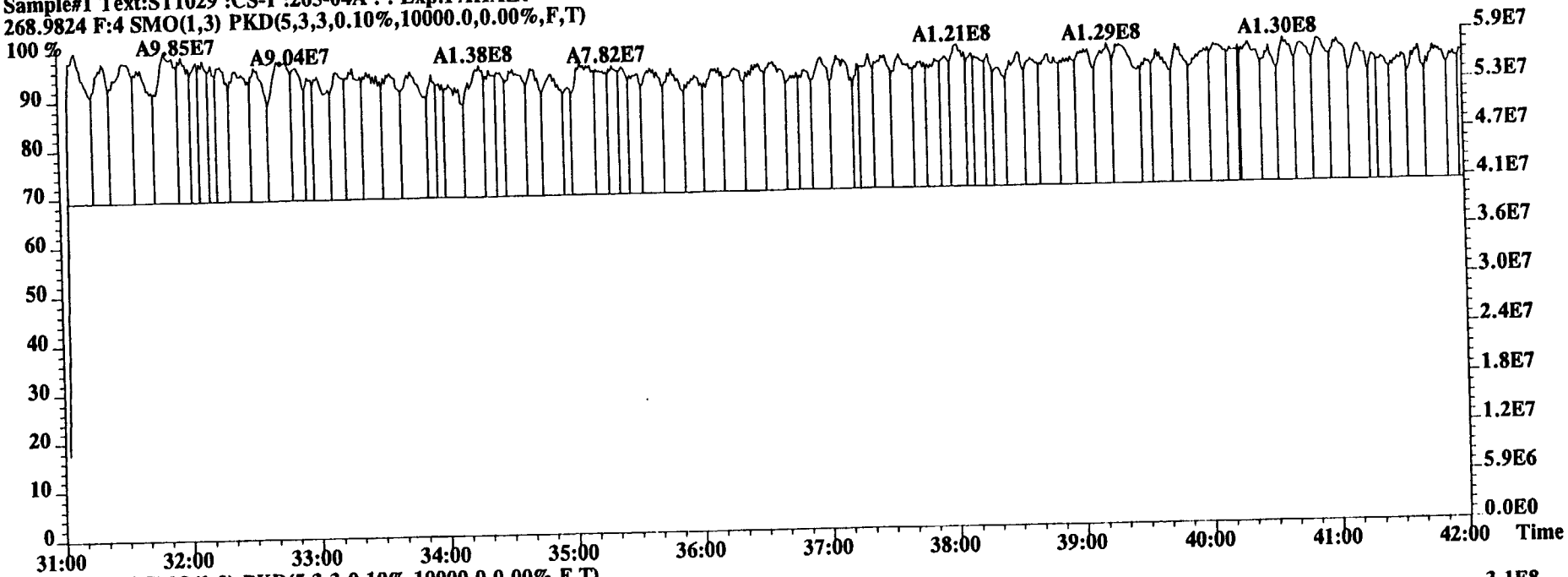
File:29OC98V4 #1-878 Acq:29-OCT-1998 15:27:18 GC EI+ Voltage SIR 70SE
Sample#1 Text:ST1029 :CS-1 :265-04A : : Exp:PAHAIR
276.0939 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



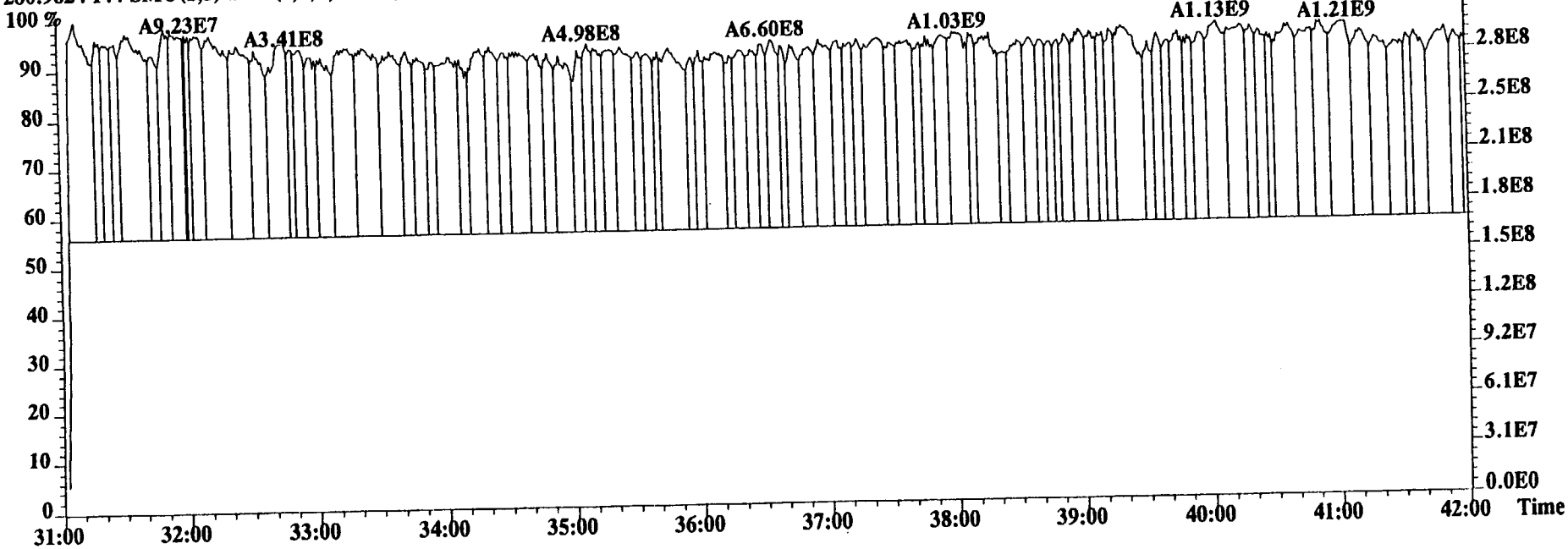
278.1096 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



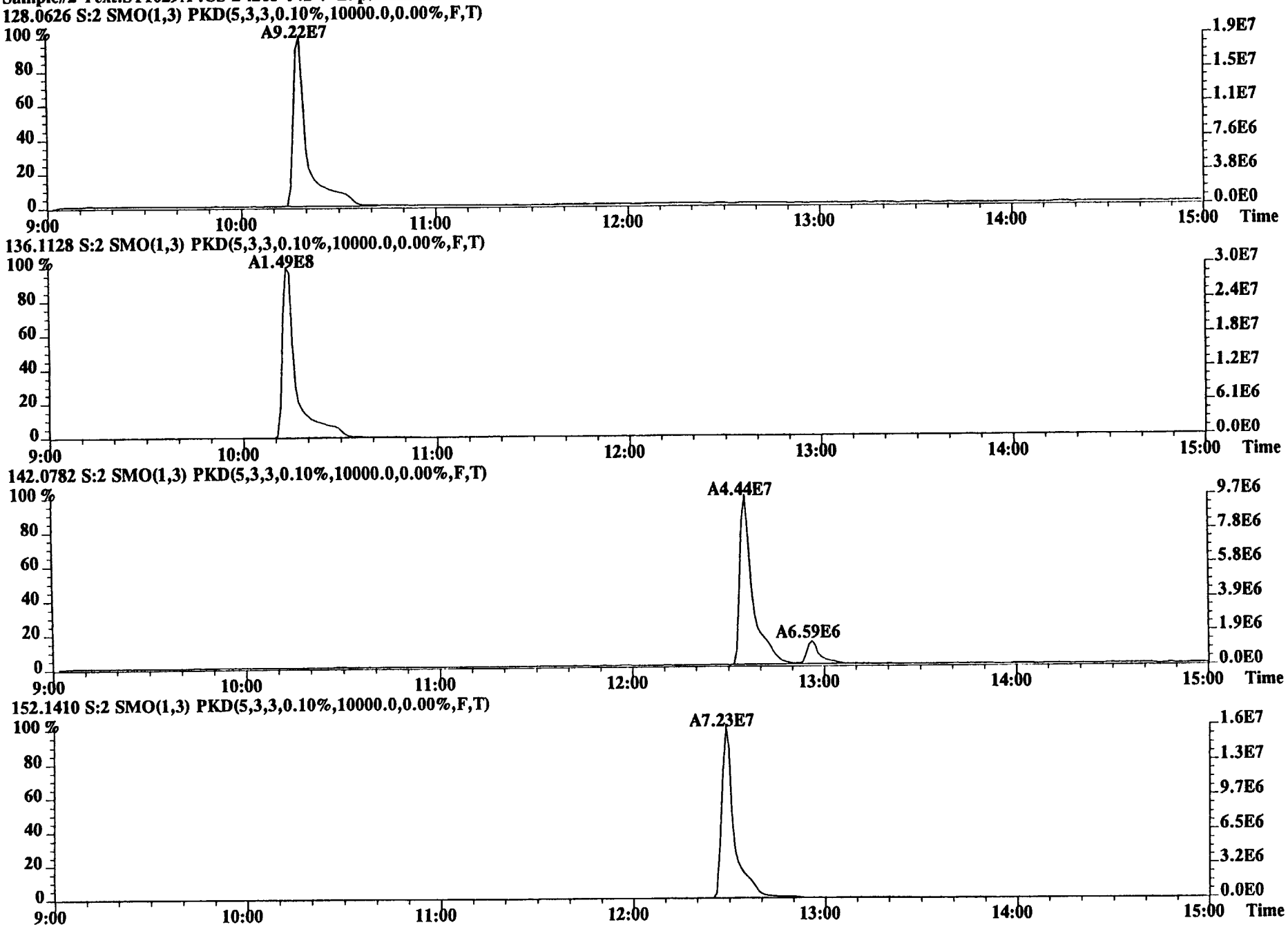
File:29OC98V4 #1-878 Acq:29-OCT-1998 15:27:18 GC EI+ Voltage SIR 70SE
Sample#1 Text:ST1029 :CS-1 :265-04A : : Exp:PAHAIR
268.9824 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



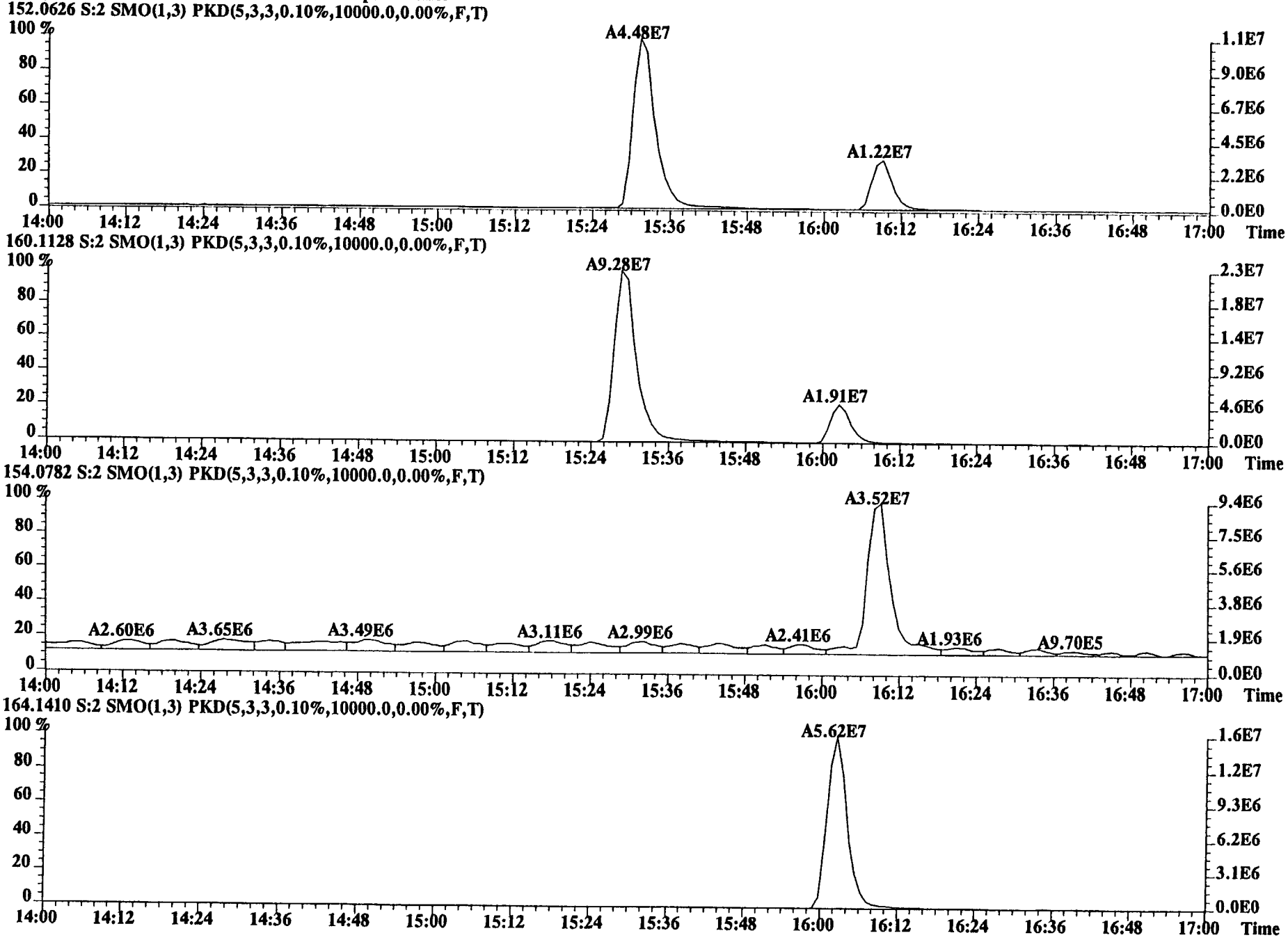
280.9824 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



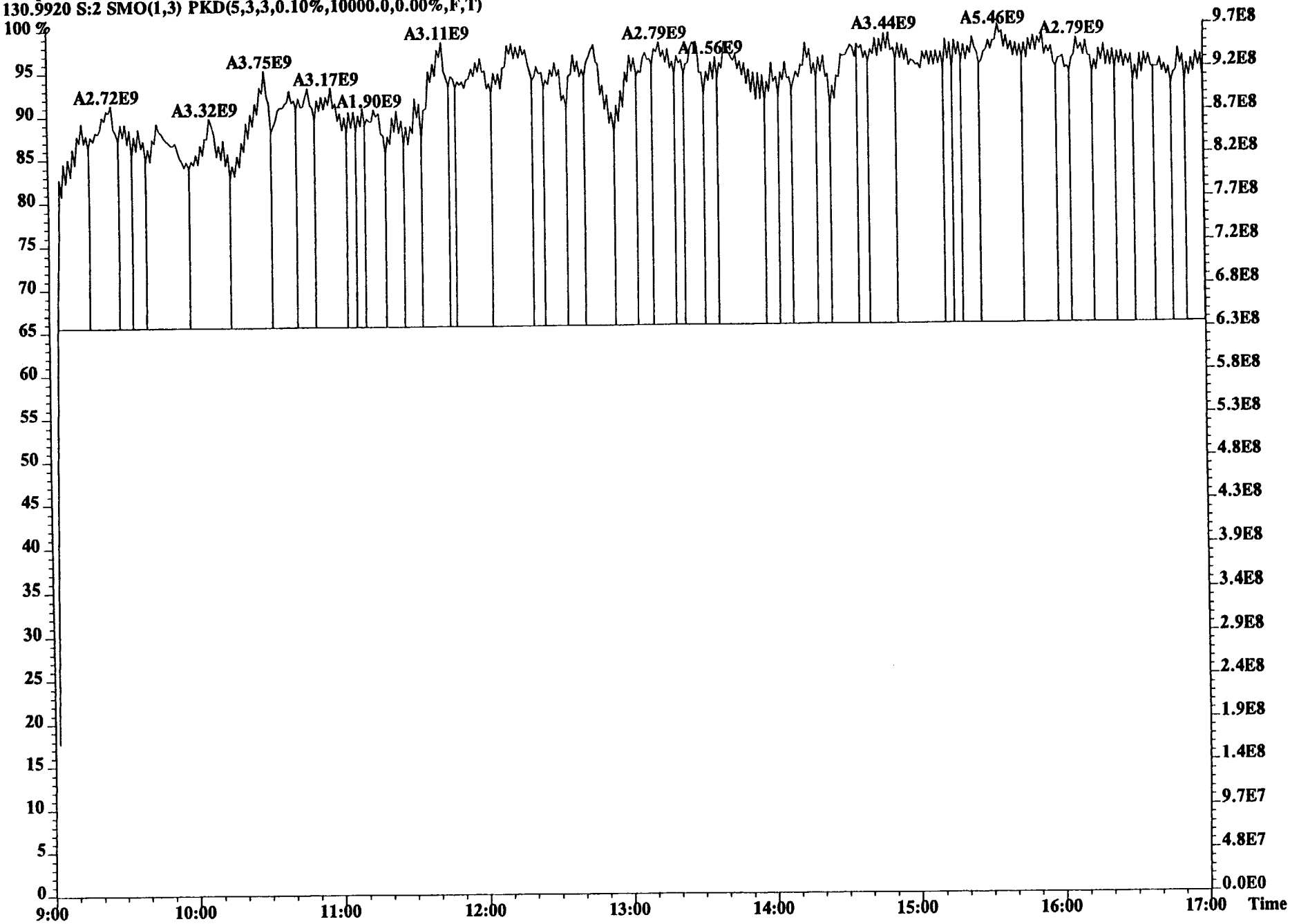
File:29OC98V4 #1-510 Acq:29-OCT-1998 16:16:17 GC EI+ Voltage SIR 70SE
Sample#2 Text:ST1029A :CS-2 :265-04B : Exp:PAHAIR



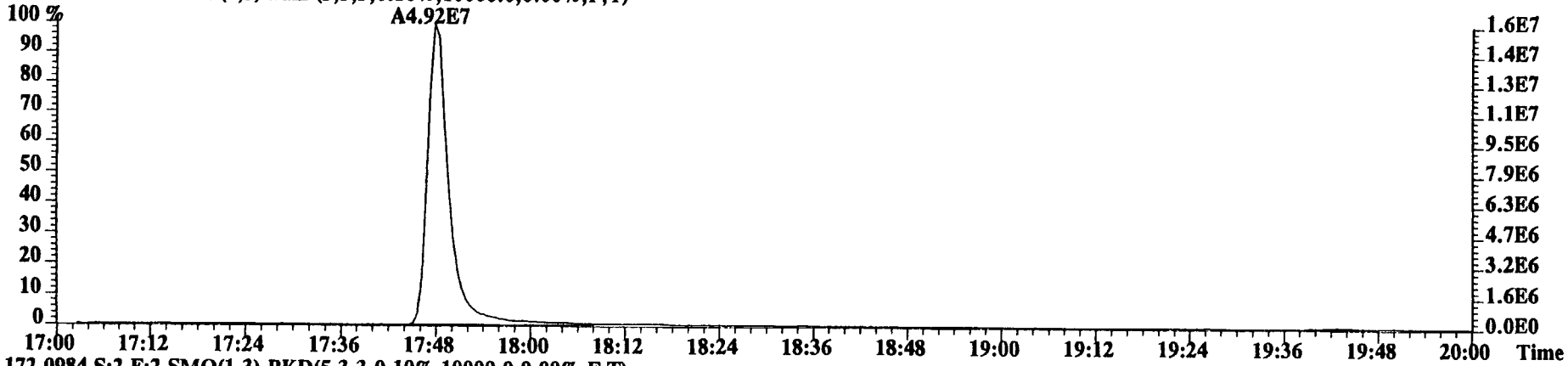
File:29OC98V4 #1-510 Acq:29-OCT-1998 16:16:17 GC EI+ Voltage SIR 70SE
Sample#2 Text:ST1029A :CS-2 :265-04B : Exp:PAHAIR



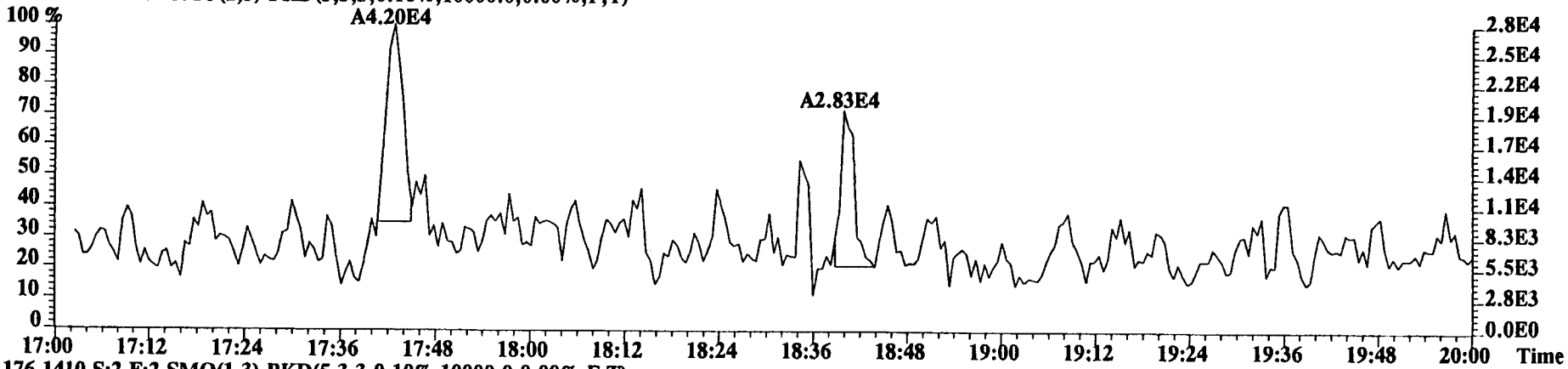
File:29OC98V4 #1-510 Acq:29-OCT-1998 16:16:17 GC EI+ Voltage SIR 70SE
Sample#2 Text:ST1029A :CS-2 :265-04B : Exp:PAHAIR
130.9920 S:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



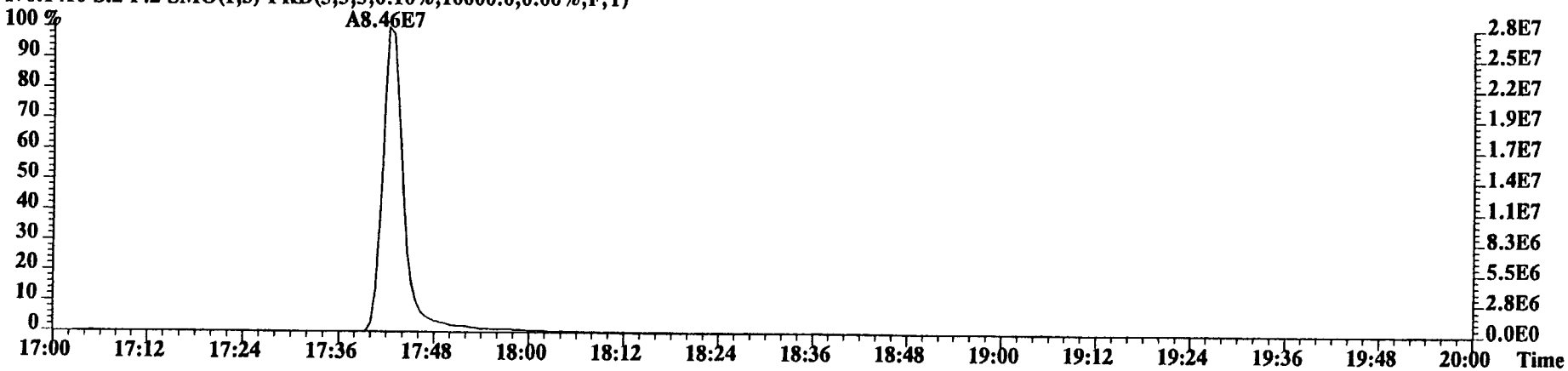
File:29OC98V4 #1-640 Acq:29-OCT-1998 16:16:17 GC EI+ Voltage SIR 70SE
Sample#2 Text:ST1029A :CS-2 :265-04B : Exp:PAHAIR
166.0798 S:2 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



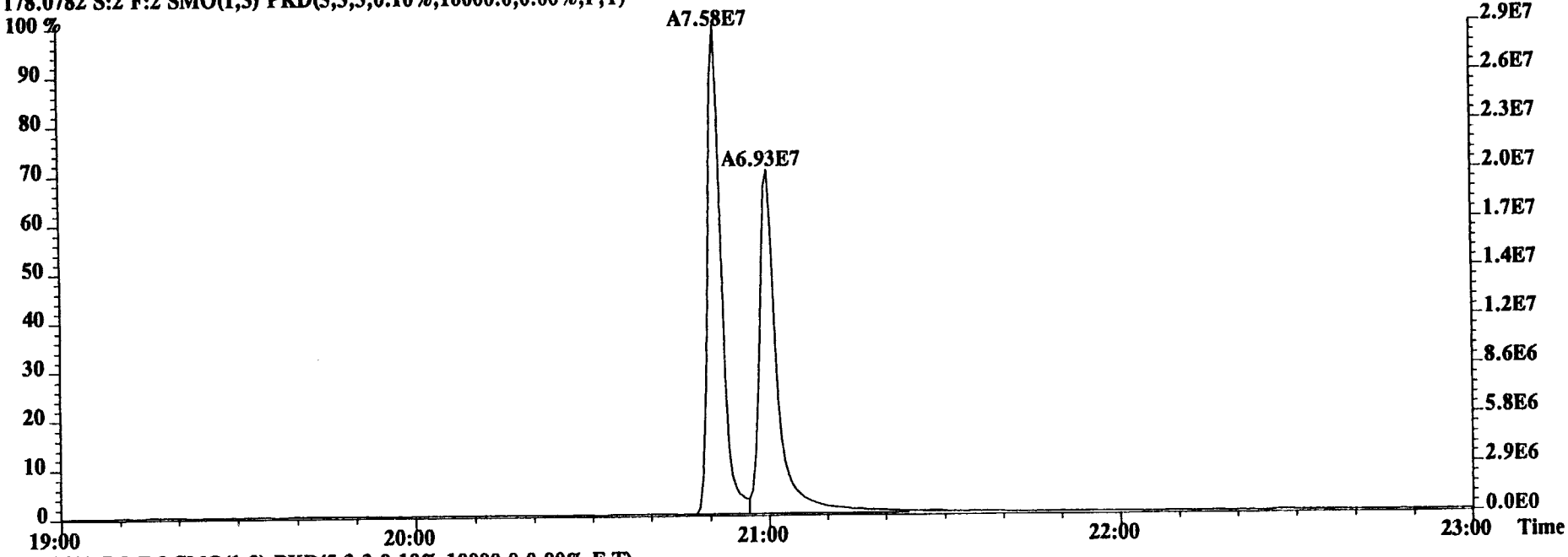
172.0984 S:2 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



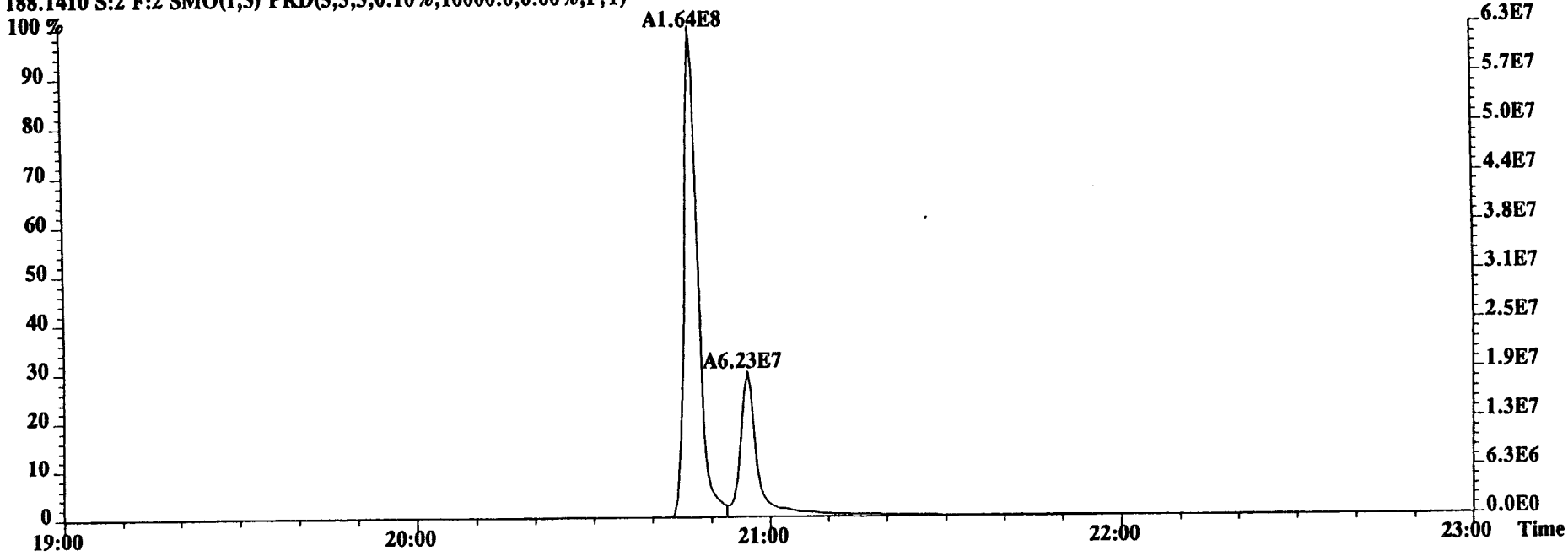
176.1410 S:2 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



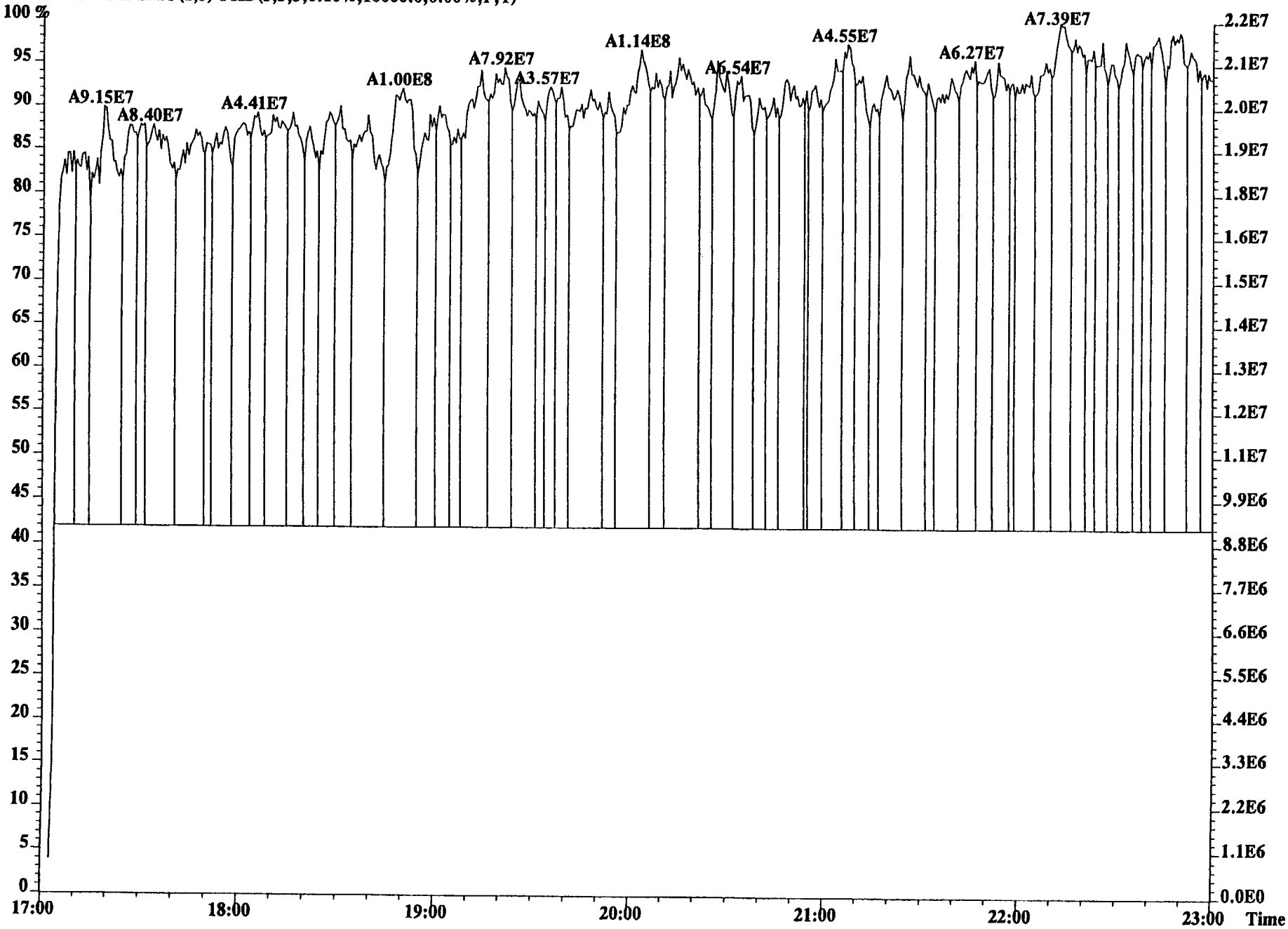
File:29OC98V4 #1-640 Acq:29-OCT-1998 16:16:17 GC EI+ Voltage SIR 70SE
Sample#2 Text:ST1029A :CS-2 :265-04B : Exp:PAHAIR
178.0782 S:2 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



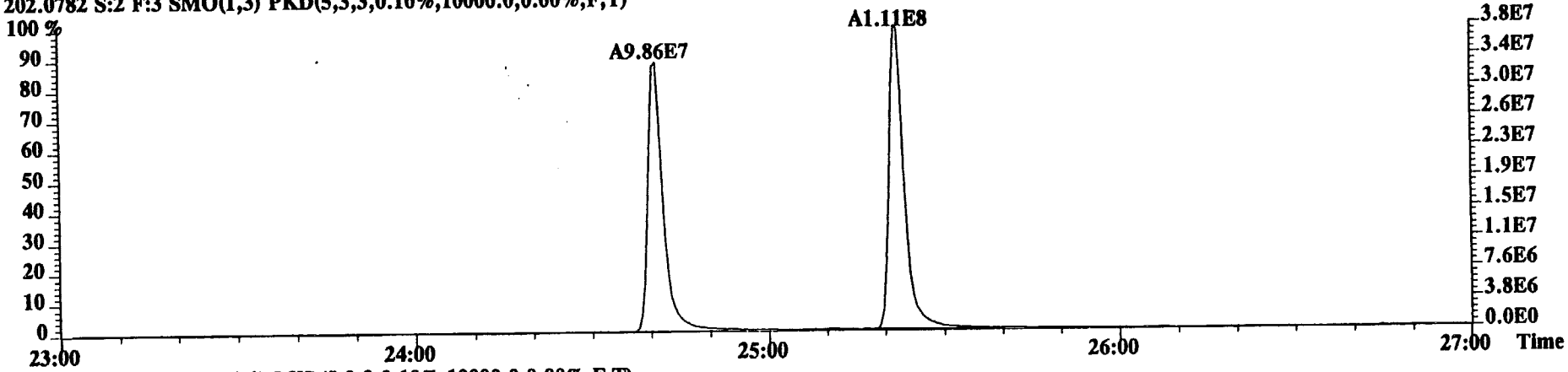
188.1410 S:2 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



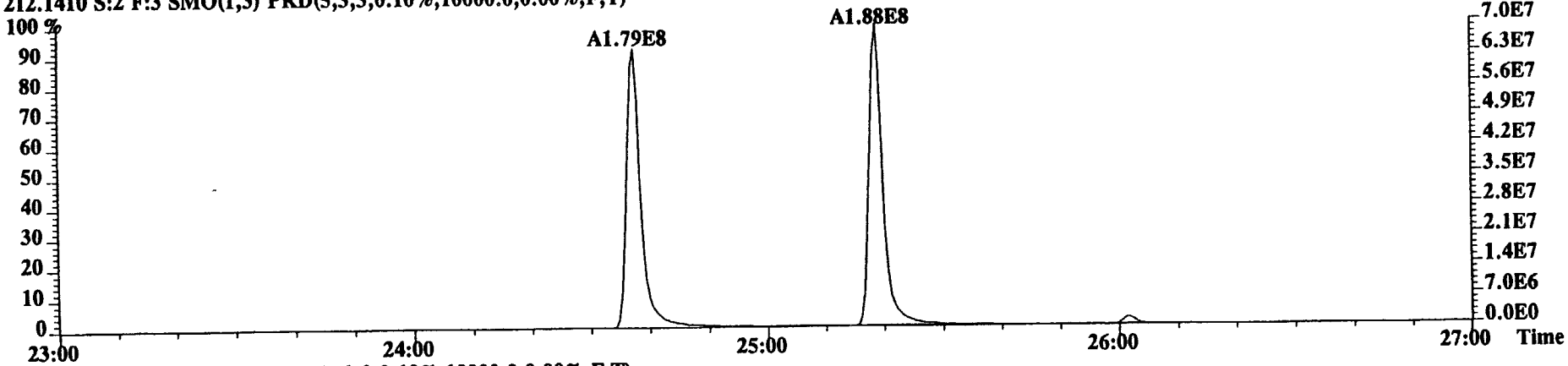
File:29OC98V4 #1-640 Acq:29-OCT-1998 16:16:17 GC EI+ Voltage SIR 70SE
Sample#2 Text:ST1029A :CS-2 :265-04B : Exp:PAHAIR
204.9888 S:2 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



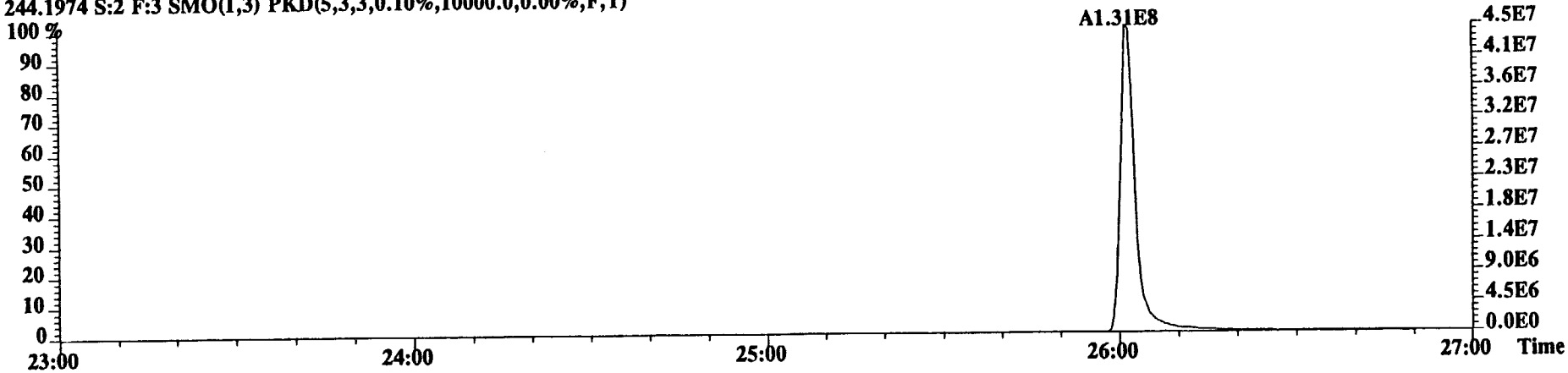
File:29OC98V4 #1-938 Acq:29-OCT-1998 16:16:17 GC EI+ Voltage SIR 70SE
Sample#2 Text:ST1029A :CS-2 :265-04B : Exp:PAHAIR
202.0782 S:2 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



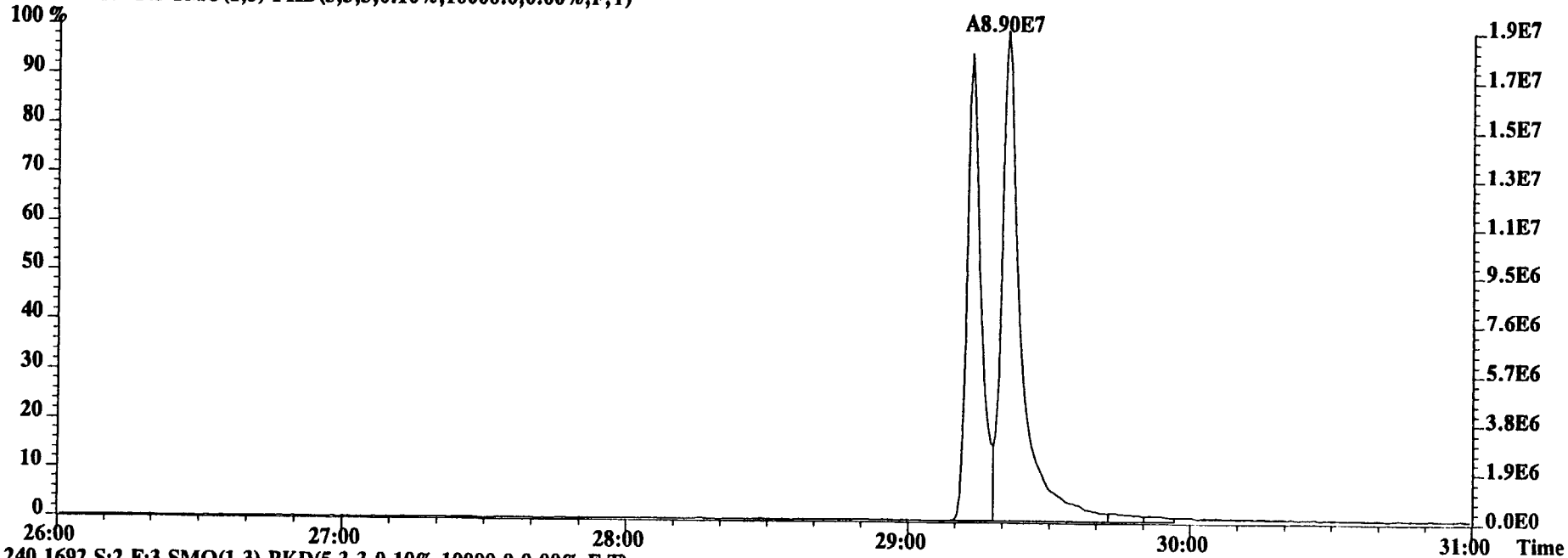
212.1410 S:2 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



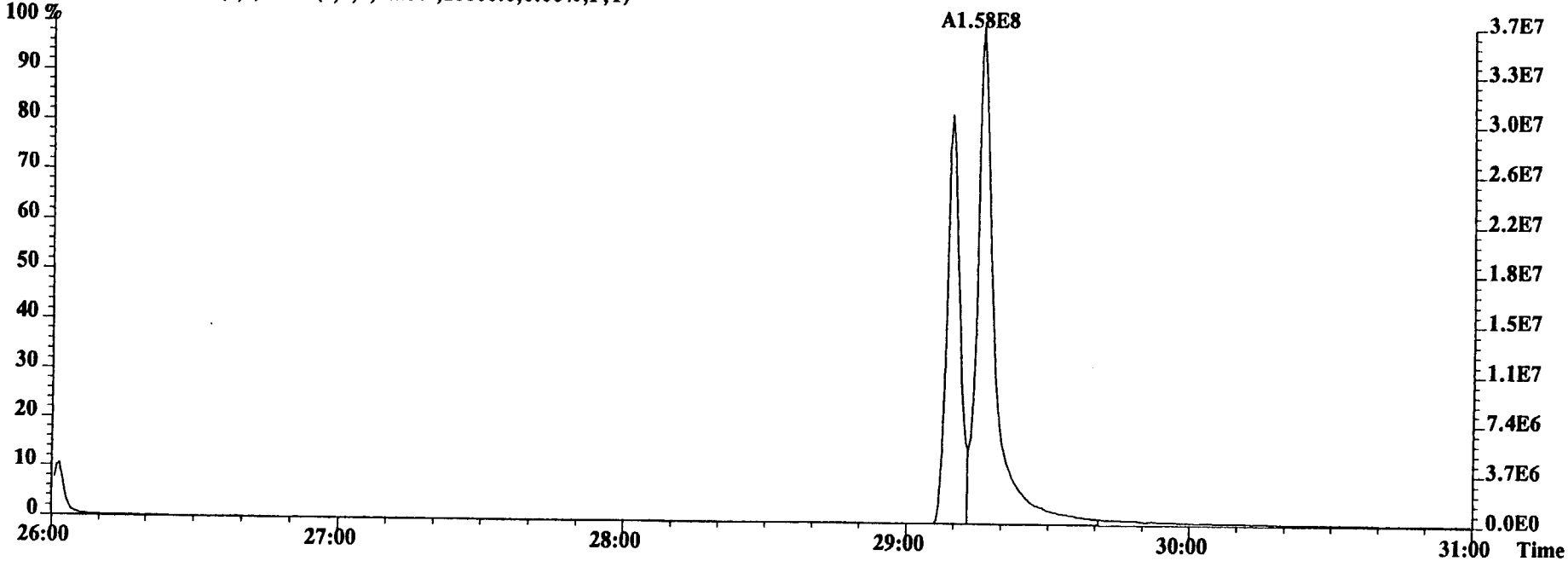
244.1974 S:2 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



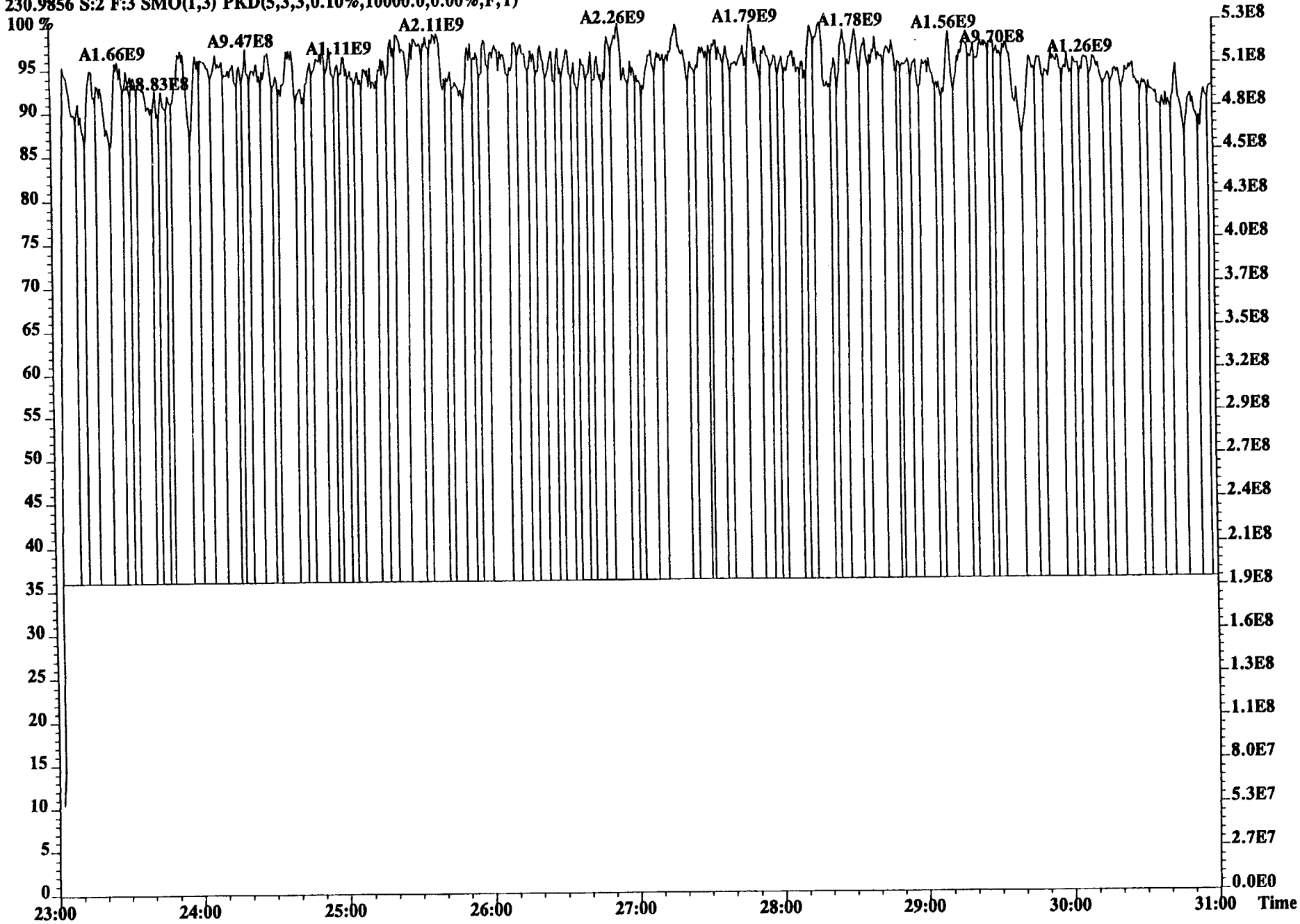
File:29OC98V4 #1-938 Acq:29-OCT-1998 16:16:17 GC EI+ Voltage SIR 70SE
Sample#2 Text:ST1029A :CS-2 :265-04B : Exp:PAHAIR
228.0939 S:2 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



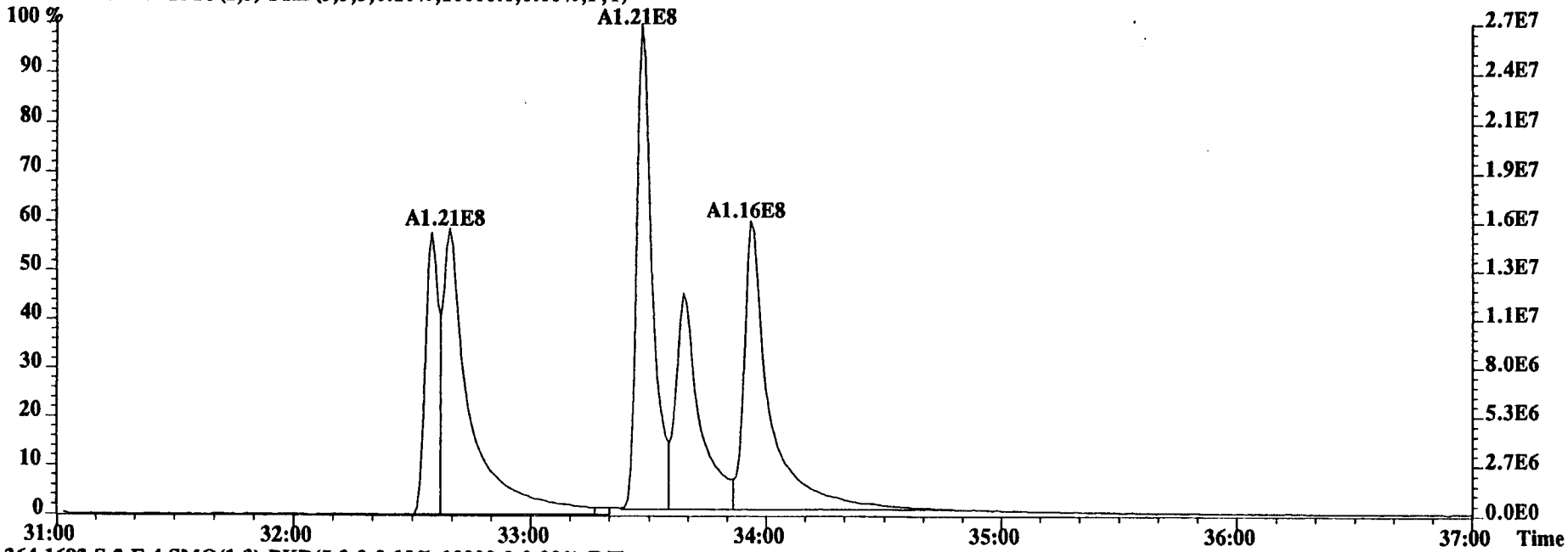
240.1692 S:2 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



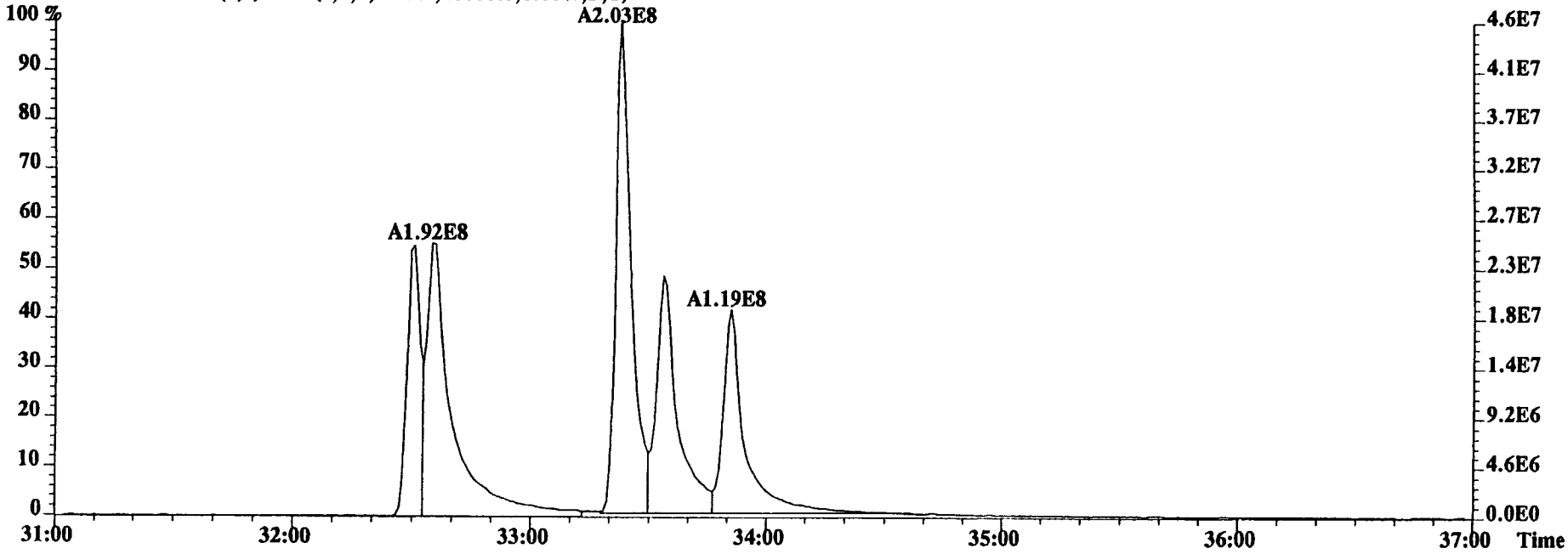
File:29OC98V4 #1-938 Acq:29-OCT-1998 16:16:17 GC EI+ Voltage SIR 70SE
Sample#2 Text:ST1029A :CS-2 :265-04B : Exp:PAHAIR
230.9856 S:2 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



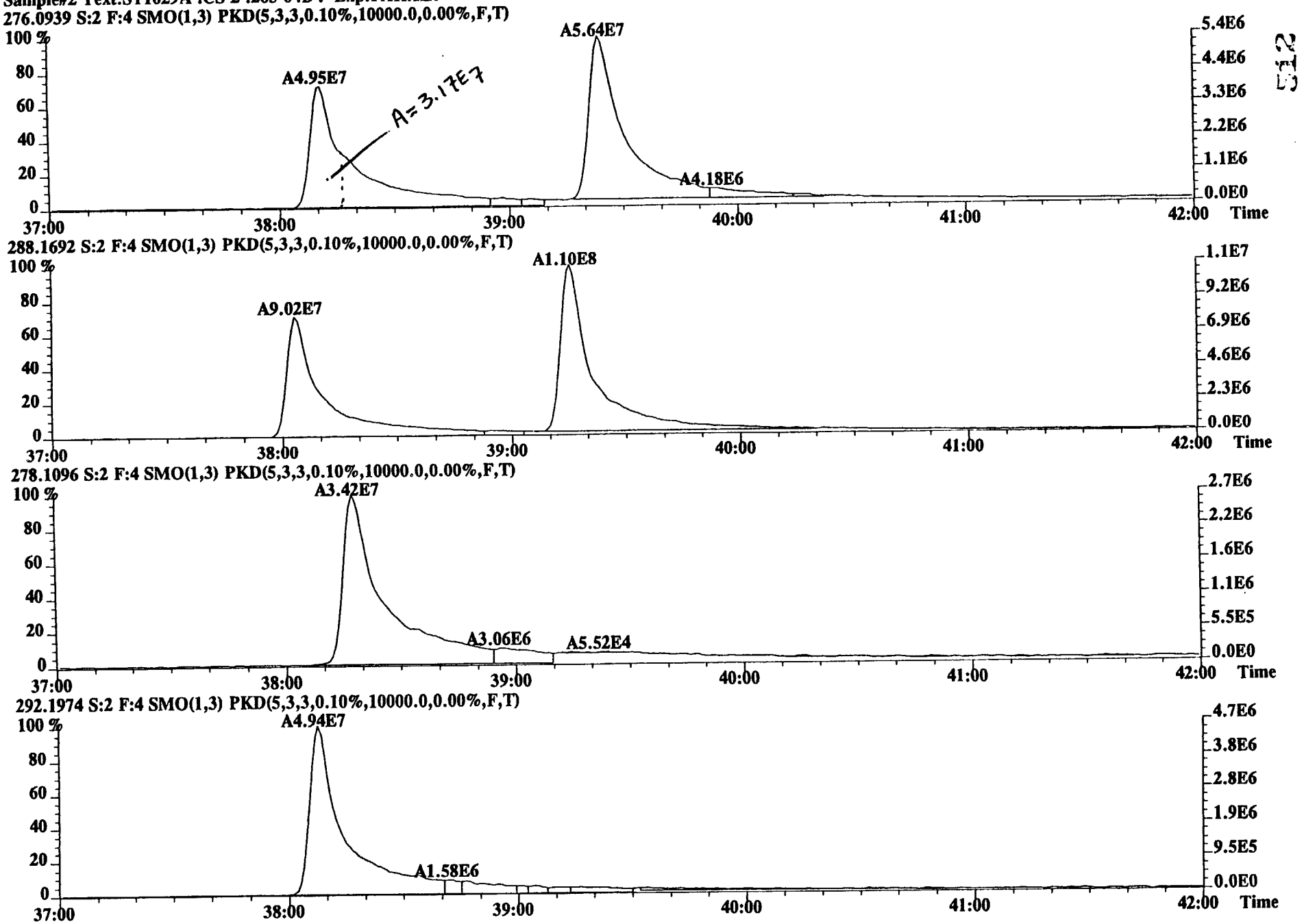
File:29OC98V4 #1-878 Acq:29-OCT-1998 16:16:17 GC EI+ Voltage SIR 70SE
Sample#2 Text:ST1029A :CS-2 :265-04B : Exp:PAHAIR
252.0939 S:2 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



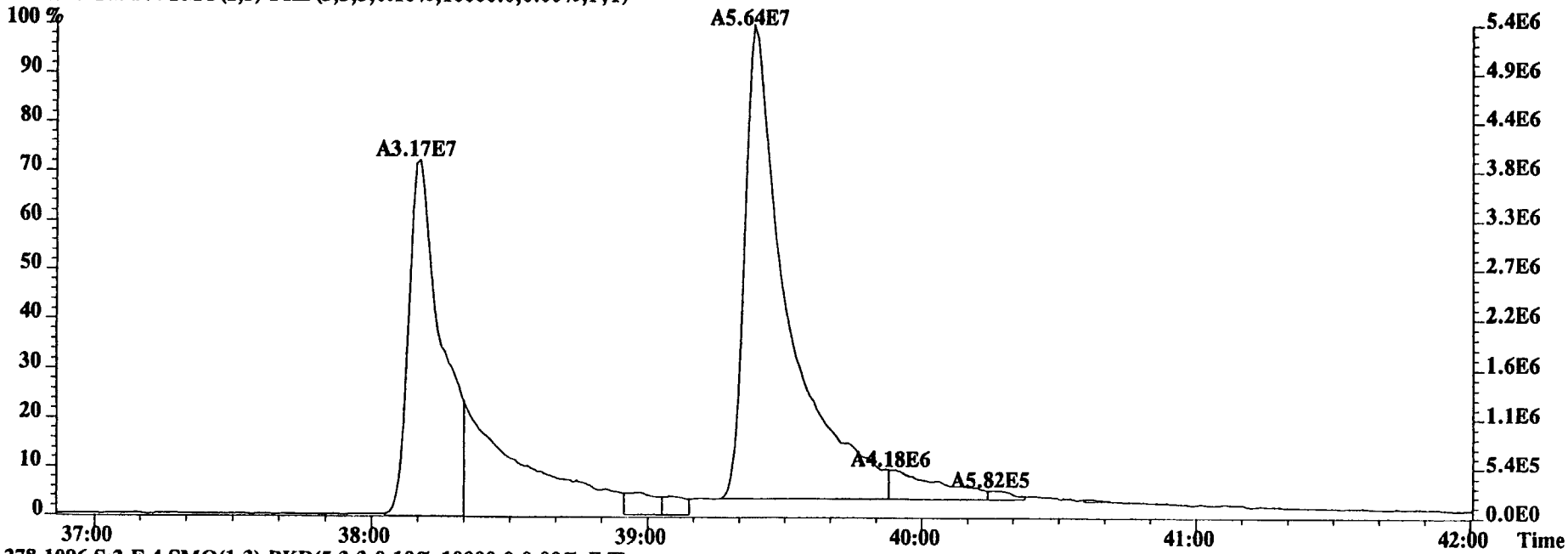
264.1692 S:2 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



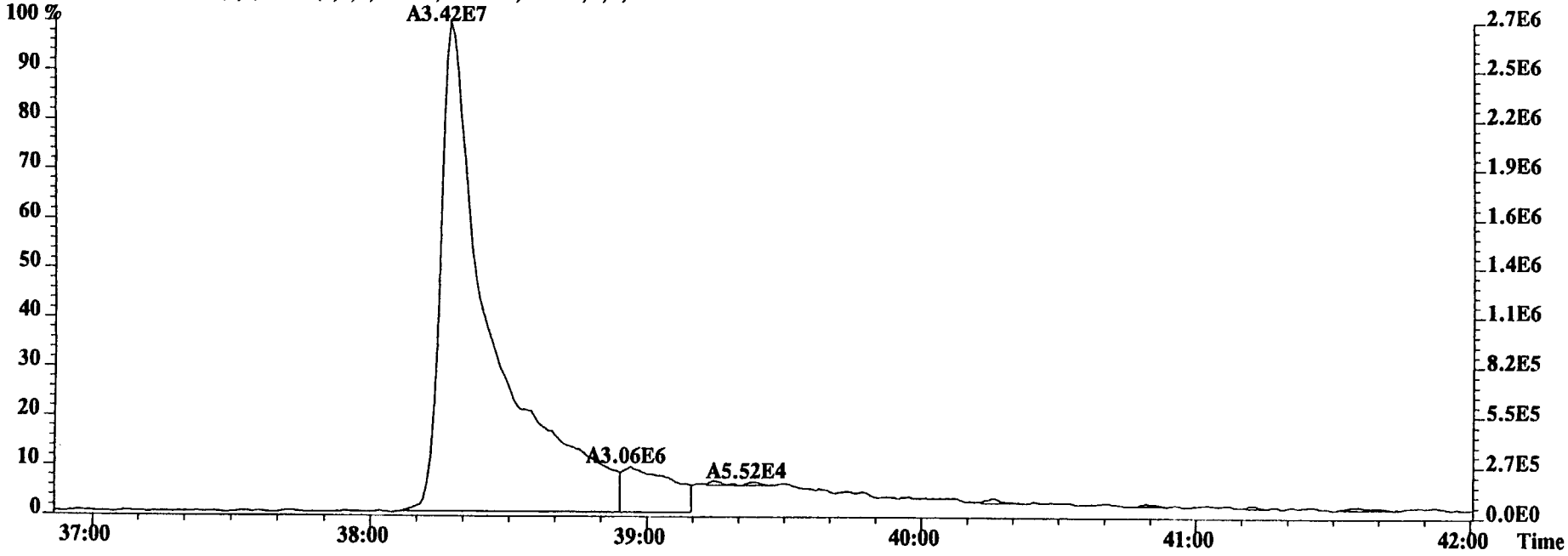
File:29OC98V4 #1-878 Acq:29-OCT-1998 16:16:17 GC EI+ Voltage SIR 70SE
Sample#2 Text:ST1029A :CS-2 :265-04B : Exp:PAHAIR



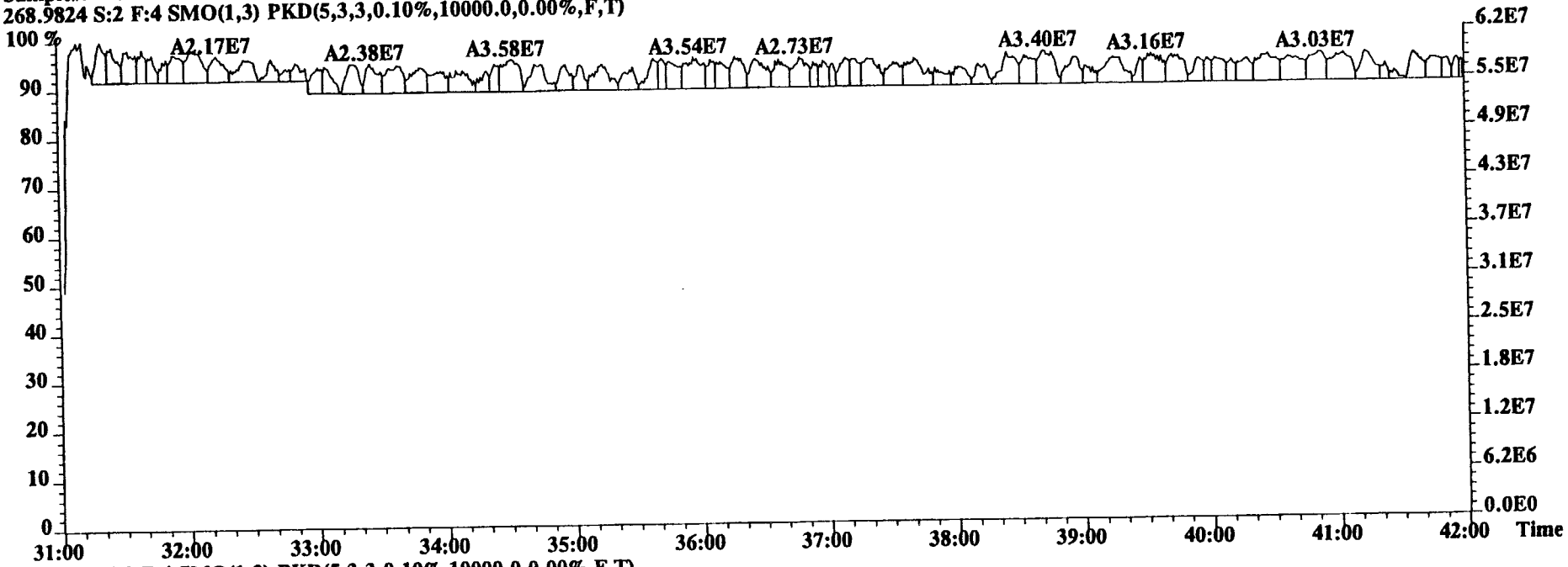
File:29OC98V4 #1-878 Acq:29-OCT-1998 16:16:17 GC EI+ Voltage SIR 70SE
Sample#2 Text:ST1029A :CS-2 :265-04B : Exp:PAHAIR
276.0939 S:2 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



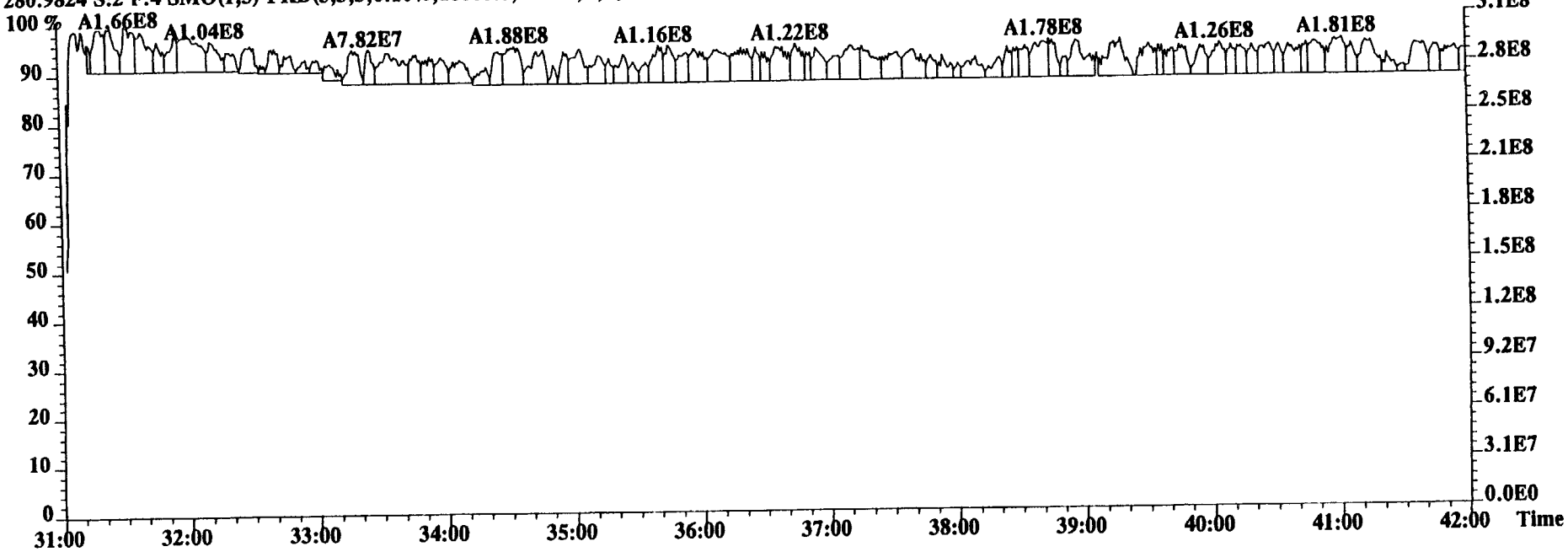
278.1096 S:2 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



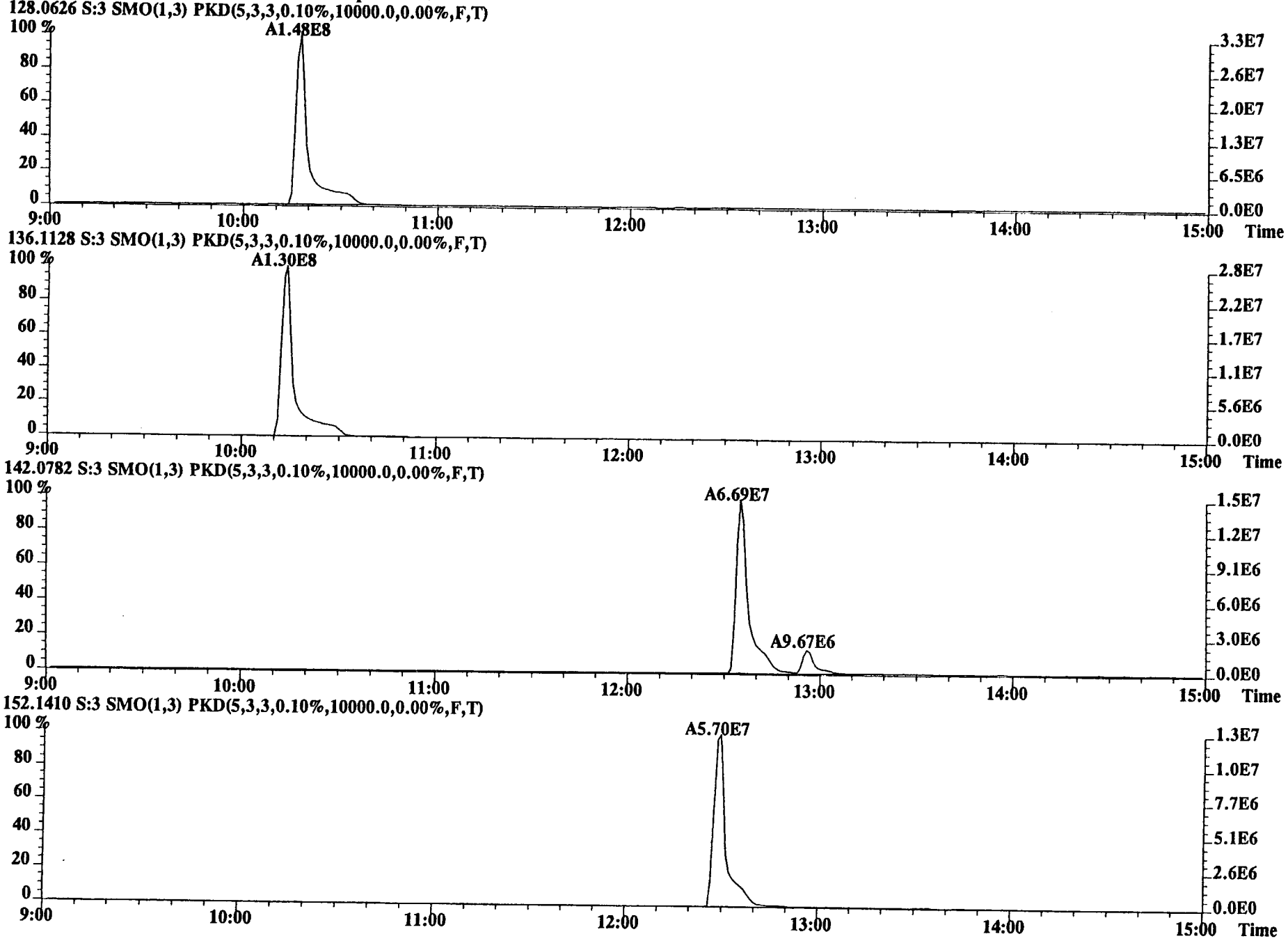
File:29OC98V4 #1-878 Acq:29-OCT-1998 16:16:17 GC EI+ Voltage SIR 70SE
Sample#2 Text:ST1029A :CS-2 :265-04B : Exp:PAHAIR
268.9824 S:2 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



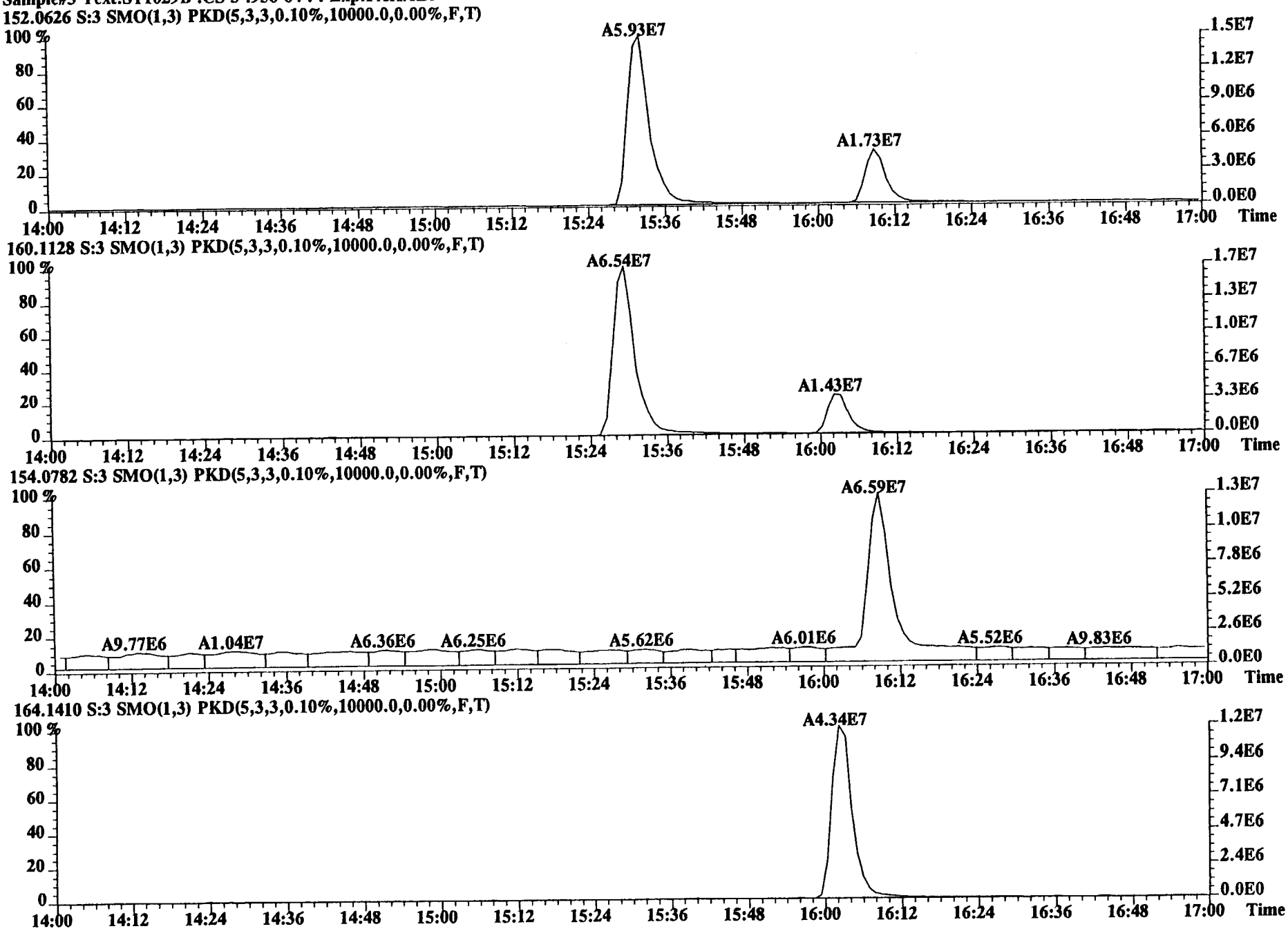
280.9824 S:2 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



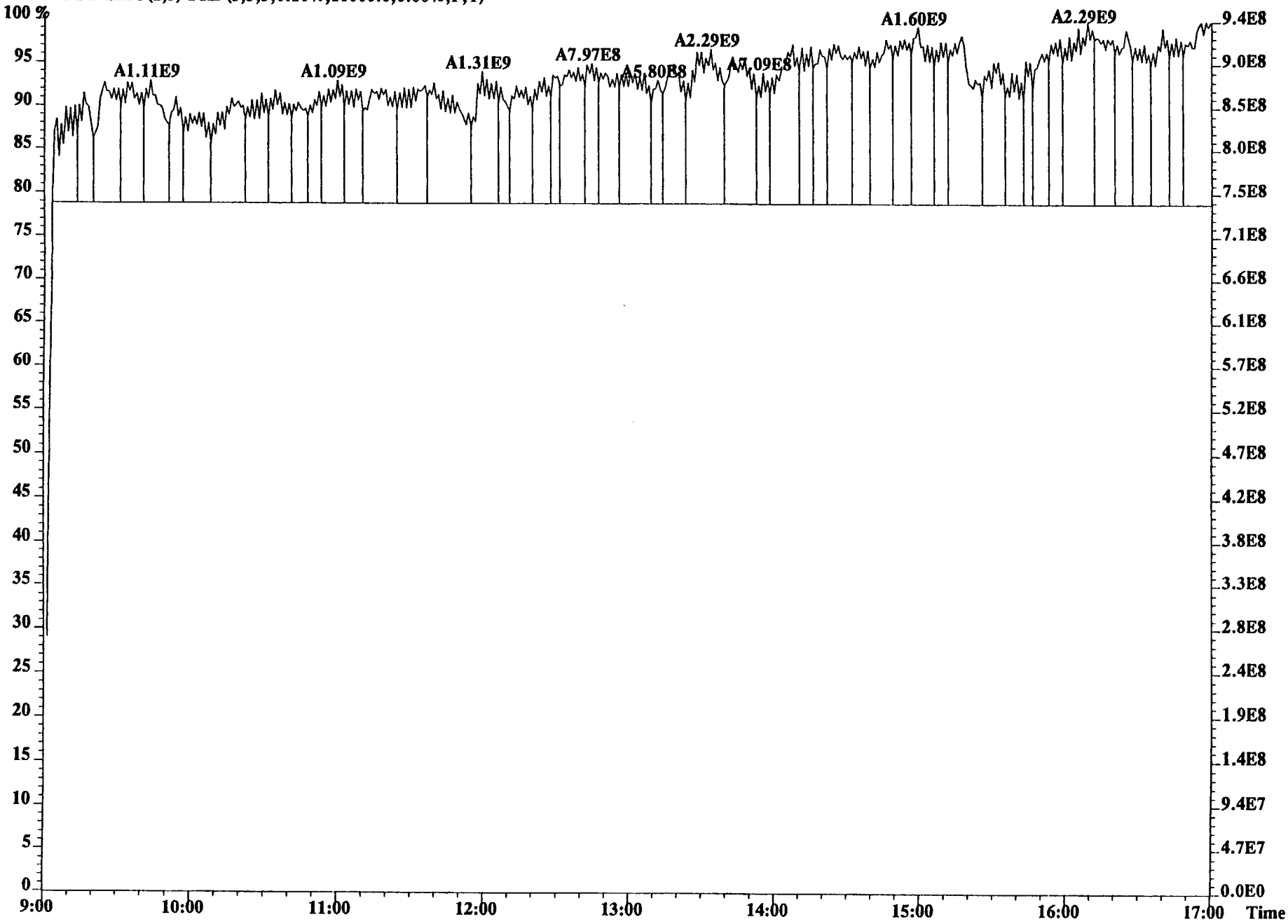
File:29OC98V4 #1-510 Acq:29-OCT-1998 17:05:20 GC EI+ Voltage SIR 70SE
Sample#3 Text:ST1029B :CS-3 :956-64 : : Exp:PAHAIR



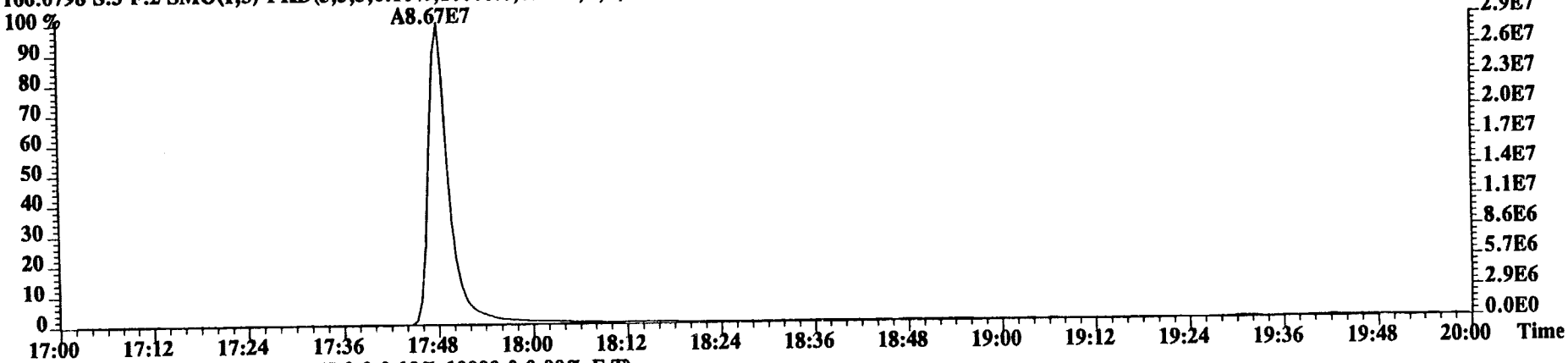
File:29OC98V4 #1-510 Acq:29-OCT-1998 17:05:20 GC EI+ Voltage SIR 70SE
Sample#3 Text:ST1029B :CS-3 :956-64 : : Exp:PAHAIR



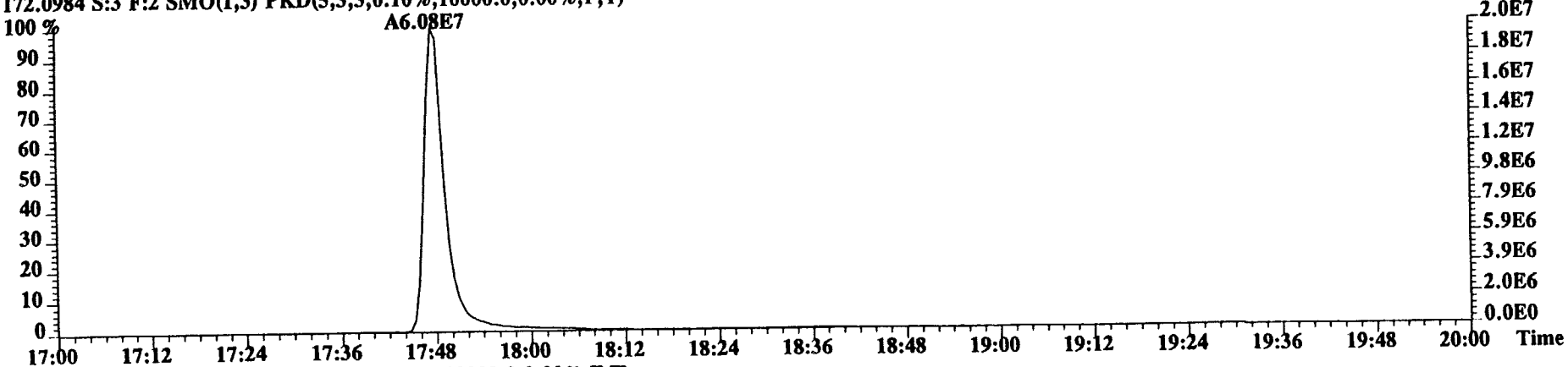
File:29OC98V4 #1-510 Acq:29-OCT-1998 17:05:20 GC EI+ Voltage SIR 70SE
Sample#3 Text:ST1029B :CS-3 :956-64 : : Exp:PAHAIR
130.9920 S:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



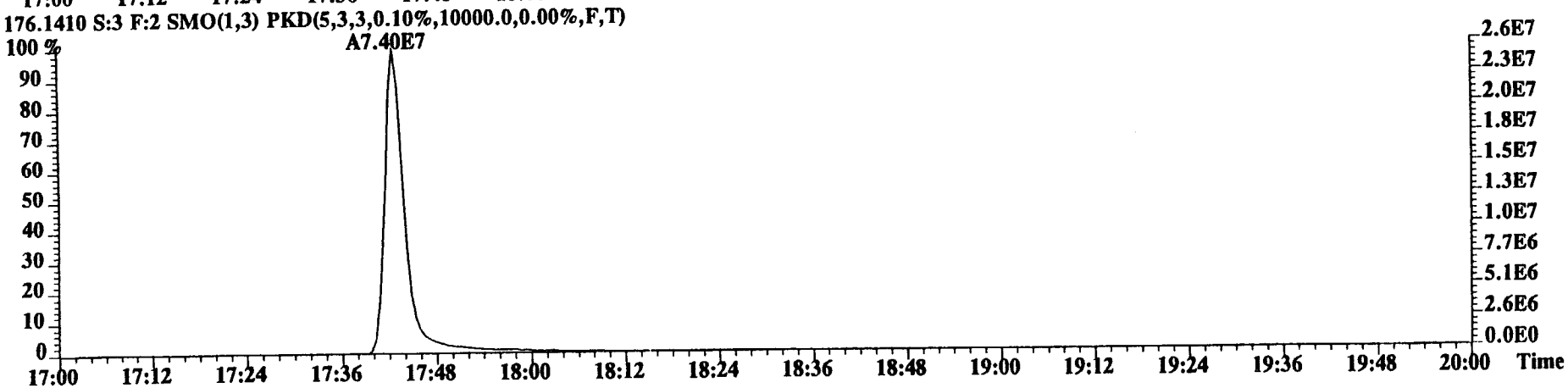
File:29OC98V4 #1-641 Acq:29-OCT-1998 17:05:20 GC EI+ Voltage SIR 70SE
Sample#3 Text:ST1029B :CS-3 :956-64 : : Exp:PAHAIR
166.0798 S:3 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



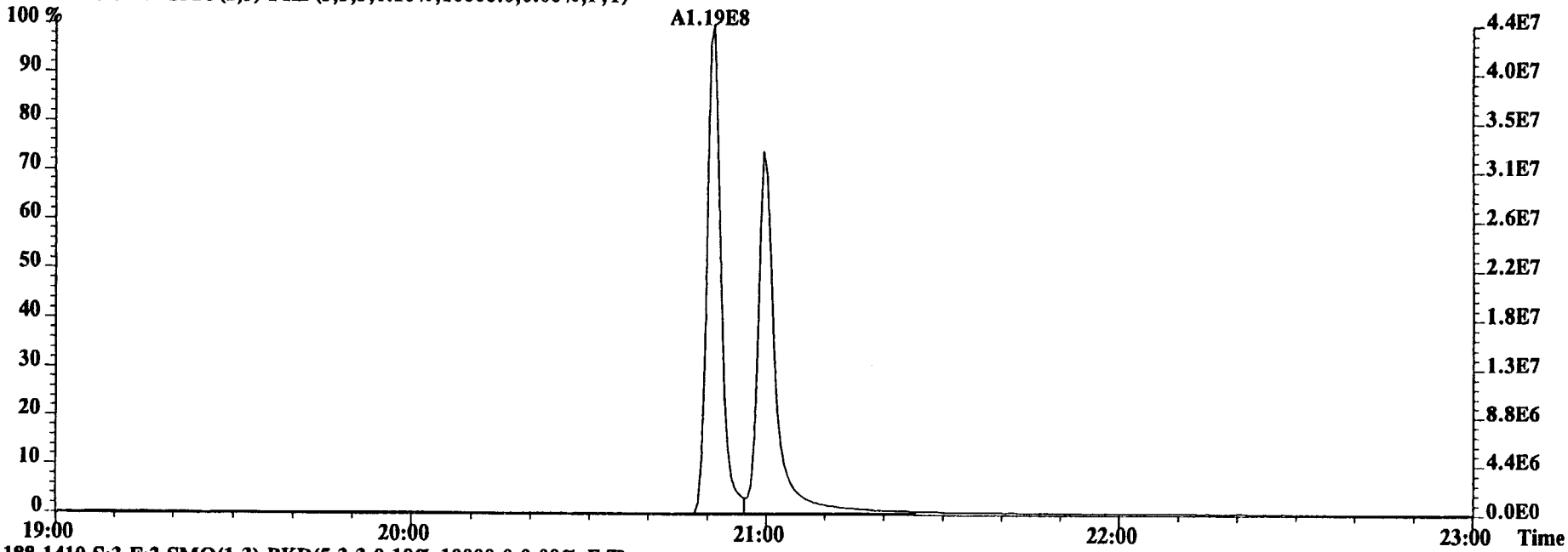
172.0984 S:3 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



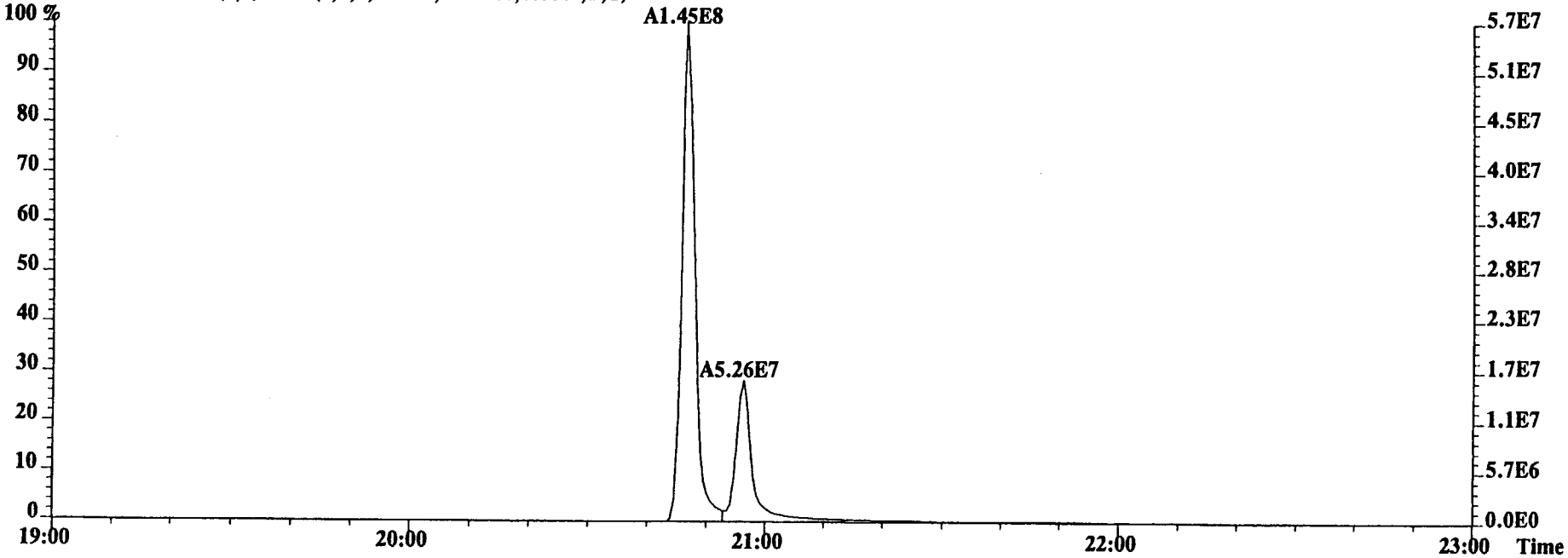
176.1410 S:3 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



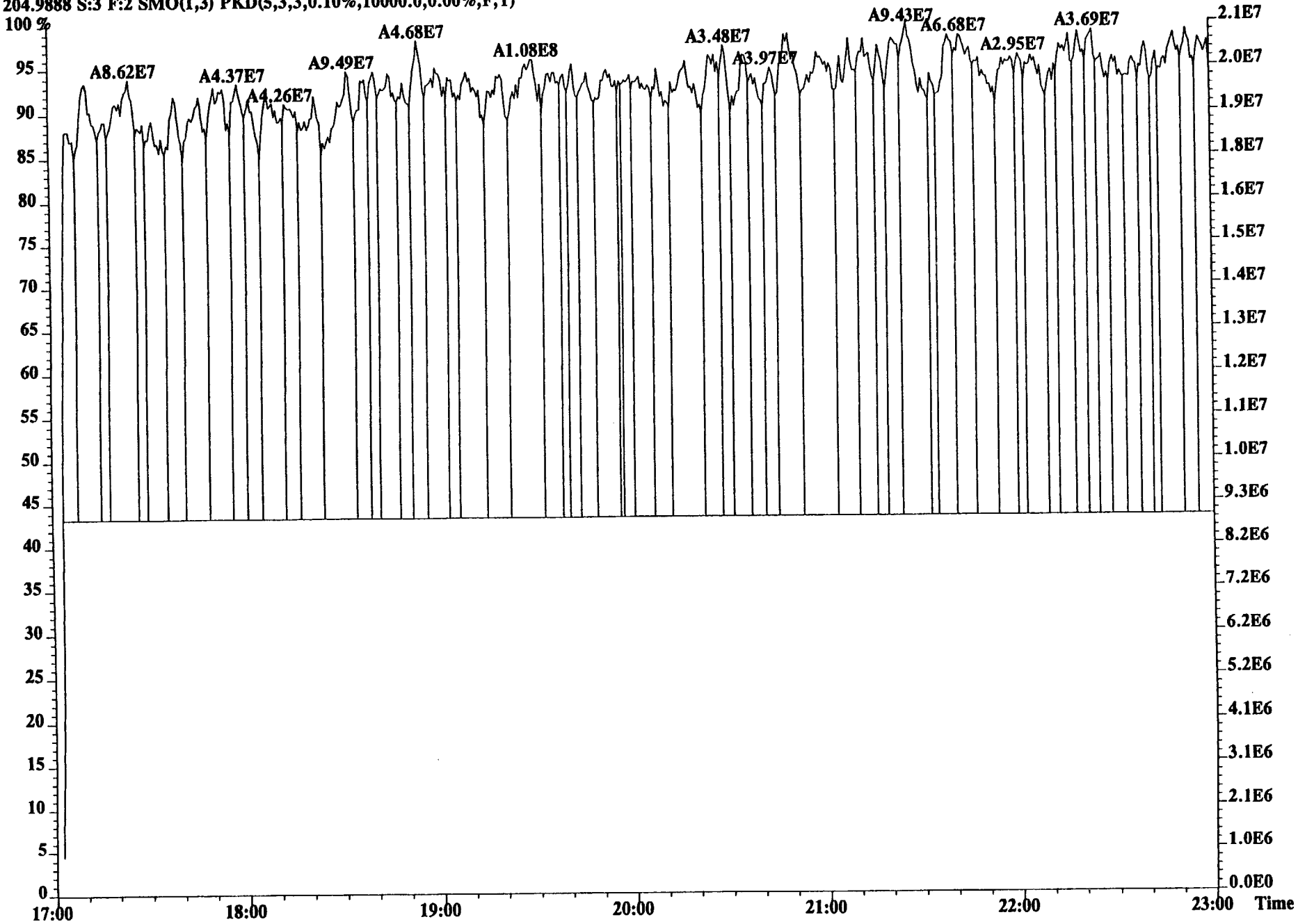
File:29OC98V4 #1-641 Acq:29-OCT-1998 17:05:20 GC EI+ Voltage SIR 70SE
Sample#3 Text:ST1029B :CS-3 :956-64 : : Exp:PAHAIR
178.0782 S:3 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



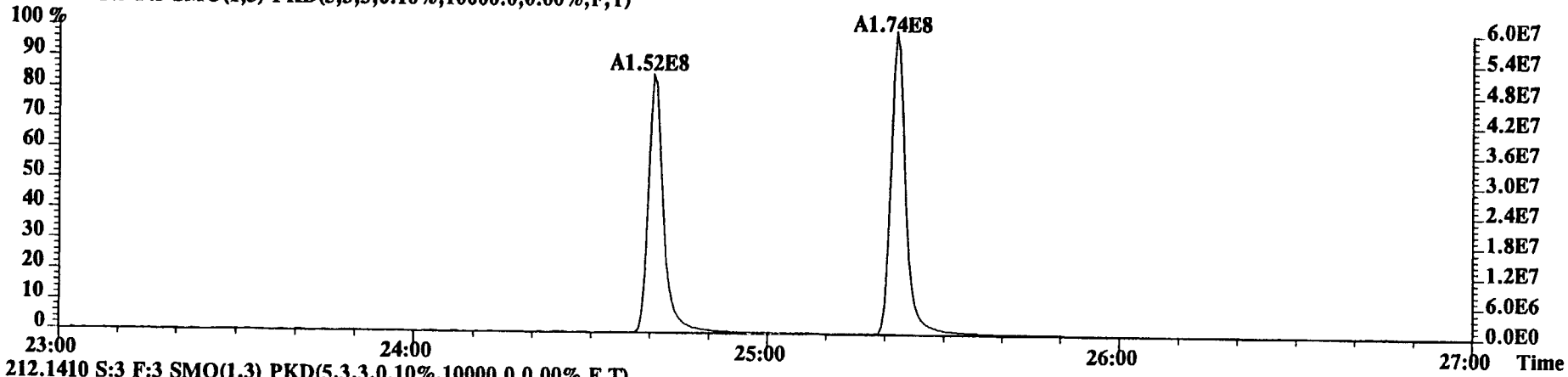
188.1410 S:3 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



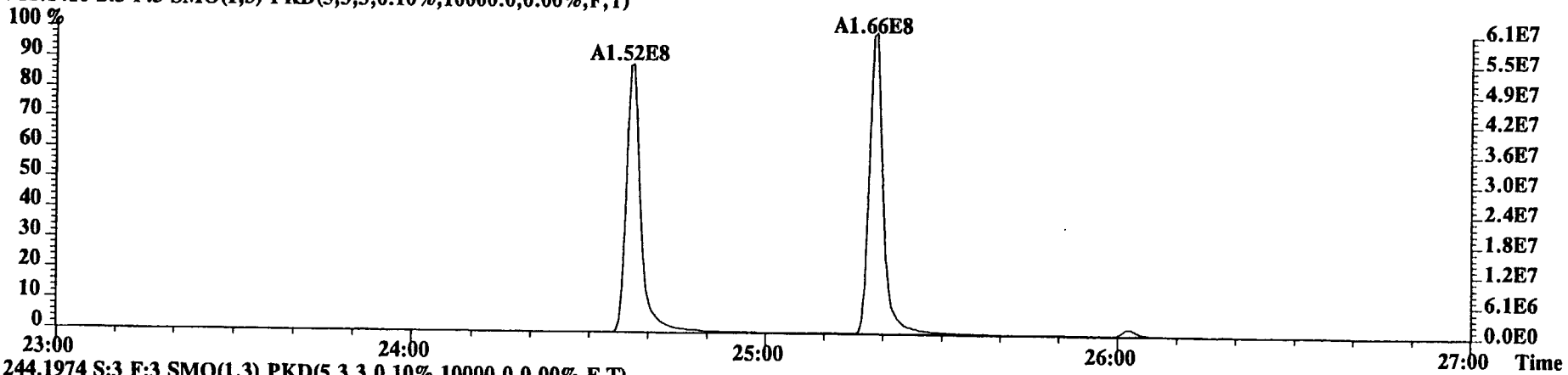
File:29OC98V4 #1-641 Acq:29-OCT-1998 17:05:20 GC EI+ Voltage SIR 70SE
Sample#3 Text:ST1029B :CS-3 :956-64 : : Exp:PAHAIR
204.9888 S:3 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



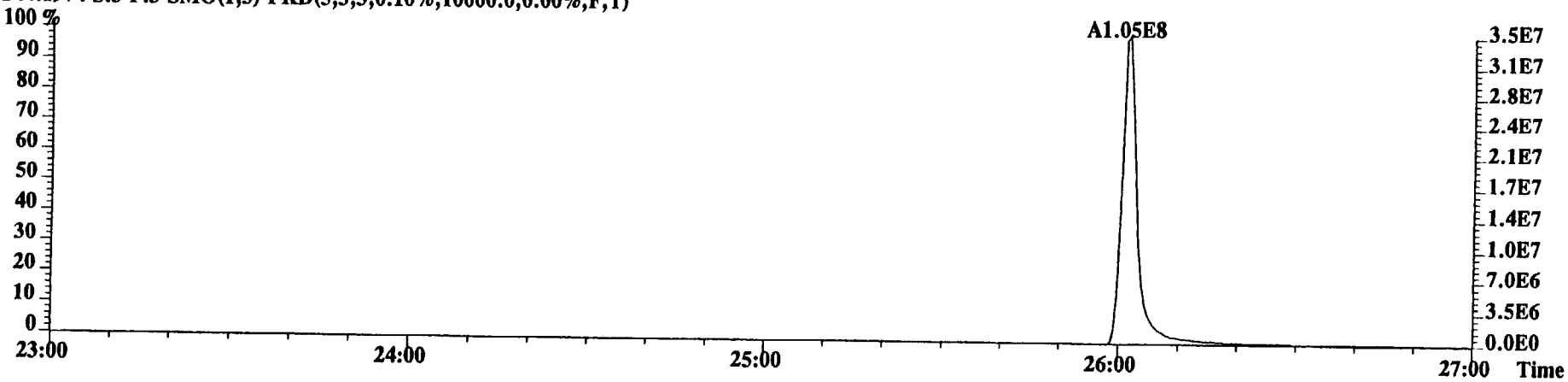
File:29OC98V4 #1-938 Acq:29-OCT-1998 17:05:20 GC EI+ Voltage SIR 70SE
Sample#3 Text:ST1029B :CS-3 :956-64 : : Exp:PAHAIR
202.0782 S:3 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



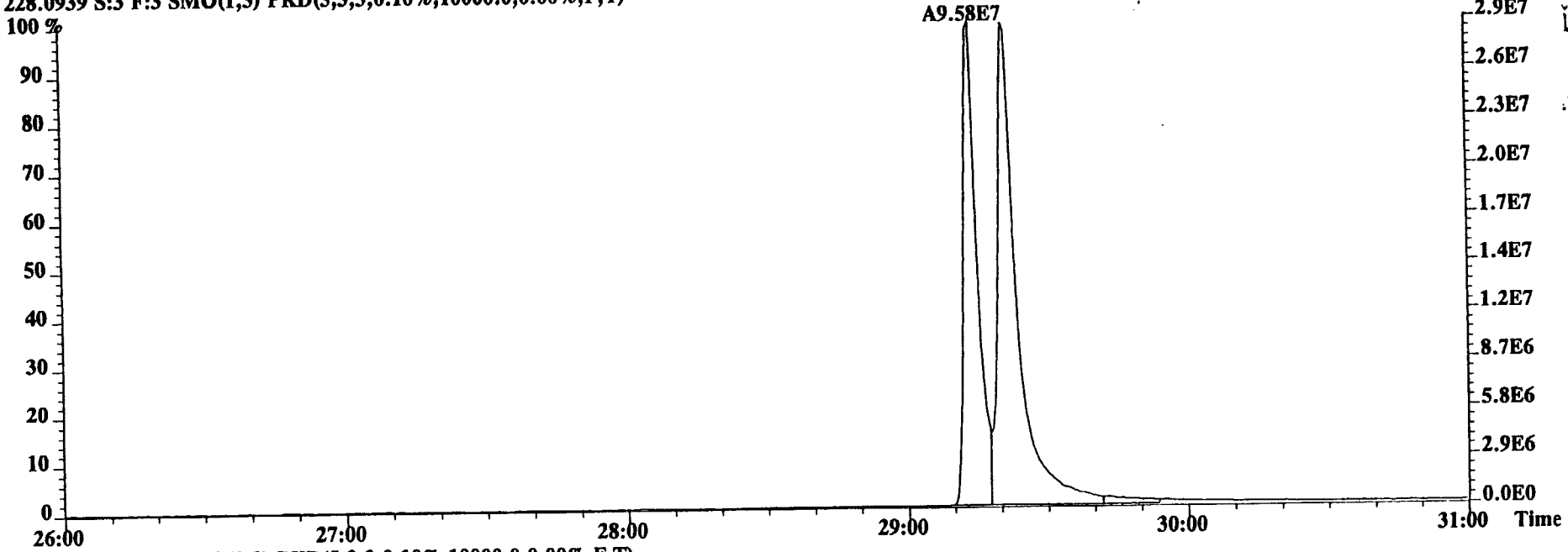
212.1410 S:3 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



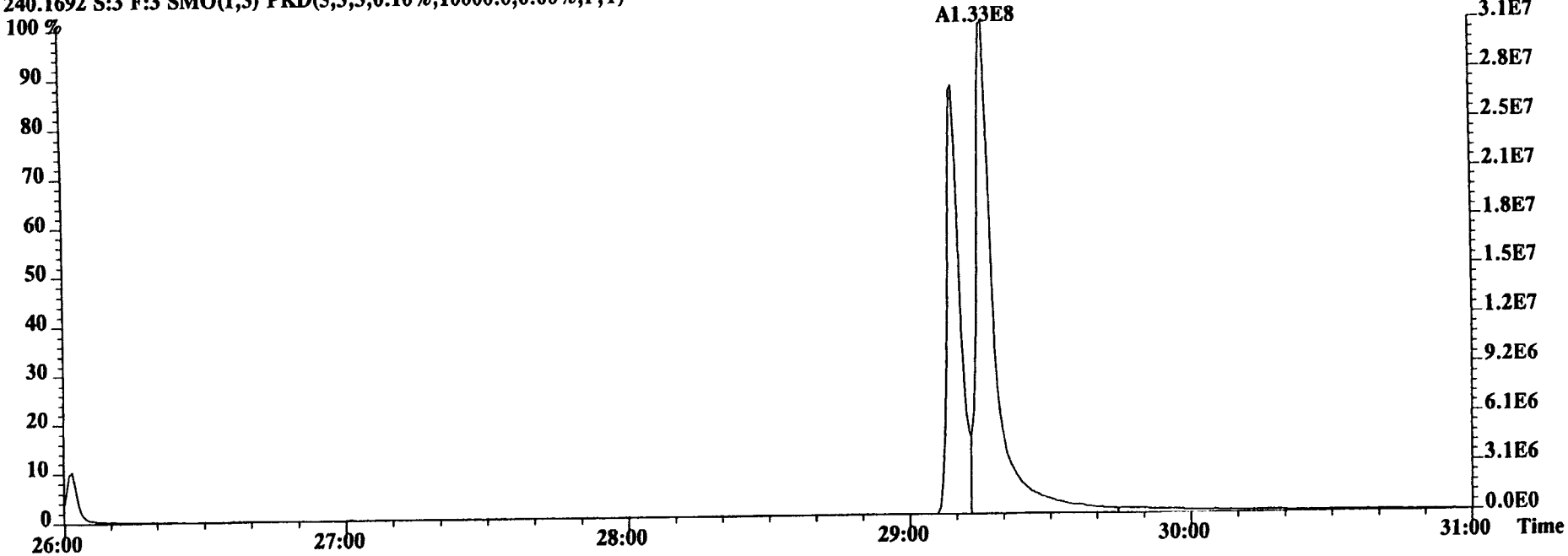
244.1974 S:3 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



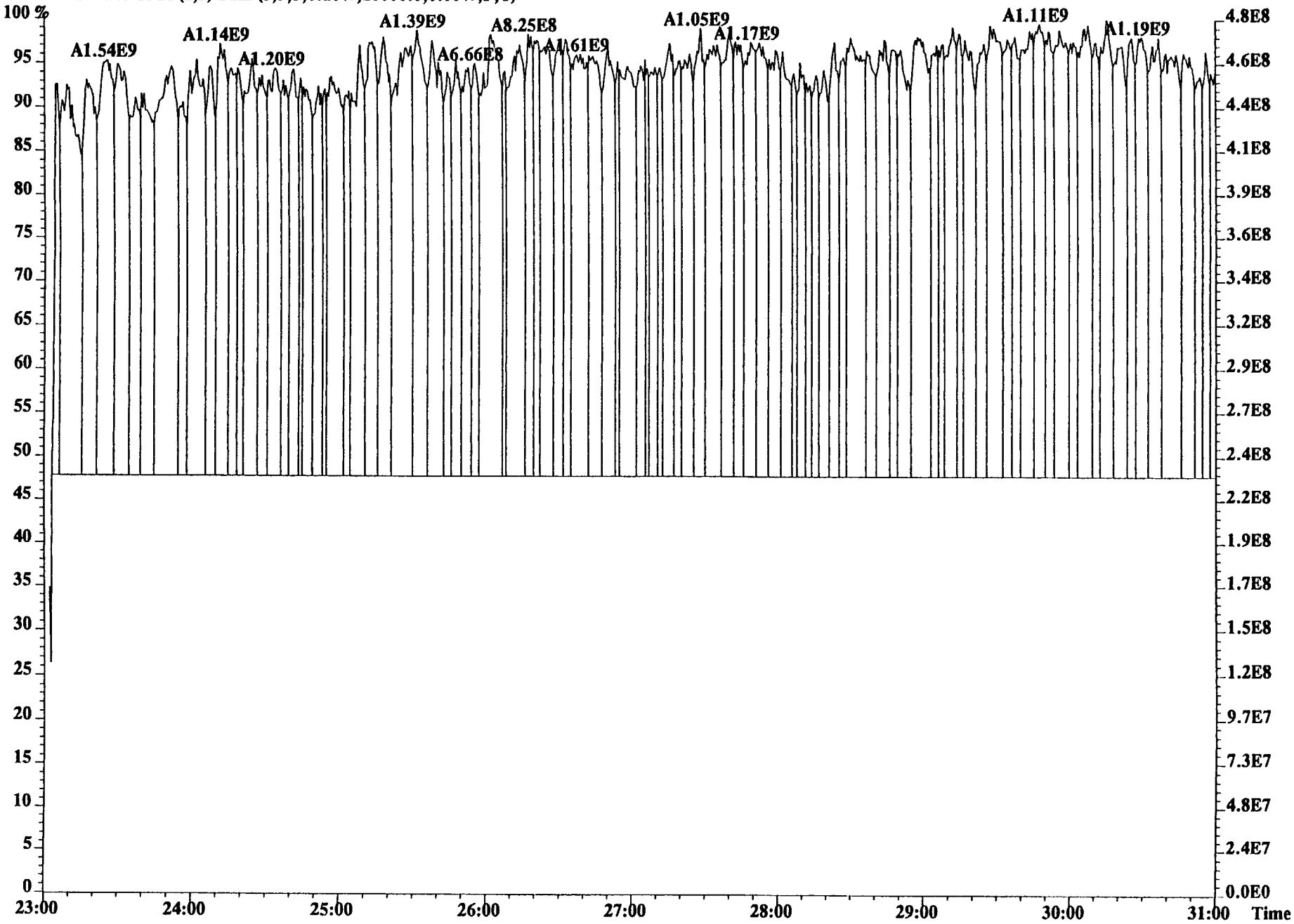
File:29OC98V4 #1-938 Acq:29-OCT-1998 17:05:20 GC EI+ Voltage SIR 70SE
Sample#3 Text:ST1029B :CS-3 :956-64 : : Exp:PAHAIR
228.0939 S:3 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



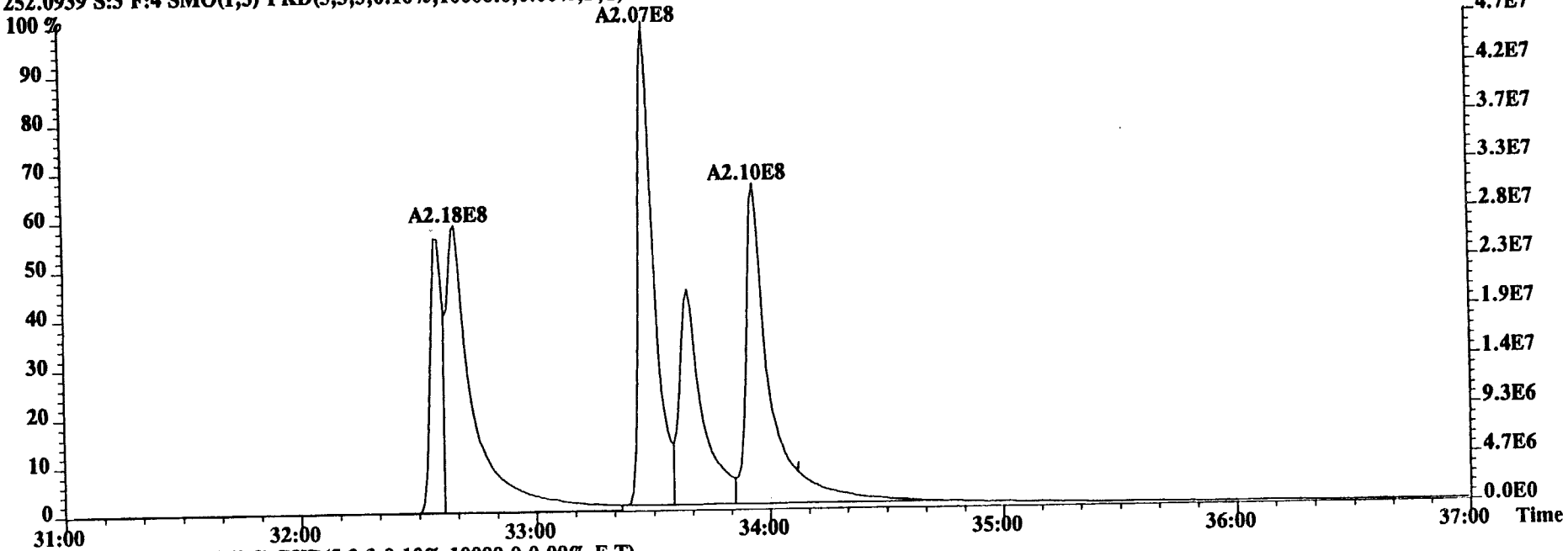
240.1692 S:3 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



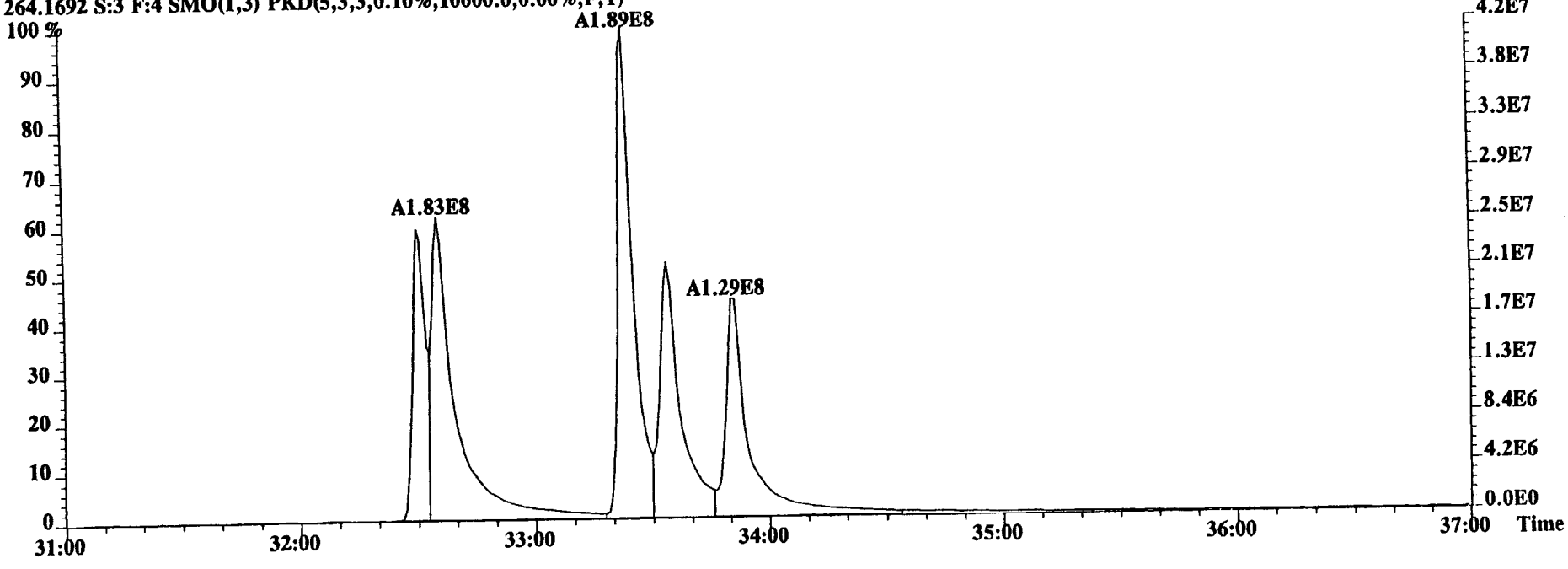
File:29OC98V4 #1-938 Acq:29-OCT-1998 17:05:20 GC EI+ Voltage SIR 70SE
Sample#3 Text:ST1029B :CS-3 :956-64 : : Exp:PAHAIR
230.9856 S:3 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



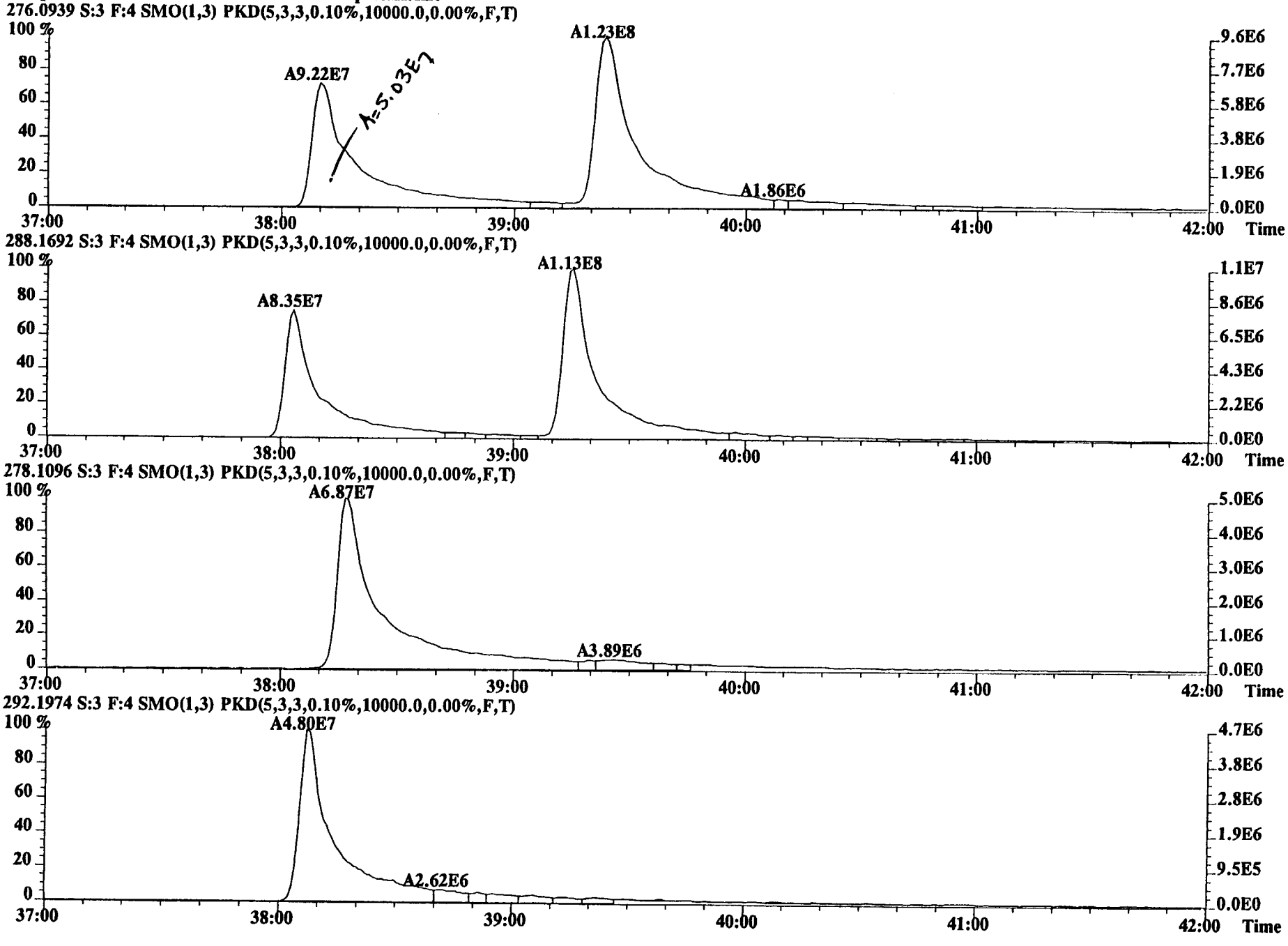
File:29OC98V4 #1-878 Acq:29-OCT-1998 17:05:20 GC EI+ Voltage SIR 70SE
Sample#3 Text:ST1029B :CS-3 :956-64 : : Exp:PAHAIR
252.0939 S:3 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



264.1692 S:3 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

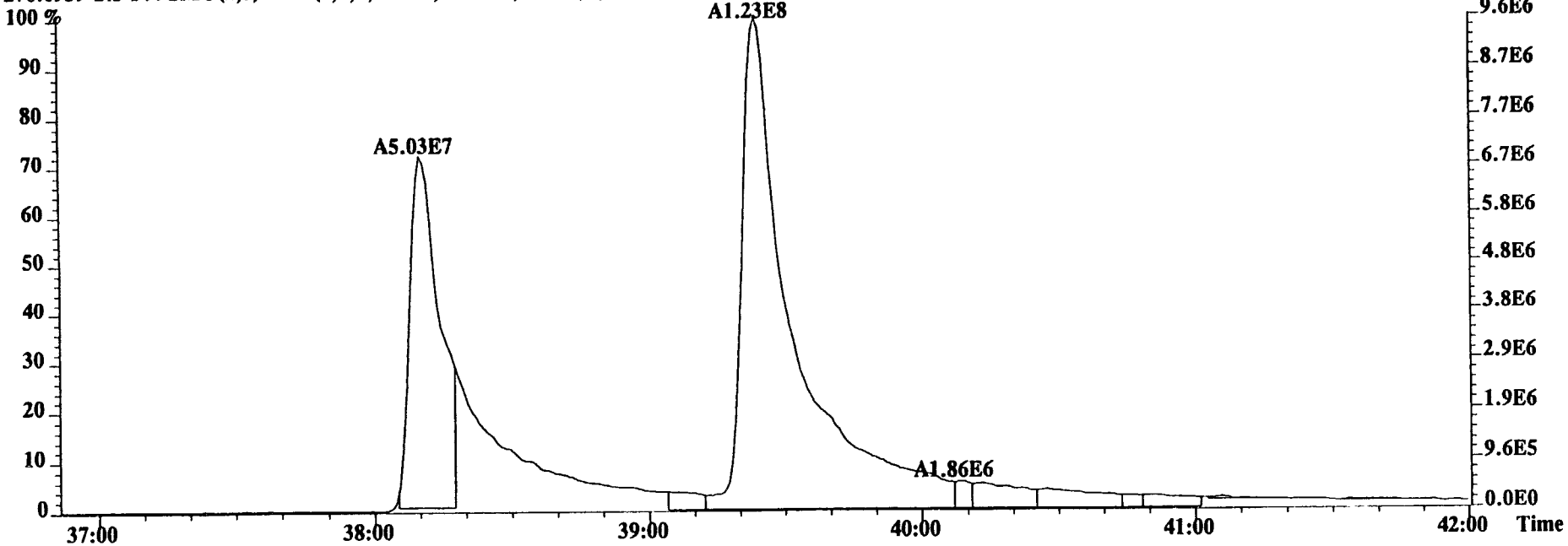


File:29OC98V4 #1-878 Acq:29-OCT-1998 17:05:20 GC EI+ Voltage SIR 70SE
Sample#3 Text:ST1029B :CS-3 :956-64 : : Exp:PAHAIR

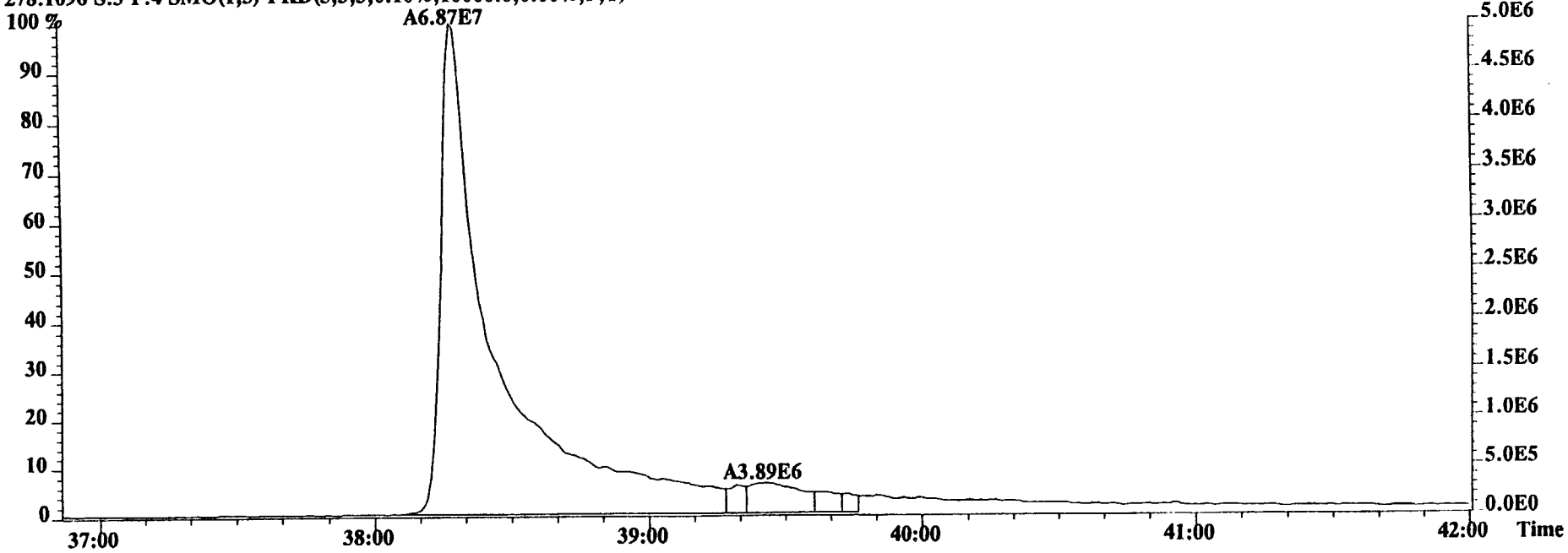


525

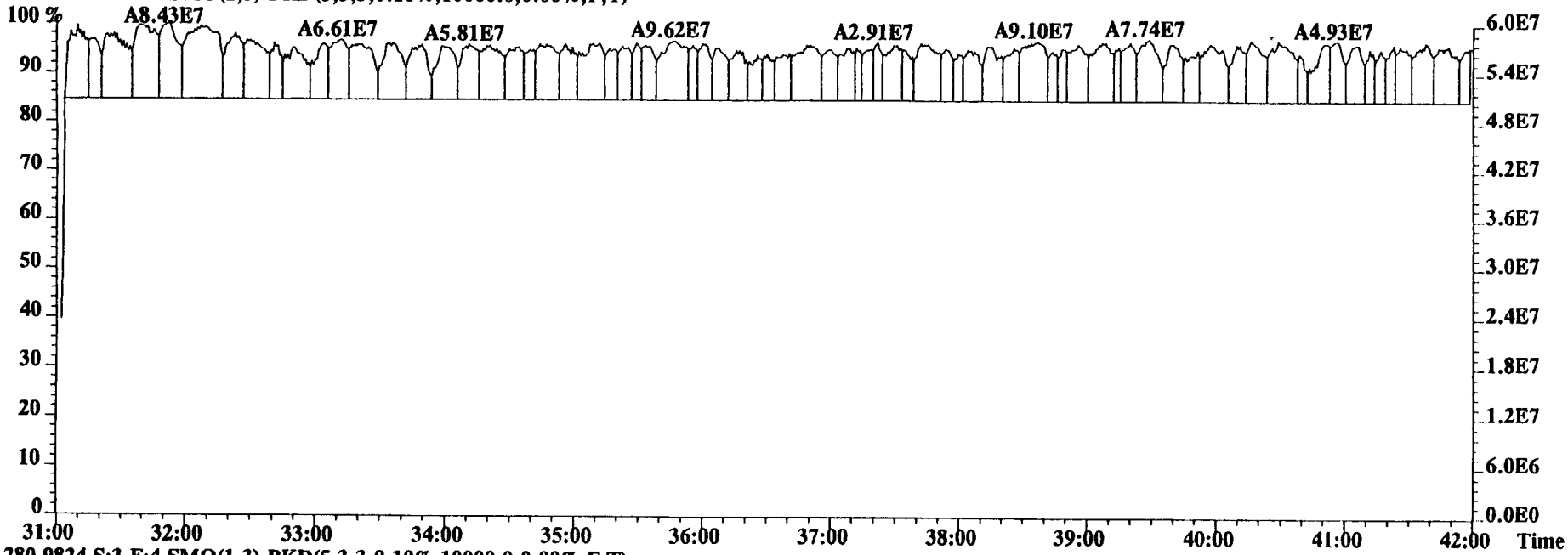
File:29OC98V4 #1-878 Acq:29-OCT-1998 17:05:20 GC EI+ Voltage SIR 70SE
Sample#3 Text:ST1029B :CS-3 :956-64 : : Exp:PAHAIR
276.0939 S:3 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



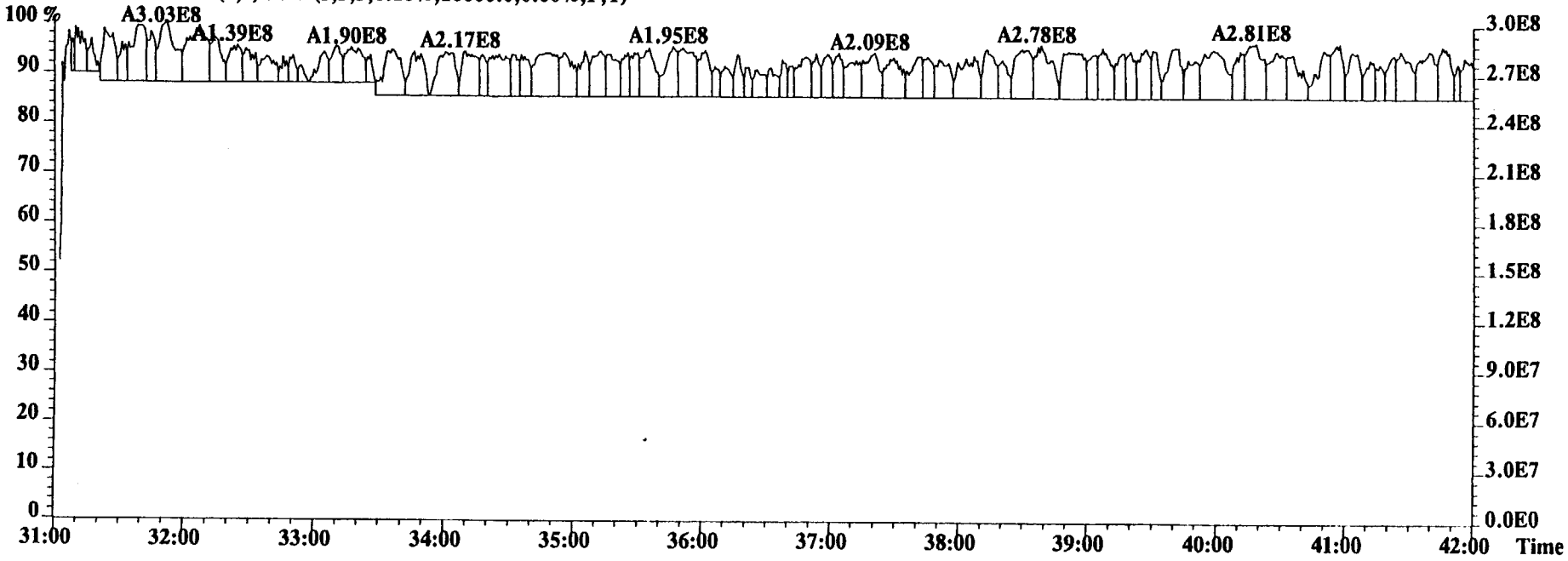
278.1096 S:3 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



File:29OC98V4 #1-878 Acq:29-OCT-1998 17:05:20 GC EI+ Voltage SIR 70SE
Sample#3 Text:ST1029B :CS-3 :956-64 : : Exp:PAHAIR
268.9824 S:3 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

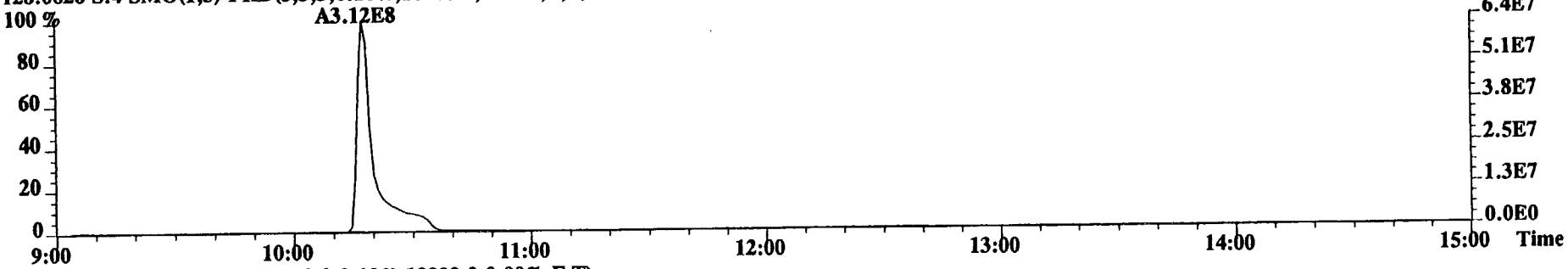


280.9824 S:3 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

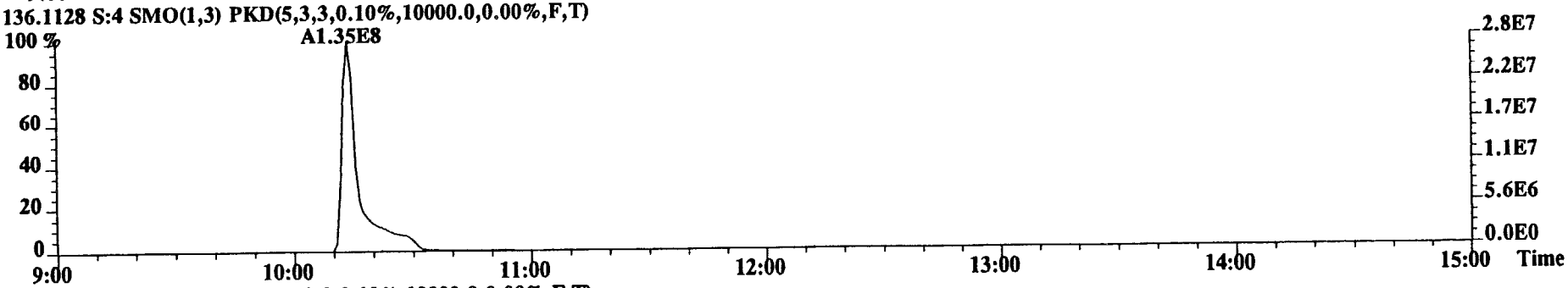


File:29OC98V4 #1-510 Acq:29-OCT-1998 17:54:20 GC EI+ Voltage SIR 70SE
Sample#4 Text:ST1029C :CS-4 :265-04D : Exp:PAHAIR

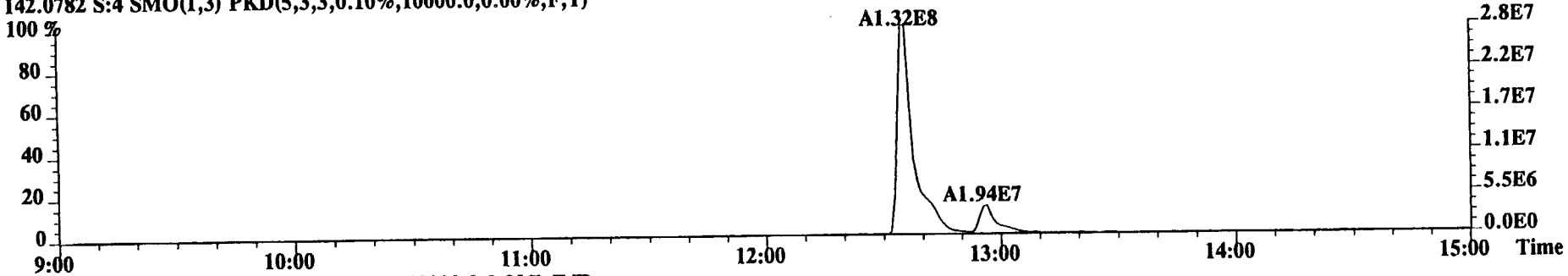
128.0626 S:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



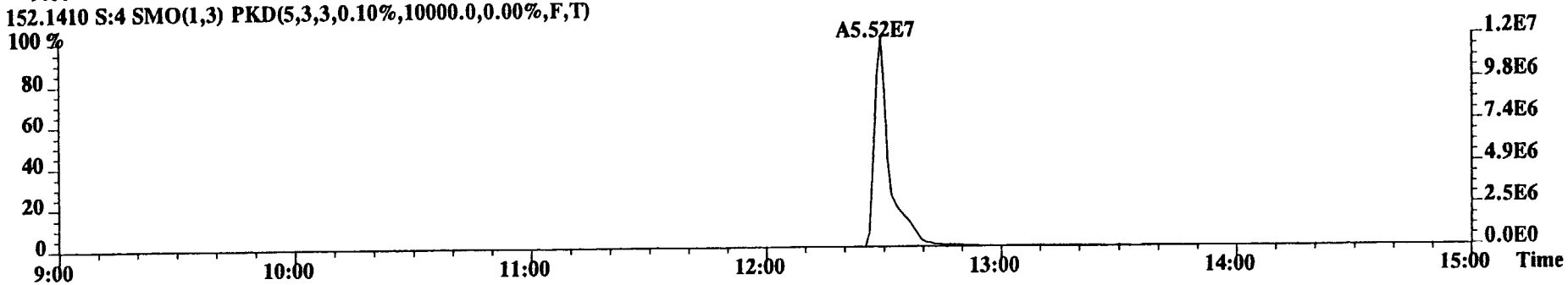
136.1128 S:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



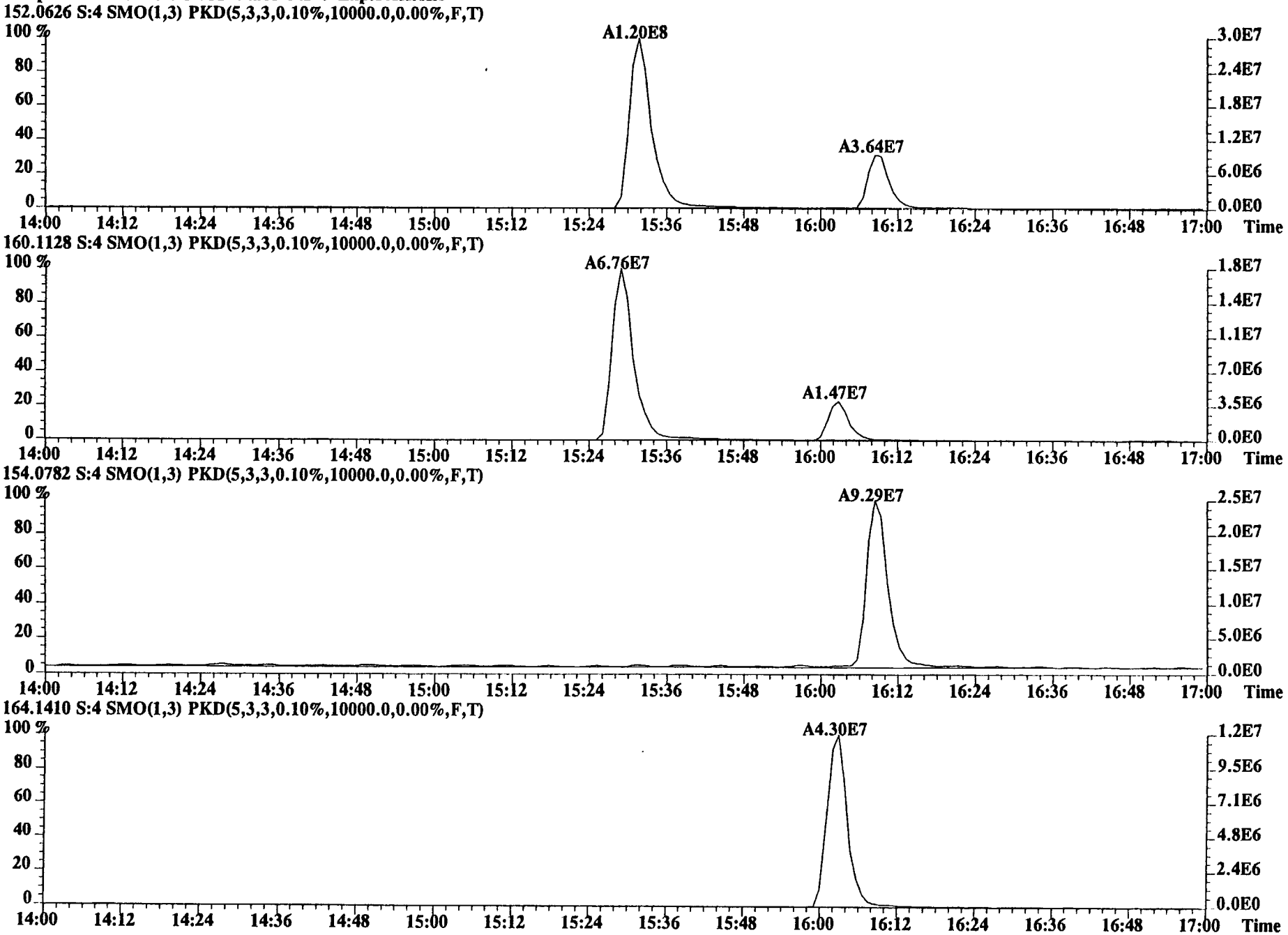
142.0782 S:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



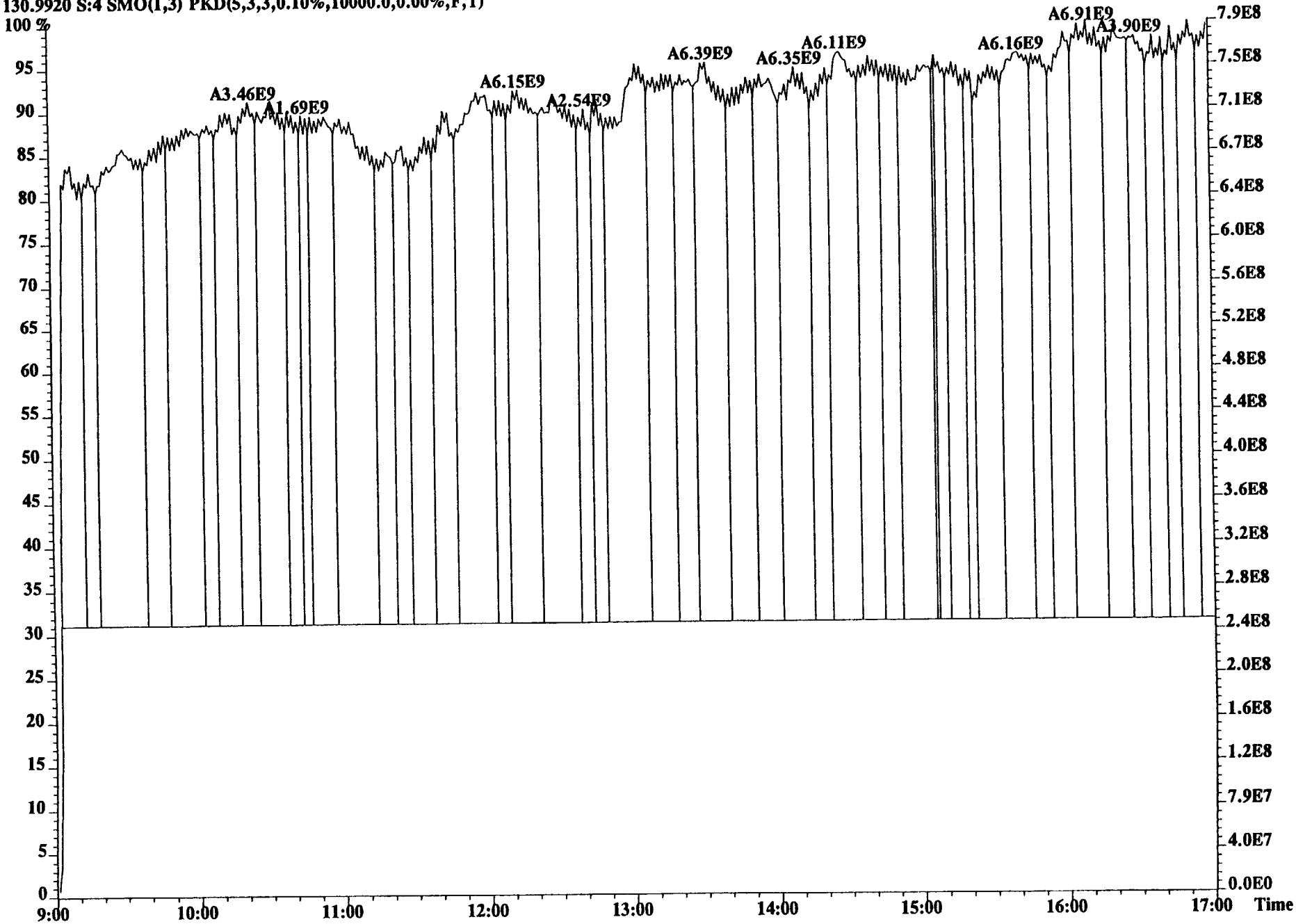
152.1410 S:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



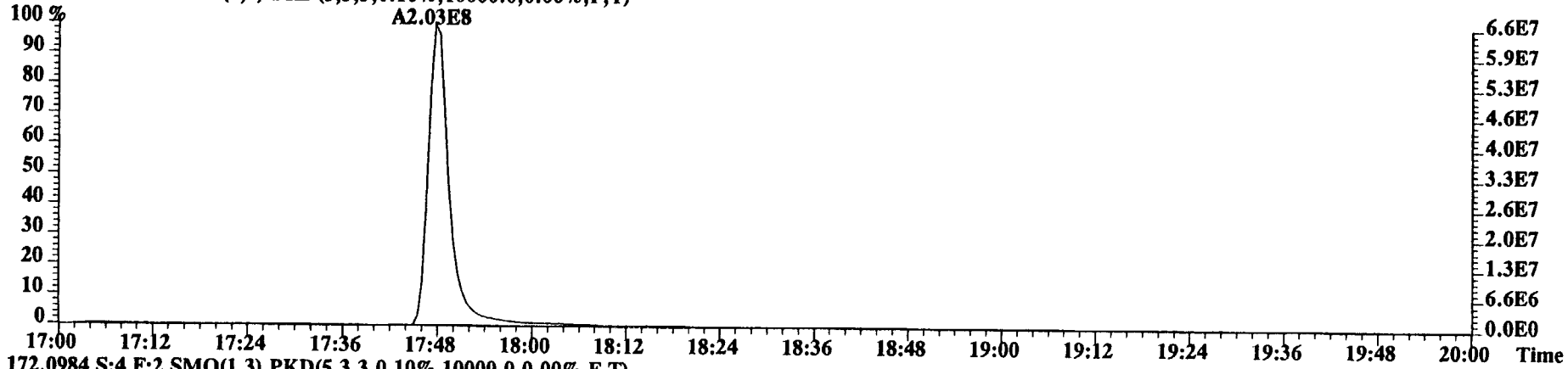
File:29OC98V4 #1-510 Acq:29-OCT-1998 17:54:20 GC EI+ Voltage SIR 70SE
Sample#4 Text:ST1029C :CS-4 :265-04D : Exp:PAHAIR



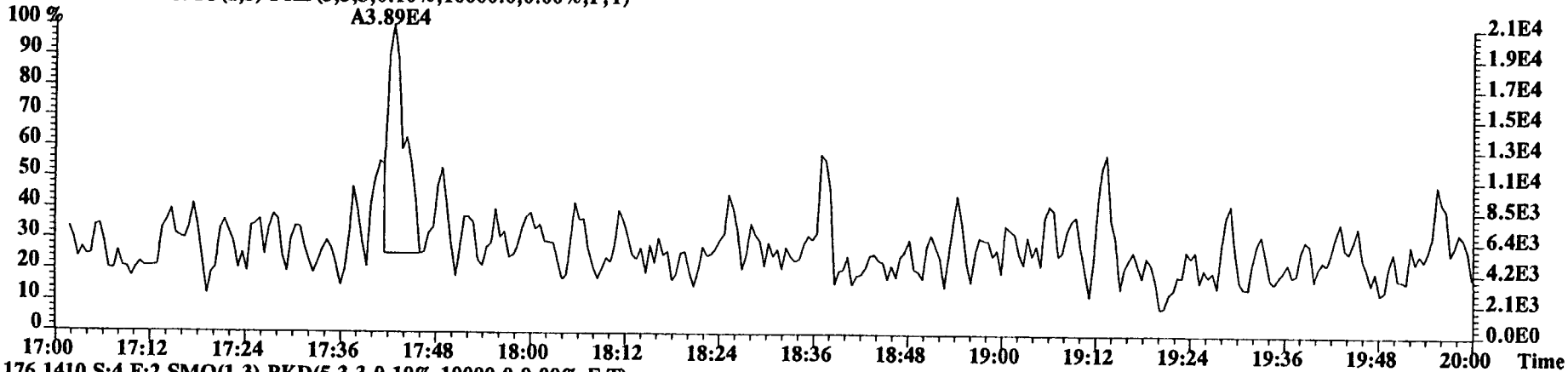
File:29OC98V4 #1-510 Acq:29-OCT-1998 17:54:20 GC EI+ Voltage SIR 70SE
Sample#4 Text:ST1029C :CS-4 :265-04D : Exp:PAHAIR
130.9920 S:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



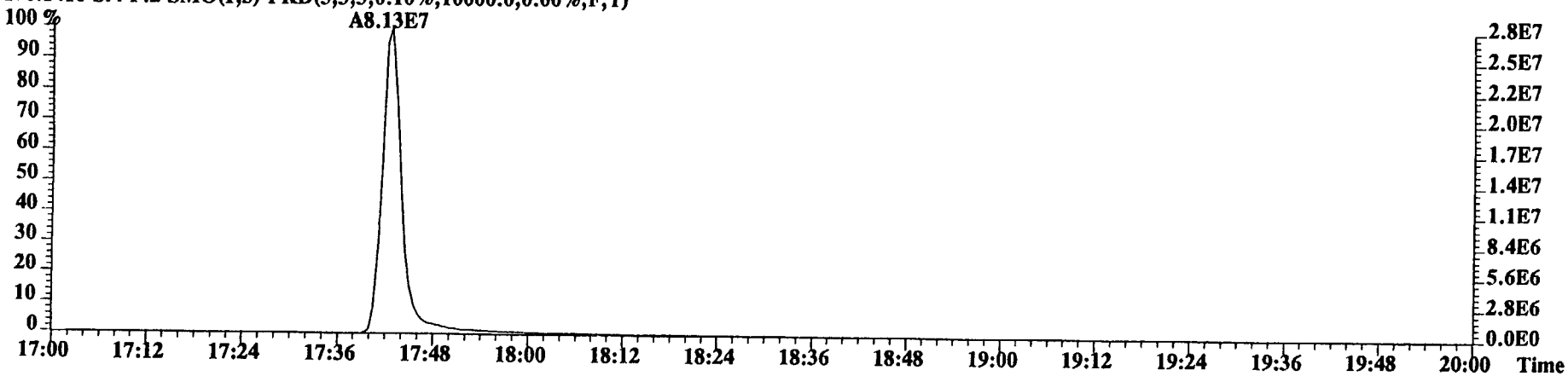
File:29OC98V4 #1-641 Acq:29-OCT-1998 17:54:20 GC EI+ Voltage SIR 70SE
Sample#4 Text:ST1029C :CS-4 :265-04D : Exp:PAHAIR
166.0798 S:4 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



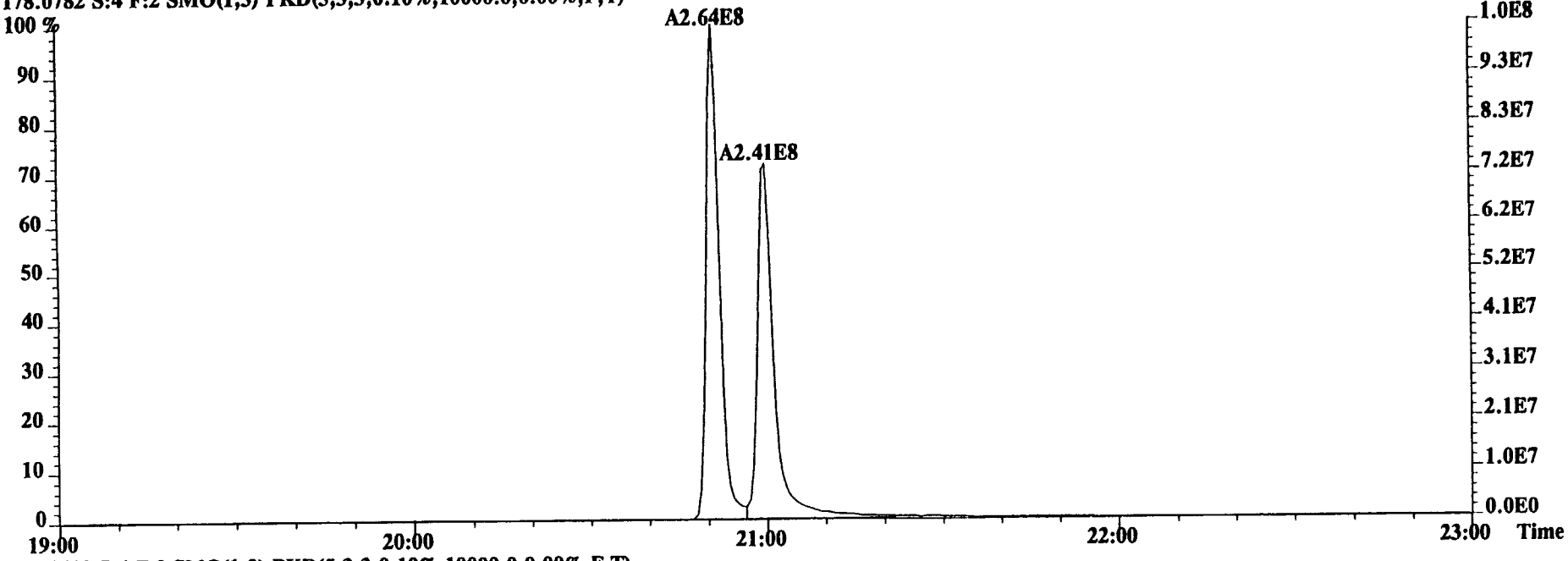
172.0984 S:4 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



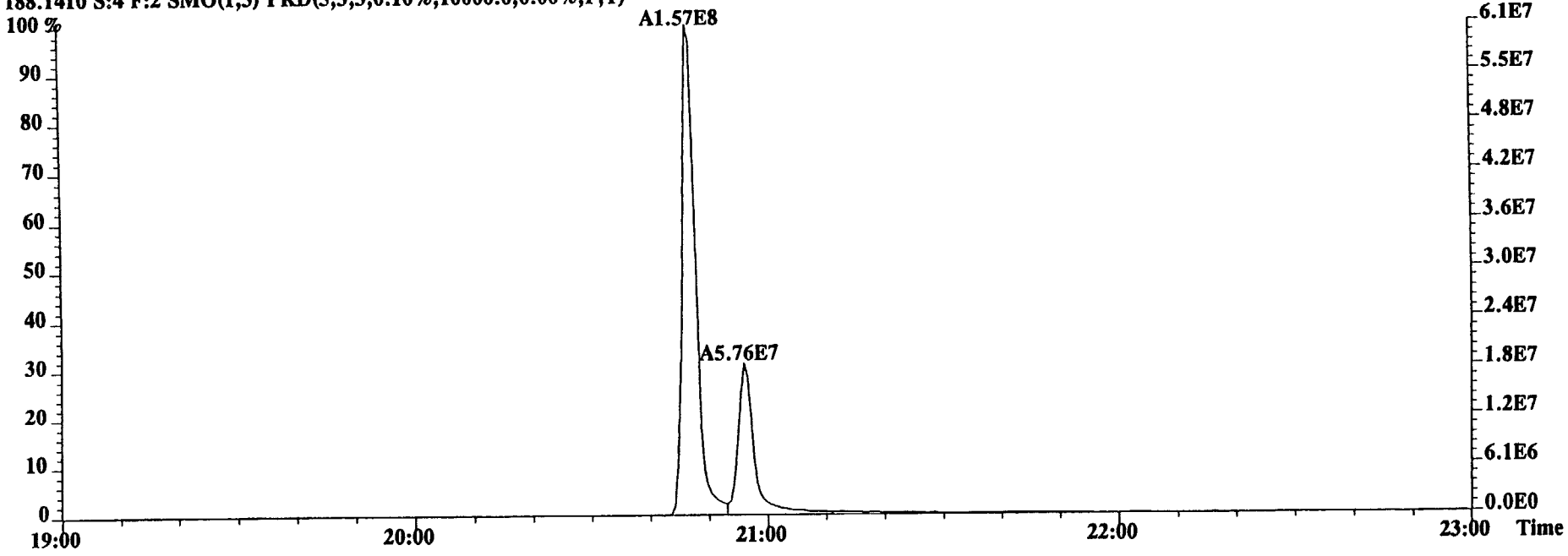
176.1410 S:4 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



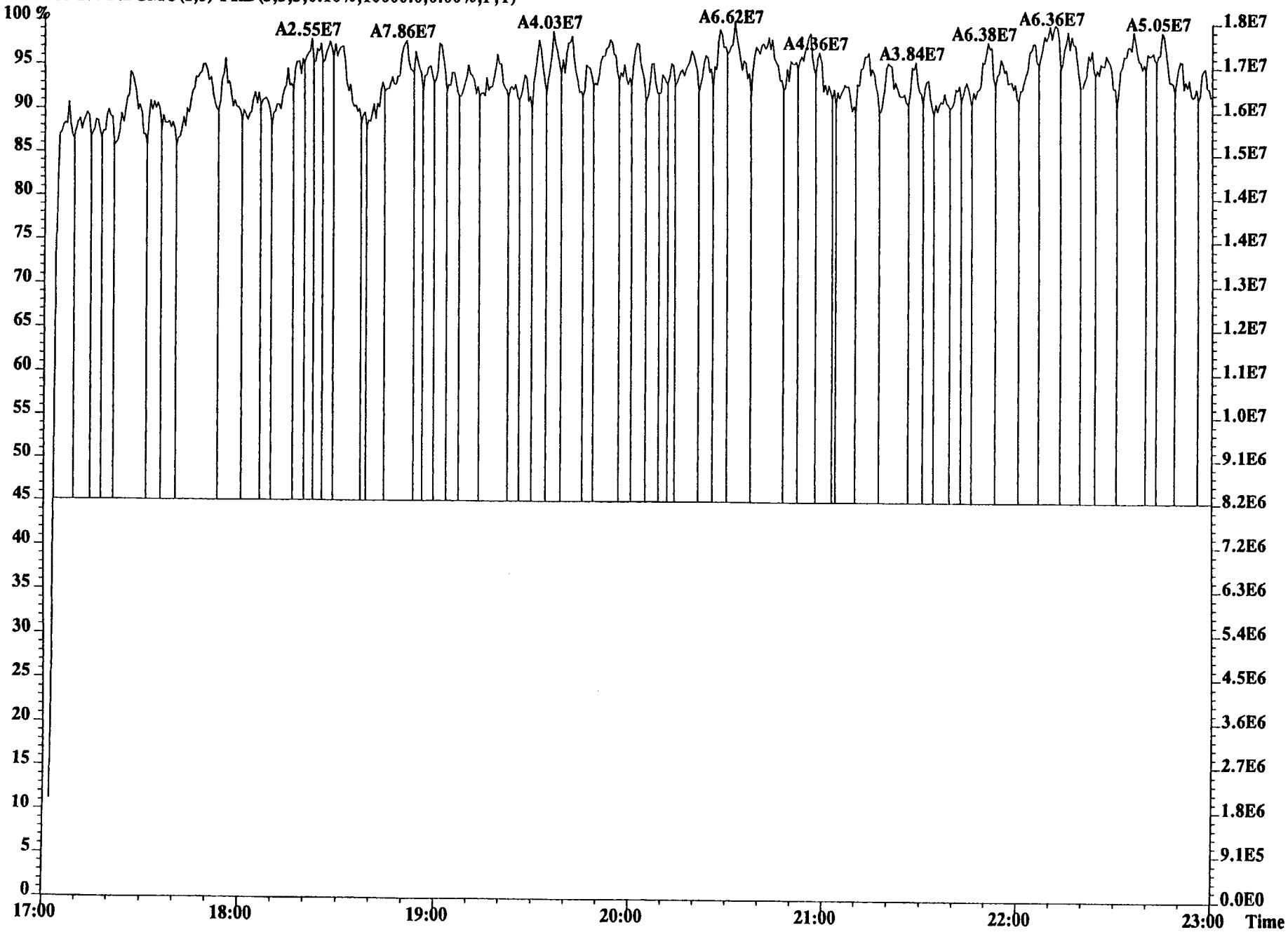
File:29OC98V4 #1-641 Acq:29-OCT-1998 17:54:20 GC EI+ Voltage SIR 70SE
Sample#4 Text:ST1029C :CS-4 :265-04D : Exp:PAHAIR
178.0782 S:4 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



188.1410 S:4 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

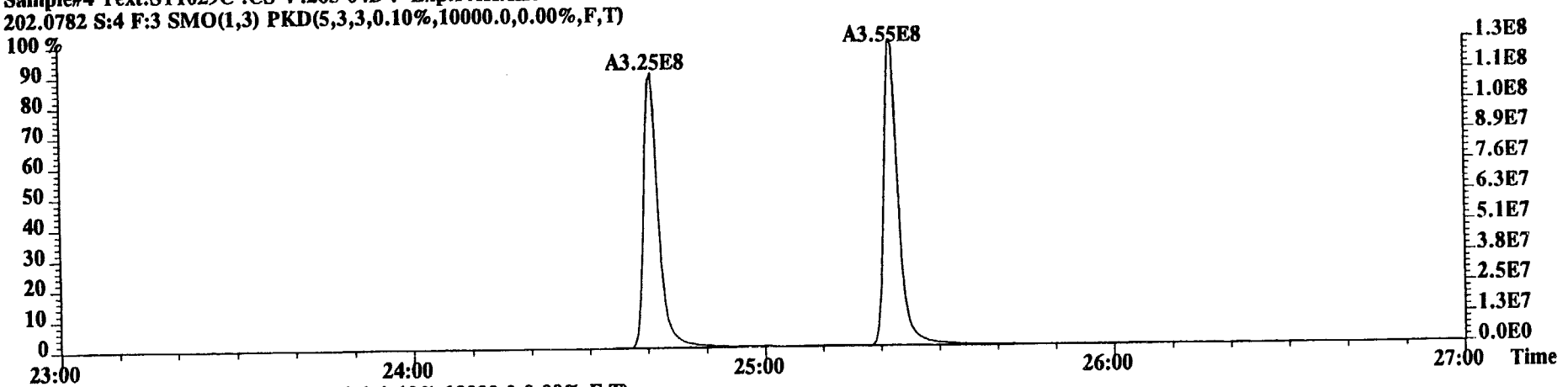


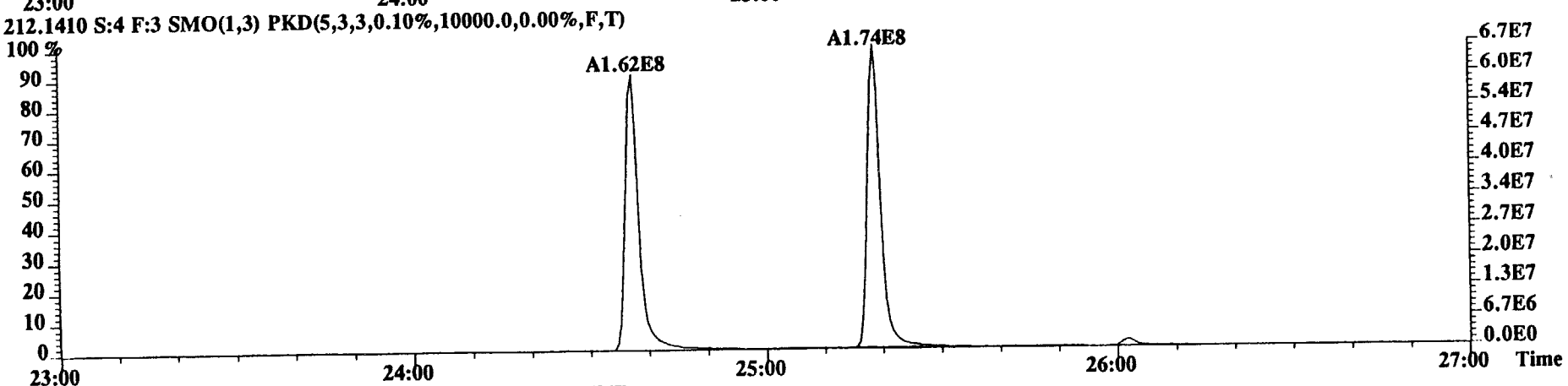
File:29OC98V4 #1-641 Acq:29-OCT-1998 17:54:20 GC EI+ Voltage SIR 70SE
Sample#4 Text:ST1029C :CS-4 :265-04D : Exp:PAHAIR
204.9888 S:4 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

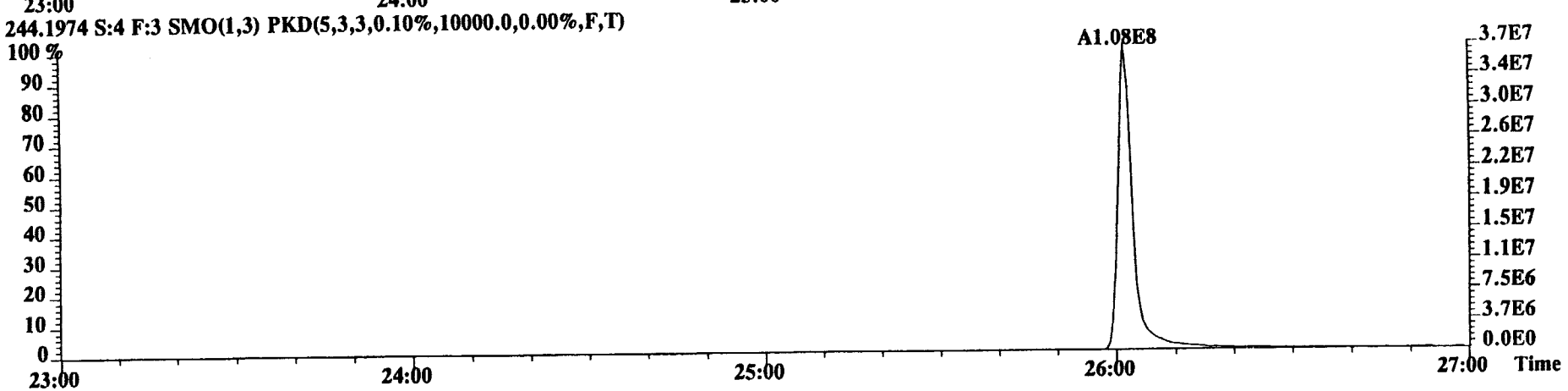


533

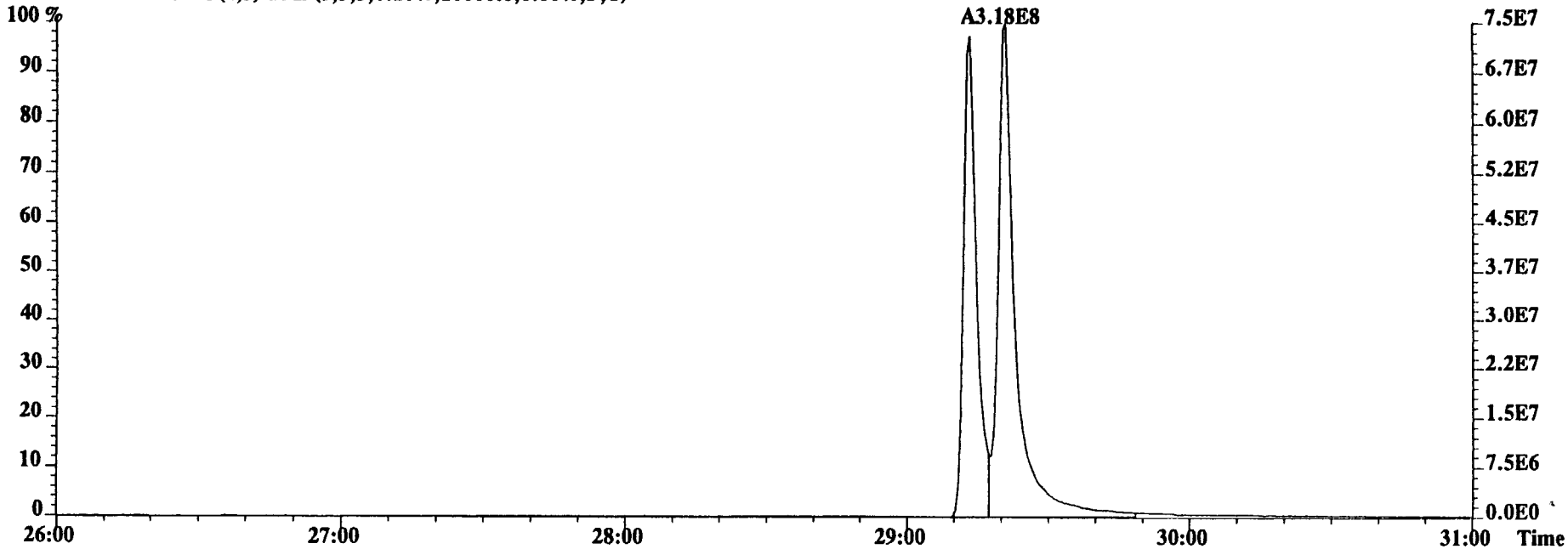
File:29OC98V4 #1-939 Acq:29-OCT-1998 17:54:20 GC EI+ Voltage SIR 70SE
Sample#4 Text:ST1029C :CS-4 :265-04D : Exp:PAHAIR



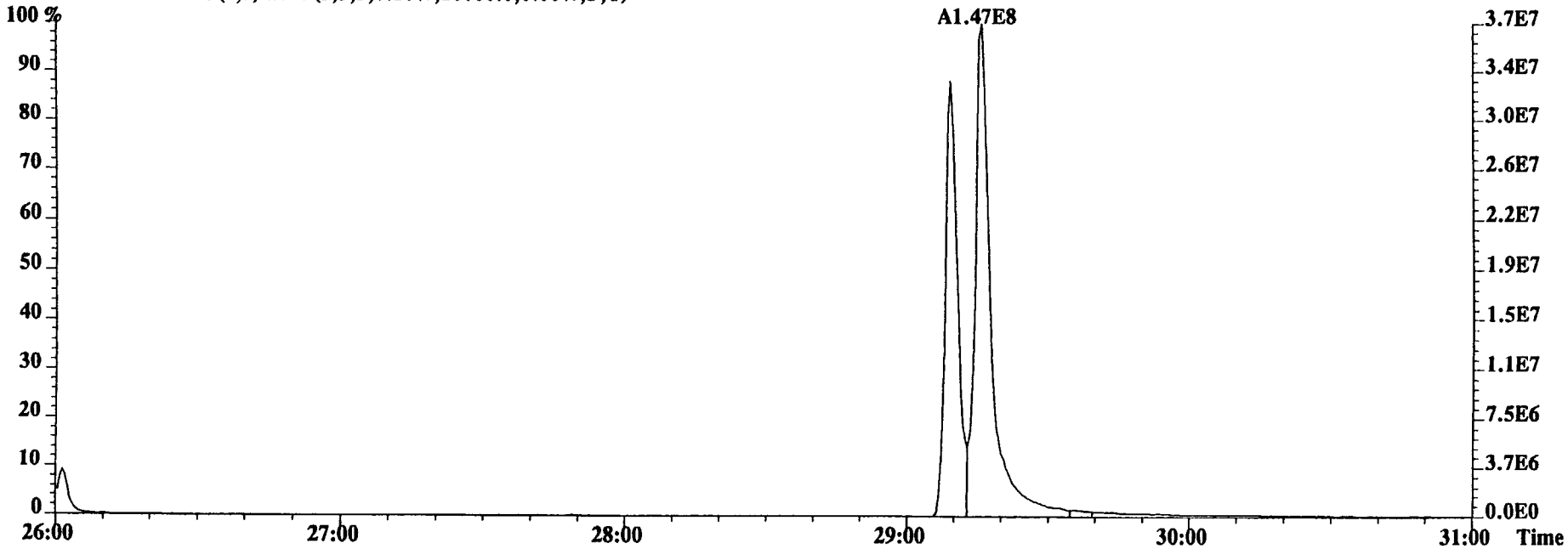




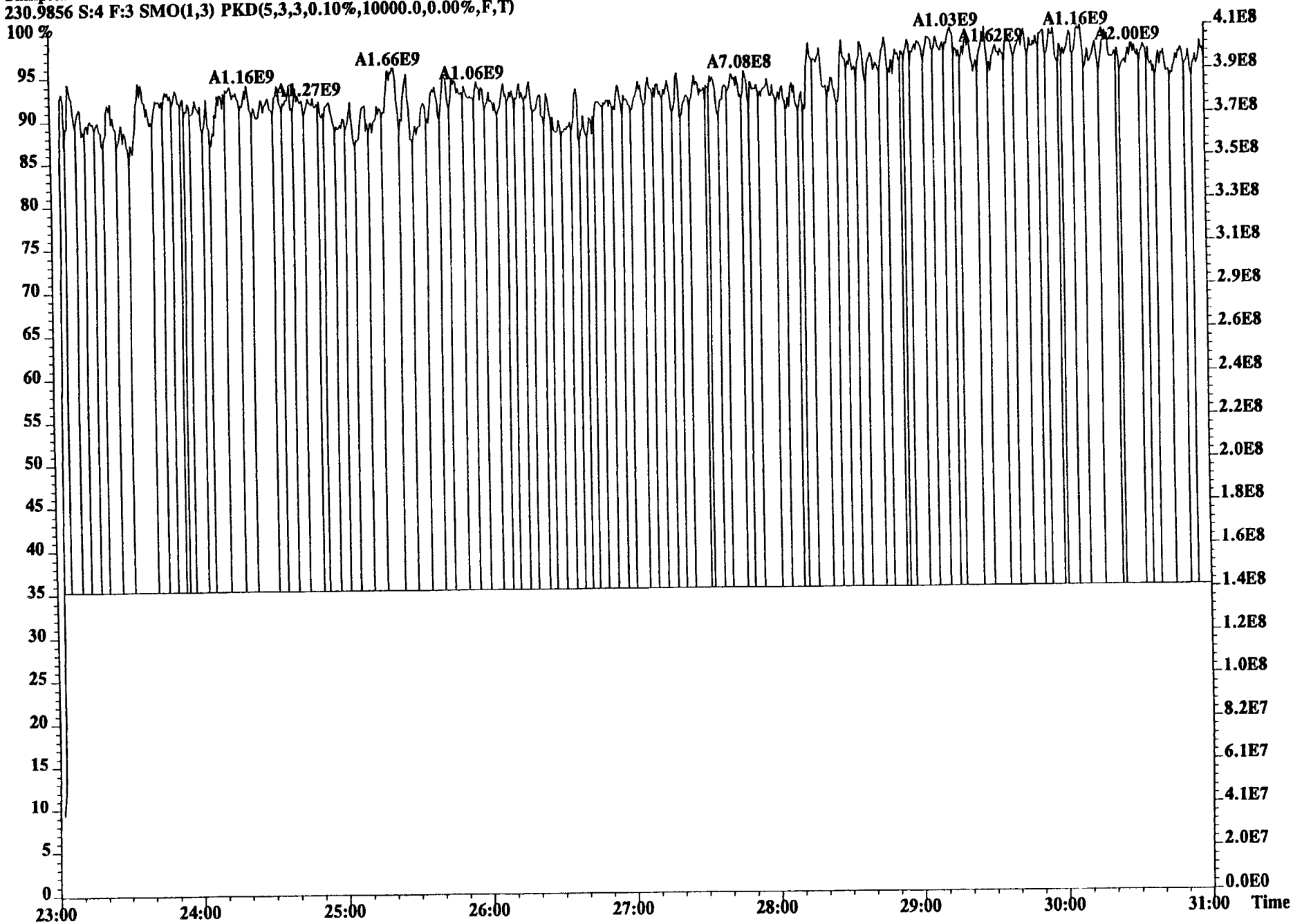
File:29OC98V4 #1-939 Acq:29-OCT-1998 17:54:20 GC EI+ Voltage SIR 70SE
Sample#4 Text:ST1029C :CS-4 :265-04D : Exp:PAHAIR
228.0939 S:4 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



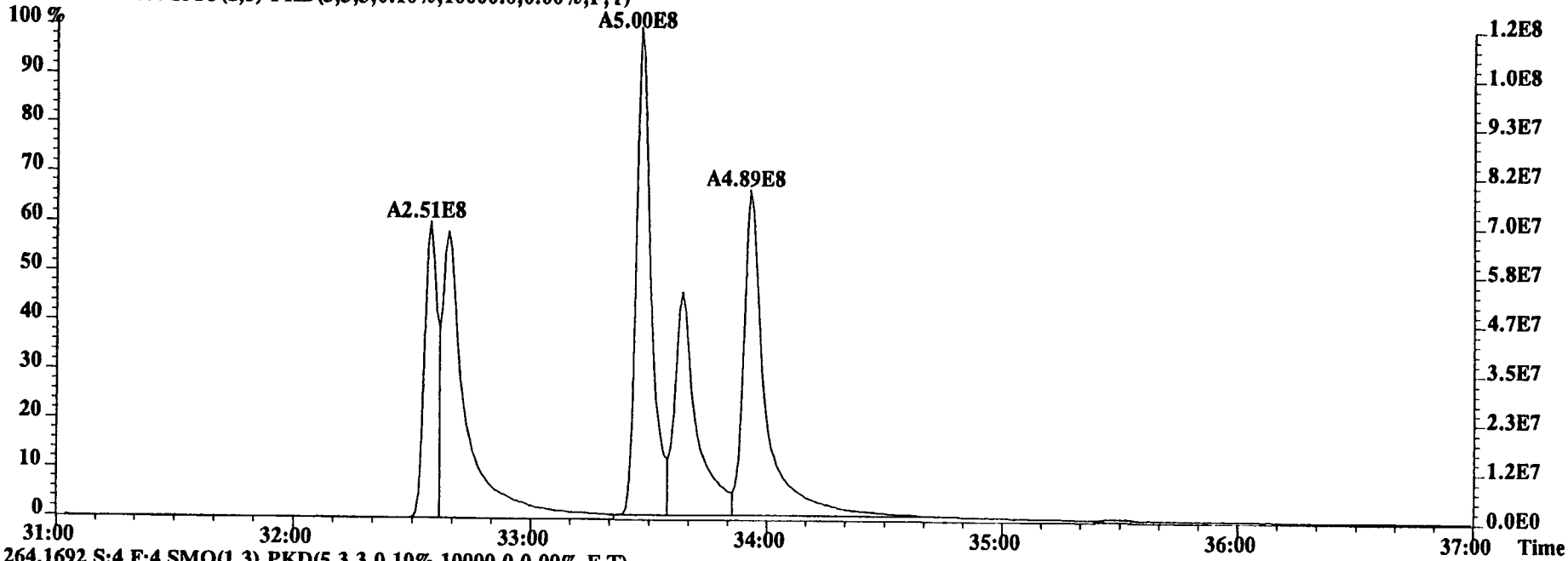
240.1692 S:4 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



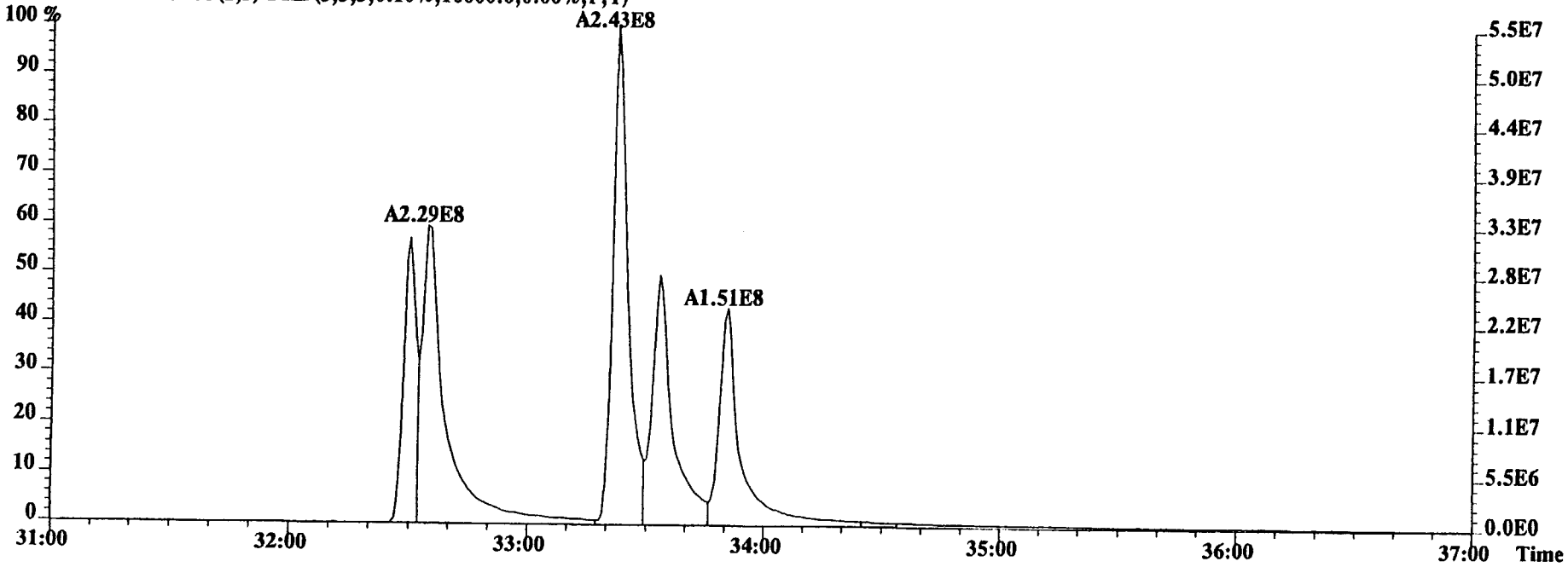
File:29OC98V4 #1-939 Acq:29-OCT-1998 17:54:20 GC EI+ Voltage SIR 70SE
Sample#4 Text:ST1029C :CS-4 :265-04D : Exp:PAHAIR
230.9856 S:4 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



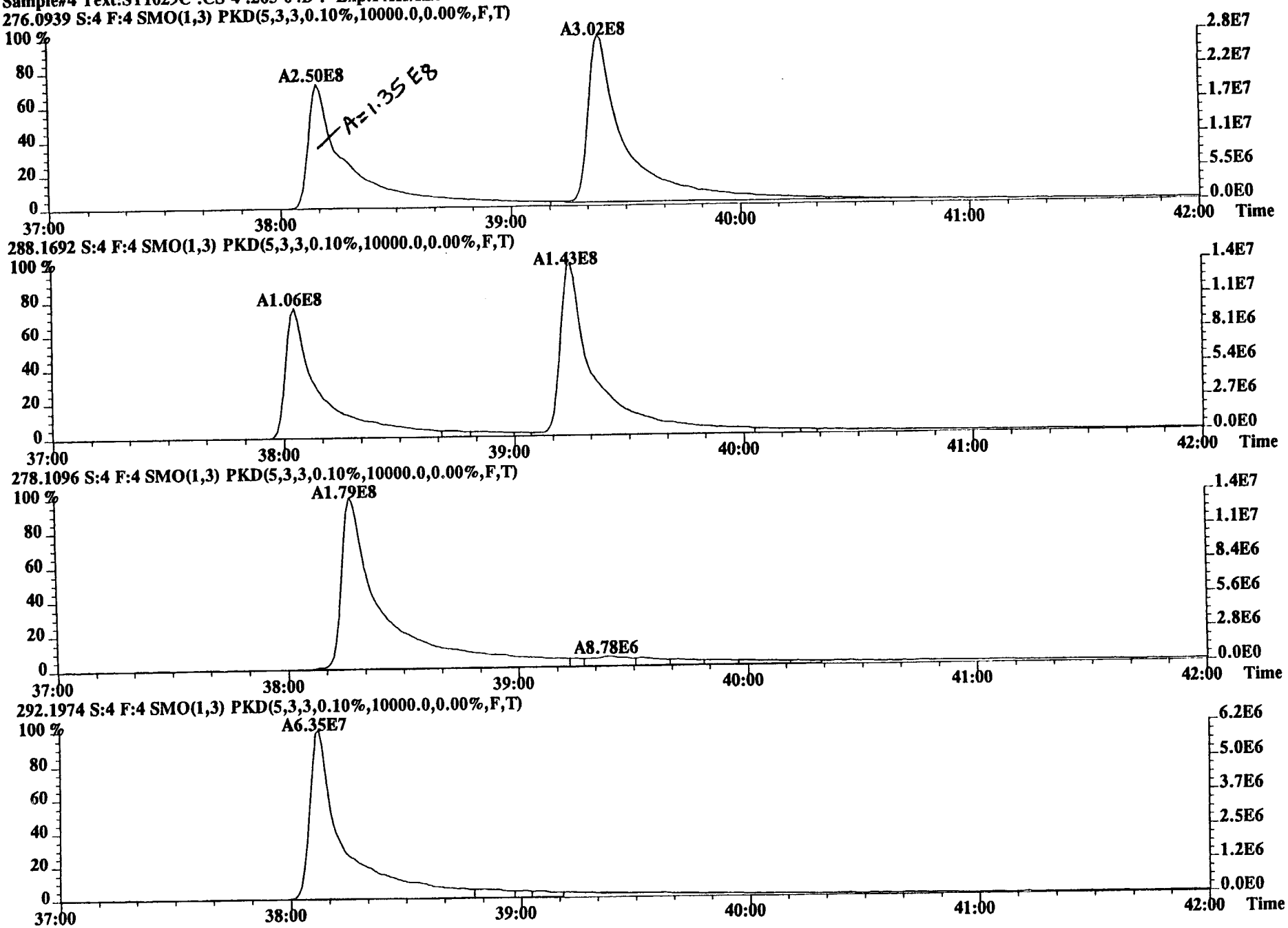
File:29OC98V4 #1-878 Acq:29-OCT-1998 17:54:20 GC EI+ Voltage SIR 70SE
Sample#4 Text:ST1029C :CS-4 :265-04D : Exp:PAHAIR
252.0939 S:4 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



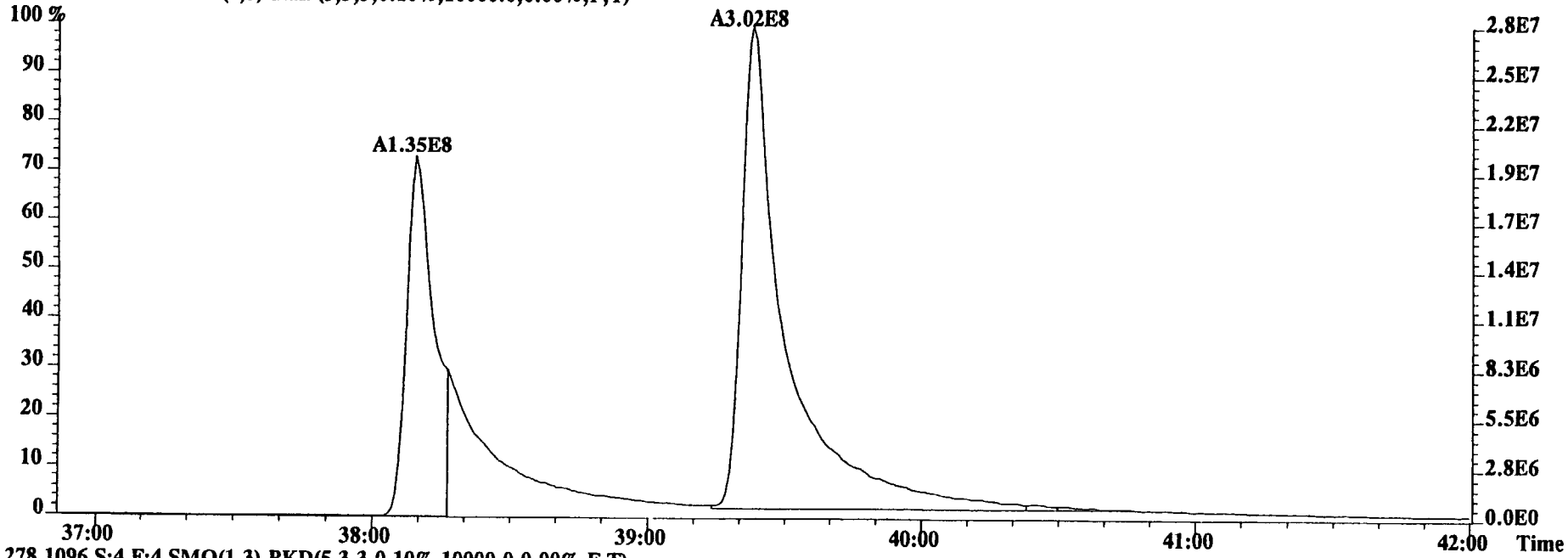
264.1692 S:4 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



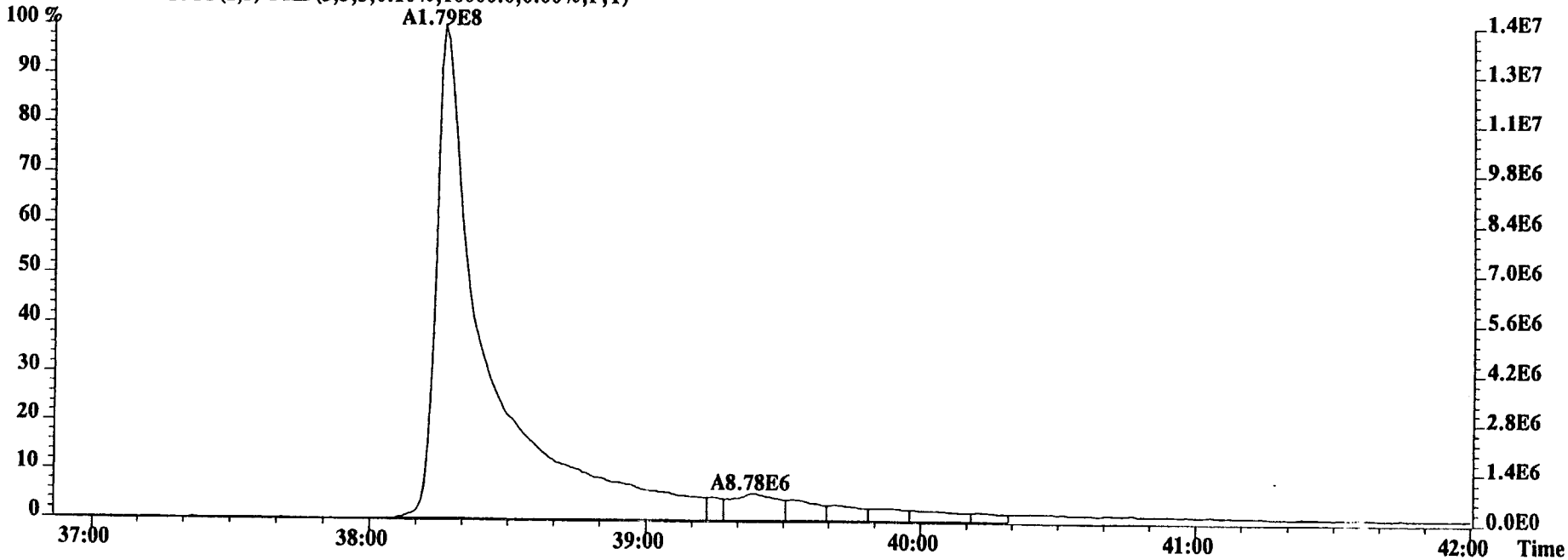
File:29OC98V4 #1-878 Acq:29-OCT-1998 17:54:20 GC EI+ Voltage SIR 70SE
Sample#4 Text:ST1029C :CS-4 :265-04D : Exp:PAHAIR



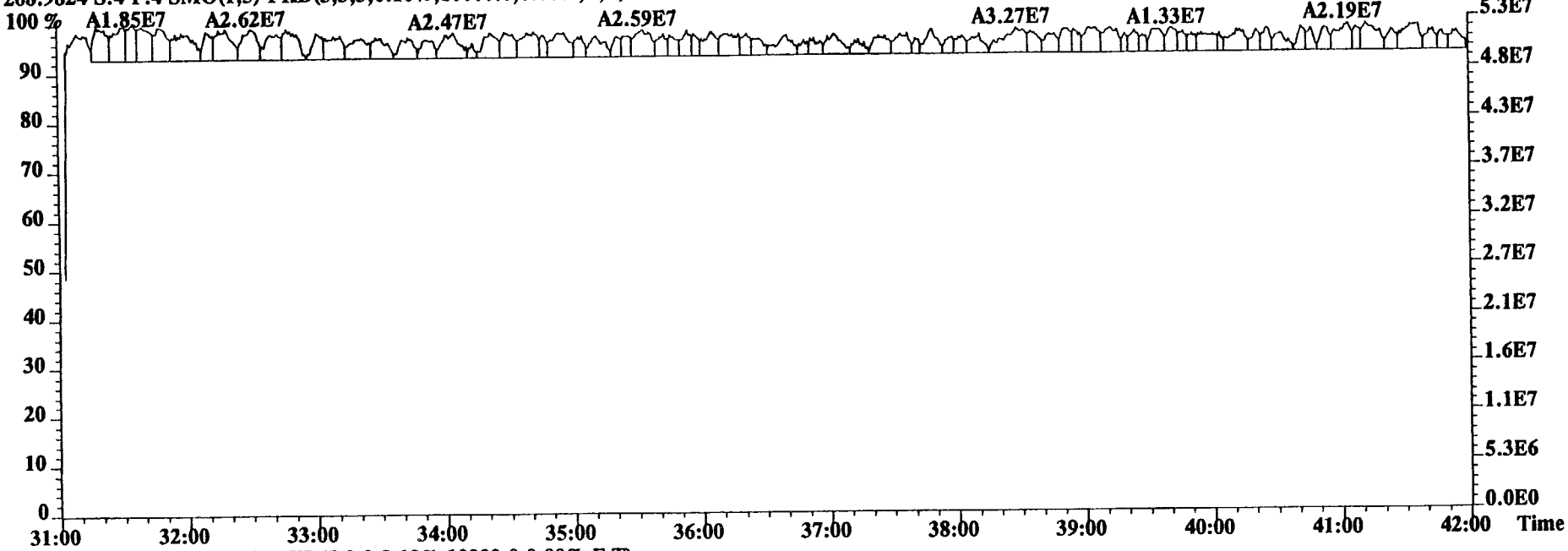
File:29OC98V4 #1-878 Acq:29-OCT-1998 17:54:20 GC EI+ Voltage SIR 70SE
Sample#4 Text:ST1029C :CS-4 :265-04D : Exp:PAHAIR
276.0939 S:4 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



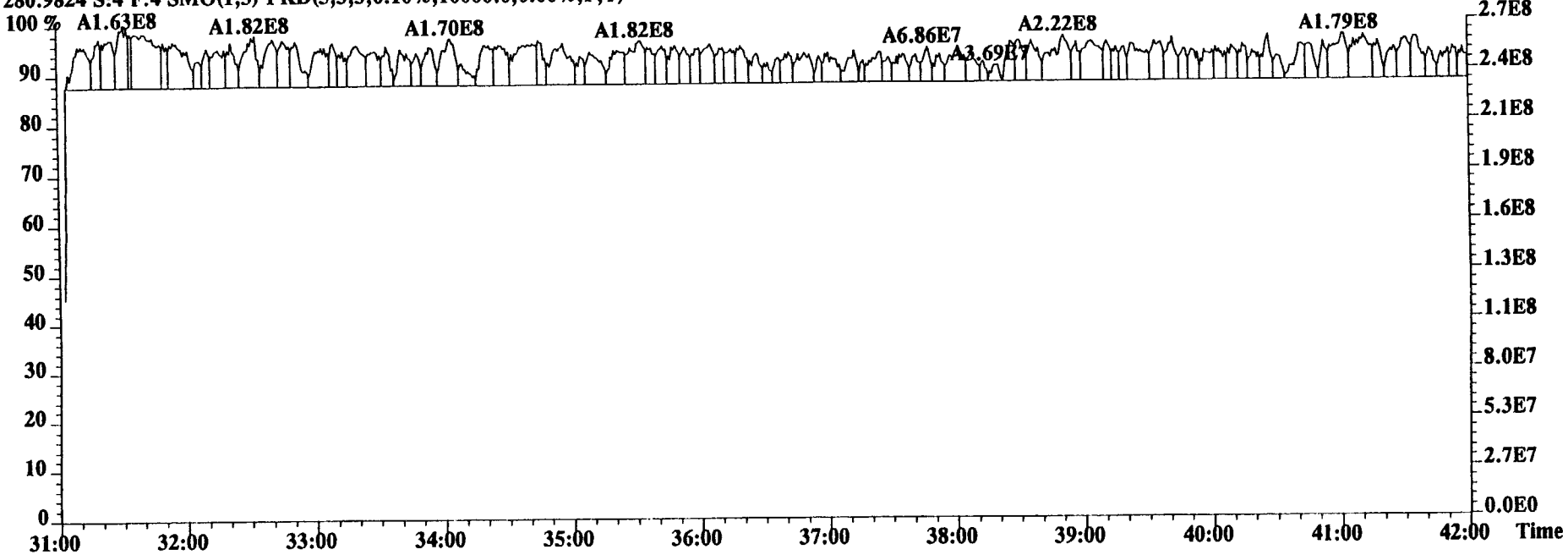
278.1096 S:4 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



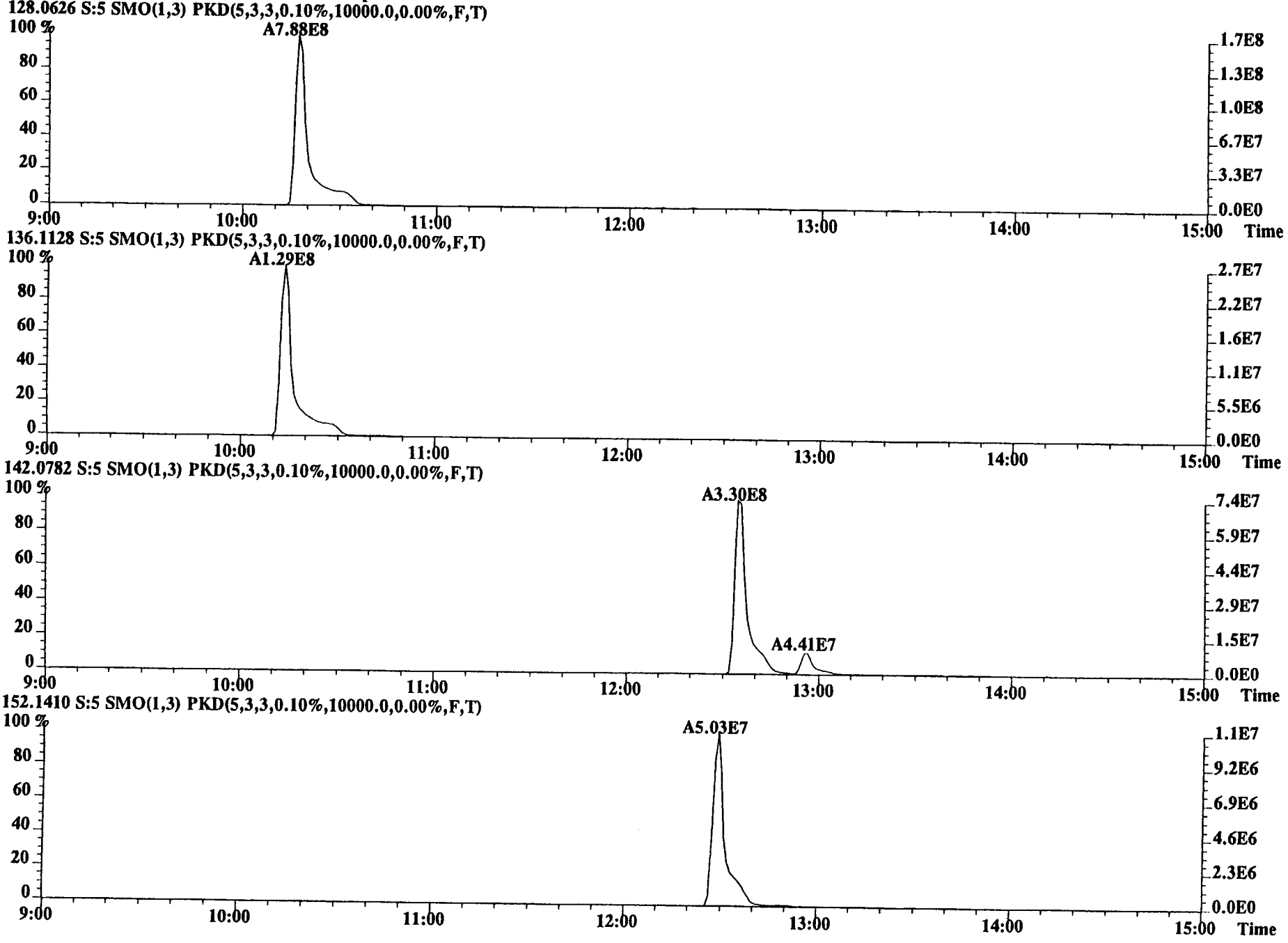
File:29OC98V4 #1-878 Acq:29-OCT-1998 17:54:20 GC EI+ Voltage SIR 70SE
Sample#4 Text:ST1029C :CS-4 :265-04D : Exp:PAHAIR
268.9824 S:4 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



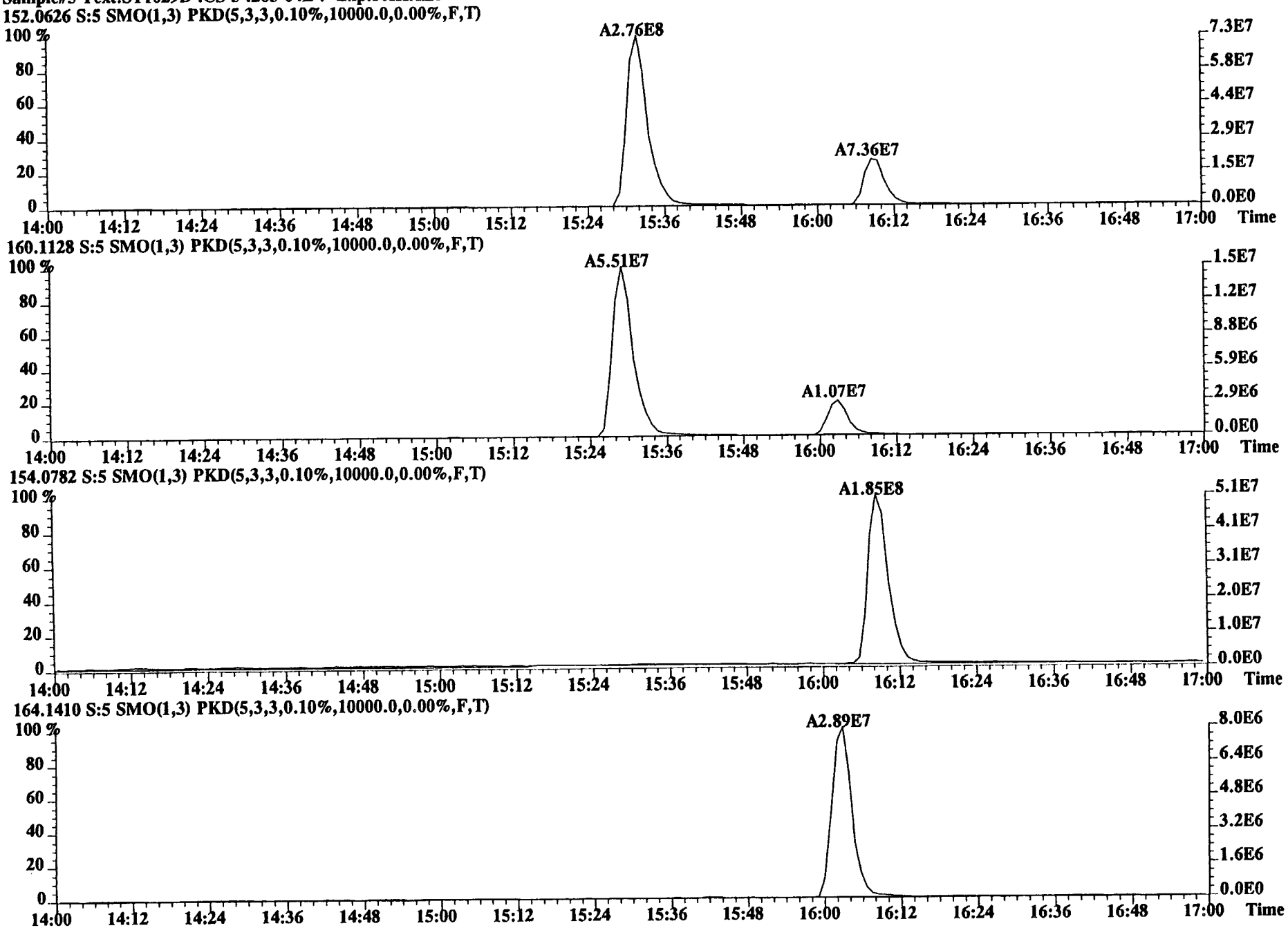
280.9824 S:4 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



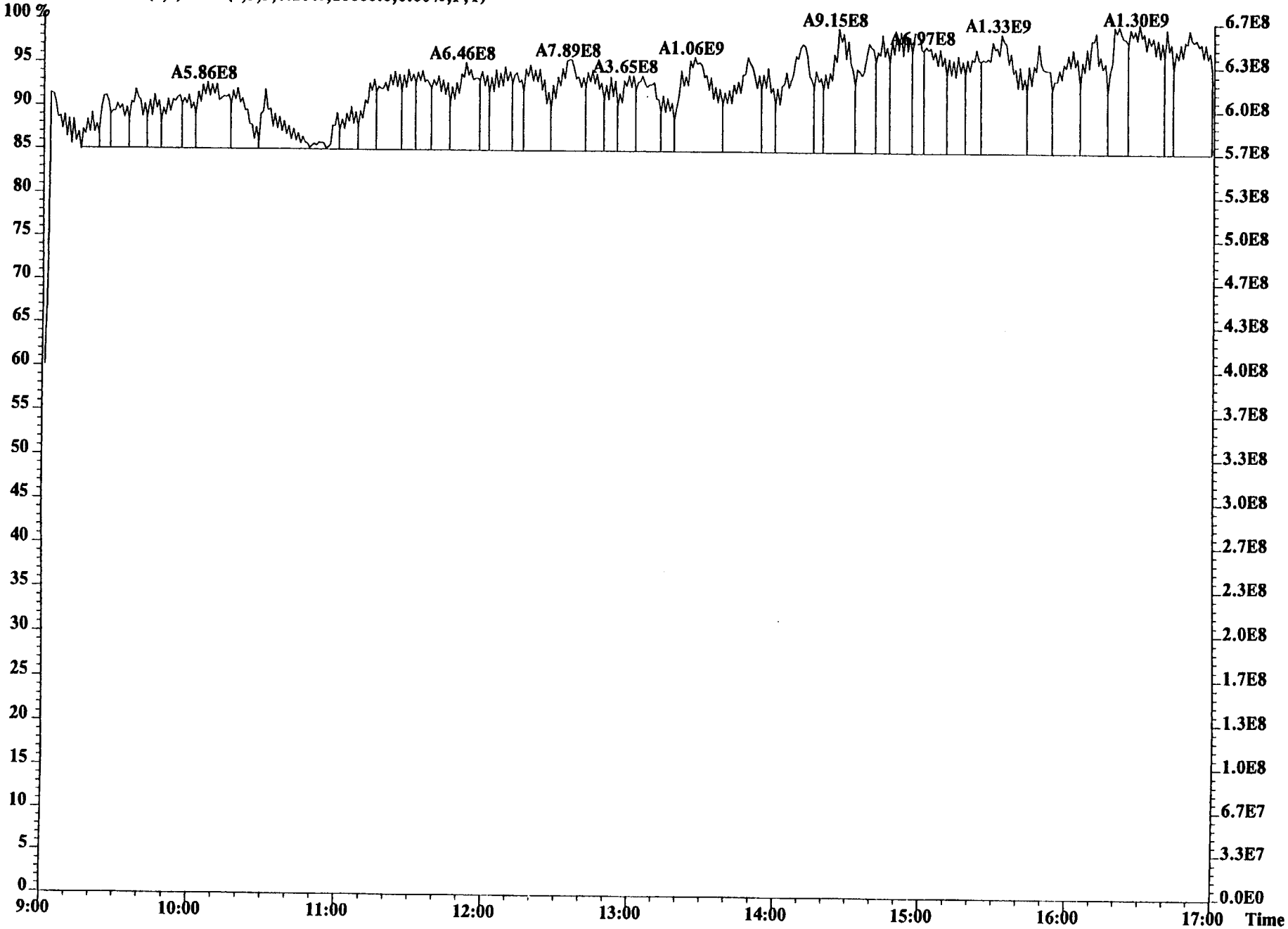
File:29OC98V4 #1-510 Acq:29-OCT-1998 18:43:24 GC EI+ Voltage SIR 70SE
Sample#5 Text:ST1029D :CS-5 :265-04E : Exp:PAHAIR



File:29OC98V4 #1-510 Acq:29-OCT-1998 18:43:24 GC EI+ Voltage SIR 70SE
Sample#5 Text:ST1029D :CS-5 :265-04E : Exp:PAHAIR

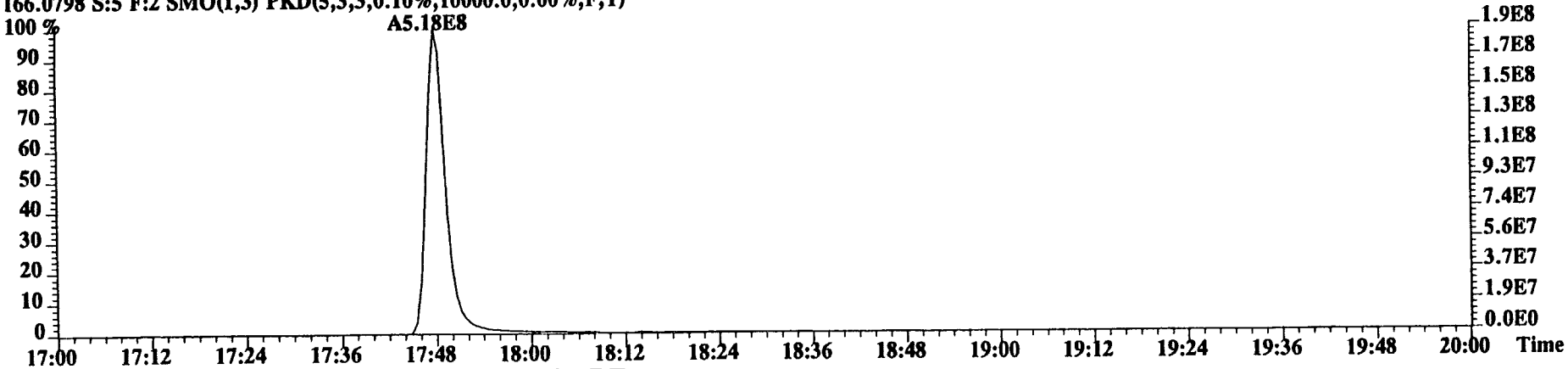


File:29OC98V4 #1-510 Acq:29-OCT-1998 18:43:24 GC EI+ Voltage SIR 70SE
Sample#5 Text:ST1029D :CS-5 :265-04E : Exp:PAHAIR
130.9920 S:5 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

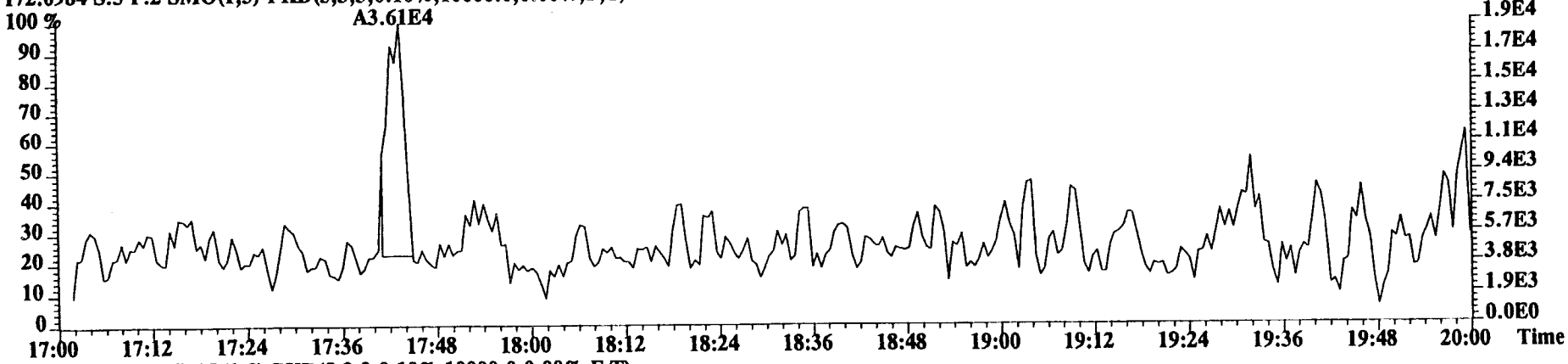


543

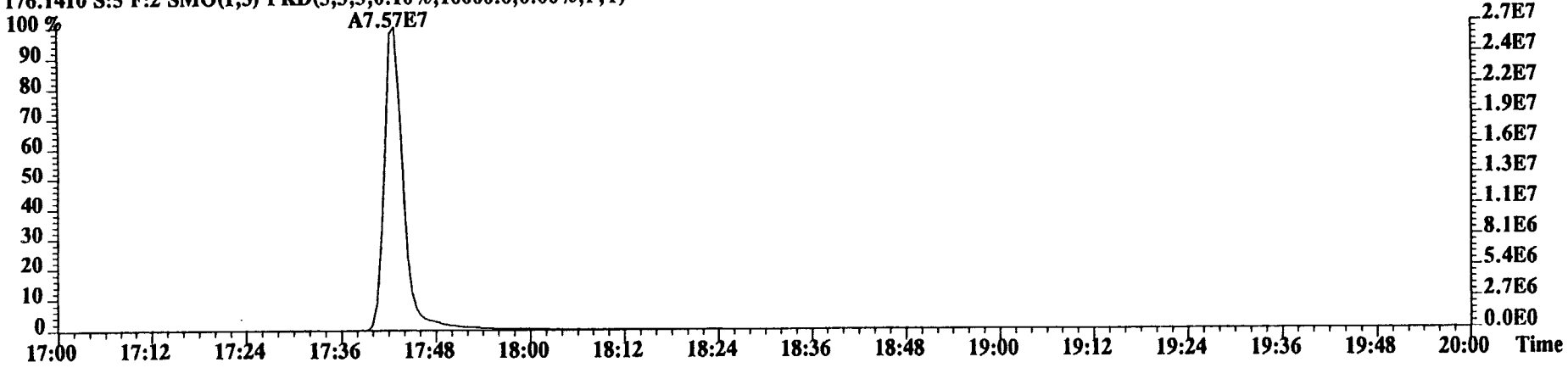
File:29OC98V4 #1-641 Acq:29-OCT-1998 18:43:24 GC EI+ Voltage SIR 70SE
Sample#5 Text:ST1029D :CS-5 :265-04E : Exp:PAHAIR
166.0798 S:5 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



172.0984 S:5 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

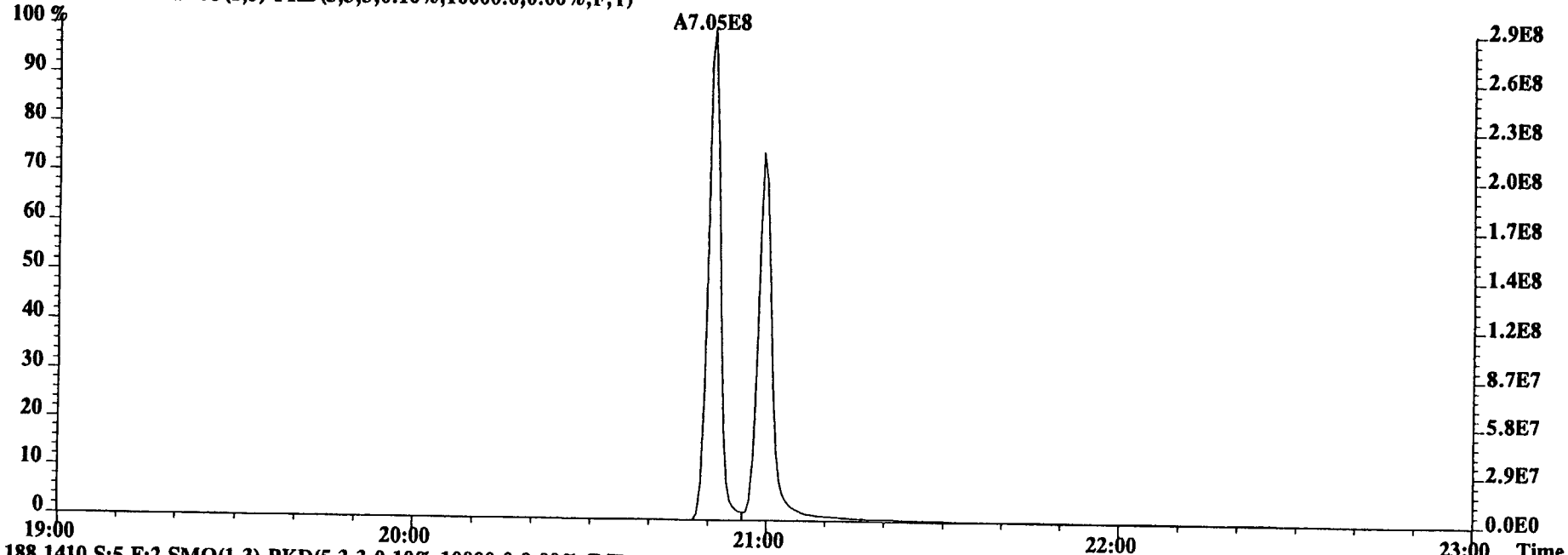


176.1410 S:5 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

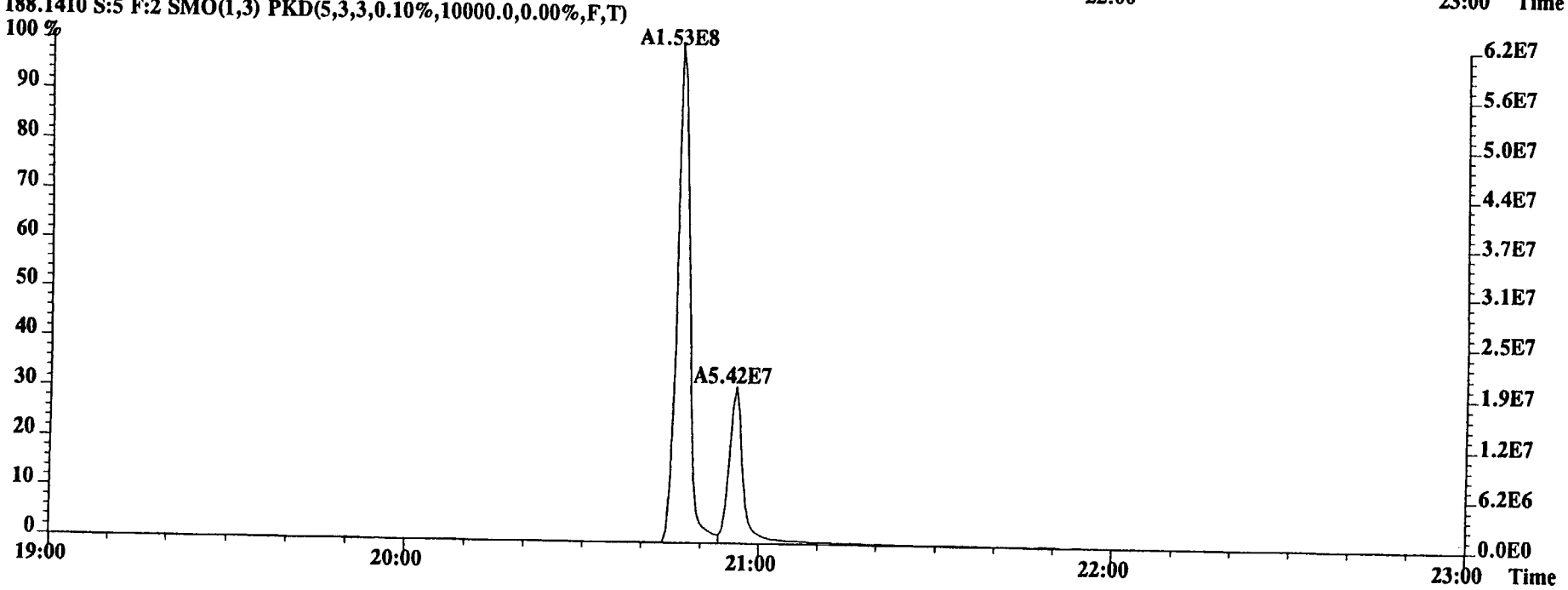


544

File:29OC98V4 #1-641 Acq:29-OCT-1998 18:43:24 GC EI+ Voltage SIR 70SE
Sample#5 Text:ST1029D :CS-5 :265-04E : Exp:PAHAIR
178.0782 S:5 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

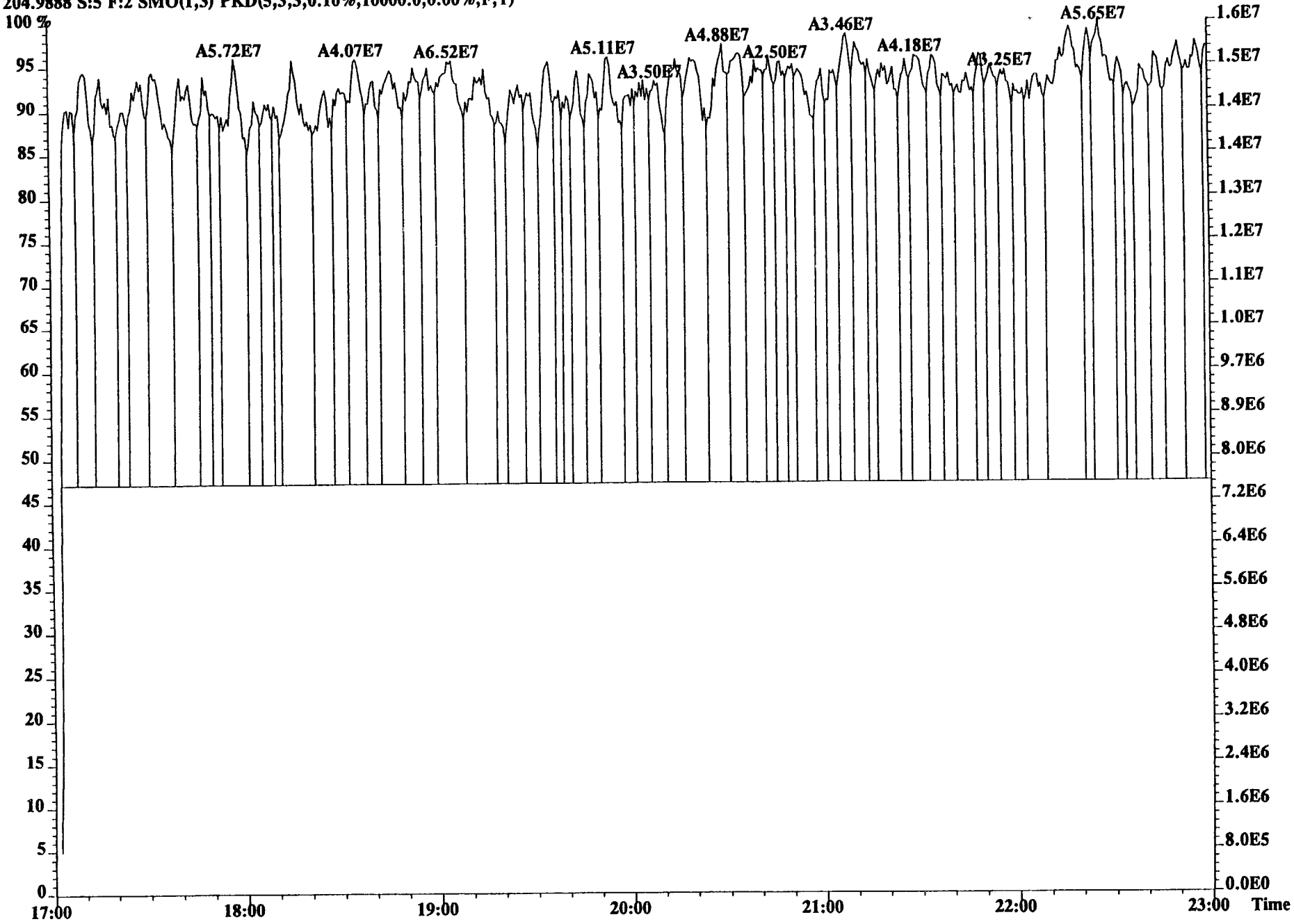


188.1410 S:5 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



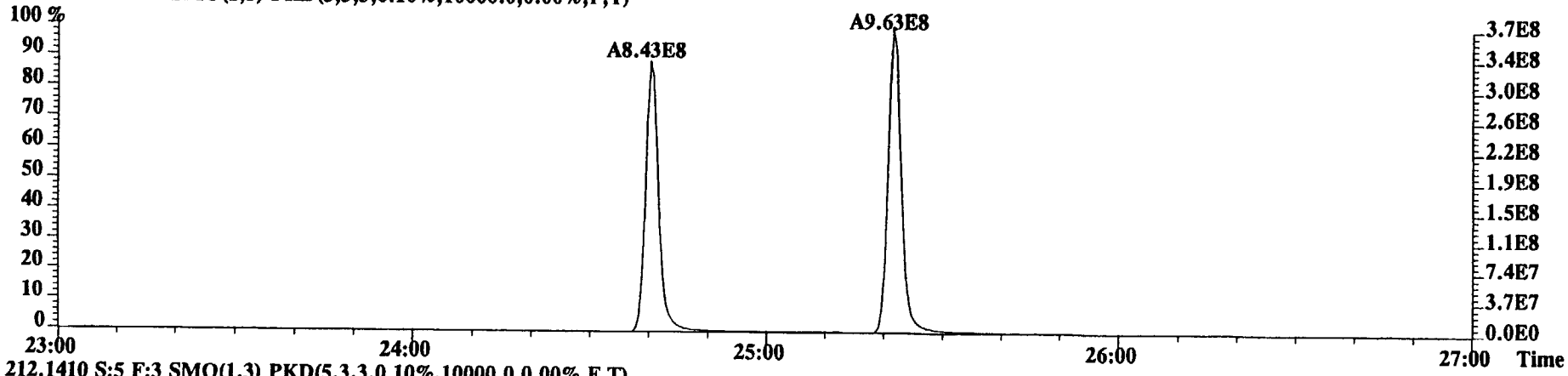
545

File:29OC98V4 #1-641 Acq:29-OCT-1998 18:43:24 GC EI+ Voltage SIR 70SE
Sample#5 Text:ST1029D :CS-5 :265-04E : Exp:PAHAIR
204.9888 S:5 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

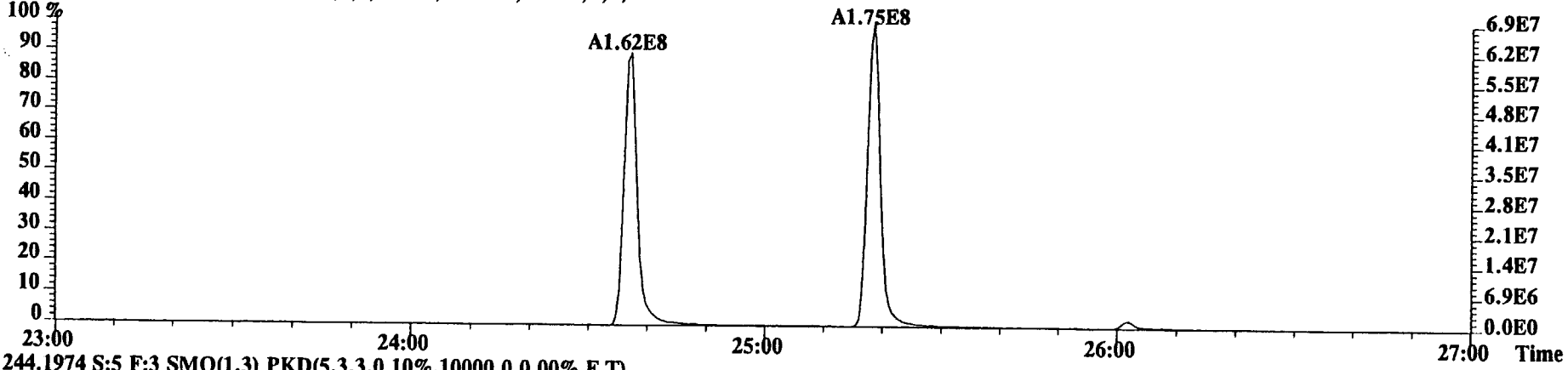


546

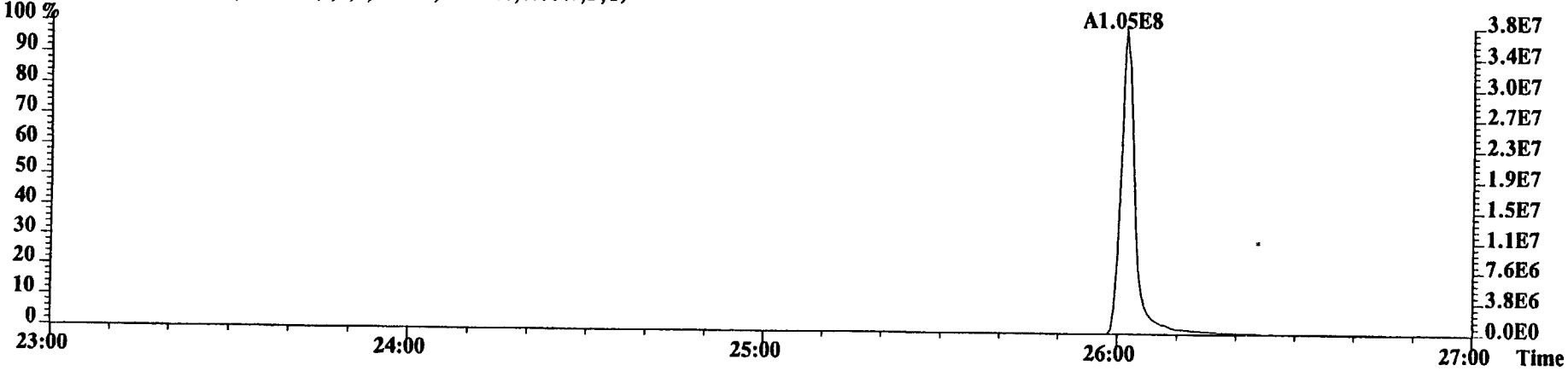
File:29OC98V4 #1-939 Acq:29-OCT-1998 18:43:24 GC EI+ Voltage SIR 70SE
Sample#5 Text:ST1029D :CS-5 :265-04E : Exp:PAHAIR
202.0782 S:5 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



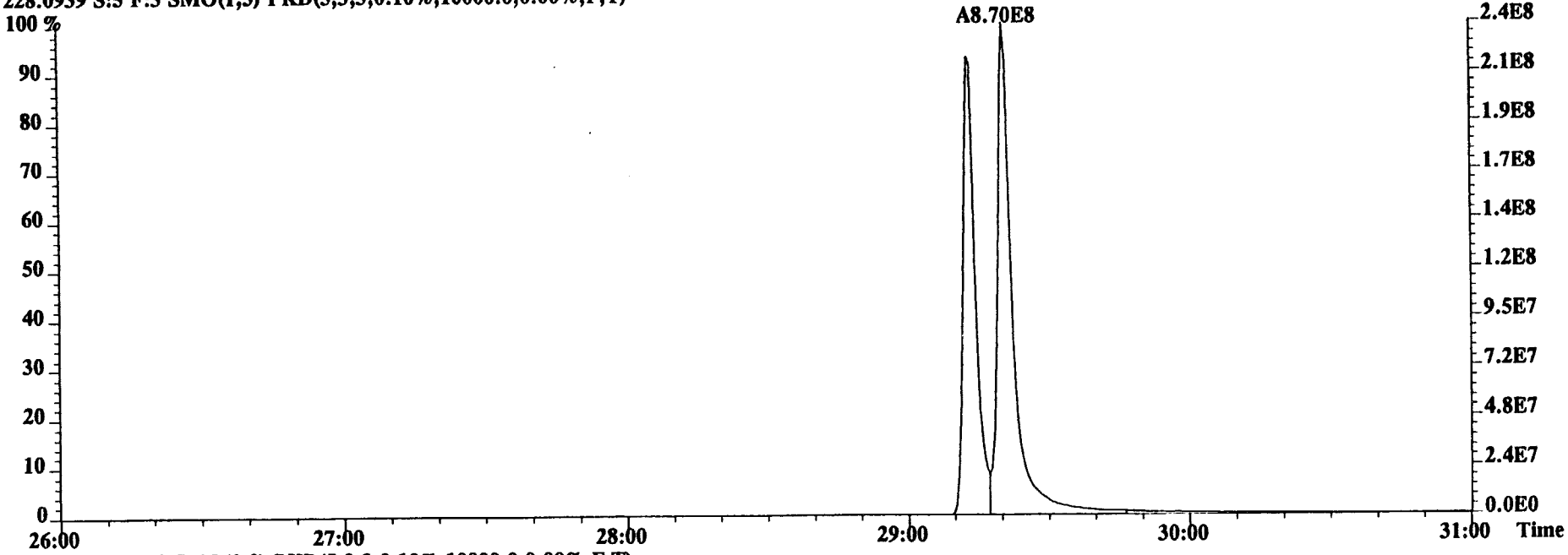
212.1410 S:5 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



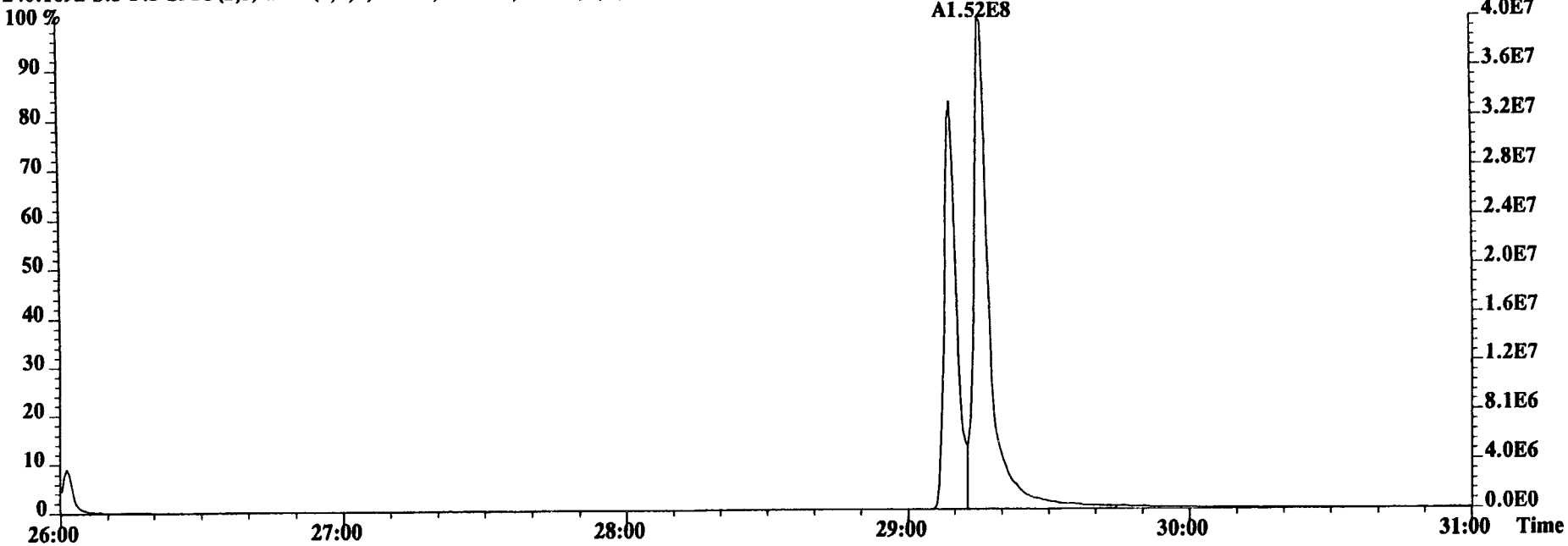
244.1974 S:5 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



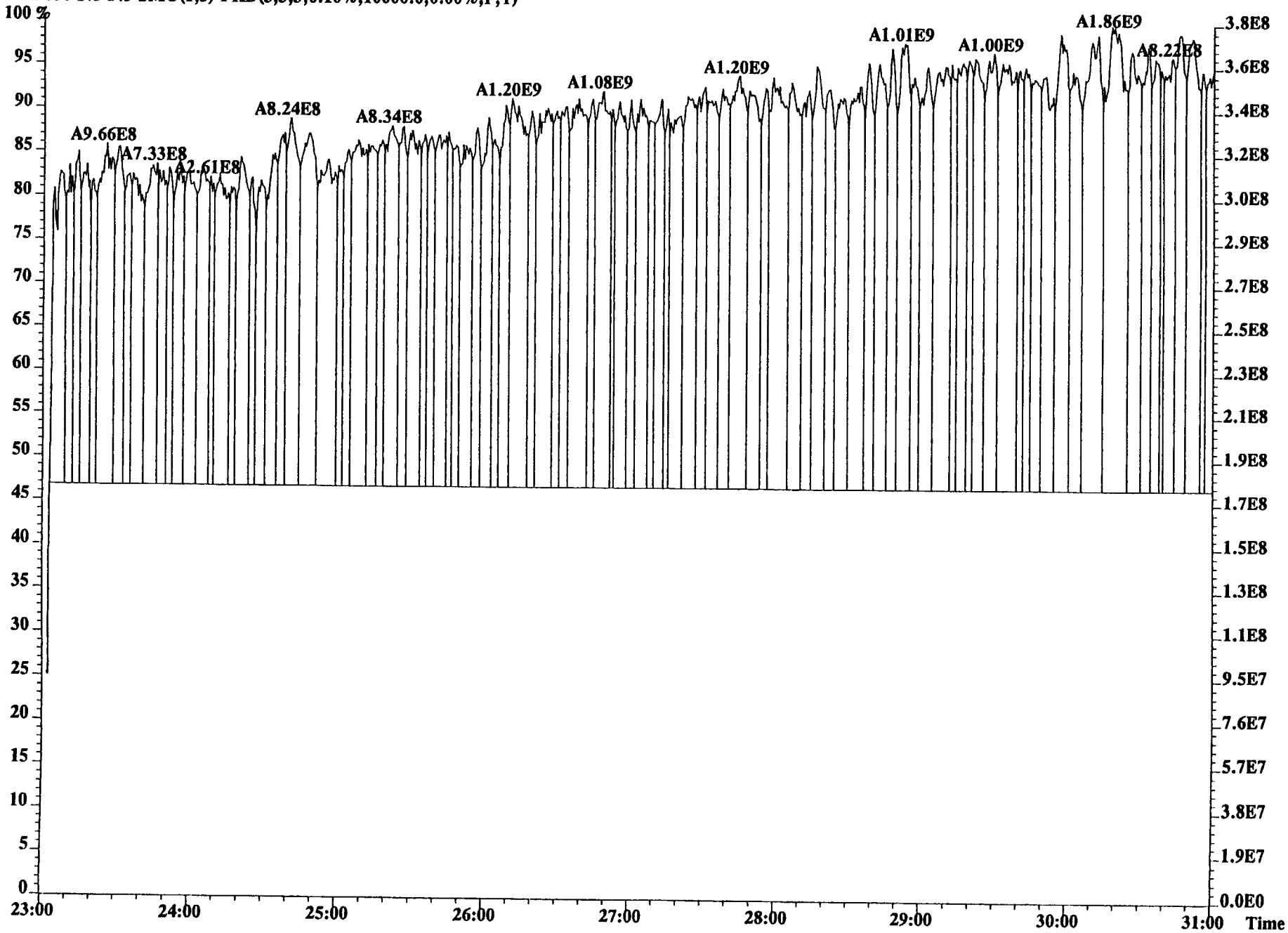
File:29OC98V4 #1-939 Acq:29-OCT-1998 18:43:24 GC EI+ Voltage SIR 70SE
Sample#5 Text:ST1029D :CS-5 :265-04E : Exp:PAHAIR
228.0939 S:5 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



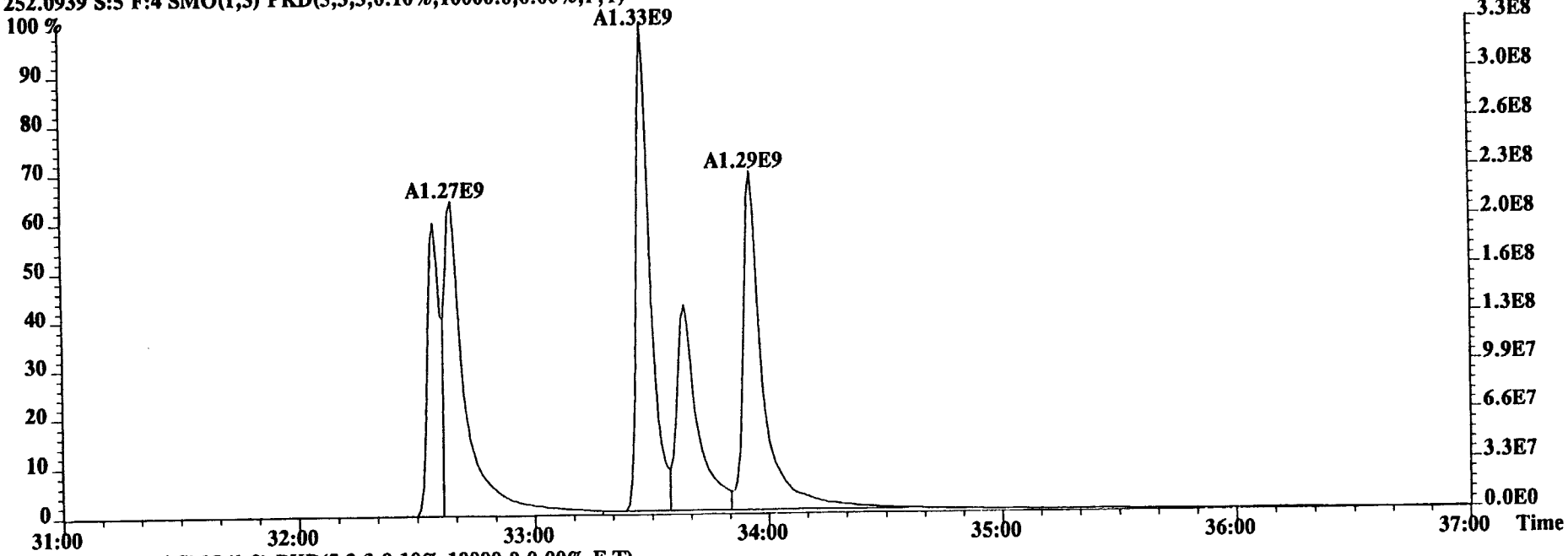
240.1692 S:5 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



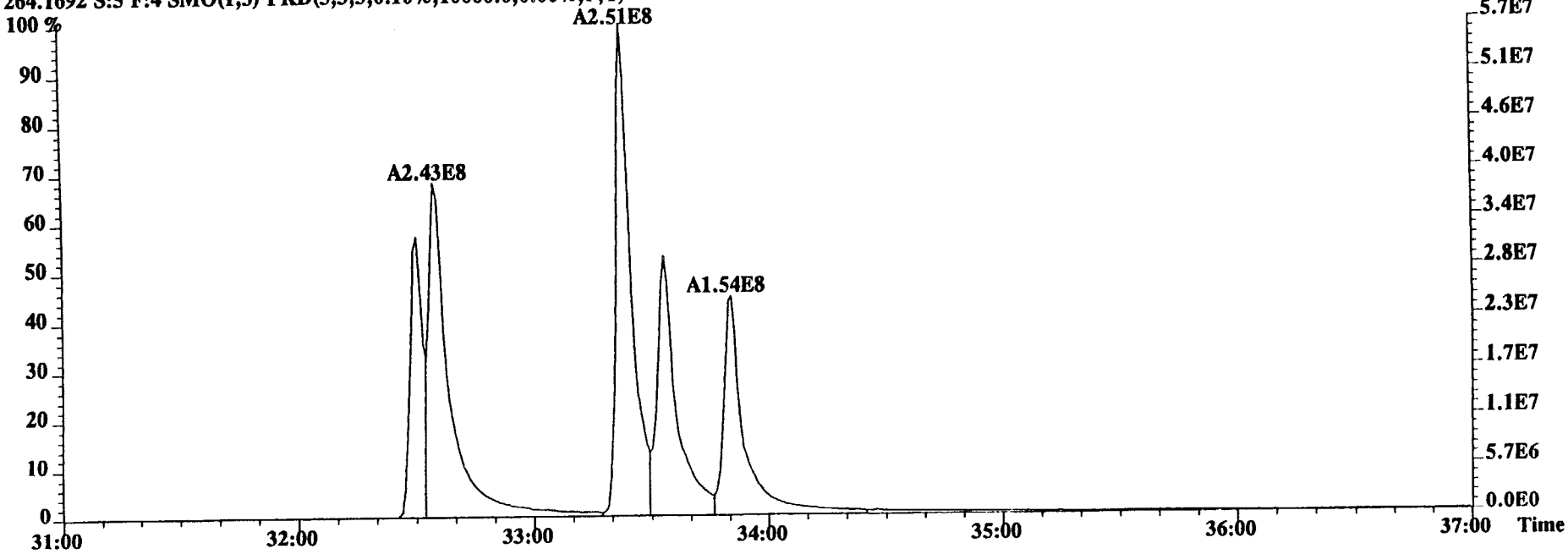
File:29OC98V4 #1-939 Acq:29-OCT-1998 18:43:24 GC EI+ Voltage SIR 70SE
Sample#5 Text:ST1029D :CS-5 :265-04E : Exp:PAHAIR
230.9856 S:5 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



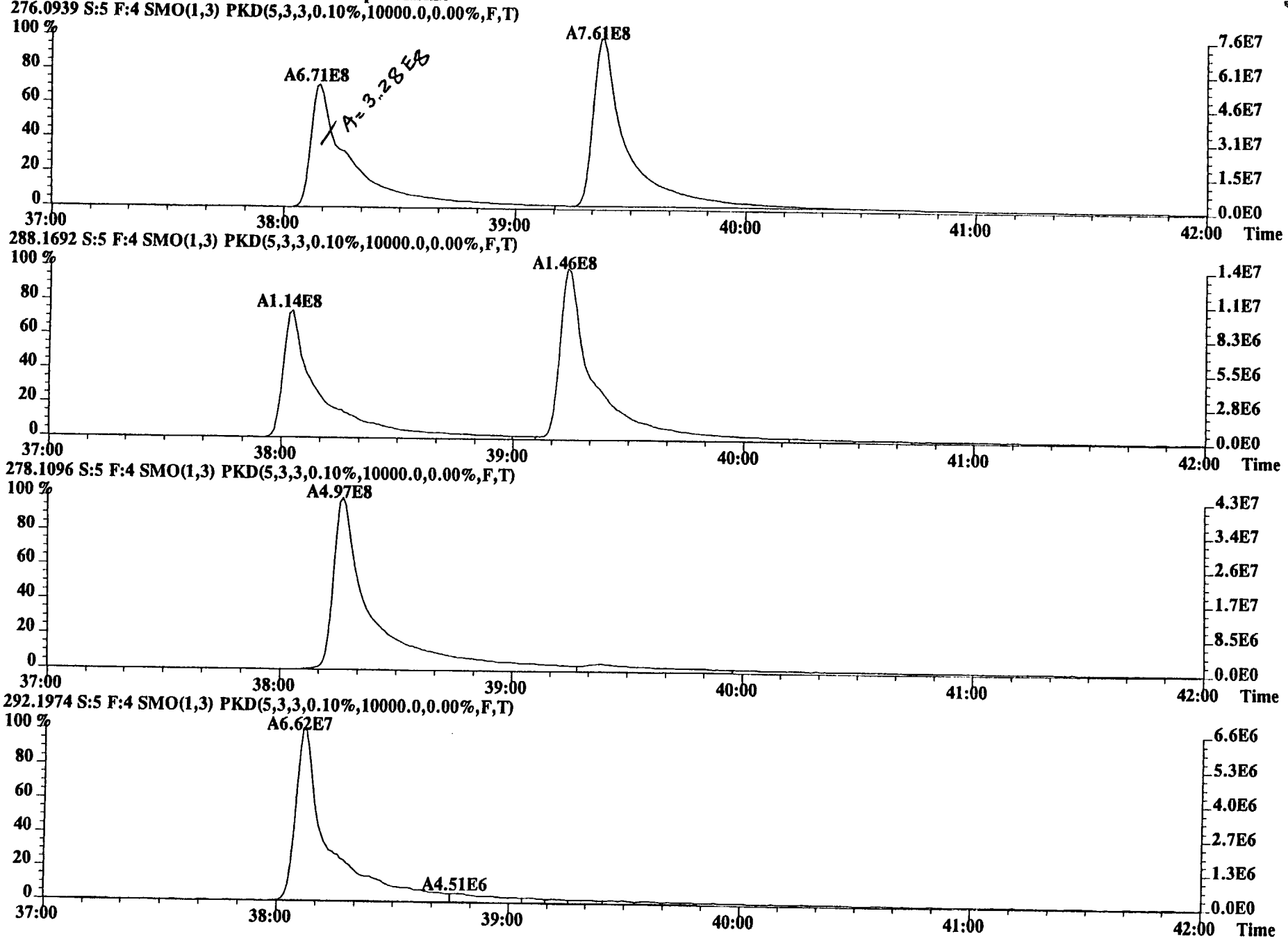
File:29OC98V4 #1-878 Acq:29-OCT-1998 18:43:24 GC EI+ Voltage SIR 70SE
Sample#5 Text:ST1029D :CS-5 :265-04E : Exp:PAHAIR
252.0939 S:5 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



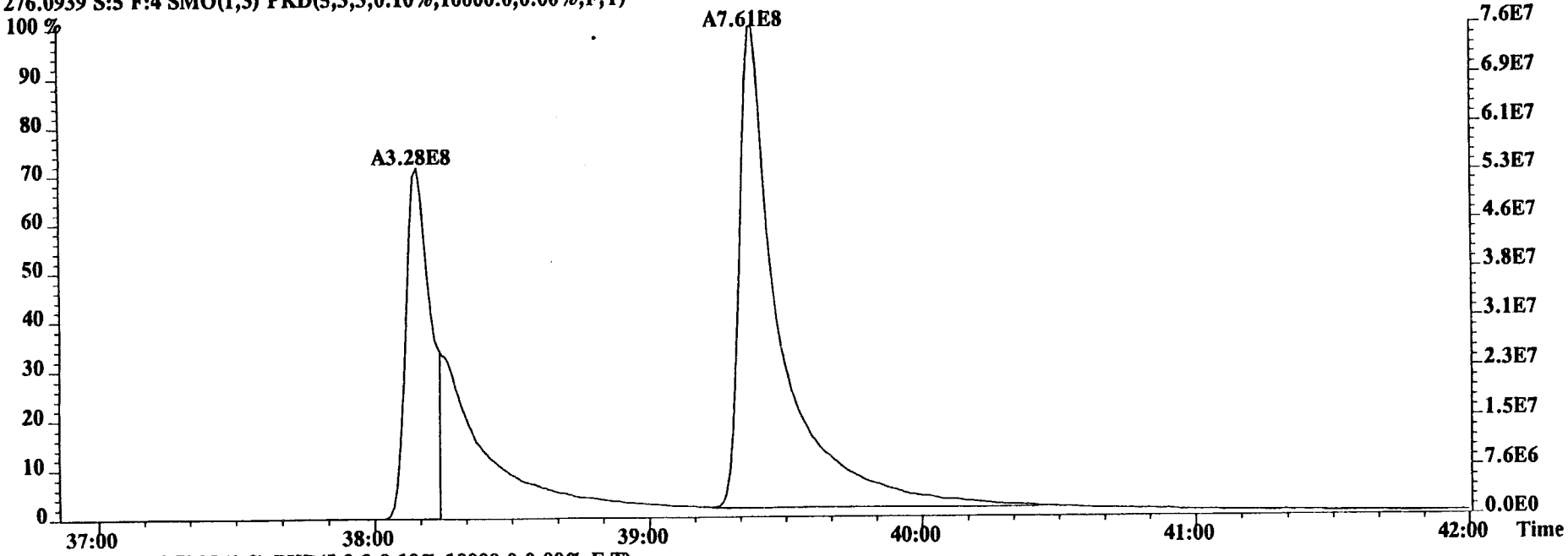
264.1692 S:5 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



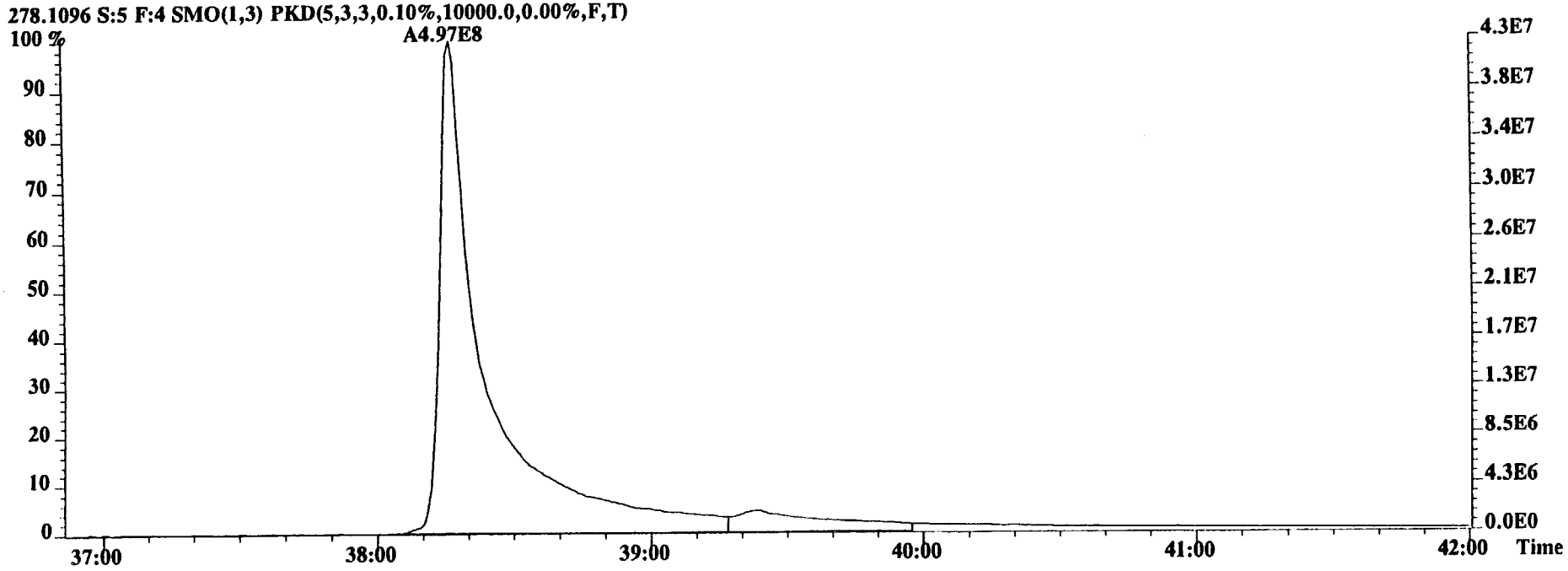
File:29OC98V4 #1-878 Acq:29-OCT-1998 18:43:24 GC EI+ Voltage SIR 70SE
Sample#5 Text:ST1029D :CS-5 :265-04E : Exp:PAHAIR



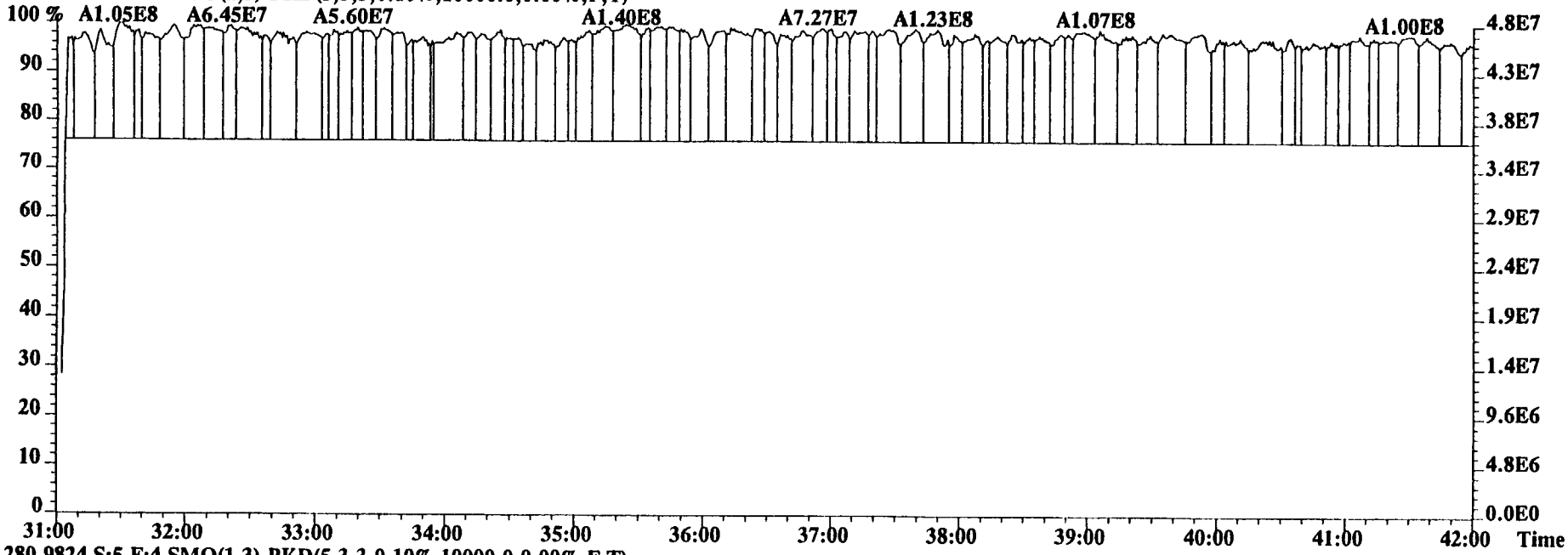
File:29OC98V4 #1-878 Acq:29-OCT-1998 18:43:24 GC EI+ Voltage SIR 70SE
Sample#5 Text:ST1029D :CS-5 :265-04E : Exp:PAHAIR
276.0939 S:5 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



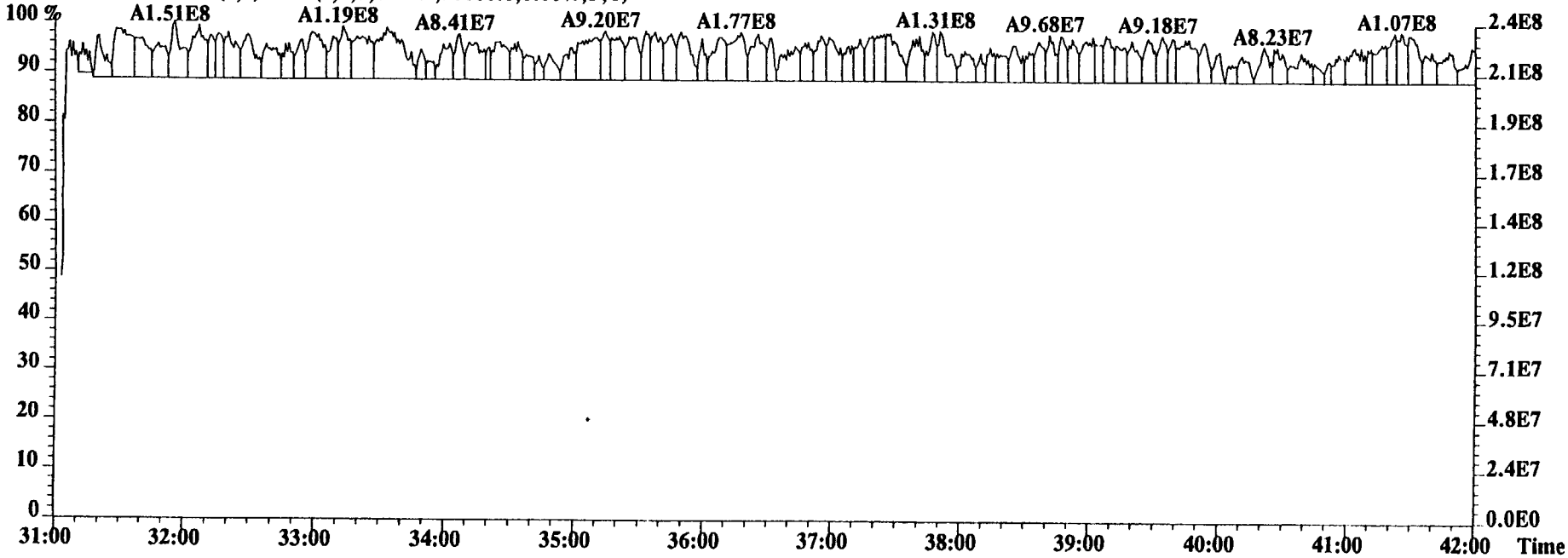
278.1096 S:5 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



File:29OC98V4 #1-878 Acq:29-OCT-1998 18:43:24 GC EI+ Voltage SIR 70SE
Sample#5 Text:ST1029D :CS-5 :265-04E : Exp:PAHAIR
268.9824 S:5 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



280.9824 S:5 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



Continuing Calibration

QUANTERRA INCORPORATED
West Sacramento

Daily Standard Checklist
Dioxin/Furan High Res

STD ID ST1029E **Method ID** 429-Air **Column ID** DB-5 **Instr ID** VG-4

Standard Solution 956-64 **Prepared By** SMA **Prepared Date** 11-02-98

Analyzed By SMA/AM **Date Analyzed** 10-29-98

Reviewed By Jeri Stone **Date Reviewed** 11-3-98

ANALYSIS OF DAILY STANDARD	INITIATED	REVIEWED
Standard, CPSM, and solvent blank present?	✓/NA	✓/NA
Copy of Instrument logfile present?	✓	✓
CPSM blow up and peak profile present?	NA/✓	NA/✓
Curve summary present?	✓	✓
Summary of 1613A criteria present?	NA	NA
Daily standard within method specified limits*?	*	①
Daily ion abundance ratios within limits?	NA	NA
CPSM valley < 25%?	NA	NA
~~CPSM~~ window correct? JS 11/3/98	✓	✓
Samples analyzed within 12 hrs of daily standard?	✓	✓

COMMENTS:

① The RRF of d8-Naphthalene is high However, some of the associated samples are saturated with native naphthalene which need dilution and that data can be used. Also those samples which have high d8-Naphthalene IS recovery will be reinjected

No CPSM in PAH's analysis

~~STD has been processed twice - will be used appropriately depending on which RS's are to be used in sample analysis.~~ JS 11/3/98

* For NCASI 551, Control Limit (CL) = +/- 20% from curve RRFs for all analytes.
For Method 8290, CL = +/- 20% from curve RRFs for native analytes, CL = +/- 30% from curve RRFs for labeled compounds.
For Method 1613A, see 3rd Revision to Method 1613 Performance Specifications, Table 7.

02-NOV-1998 08:15:11 AM Dioxin Furan ConCal RESULTS

ass Spec : VG-4
GC Column : DB-5
Data file : 29OC98V4
eight : 1

Results : 29OC98V4071.RES : PAHAIRCAL3.TRG
Date analyzed : 29-OCT-98
ST1029E :CS-3 :956-64 : : Ex

Name	Total Response	Isotope Ratio		R. T. mm:ss		RRF	pg	% Dev
d10-2-Methylnaphthalene	67809400	1.00	Y	12: 29	Y	0.00	100.00	
d8-Naphthalene	226452000	1.00	Y	10: 14	Y	3.34	100.00	49
Naphthalene	283054000	1.00	Y	10: 17	Y	1.25	100.00	2
2-Methylnaphthalene	98533400	1.00	Y	12: 36	Y	0.44	100.00	-22
d8-Acenaphthylene	67166000	1.00	Y	15: 29	Y	0.99	100.00	-18
Acenaphthylene	69855400	1.00	Y	15: 32	Y	1.04	100.00	10
d10-Acenaphthene	35367200	1.00	Y	16: 3	Y	0.52	100.00	-30
Acenaphthene	46600000	1.00	Y	16: 8	Y	1.32	100.00	6
d10-Anthracene	88742800	1.00	Y	20: 56	Y	0.00	100.00	
d10-Fluorene	116294400	1.00	Y	17: 43	Y	1.31	100.00	-8
Fluorene	157910000	1.00	Y	17: 48	Y	1.36	100.00	17
d10-Phenanthrene	240408000	1.00	Y	20: 47	Y	2.71	100.00	-4
Phenanthrene	187689600	1.00	Y	20: 51	Y	0.78	100.00	-13
Anthracene	178902400	1.00	Y	21: 0	Y	0.74	100.00	-7
d14-Terphenyl	157032000	1.00	Y	26: 1	Y	-1.00	100.00	
d10-Fluoranthene	252590000	1.00	Y	24: 37	Y	1.61	100.00	14
Fluoranthene	233216000	1.00	Y	24: 41	Y	0.92	100.00	-17
d10-Pyrene	273298000	1.00	Y	25: 18	Y	1.74	100.00	15
Pyrene	255434000	1.00	Y	25: 22	Y	0.93	100.00	-22
d12-Benzo(a)anthracene	149476600	1.00	Y	29: 9	Y	0.95	100.00	6
Benzo(a)anthracene	180687200	1.00	Y	29: 13	Y	1.21	100.00	0
d12-Chrysene	234240000	1.00	Y	29: 16	Y	1.49	100.00	17
Chrysene	267286000	1.00	Y	29: 21	Y	1.14	100.00	5
d12-Benzo(e)pyrene	478608000	1.00	Y	33: 23	Y	1.00	100.00	
d12-Benzo(b)fluoranthene	211046000	1.00	Y	32: 30	Y	0.44	100.00	-3
Benzo(b)fluoranthene	216280000	1.00	Y	32: 34	Y	1.02	100.00	-12
d12-Benzo(k)fluoranthene	444140000	1.00	Y	32: 35	Y	0.93	100.00	-2
Benzo(k)fluoranthene	459304000	1.00	Y	32: 39	Y	1.03	100.00	-11
d12-Benzo(a)pyrene	313348000	1.00	Y	33: 34	Y	0.65	100.00	-3
Benzo(e)pyrene	441892000	1.00	Y	33: 28	Y	1.41	100.00	-14
Benzo(a)pyrene	299770000	1.00	Y	33: 38	Y	0.96	100.00	-11
d12-Perylene	303216000	1.00	Y	33: 50	Y	0.63	100.00	1
Perylene	473068000	1.00	Y	33: 56	Y	1.56	100.00	-9
d12-Indeno(123-cd)pyrene	209746000	1.00	Y	38: 3	Y	0.44	100.00	-1
Indeno(123-cd)pyrene	133400000	1.00	Y	38: 10	Y	0.64	100.00	2
d14-Dibenz(ah)anthracene	95717400	1.00	Y	38: 7	Y	0.20	100.00	-19
Dibenz(ah)anthracene	174180200	1.00	Y	38: 17	Y	1.82	100.00	30
d12-Benzo(ghi)perylene	257774000	1.00	Y	39: 15	Y	0.54	100.00	-7
Benzo(ghi)perylene	331102000	1.00	Y	39: 23	Y	1.28	100.00	26
d10-Fluorene	116294400	1.00	Y	17: 43	Y	0.24	100.00	
13C-Fluorene	94089400	1.00	Y	17: 48	Y	0.81	100.00	

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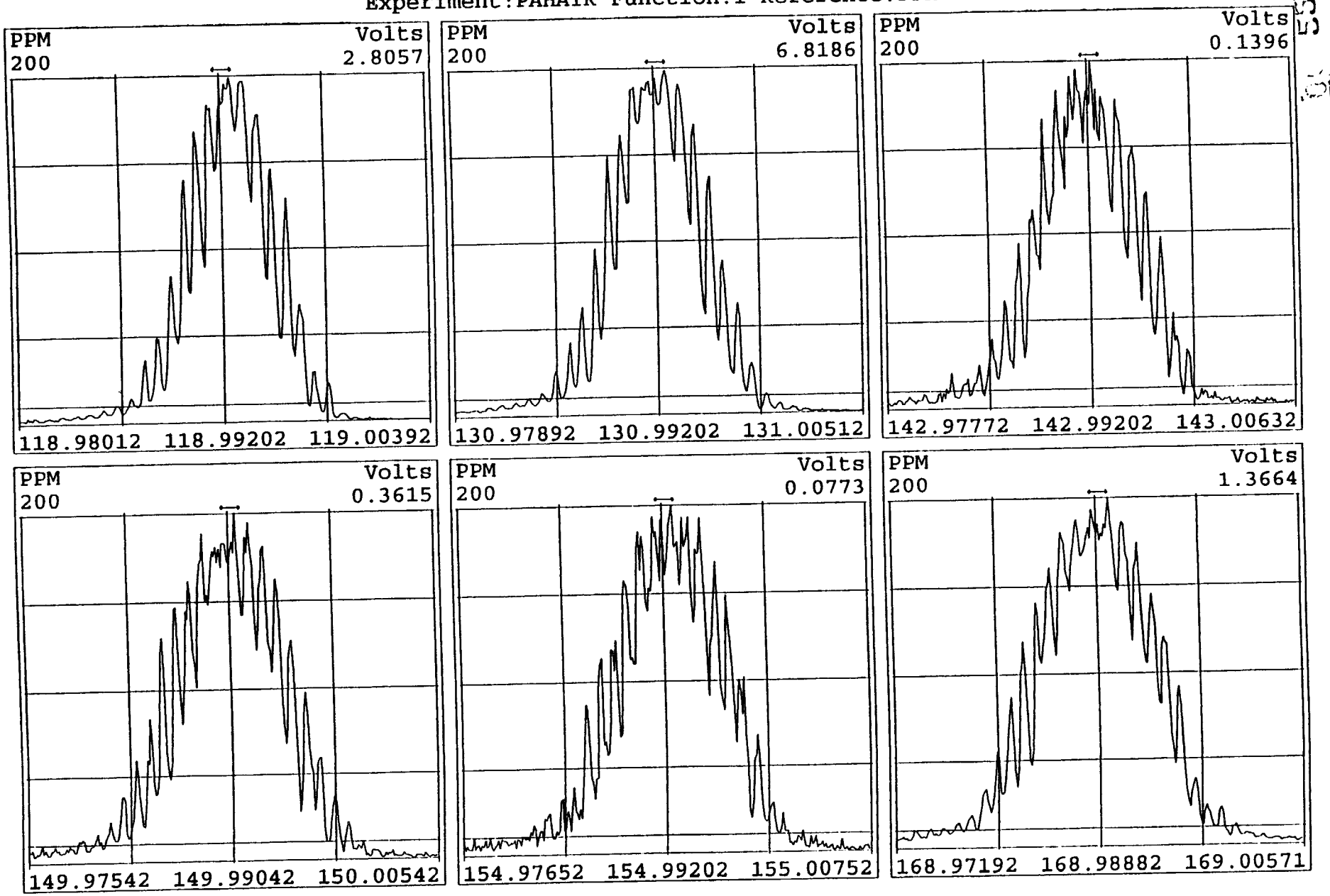
FILE	SAMP No. (1)	LAB. SAMP No	CUSTOMER ID	CLEAN UP 1 (SDS)	CLEAN UP 2 (D2)	TYPE (1)	CONCn.
290C98V4	1	ST1029	CS-1	265-04A			1
290C98V4	2	ST1029A	CS-2	265-04B			1
290C98V4	3	ST1029B	CS-3	956-64			1
290C98V4	4	ST1029C	CS-4	265-04D			1
290C98V4	5	ST1029D	CS-5	265-04E			1
290C98V4	6	SB1029A	Solvent Blank	C-8			1
290C98V4	7	ST1029E	CS-3	956-64			1
290C98V4	8	SB1029B	Solvent Blank	C-8			1
290C98V4	9	302050-1MB	METHOD BLANK	AIR	PAH	VSE-25	0.333
290C98V4	10	302050-1LC	LCS				0.333
290C98V4	11	302050-1BA	METHOD BLANK				0.333
290C98V4	12	302050-1LA	LCS				0.333
290C98V4	13	302050-2	CLXTP				0.333
290C98V4	14	302050-4	CLXTR				0.333
290C98V4	15	302050-6	CLXTW				0.333
290C98V4	16	302050-8	CLXVO				0.333
290C98V4	17	302050-1	CLXTM				0.333
290C98V4	18	302050-3	CLXTQ				0.333
290C98V4	19	302050-5	CLXTV				0.333
290C98V4	20	302050-7	CLXTX				0.333
290C98V4	21	301802-1	10X DIL.	AIR	PAH	VSE-26	0.50
290C98V4	22	301802-2	10X DIL.				0.50
290C98V4	23	301802-3	10X DIL.				0.50
290C98V4	24	SB1029C	Solvent Blank	C-8			1
290C98V4	25	ST1029F	CS-3	956-64			1
290C98V4	26	SB1029D	Solvent Blank	C-8			1
290C98V4	27	301802-1MB	METHOD BLANK	AIR	PAH	VSE-26	0.50
290C98V4	28	301802-1LC	LCS				0.50
290C98V4	29	301802-4	10X DIL.				0.50
290C98V4	30	301802-5	10X DIL.				0.50
290C98V4	31	301802-6	10X DIL.				0.50
290C98V4	32	301802-7	10X DIL.				0.50
290C98V4	33	301802-8	10X DIL.				0.50
290C98V4	34	301802-9	10X DIL.				0.50
290C98V4	35	301802-10	10X DIL.				0.50
290C98V4	36	301802-11	10X DIL.				0.50
290C98V4	37	301802-12	10X DIL.				0.50
290C98V4	38	301802-13	10X DIL.				0.50
290C98V4	39	301802-14	10X DIL.				0.50
290C98V4	40	SB1029E	Solvent Blank	C-8			1
290C98V4	41						
290C98V4	42						
290C98V4	43						
290C98V4	44						
290C98V4	45						
290C98V4	46		SMA, AM 10-29-98				
290C98V4	47						
290C98V4	48						
290C98V4	49						
290C98V4	50						

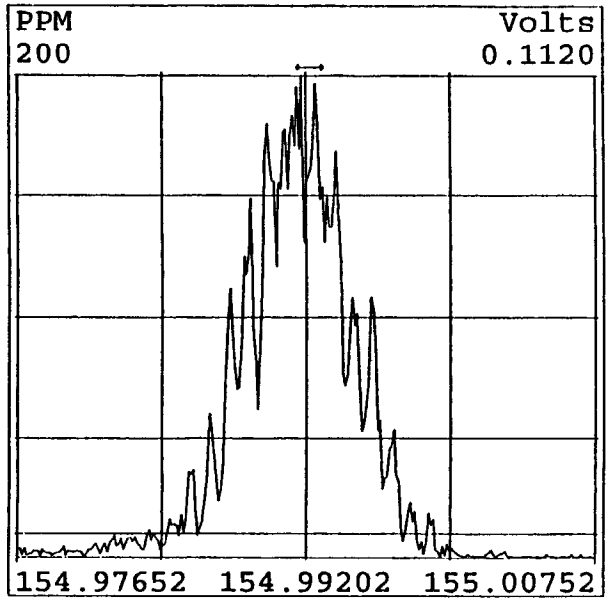
45

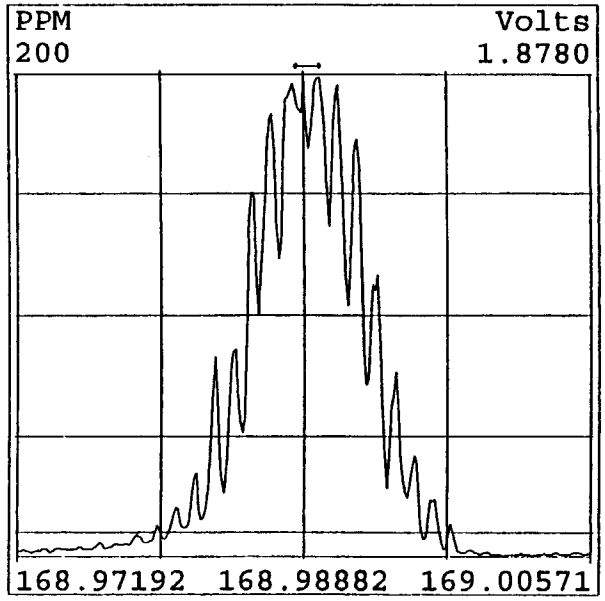
557 SMA 10-30-

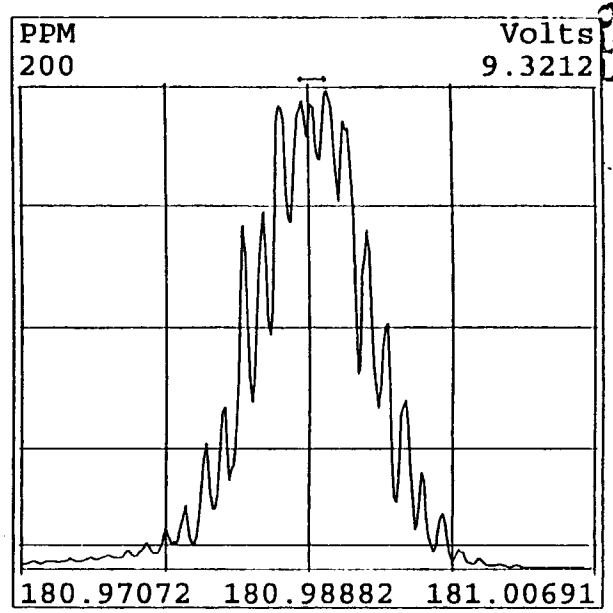
Peak Locate Examination:29-OCT-1998:15:23 File:29OC98V4
Experiment:PAHAIR Function:1 Reference:PFK

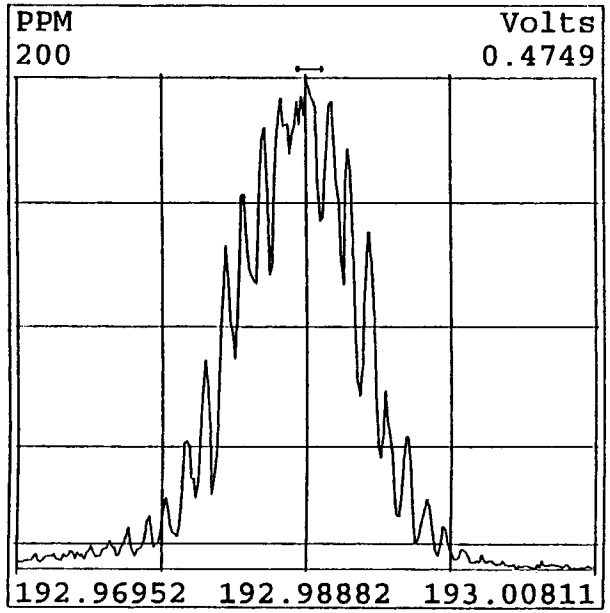


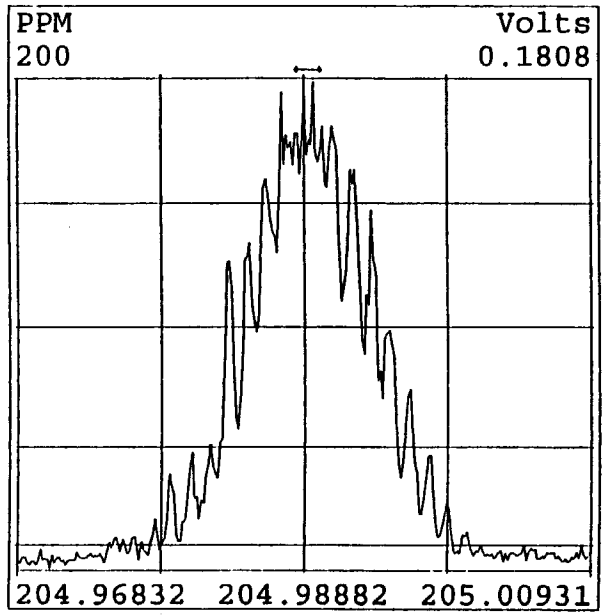
Peak Locate Examination:29-OCT-1998:15:23 File:29OC98V4
Experiment:PAHAIR Function:2 Reference:PFK



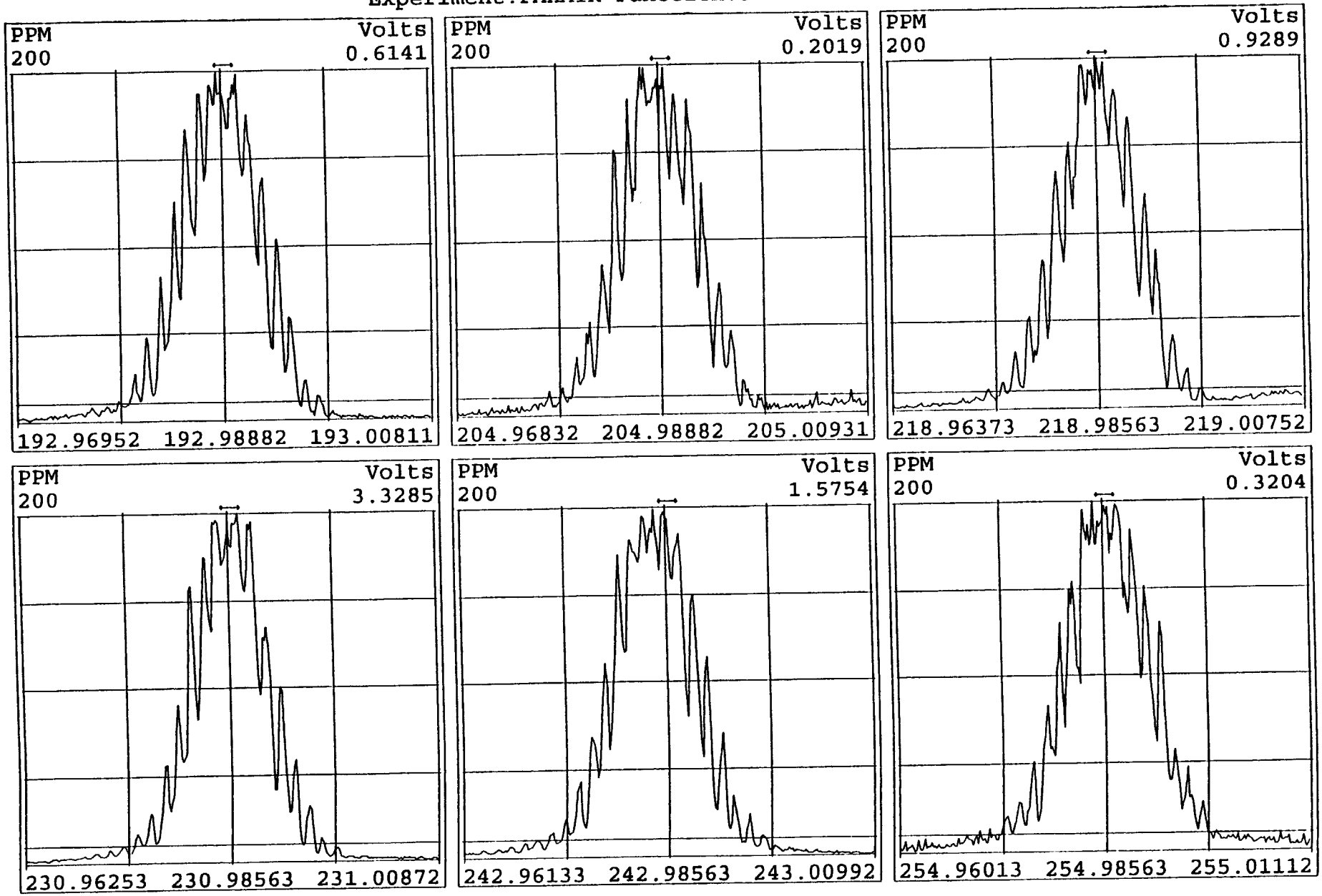




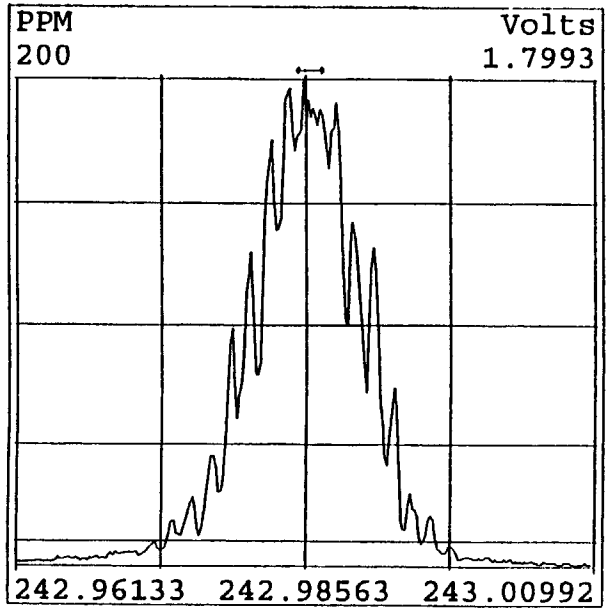


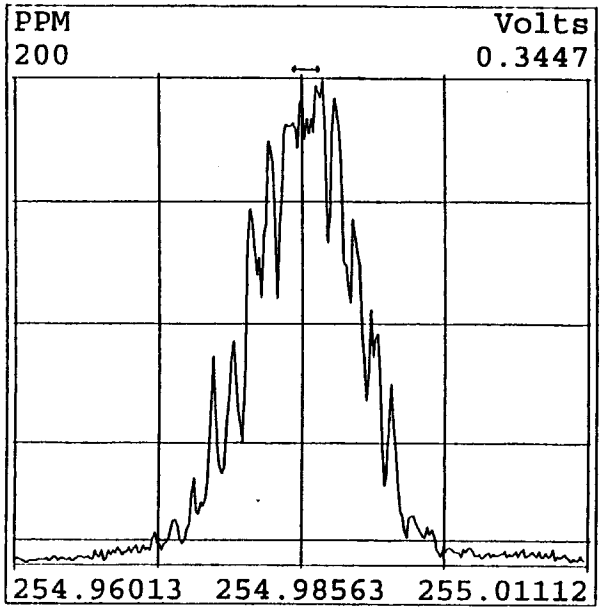


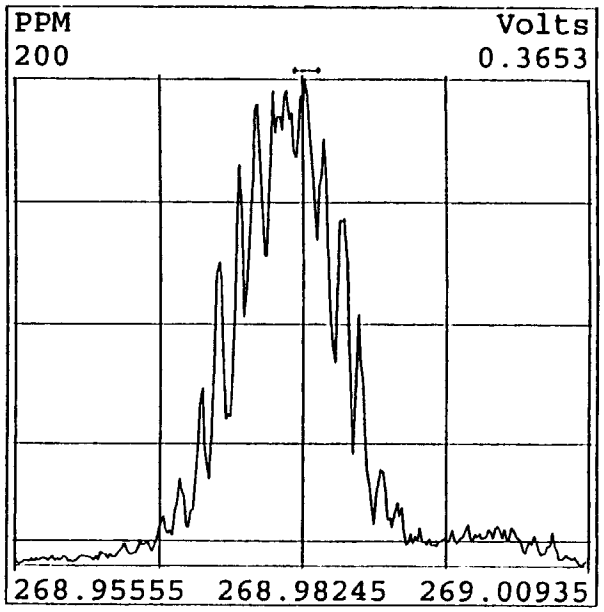
Peak Locate Examination:29-OCT-1998:15:24 File:29OC98V4
Experiment:PAHAIR Function:3 Reference:PFK

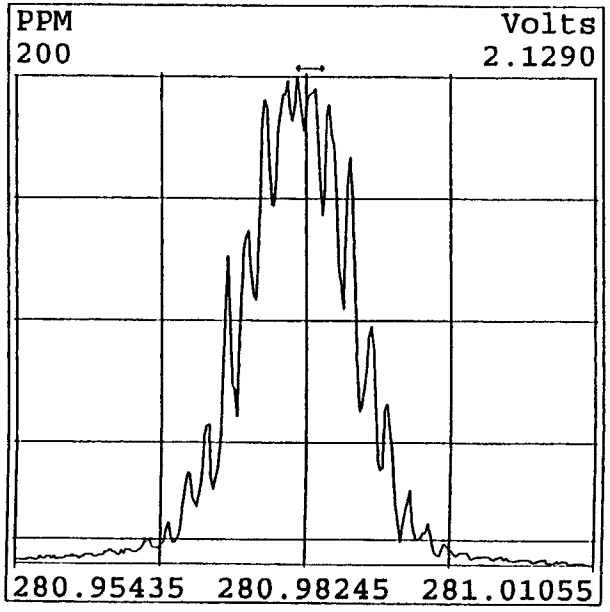


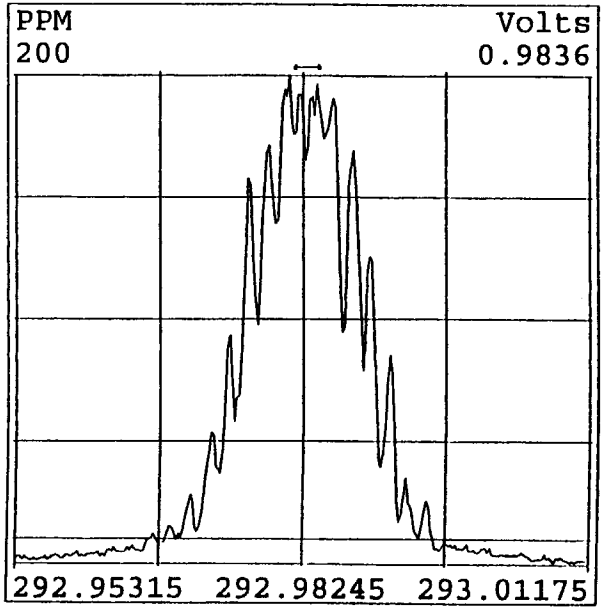
Peak Locate Examination:29-OCT-1998:15:26 File:29OC98V4
Experiment:PAHAIR Function:4 Reference:PFK











02-NOV-1998 08:06:49 AM

Mass Spec : VG-4
GC Column : DB-5
265-04A,B,D,E,956-64

Mult.: 350

Dioxin Furan CALIBRATION TABLE

File name : PAHAIR102998V4.RRF
Date analyzed : 29-OCT-98

INITIAL CALIBRATION CURVE

		Mean	S.D.	%RSD	1	2	3	4	5	6	7	8	9	10
d8-Naphthalene	Amount				100.00	100.00	100.00	100.00	100.00					
	RF				185.11	205.87	228.31	244.46	256.61					
	RRF	2.24	0.289	12.900	1.85	2.06	2.28	2.44	2.57					
Naphthalene	Amount				10.00	50.00	100.00	200.00	500.00					
	RF				13.76	61.93	113.47	231.43	609.70					
	RRF	1.23	0.094	7.707	1.38	1.24	1.13	1.16	1.22					
2-Methylnaphthalene	Amount				10.00	50.00	100.00	200.00	500.00					
	RF				6.91	29.85	51.39	97.93	255.67					
	RRF	0.56	0.084	14.909	0.69	0.60	0.51	0.49	0.51					
d8-Acenaphthylene	Amount				100.00	100.00	100.00	100.00	100.00					
	RF				131.95	128.38	114.60	122.45	109.50					
	RRF	1.21	0.093	7.696	1.32	1.28	1.15	1.22	1.10					
Acenaphthylene	Amount				10.00	50.00	100.00	200.00	500.00					
	RF				9.55	48.30	90.68	178.19	500.84					
	RRF	0.94	0.045	4.773	0.95	0.97	0.91	0.89	1.00					
d10-Acenaphthene	Amount				100.00	100.00	100.00	100.00	100.00					
	RF				83.11	77.72	76.15	77.96	57.36					
	RRF	0.74	0.099	13.310	0.83	0.78	0.76	0.78	0.57					
Acenaphthene	Amount				10.00	50.00	100.00	200.00	500.00					
	RF				10.98	62.63	151.76	215.88	641.50					
	RRF	1.25	0.177	14.178	1.10	1.25	1.52	1.08	1.28					
d10-Fluorene	Amount				100.00	100.00	100.00	100.00	100.00					
	RF				153.24	135.78	140.61	141.09	139.72					
	RRF	1.42	0.066	4.625	1.53	1.36	1.41	1.41	1.40					
Fluorene	Amount				10.00	50.00	100.00	200.00	500.00					
	RF				8.53	58.18	117.21	249.15	684.13					
	RRF	1.16	0.191	16.420	0.85	1.16	1.17	1.25	1.37					
d10-Phenanthrene	Amount				100.00	100.00	100.00	100.00	100.00					
	RF				308.98	263.63	276.27	272.04	282.87					
	RRF	2.81	0.173	6.145	3.09	2.64	2.76	2.72	2.83					
Phenanthrene	Amount				10.00	50.00	100.00	200.00	500.00					
	RF				9.70	46.13	81.87	168.14	460.23					
	RRF	0.89	0.063	7.028	0.97	0.92	0.82	0.84	0.92					
Anthracene	Amount				10.00	50.00	100.00	200.00	500.00					
	RF				8.13	42.20	77.06	153.96	402.42					
	RRF	0.80	0.031	3.901	0.81	0.84	0.77	0.77	0.80					
d10-Fluoranthene	Amount				100.00	100.00	100.00	100.00	100.00					
	RF				118.94	136.07	145.72	150.34	154.31					
	RRF	1.41	0.141	10.009	1.19	1.36	1.46	1.50	1.54					
Fluoranthene	Amount				10.00	50.00	100.00	200.00	500.00					
	RF				14.14	55.12	99.77	200.49	521.18					
	RRF	1.11	0.174	15.653	1.41	1.10	1.00	1.00	1.04					
d10-Pyrene	Amount				100.00	100.00	100.00	100.00	100.00					
	RF				129.03	143.24	158.81	161.45	166.55					
	RRF	1.52	0.154	10.160	1.29	1.43	1.59	1.61	1.67					
Pyrene	Amount				10.00	50.00	100.00	200.00	500.00					
	RF				16.74	59.11	104.58	204.18	551.22					
	RRF	1.21	0.269	22.353	1.67	1.18	1.05	1.02	1.10					

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Mass Spec : VG-4
GC Column : DB-5
265-04A,B,D,E,956-64

File name : PAHAIR102998V4.RRF
Date analyzed : 29-OCT-98

INITIAL CALIBRATION CURVE

Mult.: 350

		Mean	S.D.	%RSD	1	2	3	4	5	6	7	8	9	10
d12-Benzo(a)anthracene	Amount				100.00	100.00	100.00	100.00	100.00					
	RF				68.20	70.96	127.65	89.95	93.26					
	RRF	0.90	0.238	26.446	0.68	0.71	1.28	0.90	0.93					
Benzo(a)anthracene	Amount				10.00	50.00	100.00	200.00	500.00					
	RF				11.85	64.84	102.61	234.26	671.78					
	RRF	1.20	0.124	10.269	1.18	1.30	1.03	1.17	1.34					
d12-Chrysene	Amount				100.00	100.00	100.00	100.00	100.00					
	RF				109.94	119.85	127.65	136.79	145.35					
	RRF	1.28	0.139	10.855	1.10	1.20	1.28	1.37	1.45					
Chrysene	Amount				10.00	50.00	100.00	200.00	500.00					
	RF				10.44	56.47	102.61	215.75	571.04					
	RRF	1.08	0.051	4.716	1.04	1.13	1.03	1.08	1.14					
d12-Benzo(b)fluoranthene	Amount				100.00	100.00	100.00	100.00	100.00					
	RF				41.05	45.84	49.22	45.10	45.72					
	RRF	0.45	0.029	6.414	0.41	0.46	0.49	0.45	0.46					
Benzo(b)fluoranthene	Amount				10.00	50.00	100.00	200.00	500.00					
	RF				12.56	61.73	95.82	228.66	622.27					
	RRF	1.17	0.125	10.717	1.26	1.23	0.96	1.14	1.24					
d12-Benzo(k)fluoranthene	Amount				100.00	100.00	100.00	100.00	100.00					
	RF				91.66	94.95	96.52	94.09	96.82					
	RRF	0.95	0.021	2.203	0.92	0.95	0.97	0.94	0.97					
Benzo(k)fluoranthene	Amount				10.00	50.00	100.00	200.00	500.00					
	RF				12.71	63.16	119.14	210.18	522.11					
	RRF	1.16	0.111	9.525	1.27	1.26	1.19	1.05	1.04					
d12-Benzo(a)pyrene	Amount				100.00	100.00	100.00	100.00	100.00					
	RF				65.24	66.86	69.56	67.87	68.82					
	RRF	0.68	0.017	2.504	0.65	0.67	0.70	0.68	0.69					
Benzo(e)pyrene	Amount				10.00	50.00	100.00	200.00	500.00					
	RF				18.05	89.03	157.16	302.58	767.23					
	RRF	1.64	0.140	8.557	1.80	1.78	1.57	1.51	1.53					
Benzo(a)pyrene	Amount				10.00	50.00	100.00	200.00	500.00					
	RF				11.71	60.46	102.44	200.46	476.32					
	RRF	1.07	0.112	10.437	1.17	1.21	1.02	1.00	0.95					
d12-Perylene	Amount				100.00	100.00	100.00	100.00	100.00					
	RF				64.89	58.55	68.21	62.00	61.45					
	RRF	0.63	0.037	5.829	0.65	0.59	0.68	0.62	0.61					
Perylene	Amount				10.00	50.00	100.00	200.00	500.00					
	RF				16.93	98.08	162.24	324.02	835.41					
	RRF	1.71	0.142	8.297	1.69	1.96	1.62	1.62	1.67					
d12-Indeno(123-cd)pyrene	Amount				100.00	100.00	100.00	100.00	100.00					
	RF				44.86	44.54	44.08	43.39	45.40					
	RRF	0.44	0.008	1.722	0.45	0.45	0.44	0.43	0.45					
Indeno(123-cd)pyrene	Amount				10.00	50.00	100.00	200.00	500.00					
	RF				5.85	35.13	60.26	127.89	287.53					
	RRF	0.62	0.052	8.352	0.59	0.70	0.60	0.64	0.58					
d14-Dibenz(ah)anthracene	Amount				100.00	100.00	100.00	100.00	100.00					
	RF				20.73	24.39	25.35	26.10	26.33					
	RRF	0.25	0.023	9.286	0.21	0.24	0.25	0.26	0.26					

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Mass Spec : VG-4
GC Column : DB-5
265-04A,B,D,E,956-64

Mult.: 350

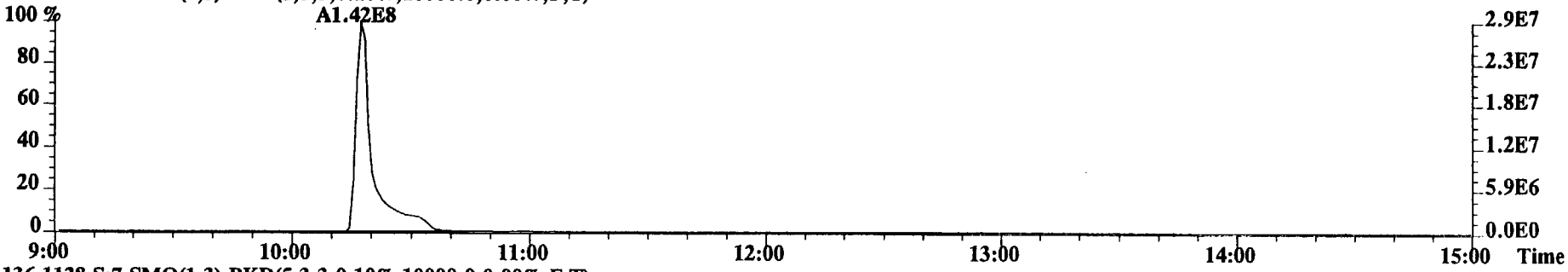
Dioxin Furan CALIBRATION TABLE

File name : PAHAIR102998V4.RRF
Date analyzed : 29-OCT-98

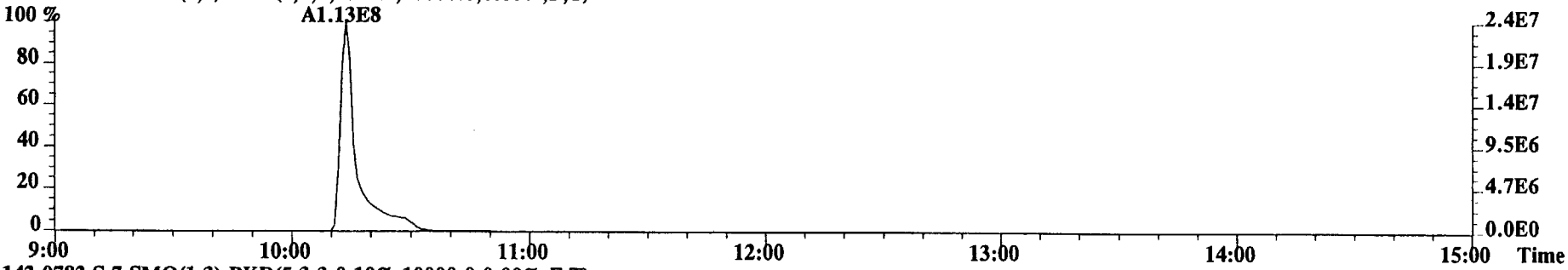
INITIAL CALIBRATION CURVE

		Mean	S.D.	%RSD	1	2	3	4	5	6	7	8	9	10
Dibenz(ah)anthracene	Amount				10.00	50.00	100.00	200.00	500.00					
	RF				12.92	69.25	143.15	281.33	751.34					
	RRF	1.40	0.077	5.452	1.29	1.38	1.43	1.41	1.50					
d12-Benzo(ghi)perylene	Amount				100.00	100.00	100.00	100.00	100.00					
	RF				59.24	54.17	59.73	58.78	57.94					
	RRF	0.58	0.022	3.838	0.59	0.54	0.60	0.59	0.58					
Benzo(ghi)perylene	Amount				10.00	50.00	100.00	200.00	500.00					
	RF				8.58	51.44	109.18	211.25	522.58					
	RRF	1.02	0.091	8.984	0.86	1.03	1.09	1.06	1.05					
	Amount													
	RF				0	0	0	0	0					
	RRF	0	0	0										

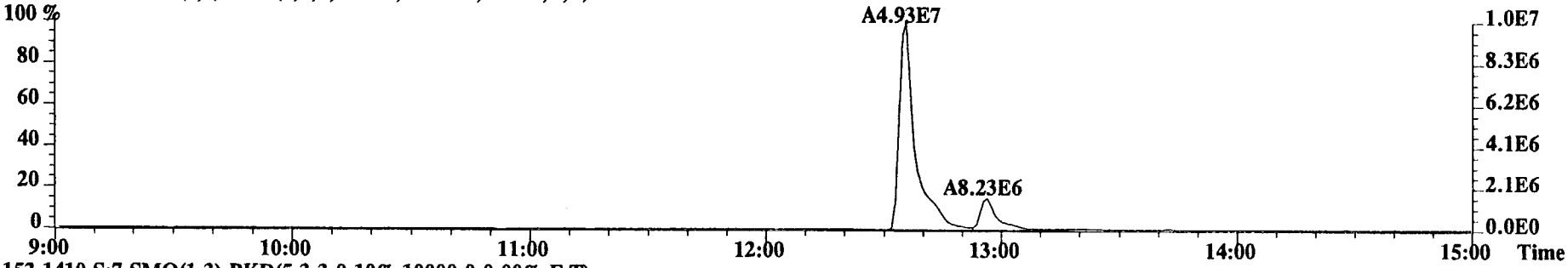
File:29OC98V4 #1-510 Acq:29-OCT-1998 20:21:30 GC EI+ Voltage SIR 70SE
Sample#7 Text:ST1029E :CS-3 :956-64 : : Exp:PAHAIR
128.0626 S:7 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



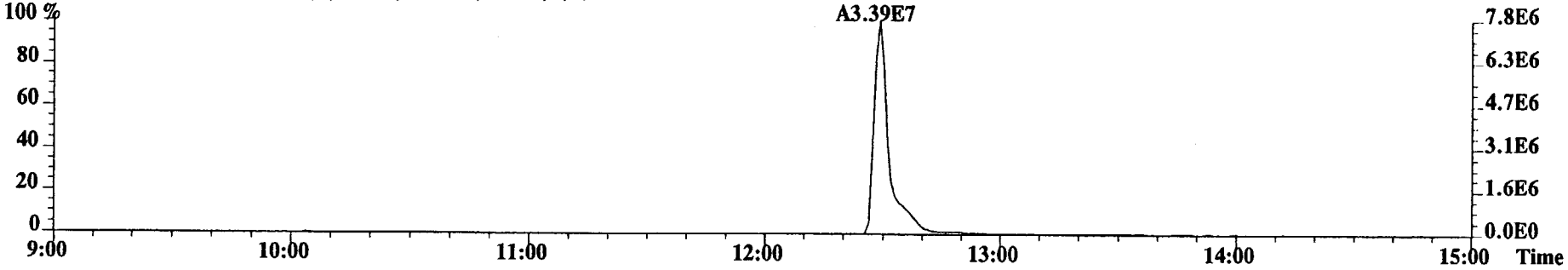
136.1128 S:7 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



142.0782 S:7 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

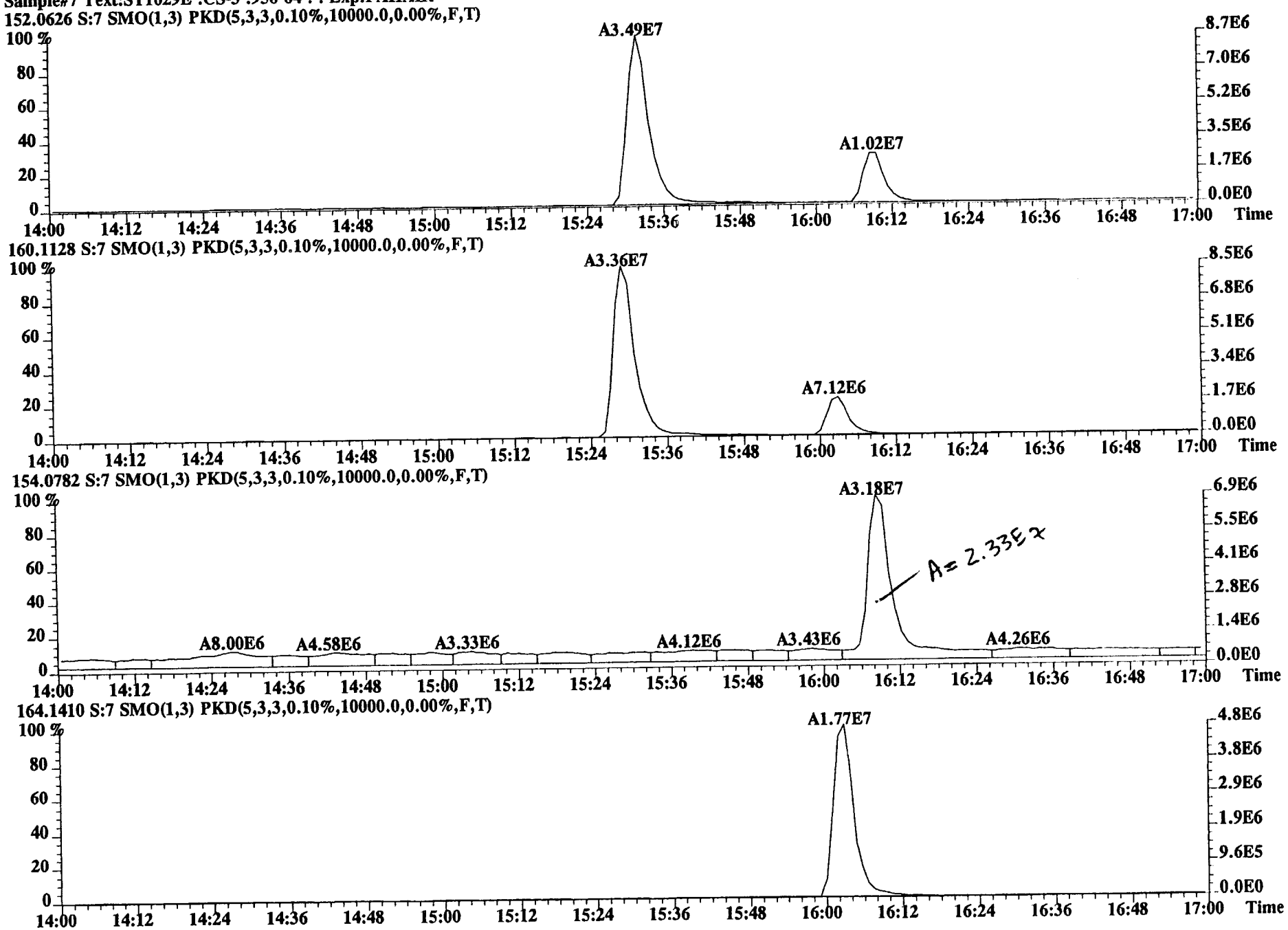


152.1410 S:7 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

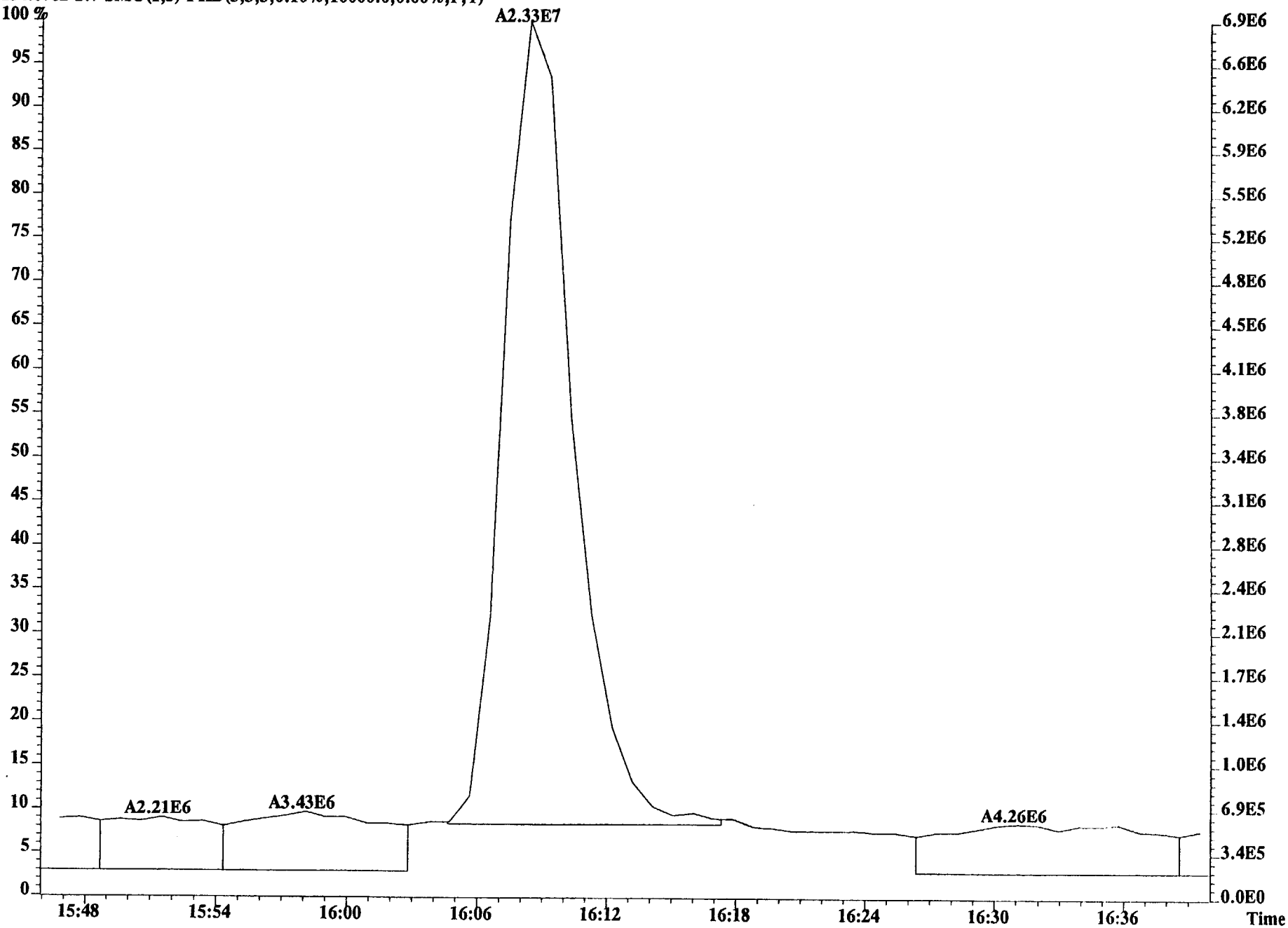


565

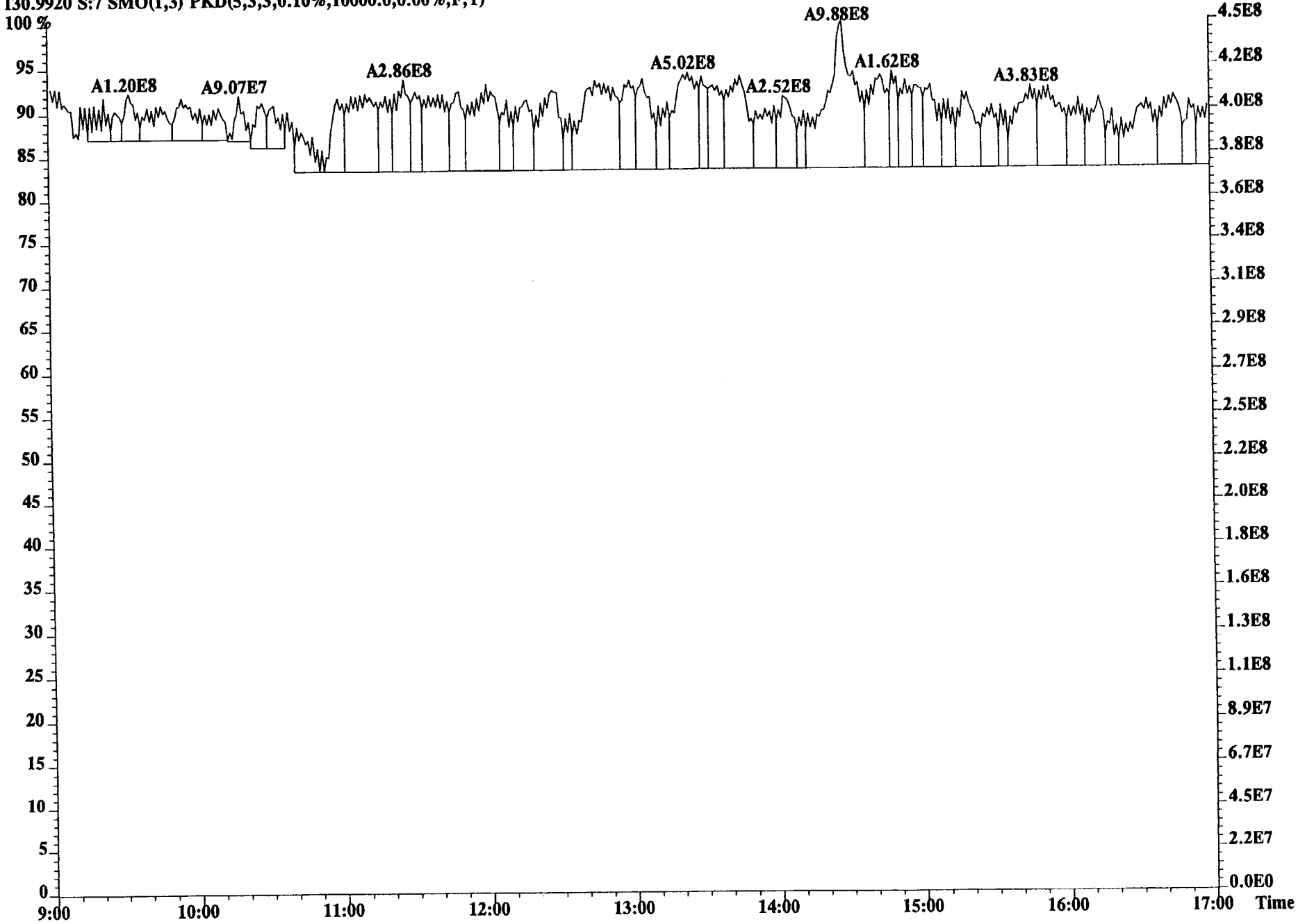
File:29OC98V4 #1-510 Acq:29-OCT-1998 20:21:30 GC EI+ Voltage SIR 70SE
Sample#7 Text:ST1029E :CS-3 :956-64 : : Exp:PAHAIR



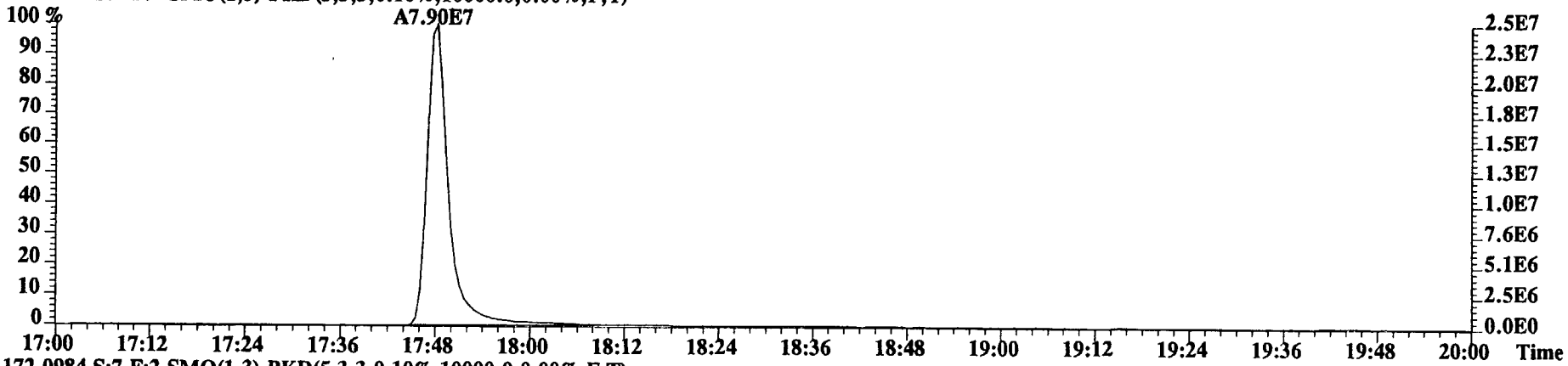
File:29OC98V4 #1-510 Acq:29-OCT-1998 20:21:30 GC EI+ Voltage SIR 70SE
Sample#7 Text:ST1029E :CS-3 :956-64 : : Exp:PAHAIR
154.0782 S:7 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



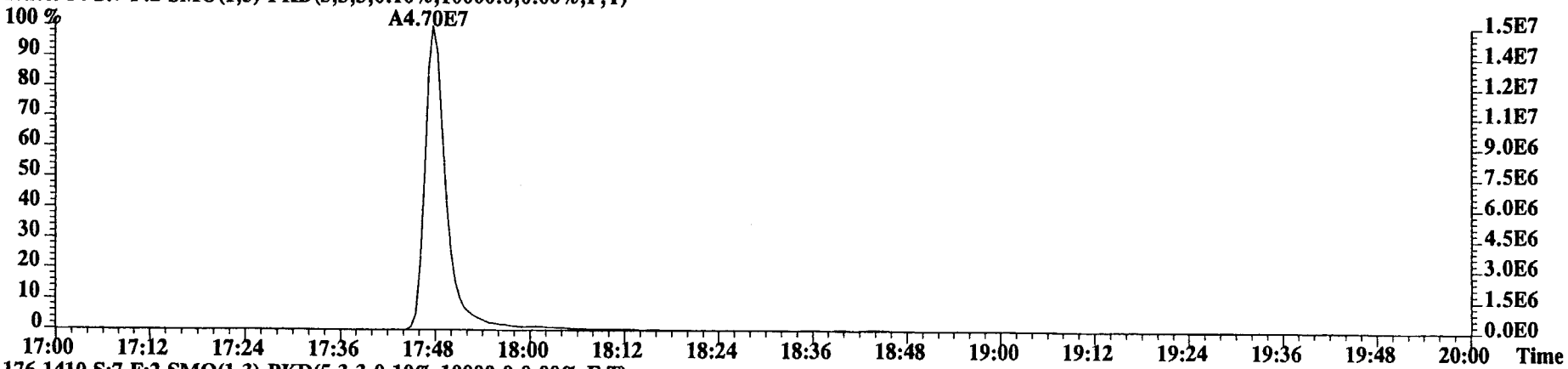
File:29OC98V4 #1-510 Acq:29-OCT-1998 20:21:30 GC EI+ Voltage SIR 70SE
Sample#7 Text:ST1029E :CS-3 :956-64 : : Exp:PAHAIR
130.9920 S:7 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



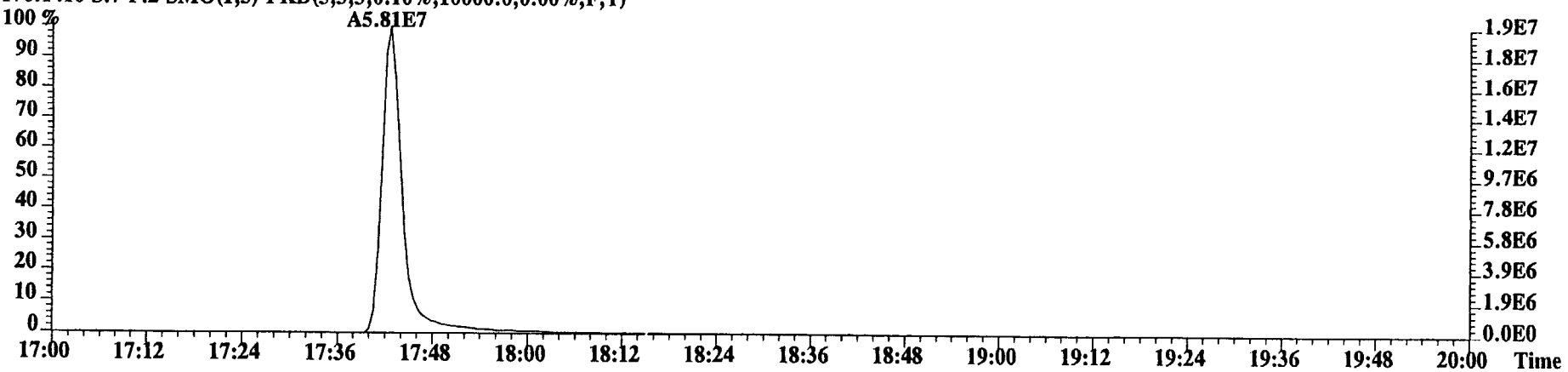
File:29OC98V4 #1-641 Acq:29-OCT-1998 20:21:30 GC EI+ Voltage SIR 70SE
Sample#7 Text:ST1029E :CS-3 :956-64 : : Exp:PAHAIR
166.0798 S:7 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



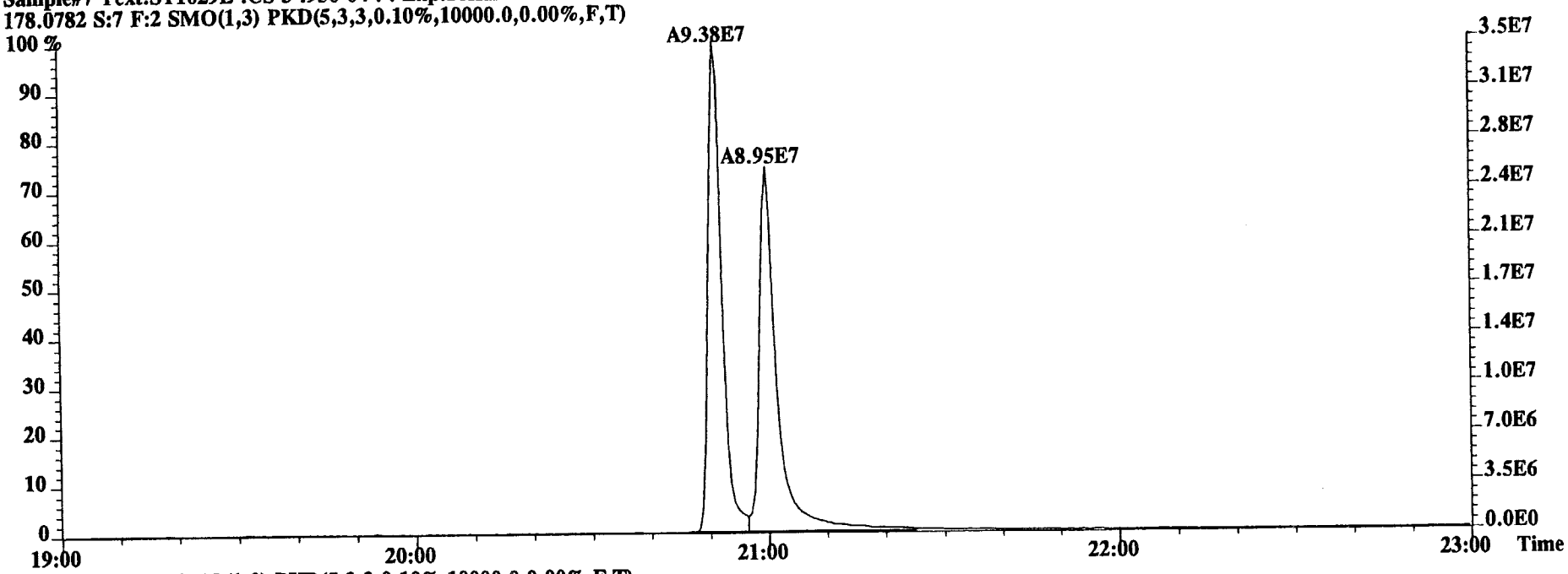
172.0984 S:7 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



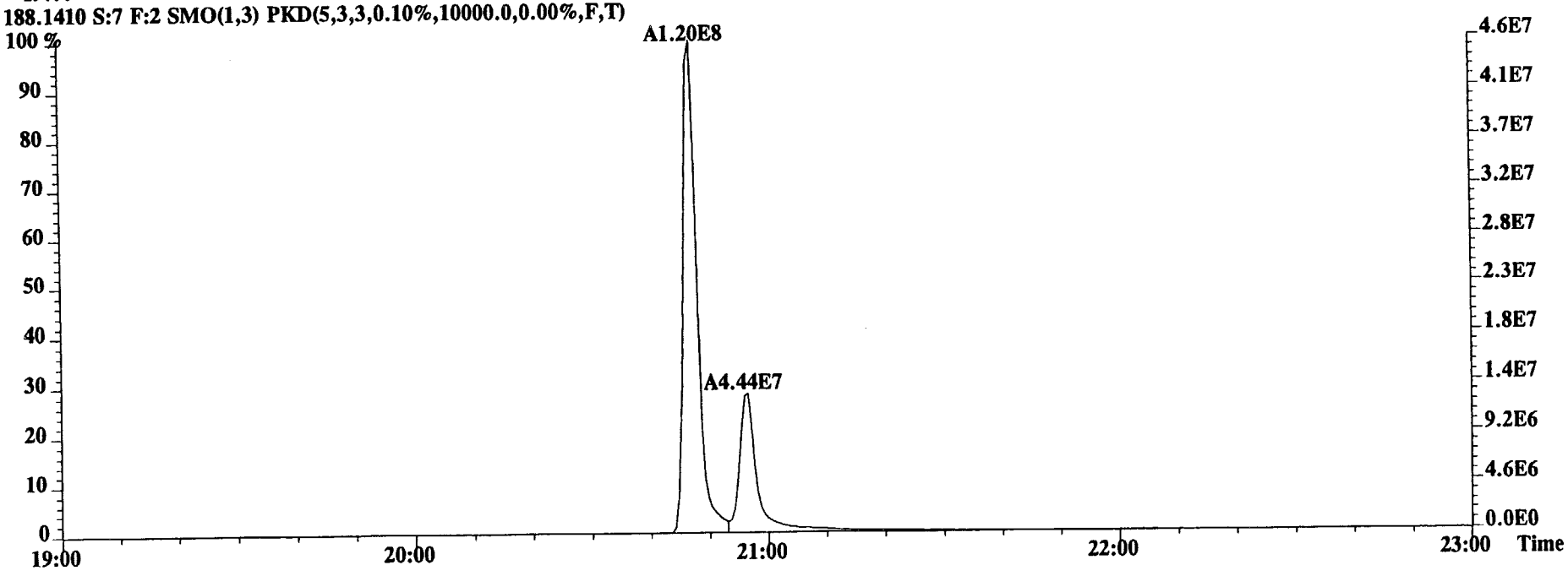
176.1410 S:7 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



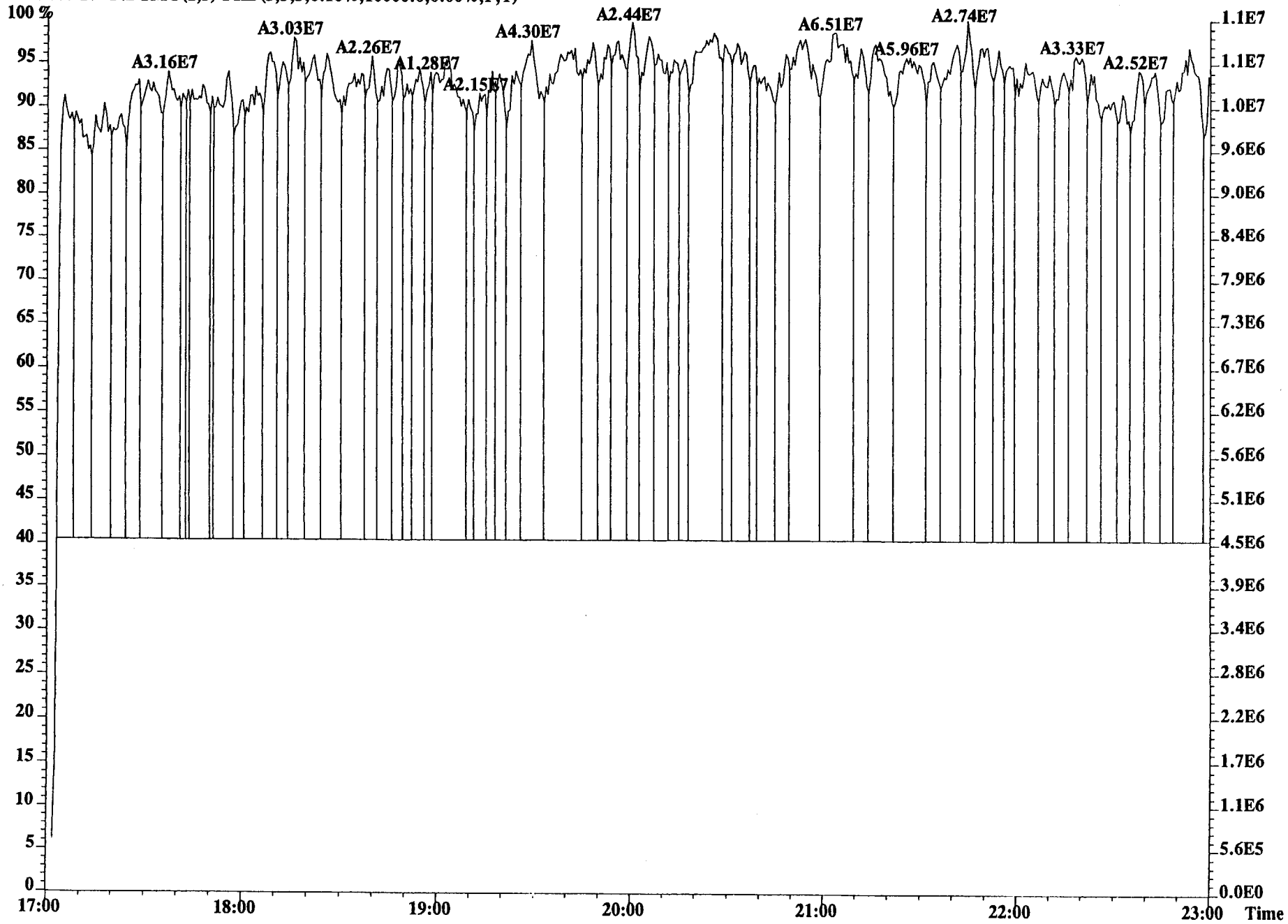
File:29OC98V4 #1-641 Acq:29-OCT-1998 20:21:30 GC EI+ Voltage SIR 70SE
Sample#7 Text:ST1029E :CS-3 :956-64 : : Exp:PAHAIR
178.0782 S:7 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



188.1410 S:7 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

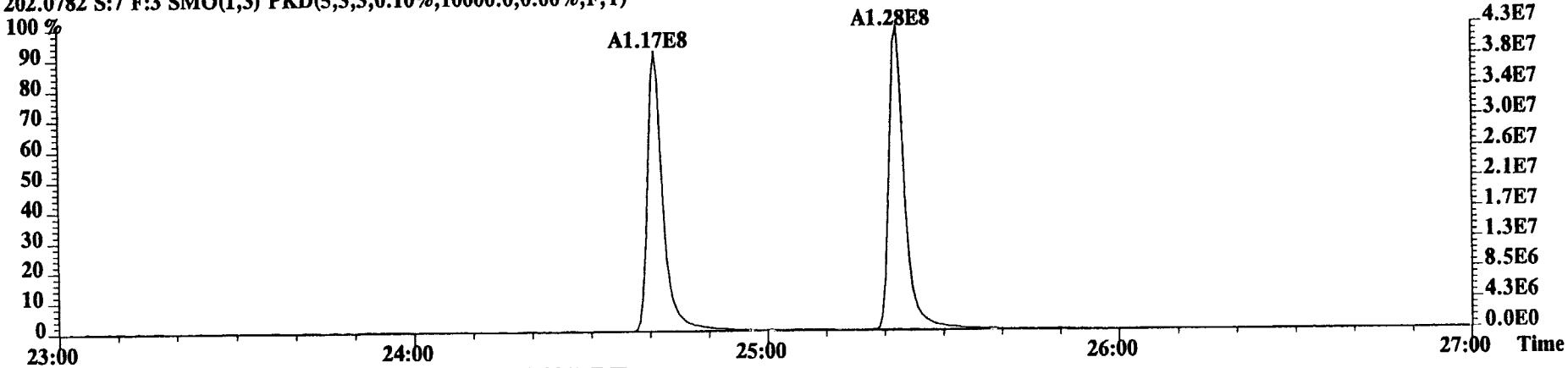


File:29OC98V4 #1-641 Acq:29-OCT-1998 20:21:30 GC EI+ Voltage SIR 70SE
Sample#7 Text:ST1029E :CS-3 :956-64 : : Exp:PAHAIR
204.9888 S:7 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

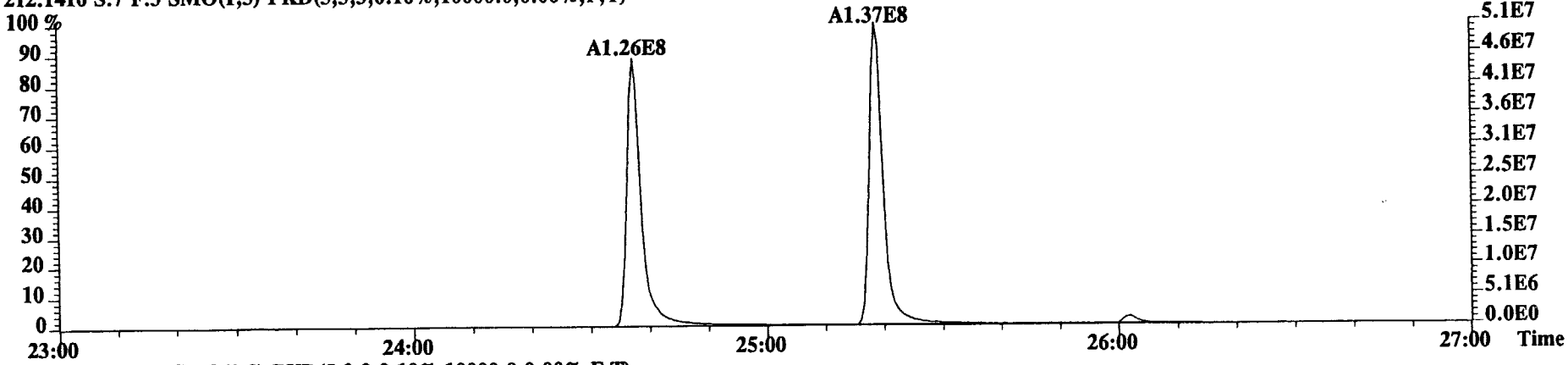


571

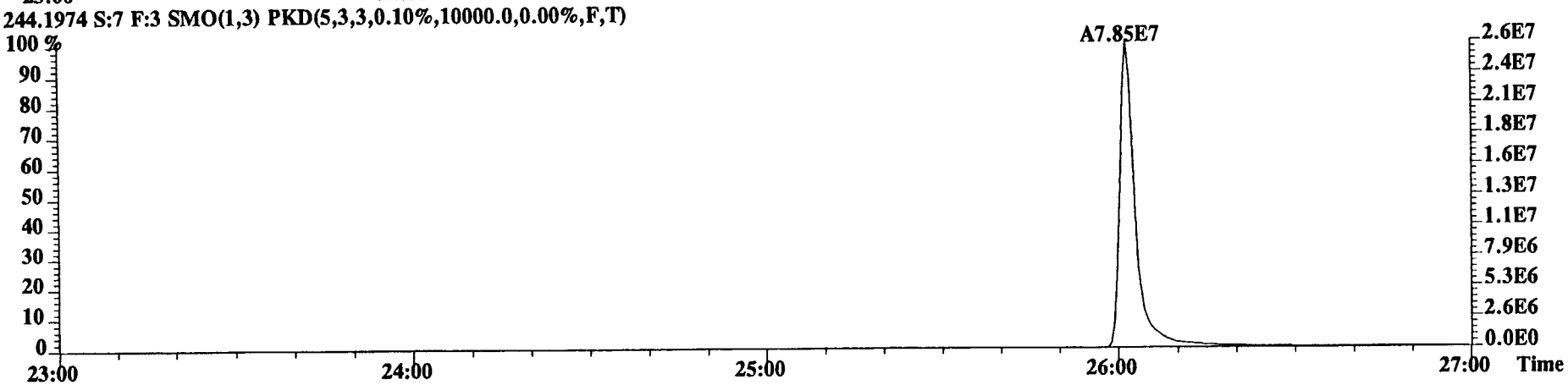
File:29OC98V4 #1-939 Acq:29-OCT-1998 20:21:30 GC EI+ Voltage SIR 70SE
Sample#7 Text:ST1029E :CS-3 :956-64 : : Exp:PAHAIR
202.0782 S:7 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



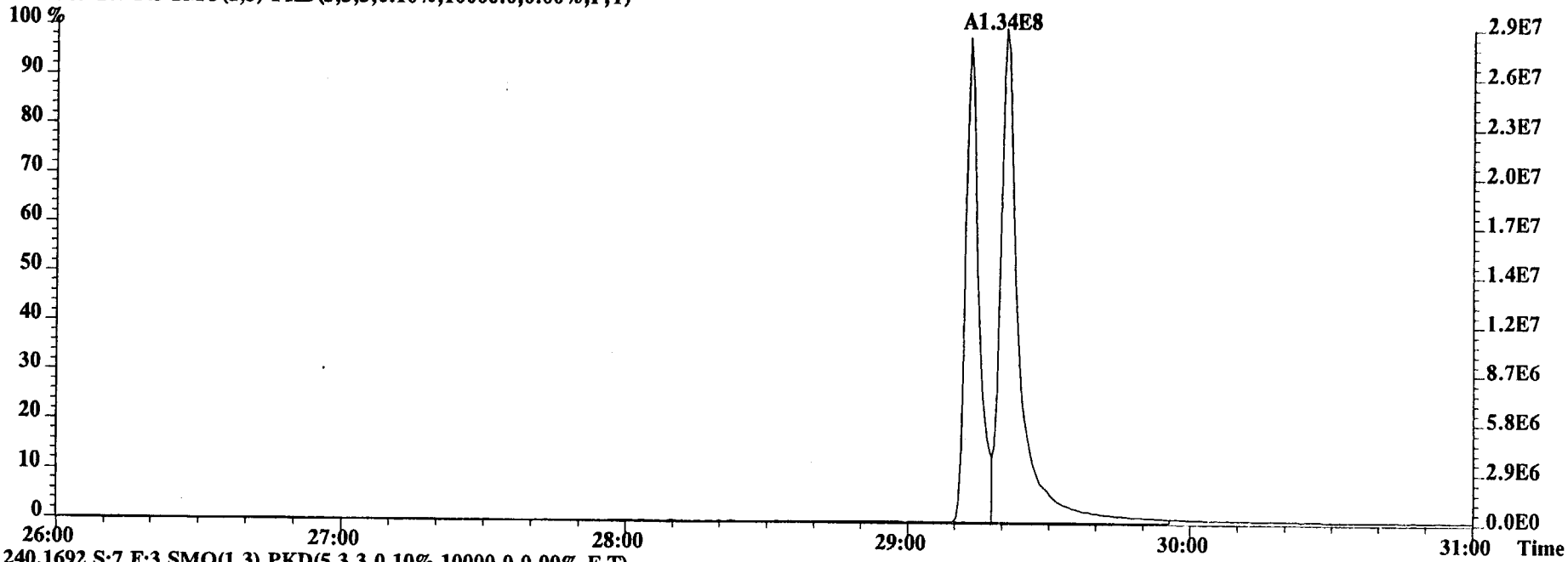
212.1410 S:7 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



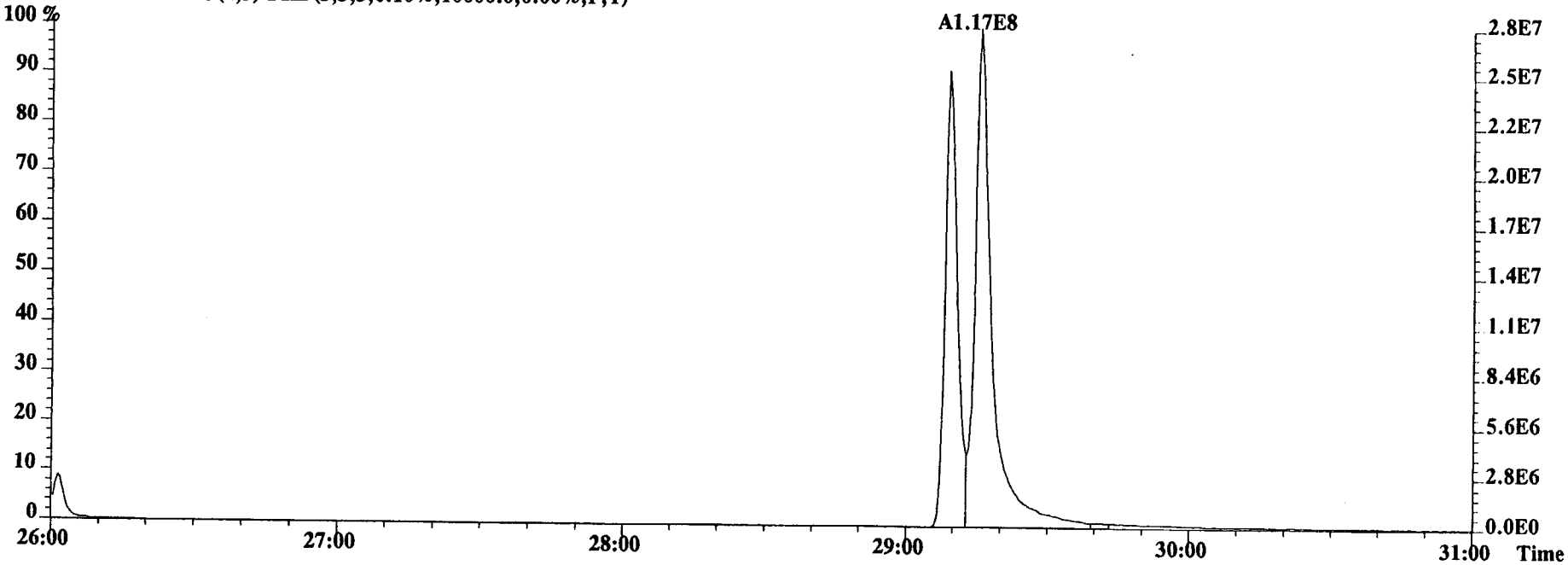
244.1974 S:7 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



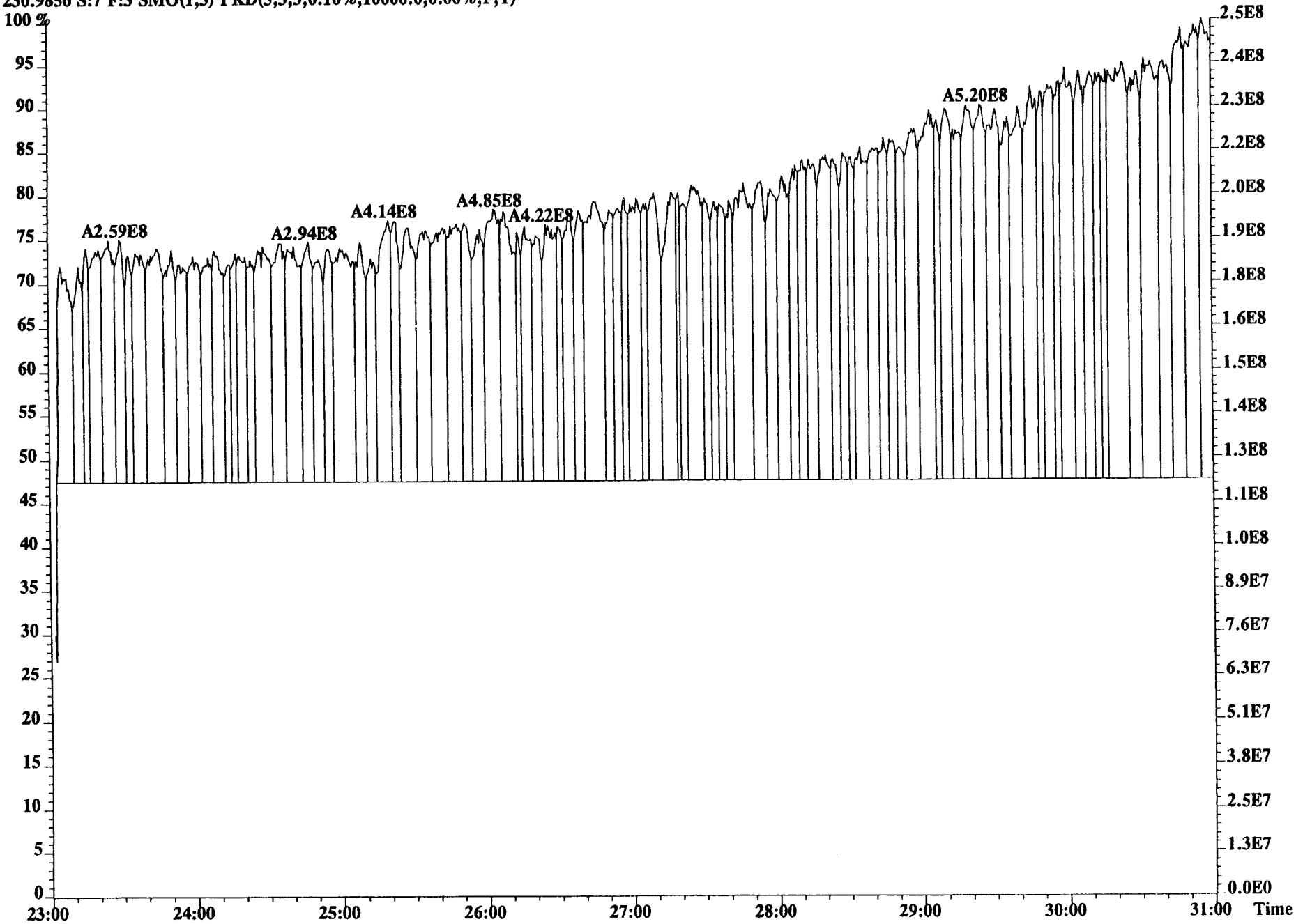
File:29OC98V4 #1-939 Acq:29-OCT-1998 20:21:30 GC EI+ Voltage SIR 70SE
Sample#7 Text:ST1029E :CS-3 :956-64 : : Exp:PAHAIR
228.0939 S:7 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



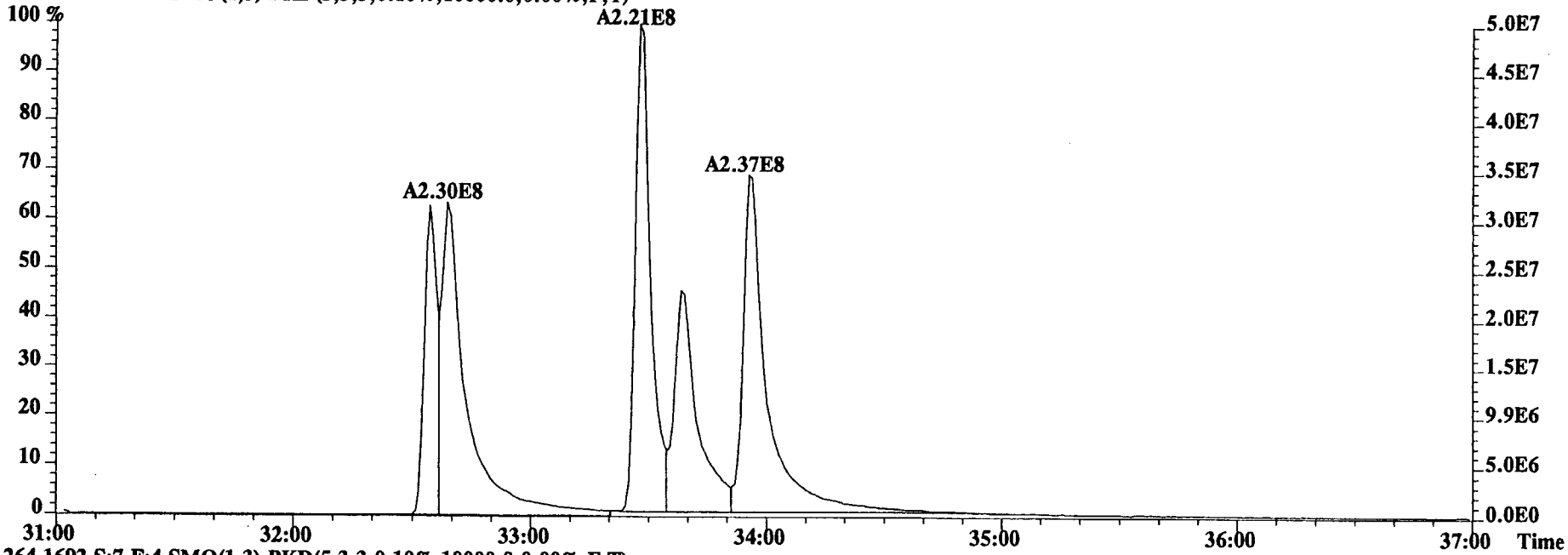
240.1692 S:7 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



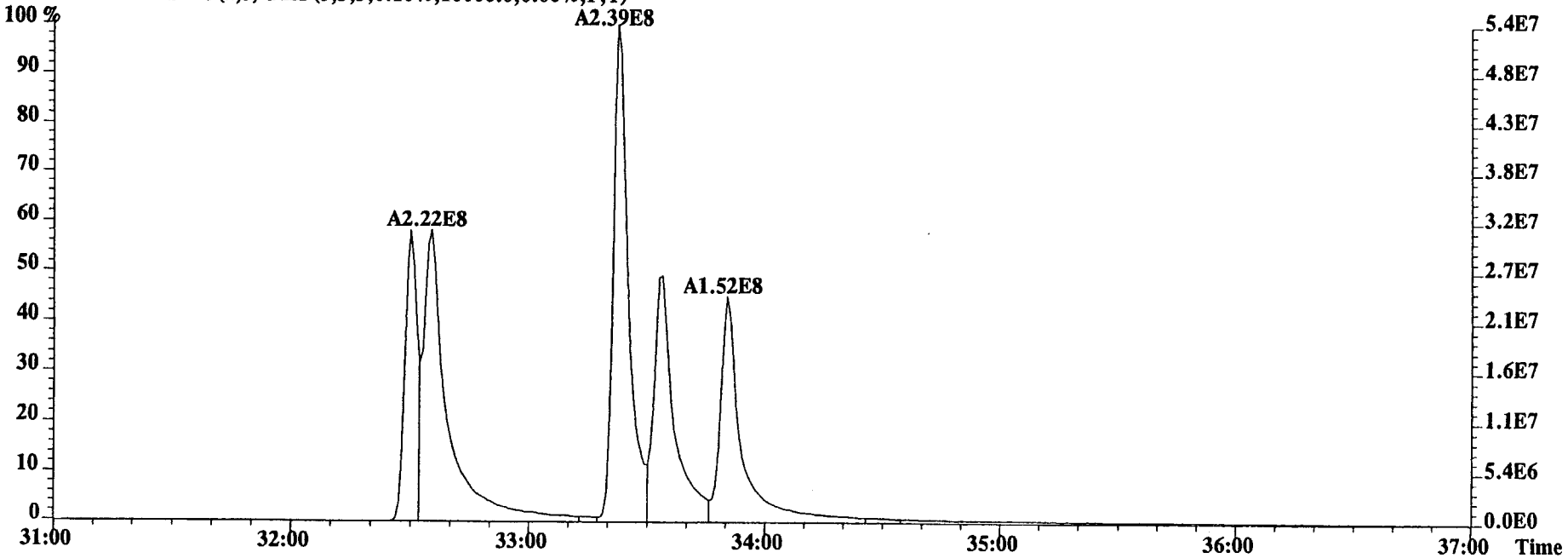
File:29OC98V4 #1-939 Acq:29-OCT-1998 20:21:30 GC EI+ Voltage SIR 70SE
Sample#7 Text:ST1029E :CS-3 :956-64 : : Exp:PAHAIR
230.9856 S:7 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



File:29OC98V4 #1-878 Acq:29-OCT-1998 20:21:30 GC EI+ Voltage SIR 70SE
Sample#7 Text:ST1029E :CS-3 :956-64 : : Exp:PAHAIR
252.0939 S:7 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

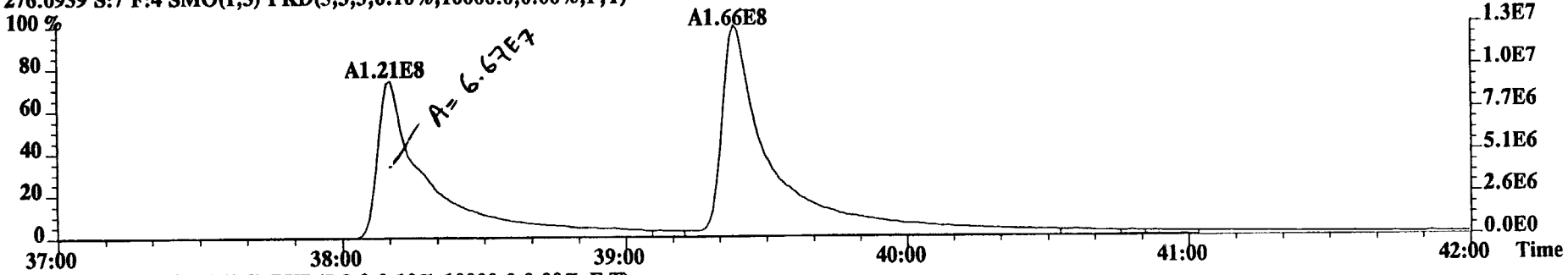


264.1692 S:7 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

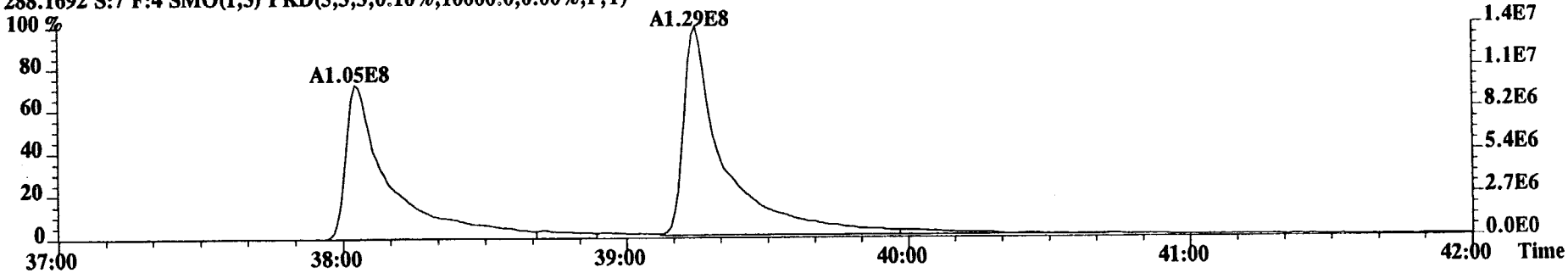


File:29OC98V4 #1-878 Acq:29-OCT-1998 20:21:30 GC EI+ Voltage SIR 70SE
Sample#7 Text:ST1029E :CS-3 :956-64 : : Exp:PAHAIR

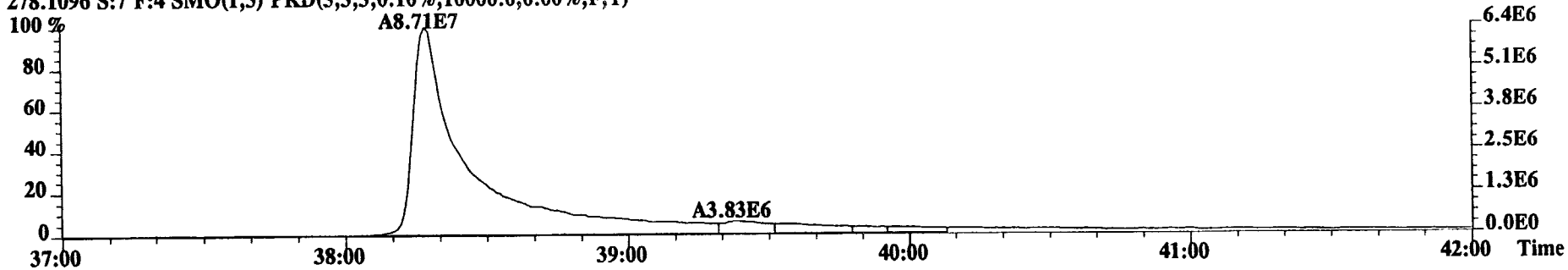
276.0939 S:7 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



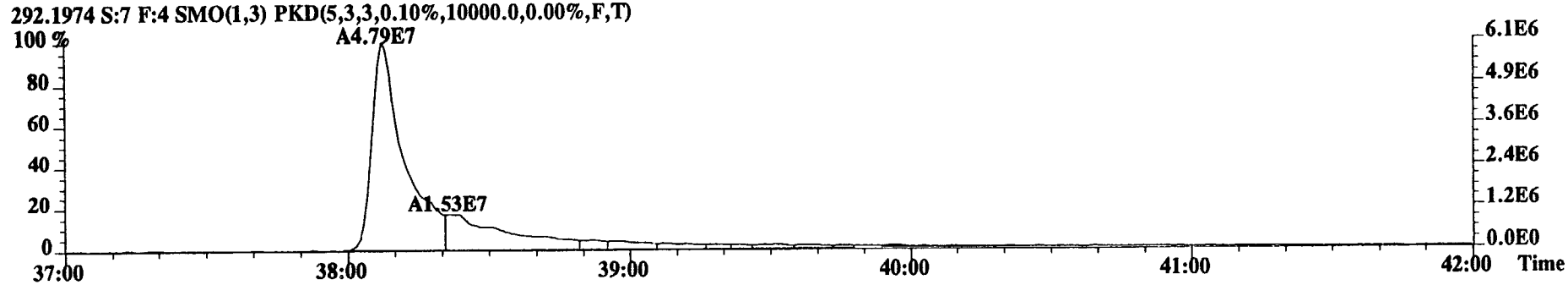
288.1692 S:7 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



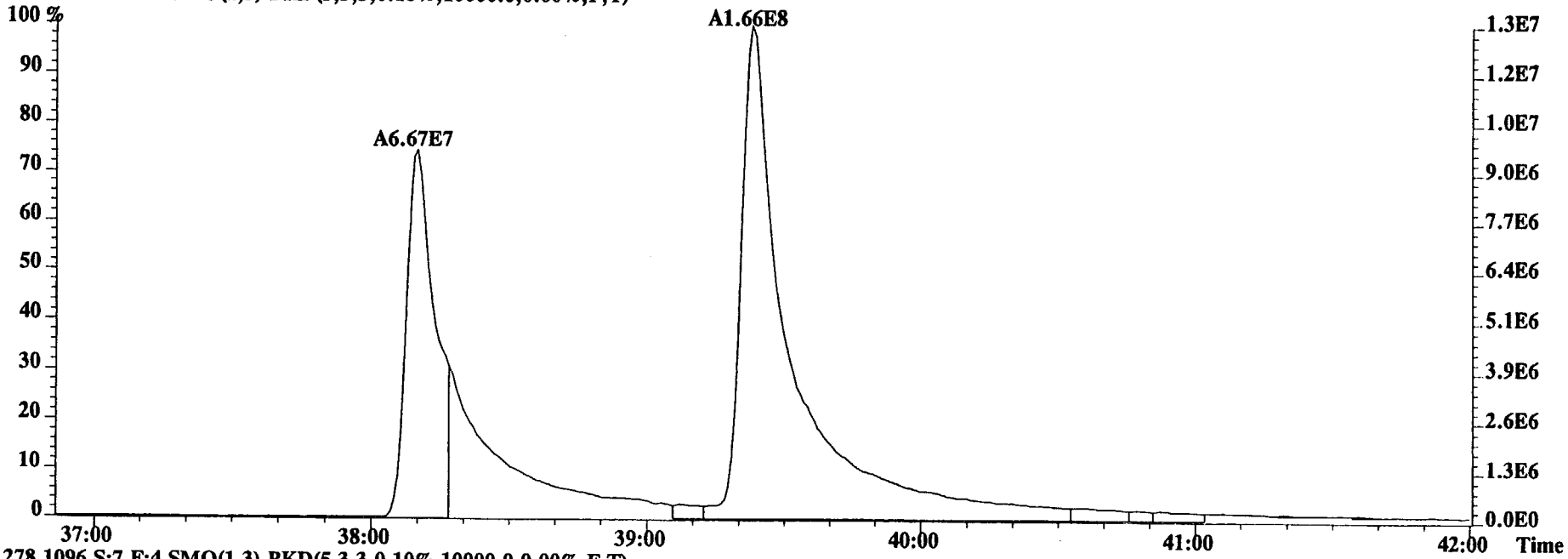
278.1096 S:7 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



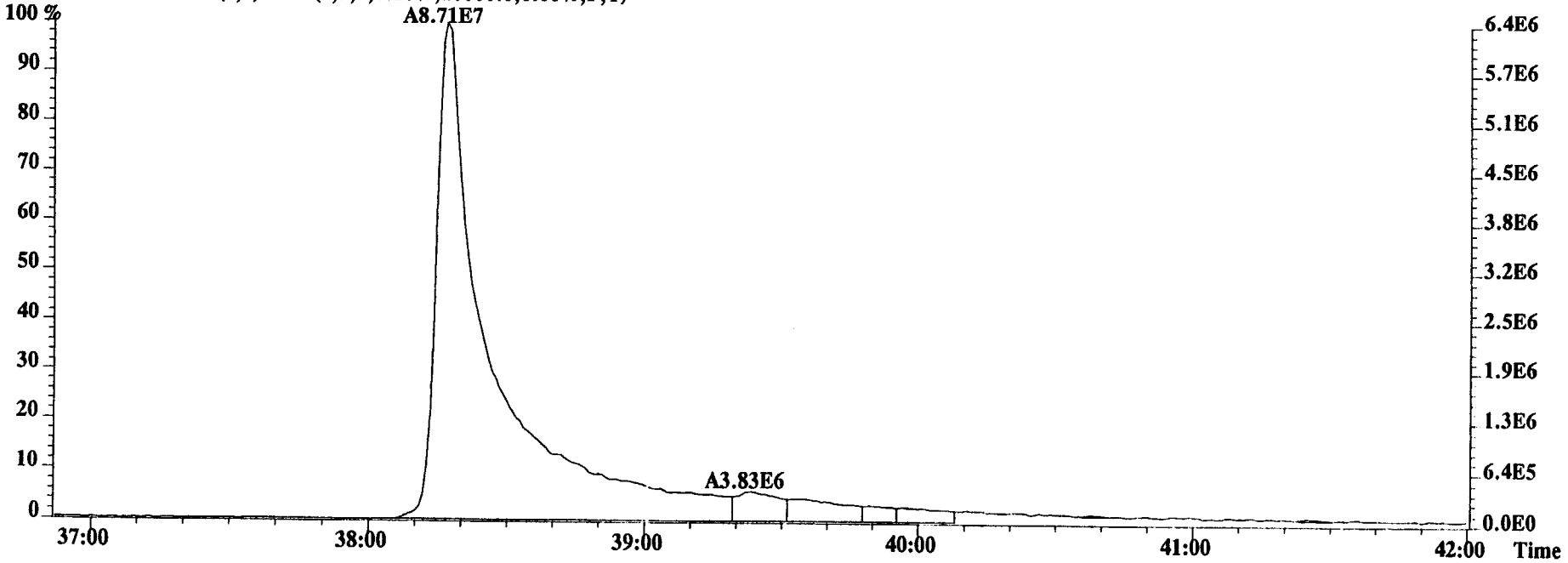
292.1974 S:7 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



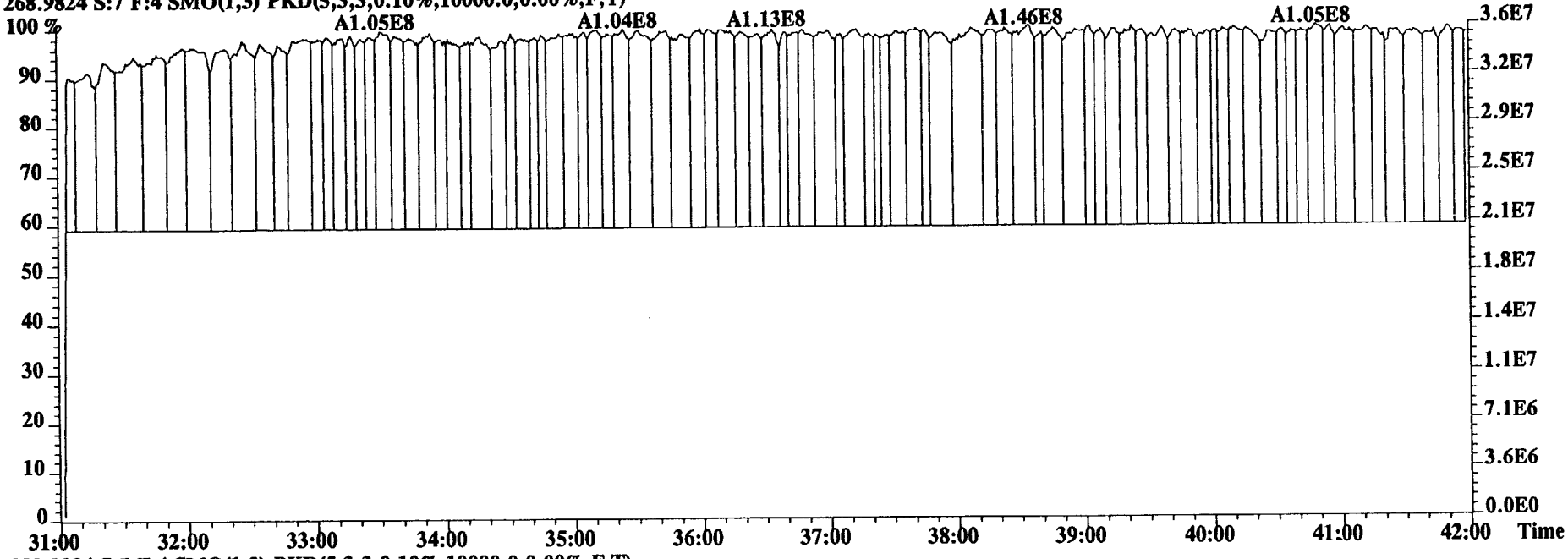
File:29OC98V4 #1-878 Acq:29-OCT-1998 20:21:30 GC EI+ Voltage SIR 70SE
Sample#7 Text:ST1029E :CS-3 :956-64 : : Exp:PAHAIR
276.0939 S:7 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



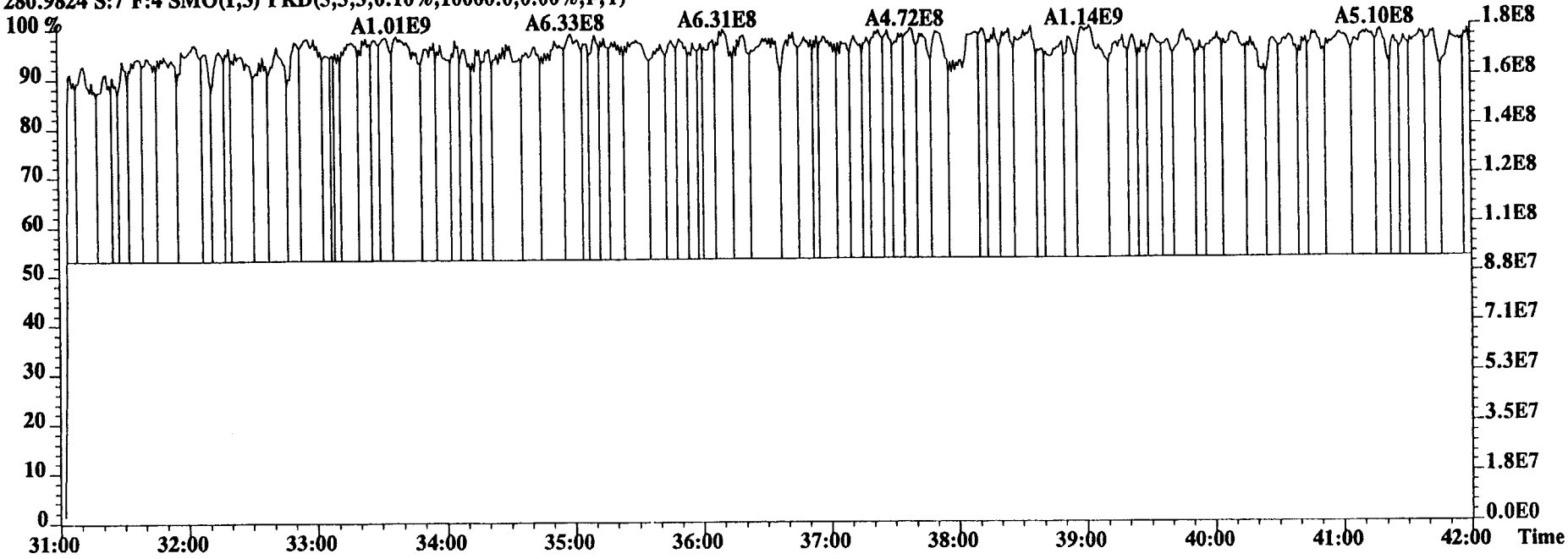
278.1096 S:7 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



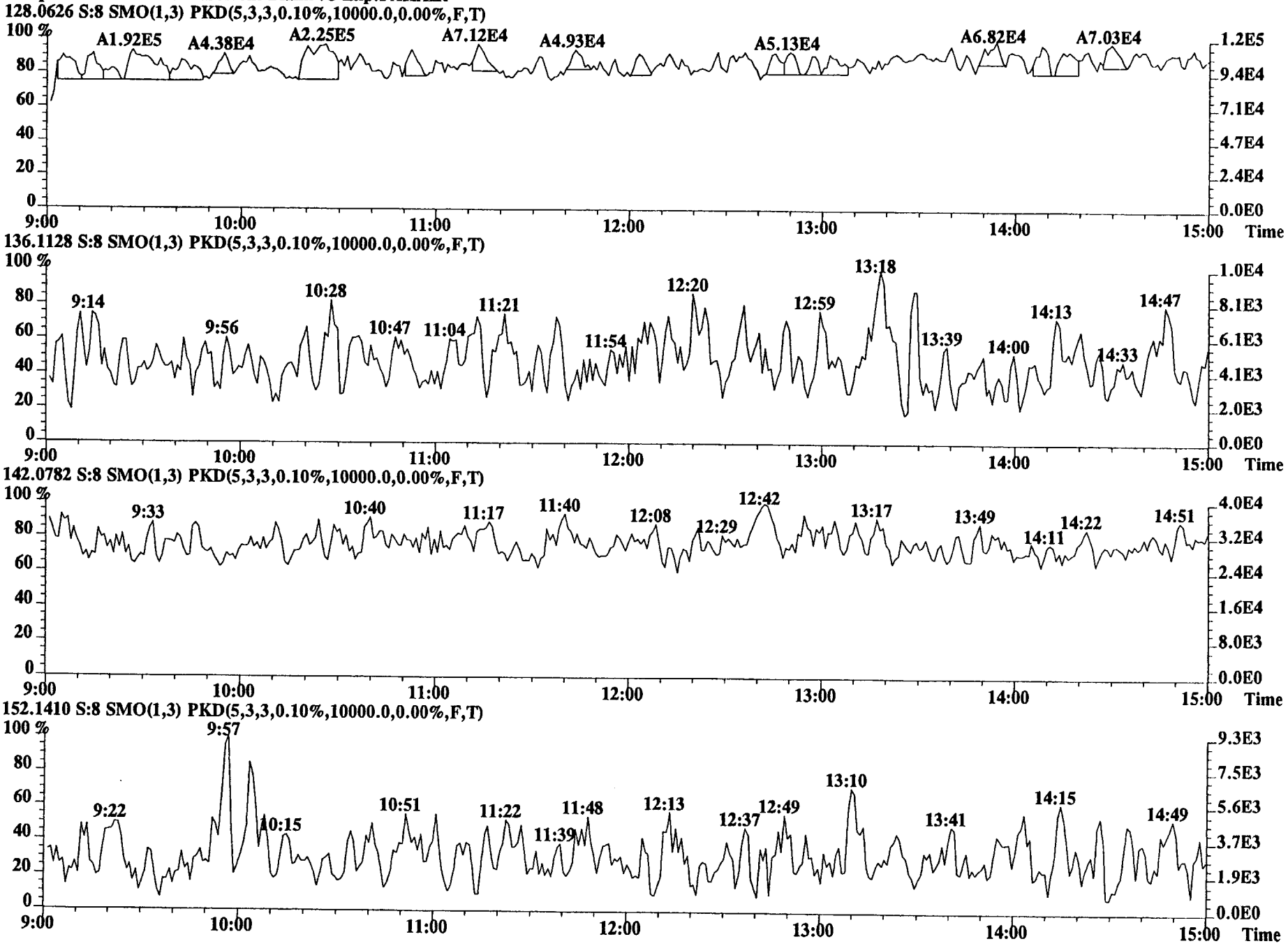
File:29OC98V4 #1-878 Acq:29-OCT-1998 20:21:30 GC EI+ Voltage SIR 70SE
Sample#7 Text:ST1029E :CS-3 :956-64 : : Exp:PAHAIR
268.9824 S:7 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



280.9824 S:7 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

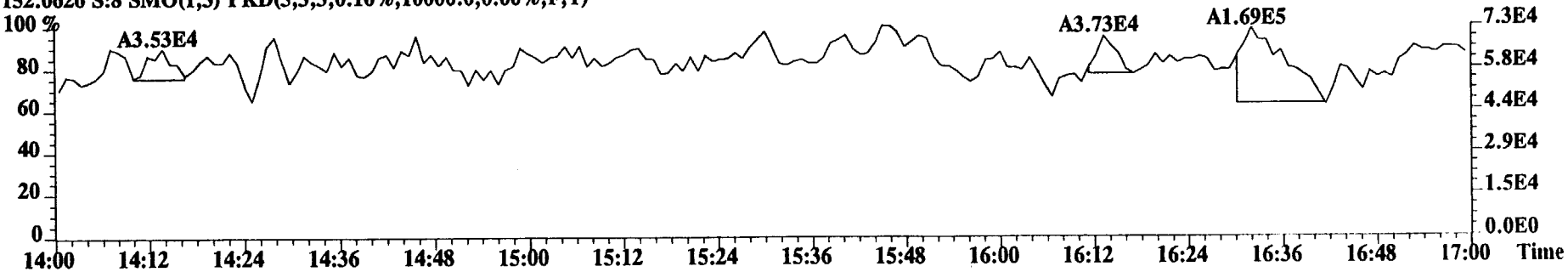


File:29OC98V4 #1-510 Acq:29-OCT-1998 21:10:34 GC EI+ Voltage SIR 70SE
Sample#8 Text:SB1029B :Solvent Blank :C Exp:PAHAIR

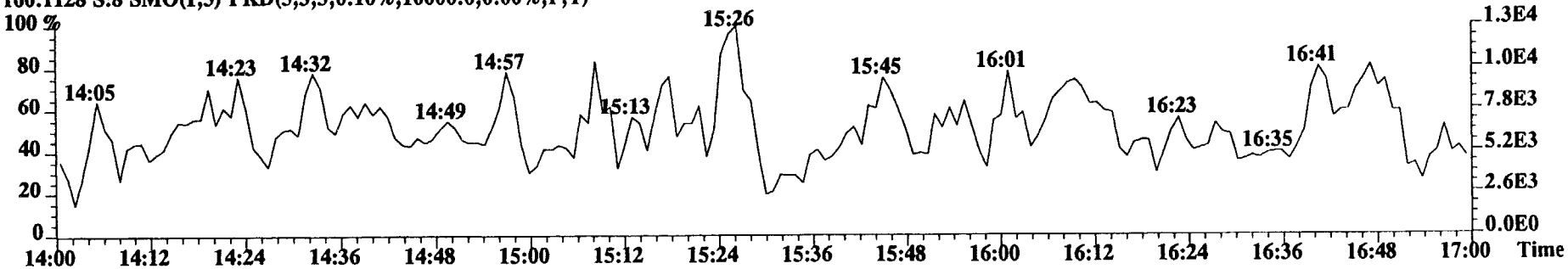


File:29OC98V4 #1-510 Acq:29-OCT-1998 21:10:34 GC EI+ Voltage SIR 70SE
Sample#8 Text:SB1029B :Solvent Blank :C Exp:PAHAIR

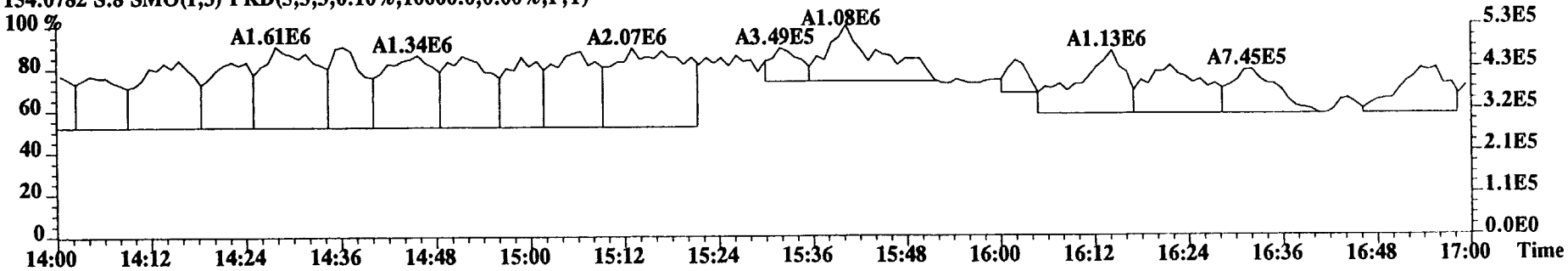
152.0626 S:8 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



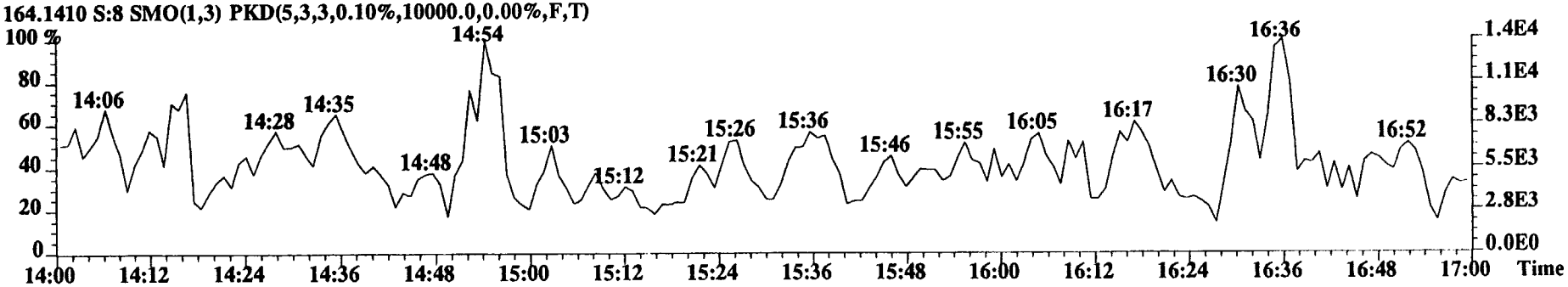
160.1128 S:8 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



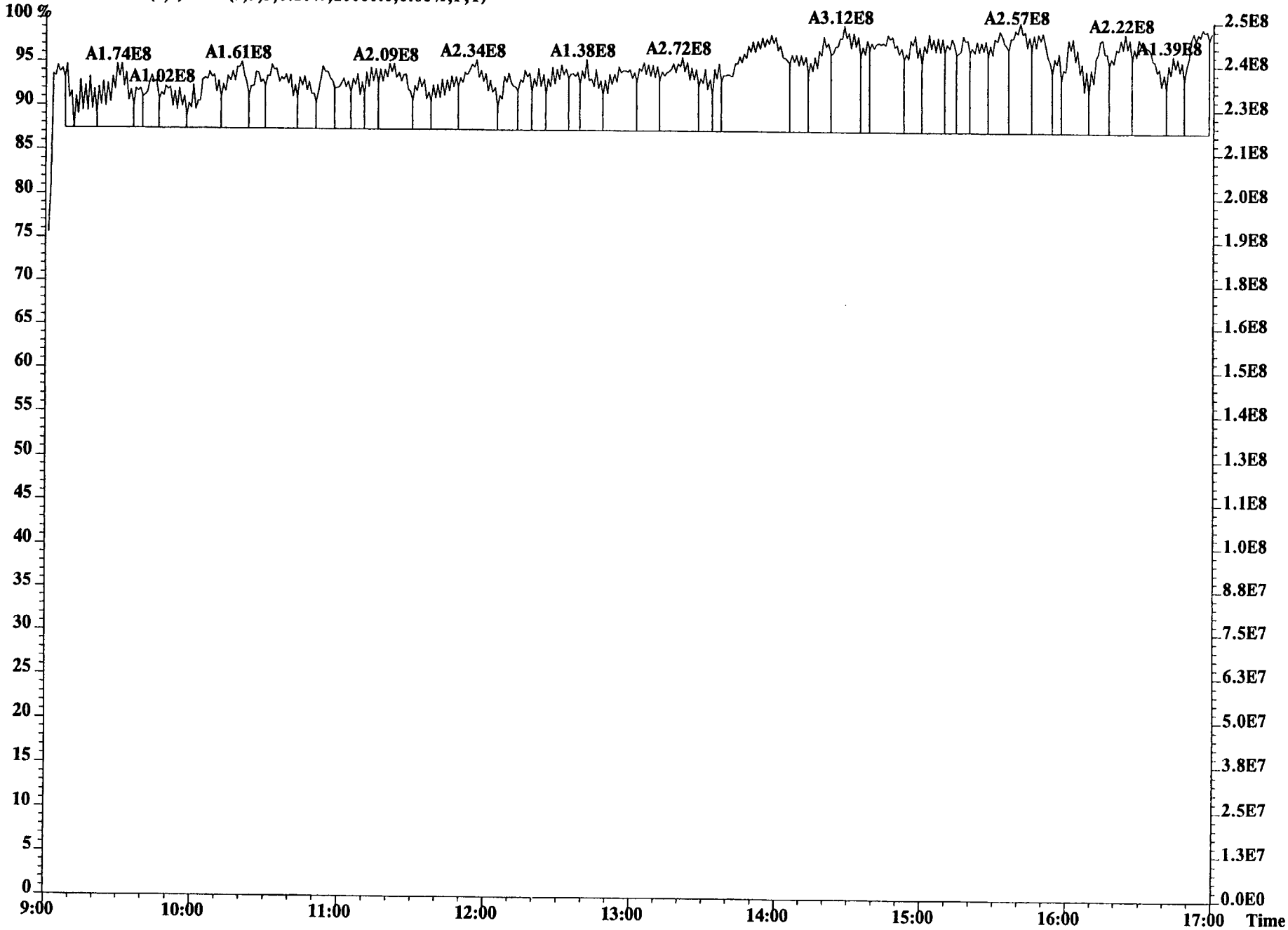
154.0782 S:8 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



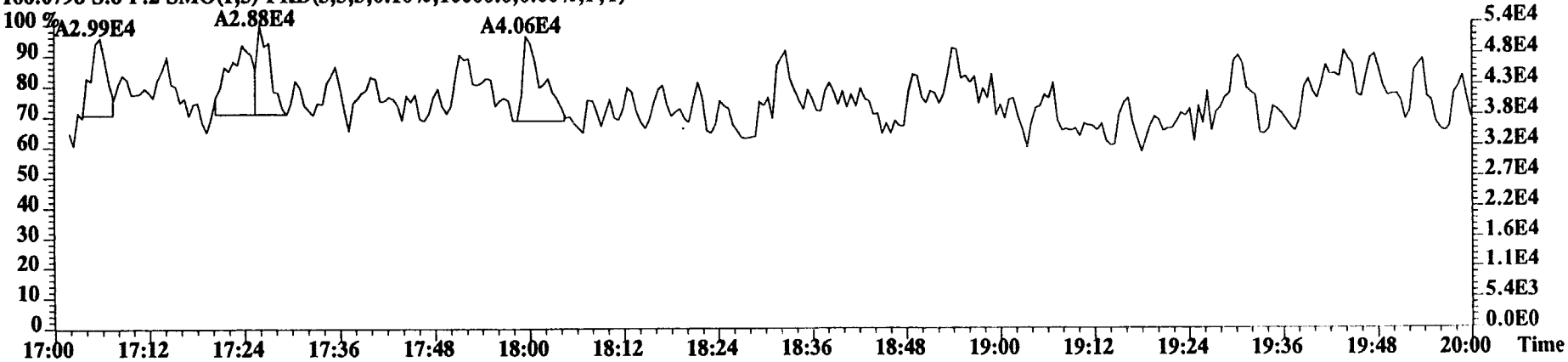
164.1410 S:8 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



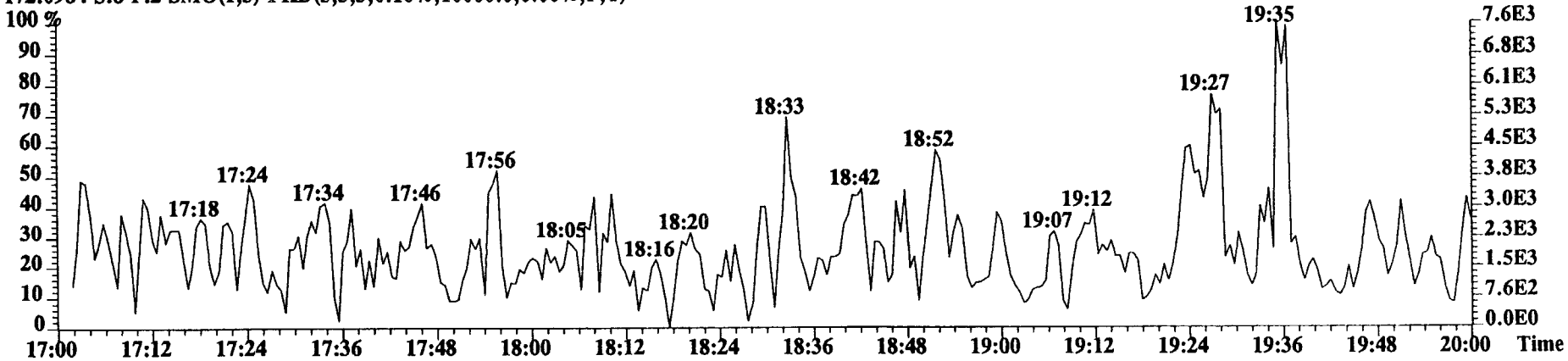
File:29OC98V4 #1-510 Acq:29-OCT-1998 21:10:34 GC EI+ Voltage SIR 70SE
Sample#8 Text:SB1029B :Solvent Blank :C Exp:PAHAIR
130.9920 S:8 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



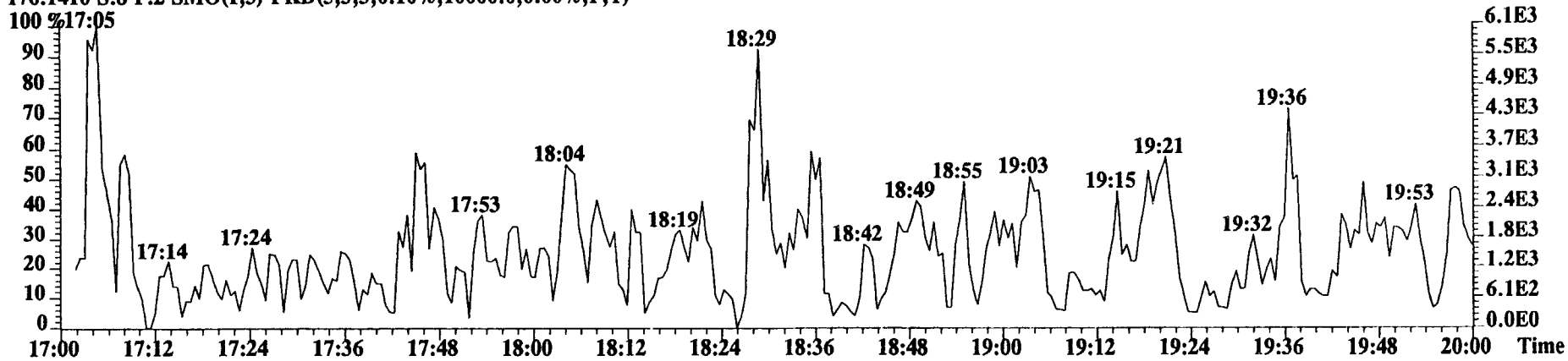
File:29OC98V4 #1-641 Acq:29-OCT-1998 21:10:34 GC EI+ Voltage SIR 70SE
Sample#8 Text:SB1029B :Solvent Blank :C Exp:PAHAIR
166.0798 S:8 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



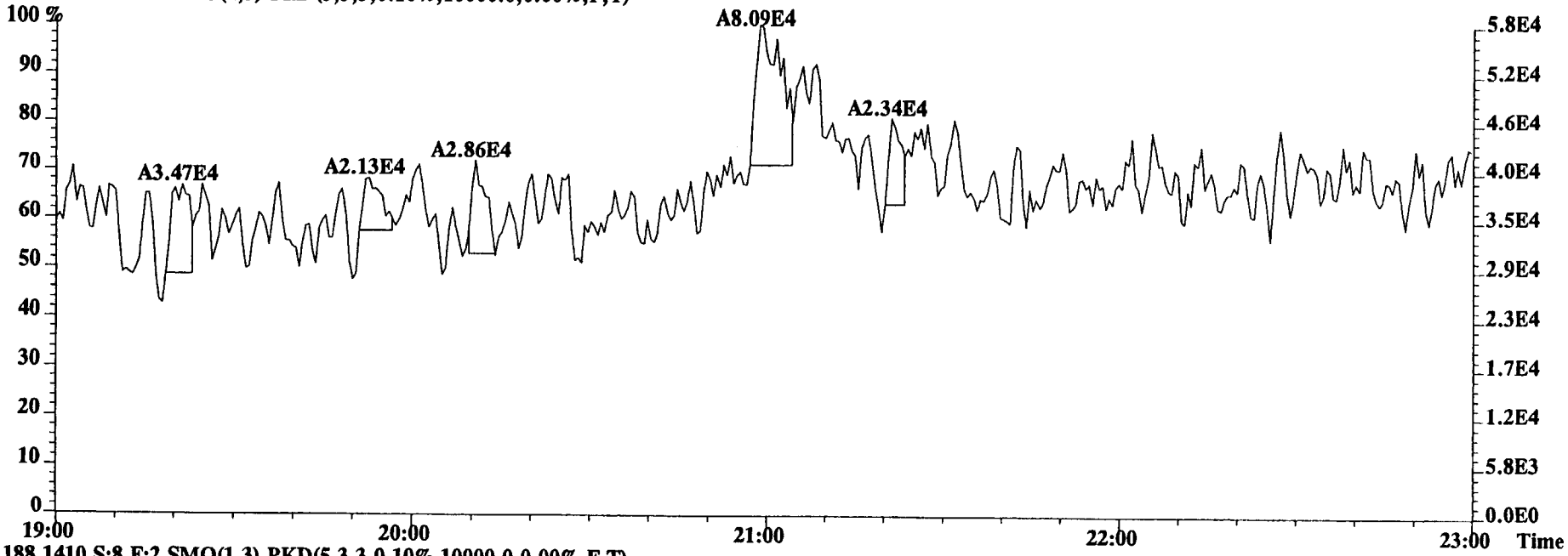
172.0984 S:8 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



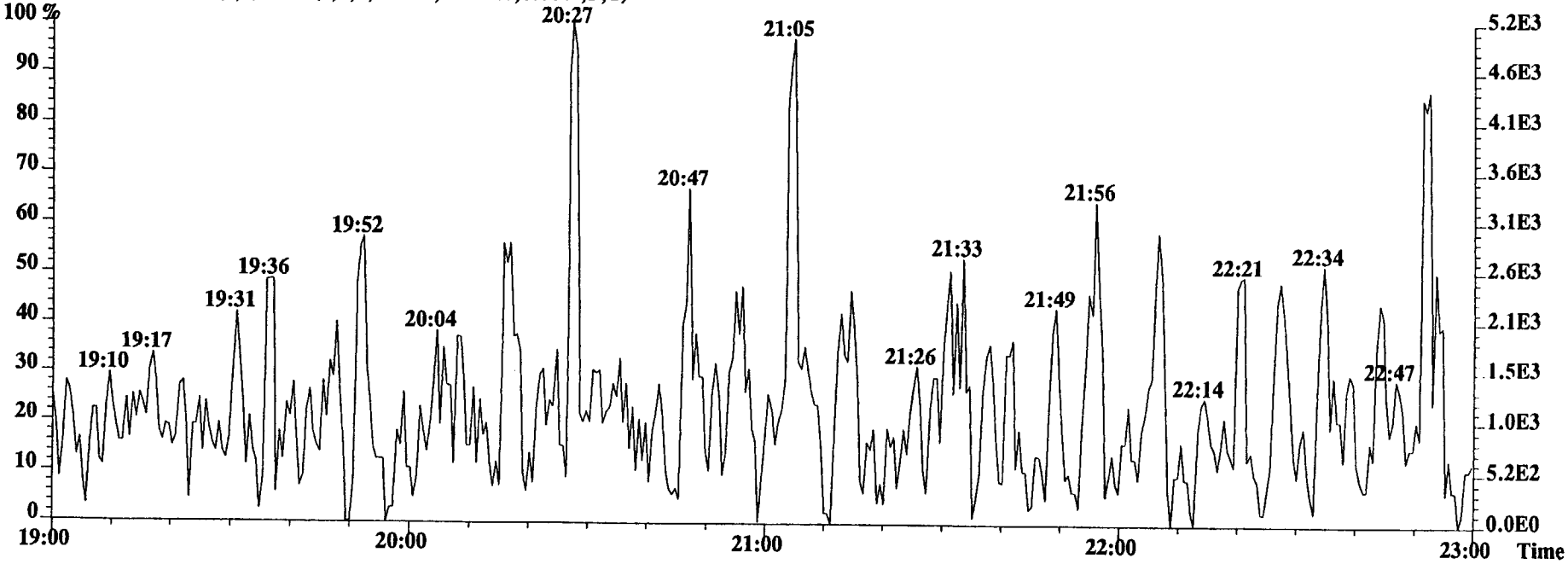
176.1410 S:8 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



File:29OC98V4 #1-641 Acq:29-OCT-1998 21:10:34 GC EI+ Voltage SIR 70SE
Sample#8 Text:SB1029B :Solvent Blank :C Exp:PAHAIR
178.0782 S:8 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

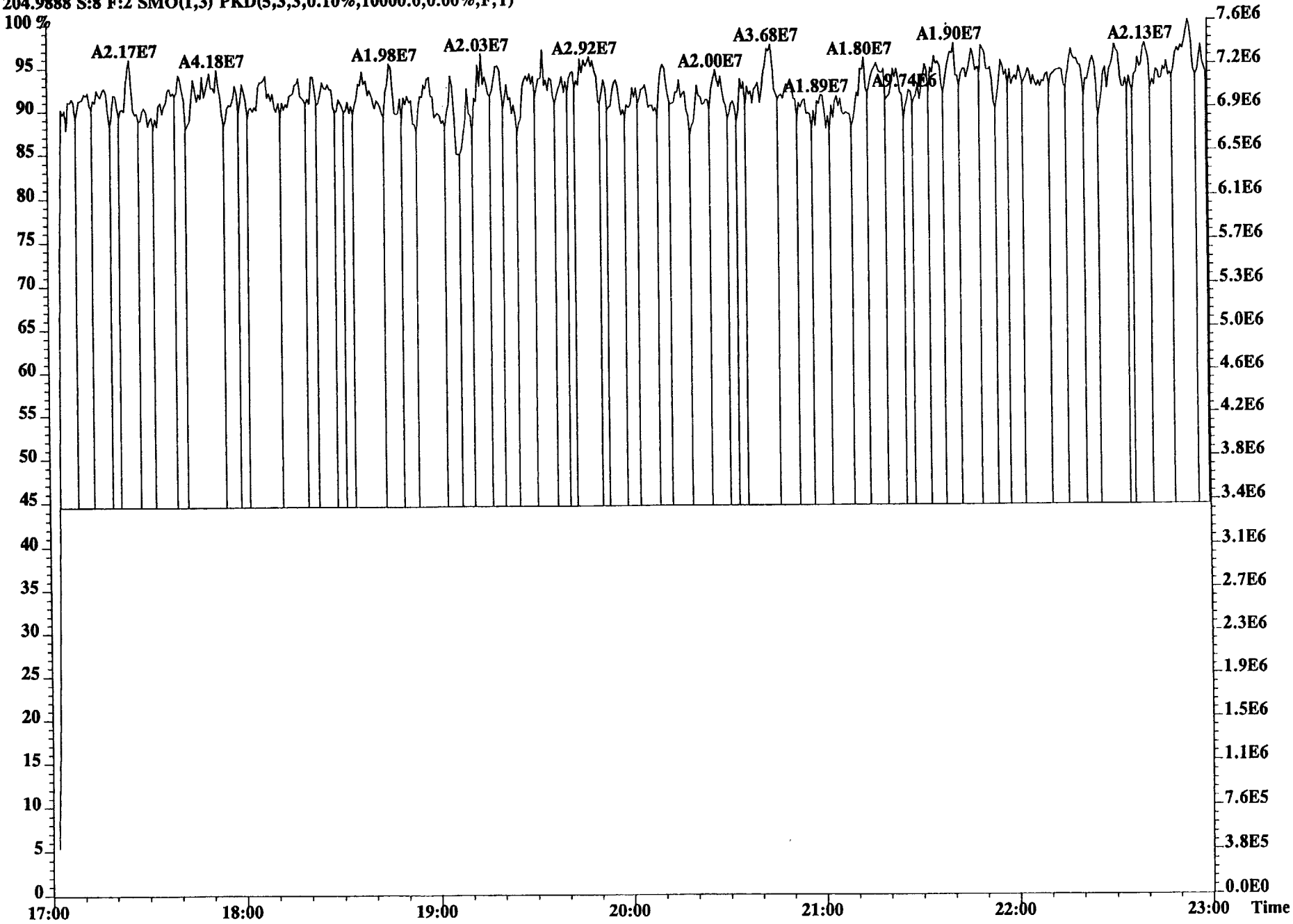


188.1410 S:8 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

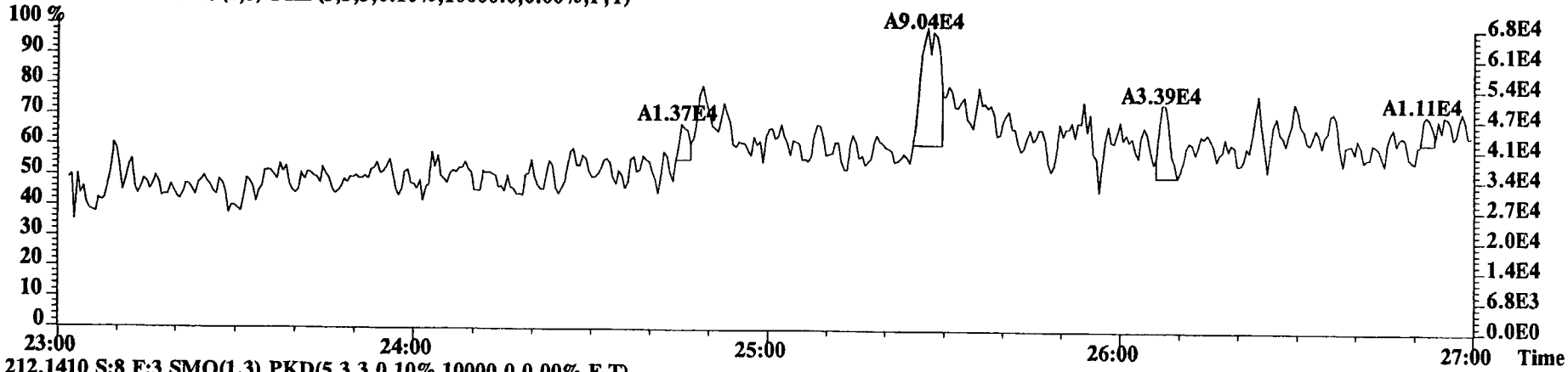


583

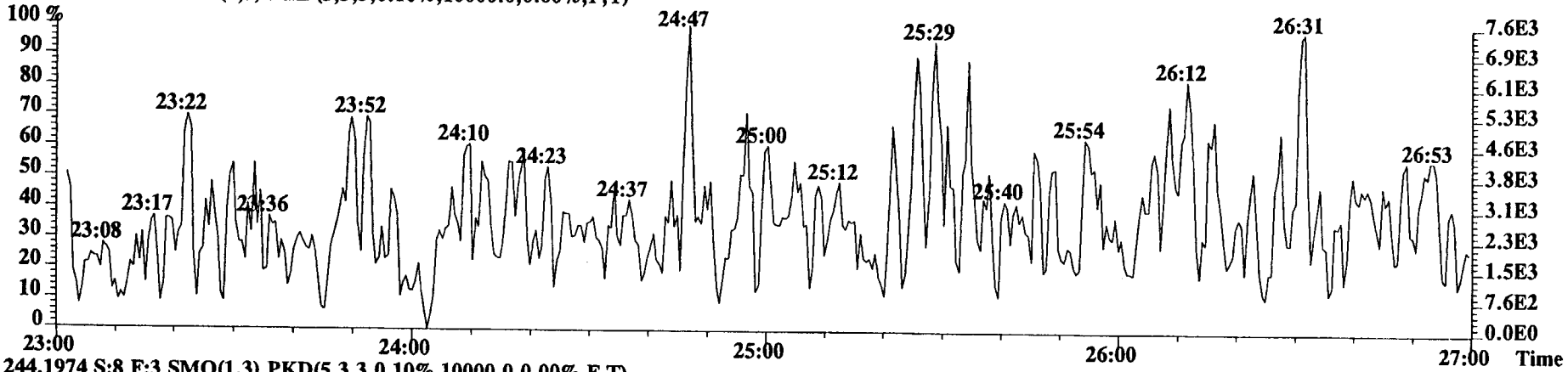
File:29OC98V4 #1-641 Acq:29-OCT-1998 21:10:34 GC EI+ Voltage SIR 70SE
Sample#8 Text:SB1029B :Solvent Blank :C Exp:PAHAIR
204.9888 S:8 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



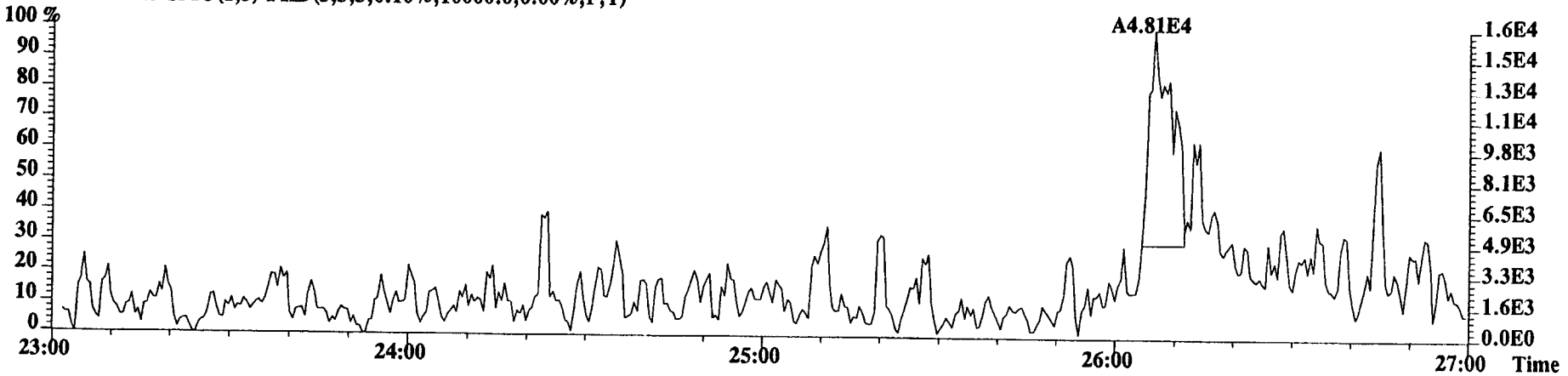
File:29OC98V4 #1-939 Acq:29-OCT-1998 21:10:34 GC EI+ Voltage SIR 70SE
Sample#8 Text:SB1029B :Solvent Blank :C Exp:PAHAIR
202.0782 S:8 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



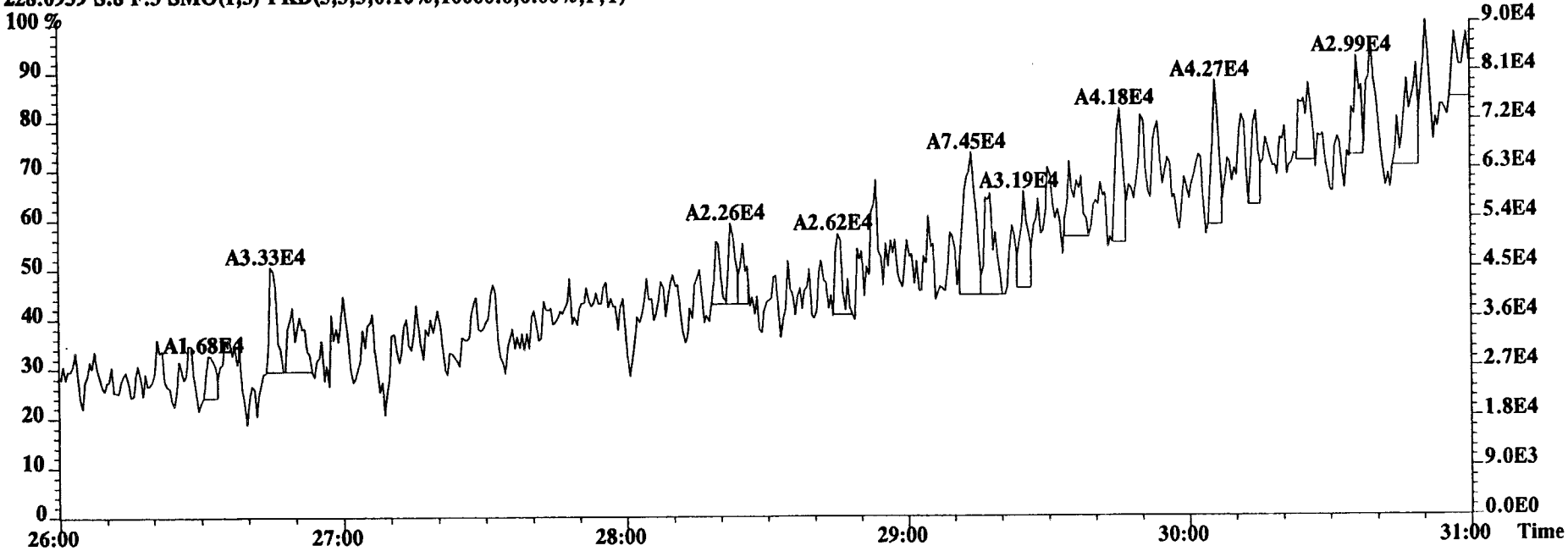
212.1410 S:8 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



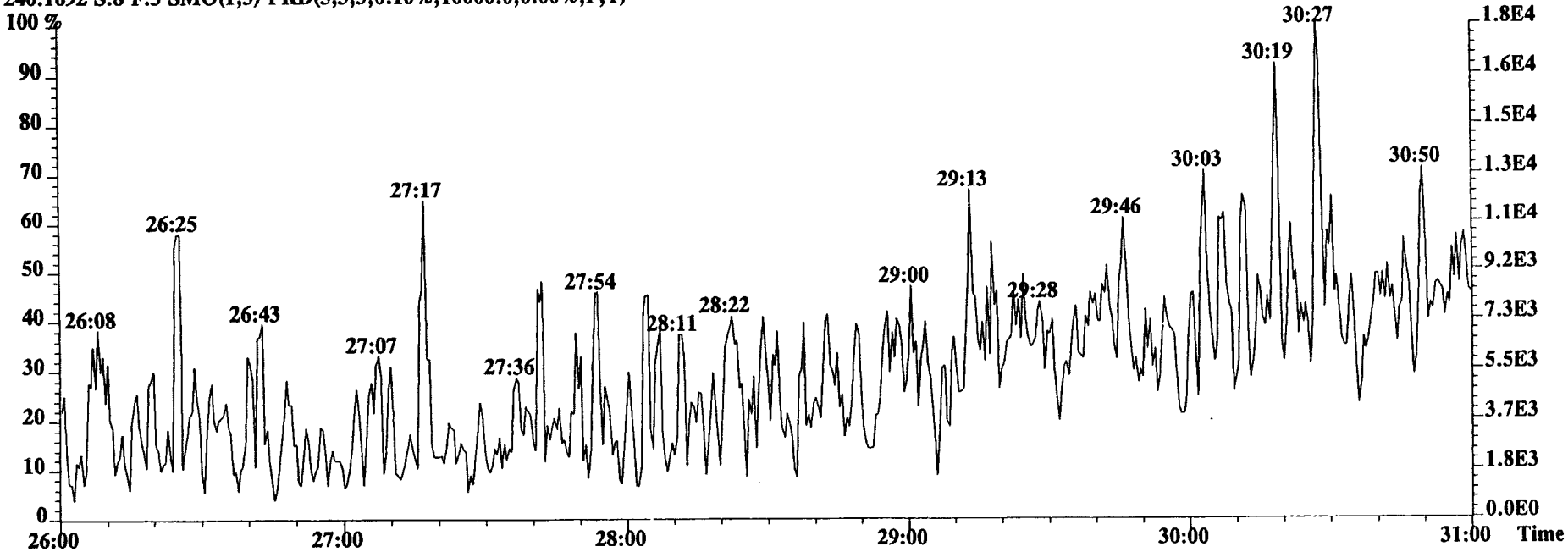
244.1974 S:8 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



File:29OC98V4 #1-939 Acq:29-OCT-1998 21:10:34 GC EI+ Voltage SIR 70SE
Sample#8 Text:SB1029B :Solvent Blank :C Exp:PAHAIR
228.0939 S:8 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

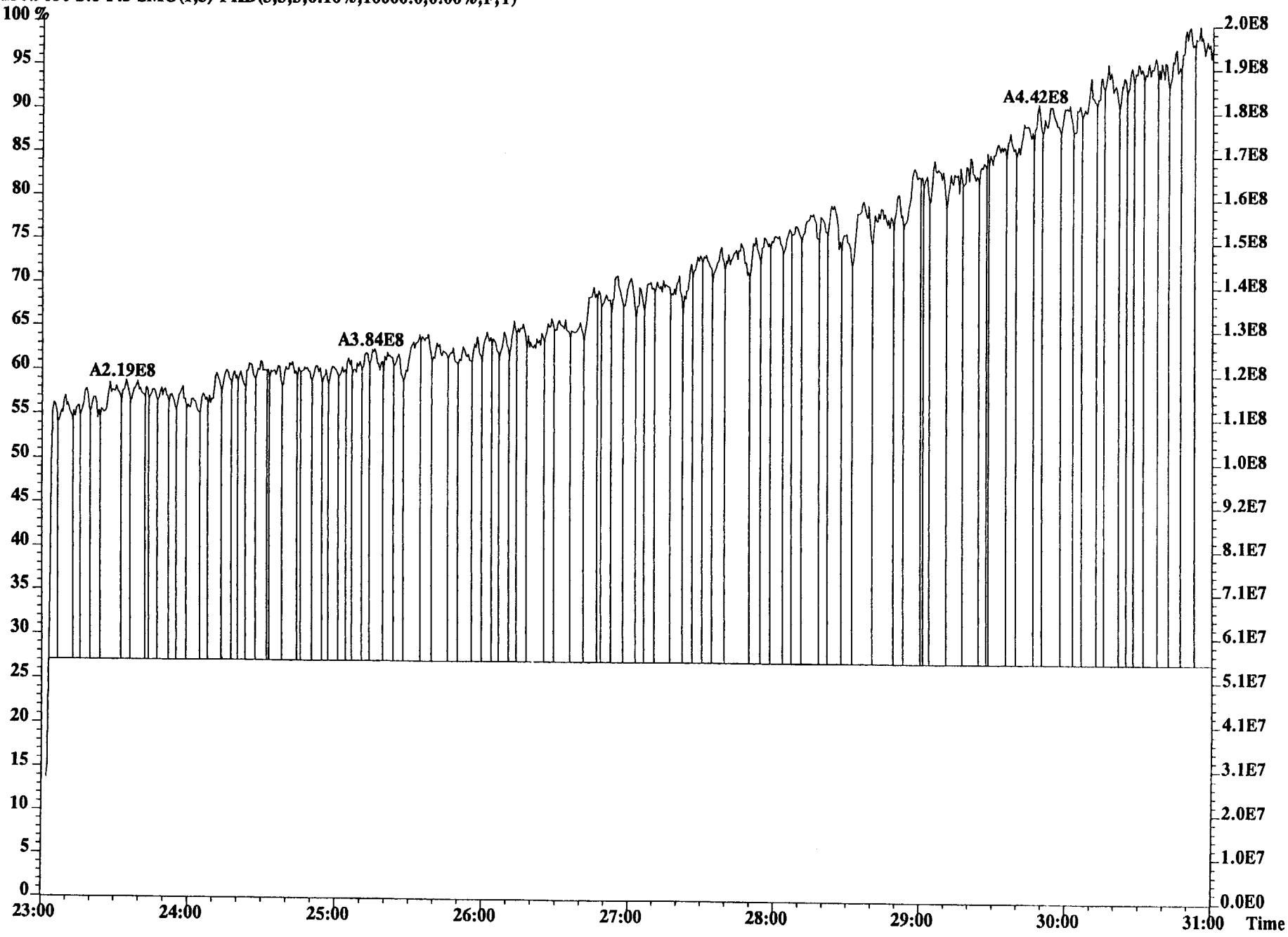


240.1692 S:8 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



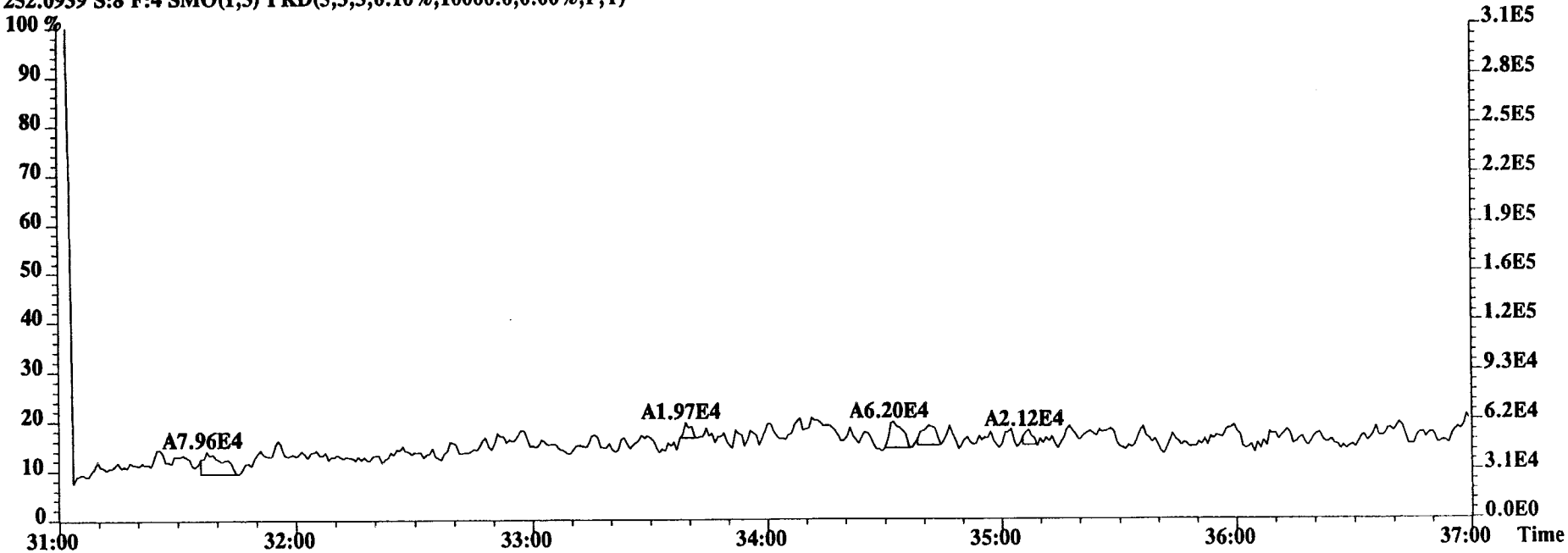
586

File:29OC98V4 #1-939 Acq:29-OCT-1998 21:10:34 GC EI+ Voltage SIR 70SE
Sample#8 Text:SB1029B :Solvent Blank :C Exp:PAHAIR
230.9856 S:8 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

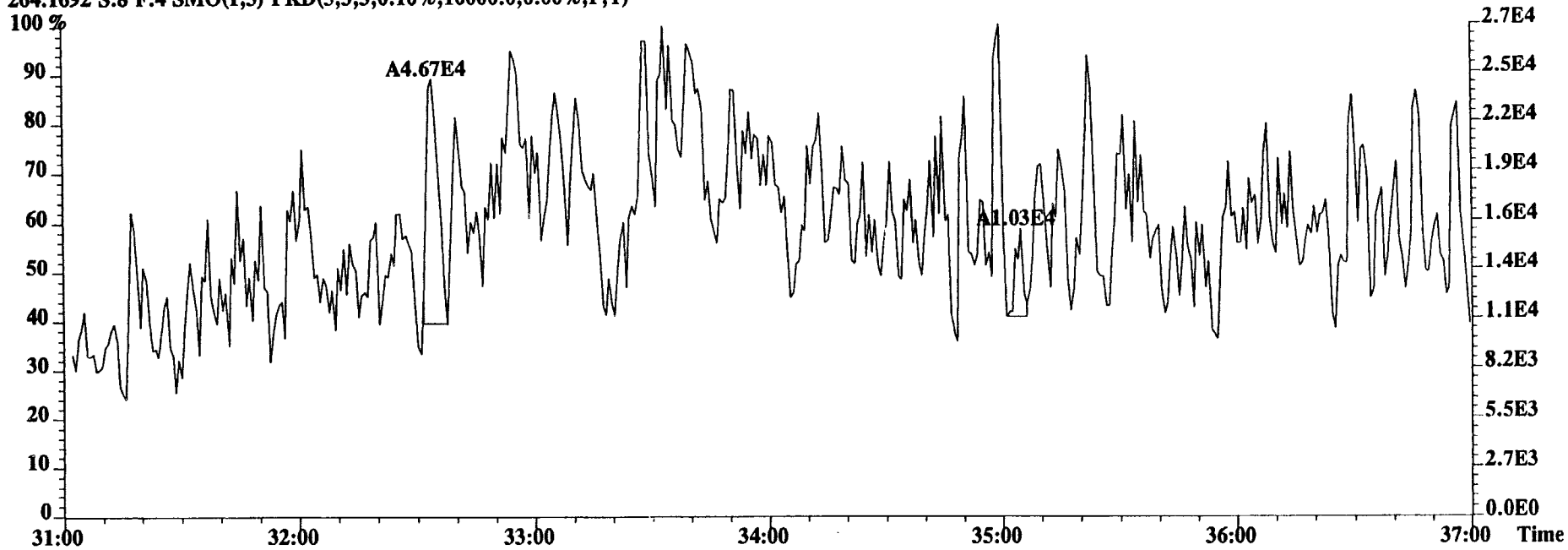


587

File:29OC98V4 #1-878 Acq:29-OCT-1998 21:10:34 GC EI+ Voltage SIR 70SE
Sample#8 Text:SB1029B :Solvent Blank :C Exp:PAHAIR
252.0939 S:8 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

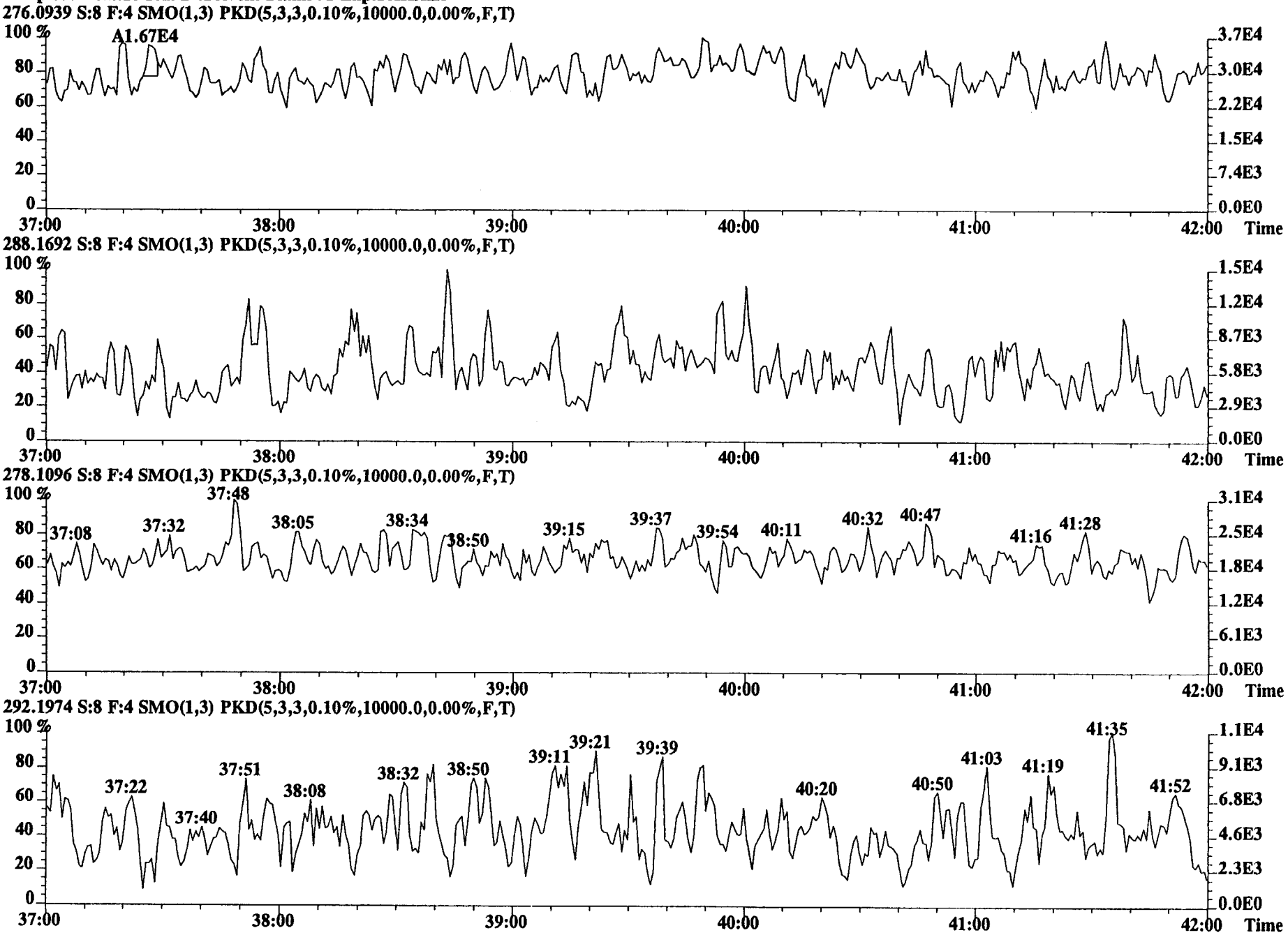


264.1692 S:8 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

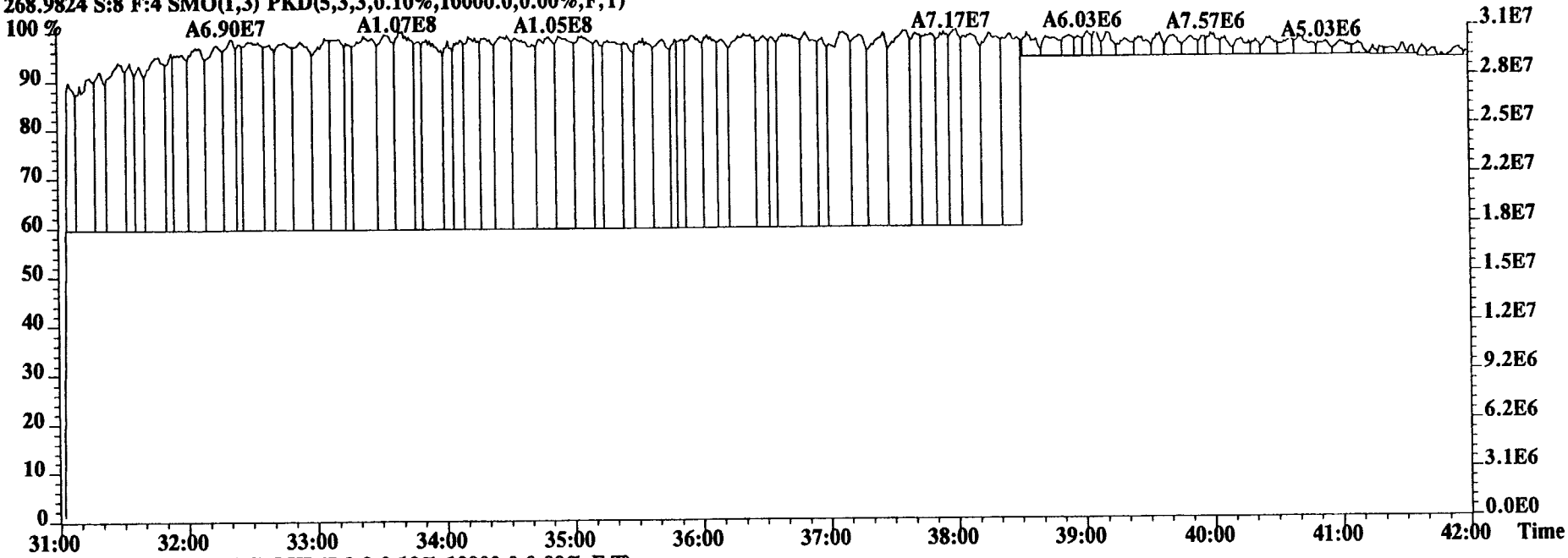


885

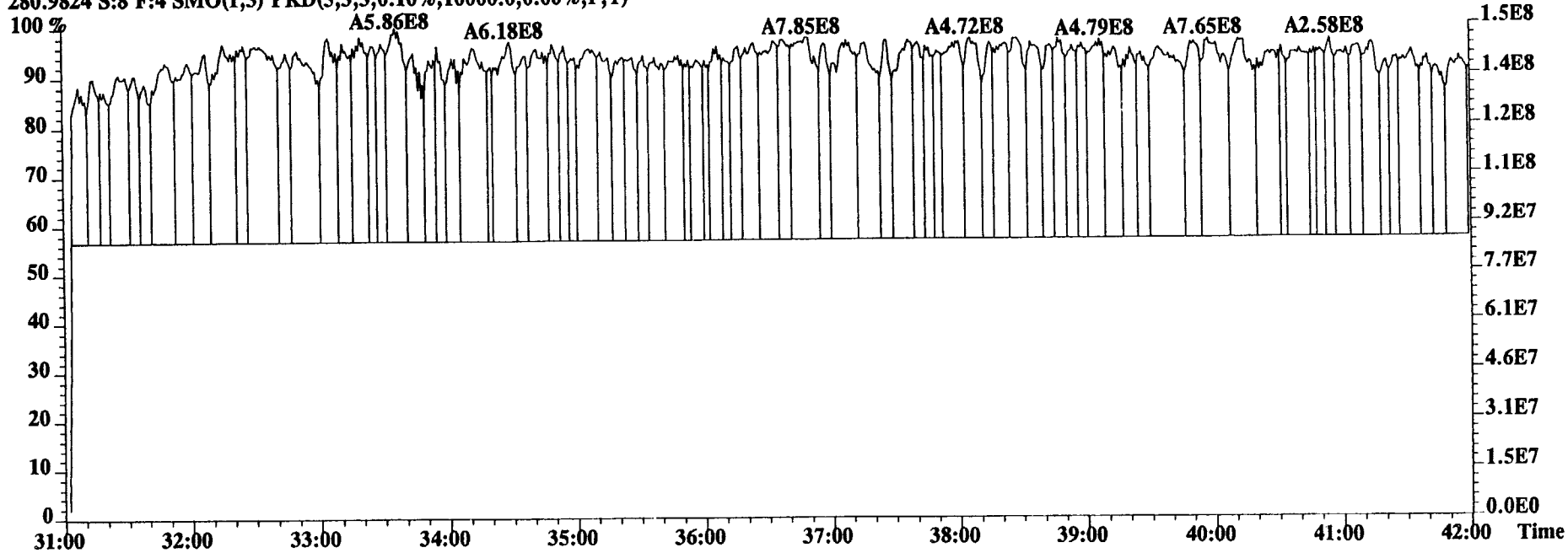
File:29OC98V4 #1-878 Acq:29-OCT-1998 21:10:34 GC EI+ Voltage SIR 70SE
Sample#8 Text:SB1029B :Solvent Blank :C Exp:PAHAIR



File:29OC98V4 #1-878 Acq:29-OCT-1998 21:10:34 GC EI+ Voltage SIR 70SE
Sample#8 Text:SB1029B :Solvent Blank :C Exp:PAHAIR
268.9824 S:8 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



280.9824 S:8 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



590

QUANTERRA INCORPORATED
West Sacramento

Daily Standard Checklist
Dioxin/Furan High Res

STD ID ST1030A **Method ID** 429air **Column ID** DB-5 **Instr ID** VG-4

Standard Solution 956-64 **Prepared By** SMA **Prepared Date** 11-02-98

Analyzed By SMA/AM **Date Analyzed** 10-30-98

Reviewed By Deri Stone **Date Reviewed** 11-03-98

ANALYSIS OF DAILY STANDARD	INITIATED	REVIEWED
Standard, CPSM, and solvent blank present?	✓/NA	✓/NA
Copy of Instrument logfile present?	✓	✓
CPSM blow up and peak profile present?	NA/✓	NA/✓
Curve summary present?	✓	✓
Summary of 1613A criteria present?	NA	NA
Daily standard within method specified limits*?	✓	✓
Daily ion abundance ratios within limits?	NA	NA
CPSM valley < 25%?	NA	NA
~~CPSM~~ window correct?	NA/✓	✓
Samples analyzed within 12 hrs of daily standard?	✓	✓

COMMENTS:
No cpsm in PAH's analysis.

* For NCASI 551, Control Limit (CL) = +/- 20% from curve RRFs for all analytes.
For Method 8290, CL = +/- 20% from curve RRFs for native analytes, CL = +/- 30% from curve RRFs for labeled compounds.
For Method 1613A, see 3rd Revision to Method 1613 Performance Specifications, Table 7.

QA-231 gcc

02-NOV-1998 08:06:27 AM Dioxin Furan ConCal RESULTS

ass Spec : VG-4 Results : 30OC98V4031.RES : PAHAIRCAL3.TRG
C Column : DB-5 Date analyzed : 30-OCT-98
Data file : 30OC98V4 ST1030A :CS-3 :956-64 : : Ex
Weight : 1

Name	Total Response	Isotope Ratio		R. T. mm:ss		RRF	pg	% Dev
d10-2-Methylnaphthalene	78684600	1.00	Y	12: 28	Y	-1.00	100.00	
d8-Naphthalene	139825400	1.00	Y	10: 13	Y	1.78	100.00	-21
Naphthalene	153251600	1.00	Y	10: 16	Y	1.10	100.00	-11
2-Methylnaphthalene	70172200	1.00	Y	12: 34	Y	0.50	100.00	-10
d8-Acenaphthylene	103173000	1.00	Y	15: 28	Y	1.31	100.00	8
Acenaphthylene	87923600	1.00	Y	15: 31	Y	0.85	100.00	-10
d10-Acenaphthene	65038200	1.00	Y	16: 1	Y	0.83	100.00	11
Acenaphthene	59601000	1.00	Y	16: 8	Y	0.92	100.00	-26
d10-Anthracene	49881400	1.00	Y	20: 55	Y	-1.00	100.00	
d10-Fluorene	73075400	1.00	Y	17: 42	Y	1.46	100.00	3
Fluorene	60563400	1.00	Y	17: 47	Y	0.83	100.00	-29
d10-Phenanthrene	155005800	1.00	Y	20: 46	Y	3.11	100.00	11
Phenanthrene	123196000	1.00	Y	20: 50	Y	0.79	100.00	-11
Anthracene	112909800	1.00	Y	20: 59	Y	0.73	100.00	-9
d14-Terphenyl	127810400	1.00	Y	26: 0	Y	-2.00	100.00	
d10-Fluoranthene	143799600	1.00	Y	24: 36	Y	1.13	100.00	-20
Fluoranthene	153031600	1.00	Y	24: 40	Y	1.06	100.00	-4
d10-Pyrene	159392600	1.00	Y	25: 17	Y	1.25	100.00	-18
Pyrene	180647000	1.00	Y	25: 21	Y	1.13	100.00	-6
d12-Benzo(a)anthracene	107231400	1.00	Y	29: 8	Y	0.84	100.00	-7
Benzo(a)anthracene	109481400	1.00	Y	29: 12	Y	1.02	100.00	-15
d12-Chrysene	172908800	1.00	Y	29: 15	Y	1.35	100.00	6
Chrysene	147111000	1.00	Y	29: 20	Y	0.85	100.00	-22
d12-Benzo(e)pyrene	229522000	1.00	Y	33: 22	Y	0.00	100.00	
d12-Benzo(b)fluoranthene	110222800	1.00	Y	32: 28	Y	0.48	100.00	6
Benzo(b)fluoranthene	115912400	1.00	Y	32: 34	Y	1.05	100.00	-10
d12-Benzo(k)fluoranthene	222508000	1.00	Y	32: 34	Y	0.97	100.00	2
Benzo(k)fluoranthene	276998000	1.00	Y	32: 38	Y	1.24	100.00	7
d12-Benzo(a)pyrene	163626400	1.00	Y	33: 32	Y	0.71	100.00	5
Benzo(e)pyrene	284102000	1.00	Y	33: 27	Y	1.74	100.00	6
Benzo(a)pyrene	187480200	1.00	Y	33: 38	Y	1.15	100.00	7
d12-Perylene	153983800	1.00	Y	33: 49	Y	0.67	100.00	6
Perylene	303846000	1.00	Y	33: 55	Y	1.97	100.00	15
d12-Indeno(123-cd)pyrene	120288800	1.00	Y	38: 1	Y	0.52	100.00	18
Indeno(123-cd)pyrene	59200000	1.00	Y	38: 8	Y	0.49	100.00	-21
d14-Dibenz(ah)anthracene	69941000	1.00	Y	38: 5	Y	0.30	100.00	24
Dibenz(ah)anthracene	83626600	1.00	Y	38: 15	Y	1.20	100.00	-15
d12-Benzo(ghi)perylene	163634200	1.00	Y	39: 12	Y	0.71	100.00	23
Benzo(ghi)perylene	144641400	1.00	Y	39: 21	Y	0.88	100.00	-13
d10-Fluorene	73075400	1.00	Y	17: 42	Y	0.32	100.00	
13C-Fluorene	59403200	1.00	Y	17: 47	Y	0.81	100.00	

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FILE	SAMP No. (1)	LAB. SAMP No	CUSTOMER ID	CLEAN UP 1 (SDS)	CLEAN UP 2 (D2)	TYPE (1)	CONCn.
300C98V4	1	ST1030	CS-3	956-64			1
300C98V4	2	SB1030	Solvent Blank	C-8			1
300C98V4	3	ST1030A	CS-3	956-64			1
300C98V4	4	SB1030A	Solvent Blank	C-8			1
300C98V4	5	301802-1MB	METHOD BLANK	AIR	PAH	VSE-26	0.50
300C98V4	6	301802-1LC	LCS				0.50
300C98V4	7	301802-4	10X DIL.				0.50
300C98V4	8	301802-5	10X DIL.				0.50
300C98V4	9	301802-6	10X DIL.				0.50
300C98V4	10	301802-7	10X DIL.				0.50
300C98V4	11	301802-8	10X DIL.				0.50
300C98V4	12	301802-9	10X DIL.				0.50
300C98V4	13	301802-10	10X DIL.				0.50
300C98V4	14	301802-11	10X DIL.				0.50
300C98V4	15	301802-12	10X DIL.				0.50
300C98V4	16	301802-13	10X DIL.				0.50
300C98V4	17	301802-14	10X DIL.				0.50
300C98V4	18	SB1029E	Solvent Blank	C-8			1
300C98V4	19						
300C98V4	20						
300C98V4	21						
300C98V4	22						
300C98V4	23						
300C98V4	24						
300C98V4	25						
300C98V4	26						
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300C98V4	43						
300C98V4	44						
300C98V4	45						
300C98V4	46		SMA, AM 10-30-98				
300C98V4	47						
300C98V4	48						
300C98V4	49						
300C98V4	50						

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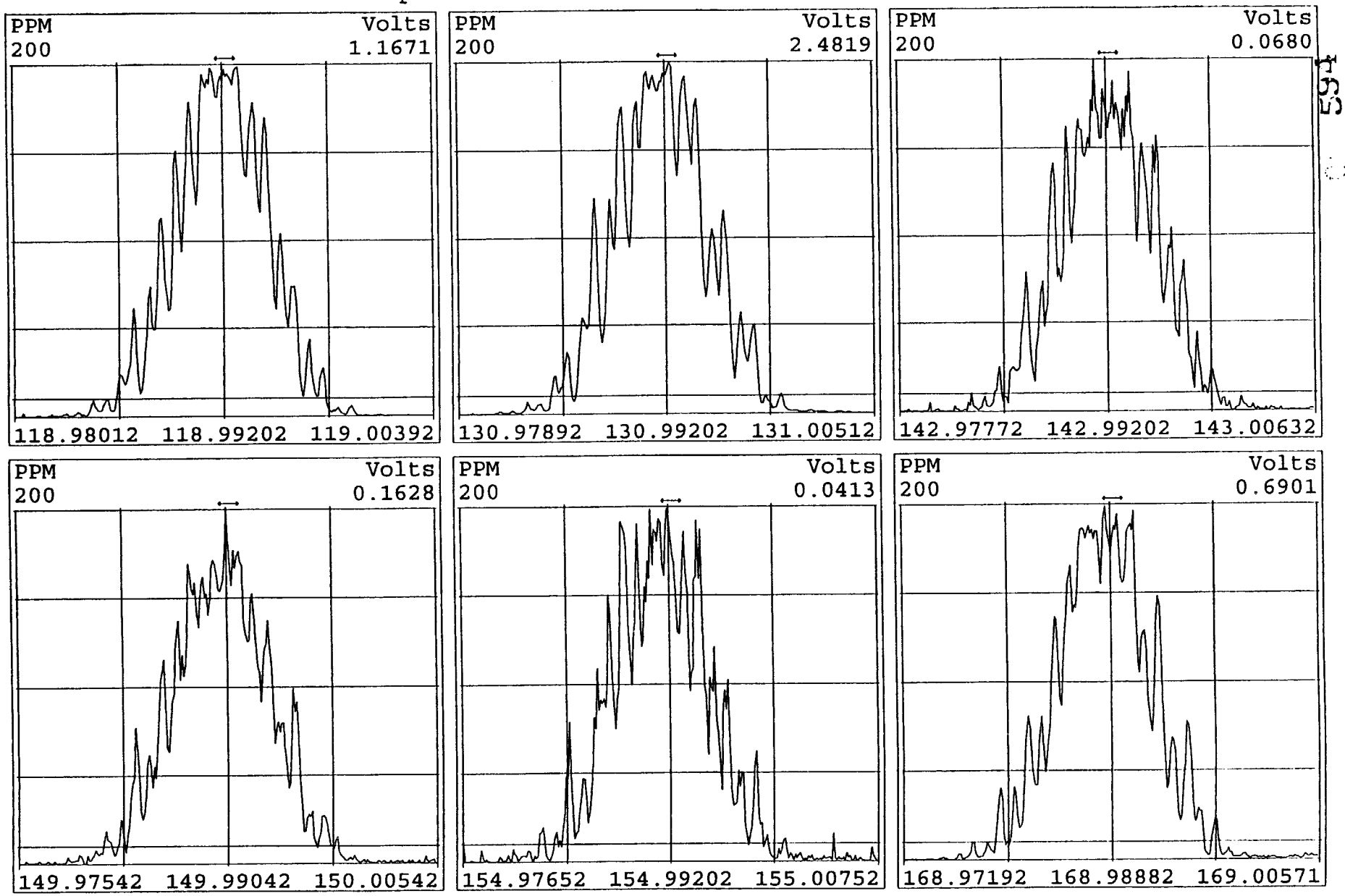
593 SMA 11-07

Peak Locate Examination:30-OCT-1998:16:37 File:30OC98V4
Experiment:PAHAIR Function:1 Reference:PFK



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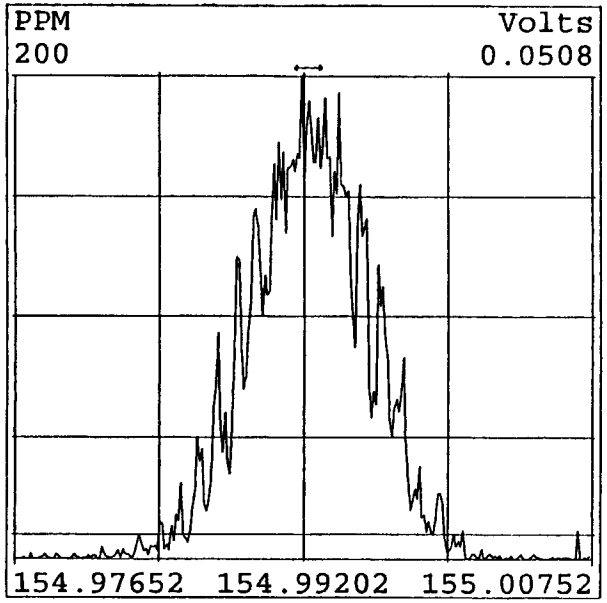
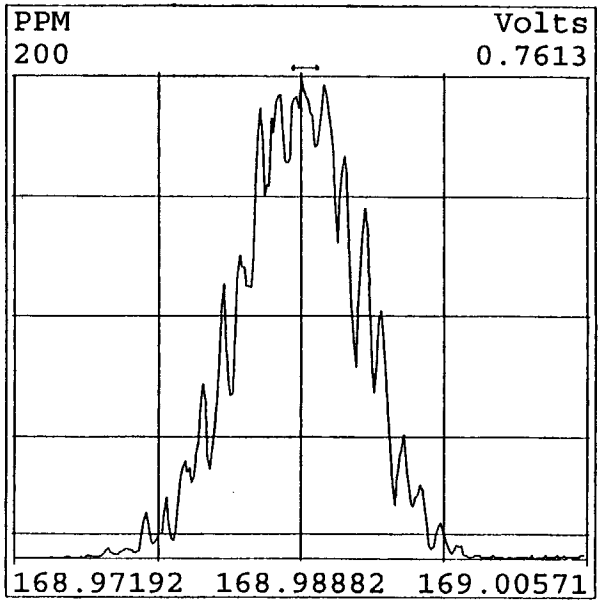
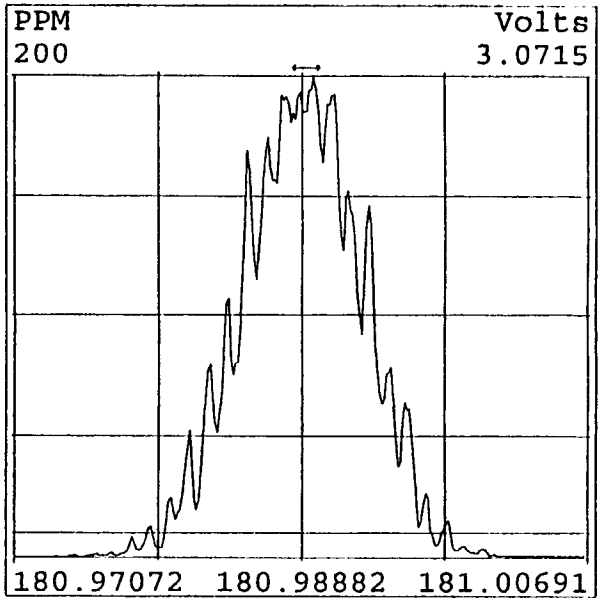
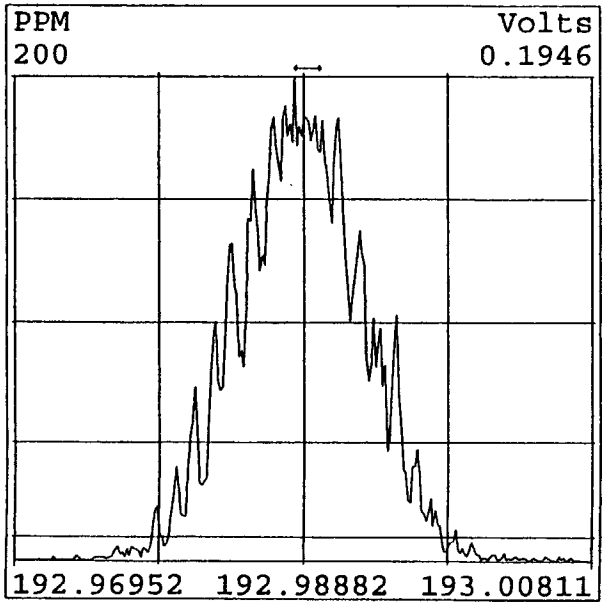
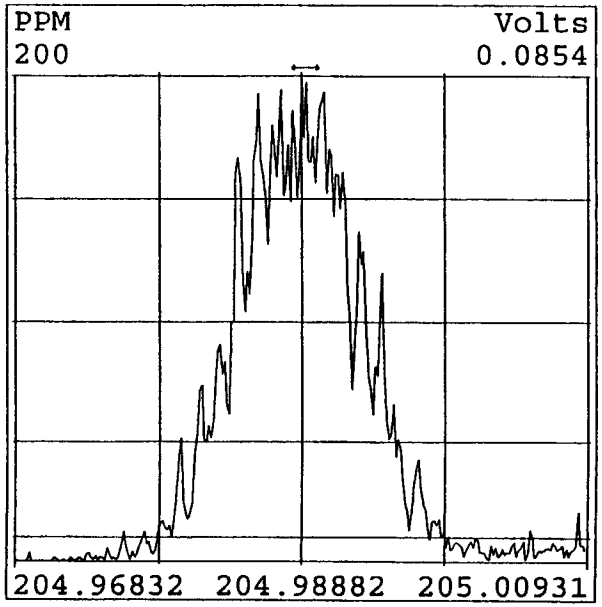
Experiment:PAHAIR Function:2 Reference:PFK











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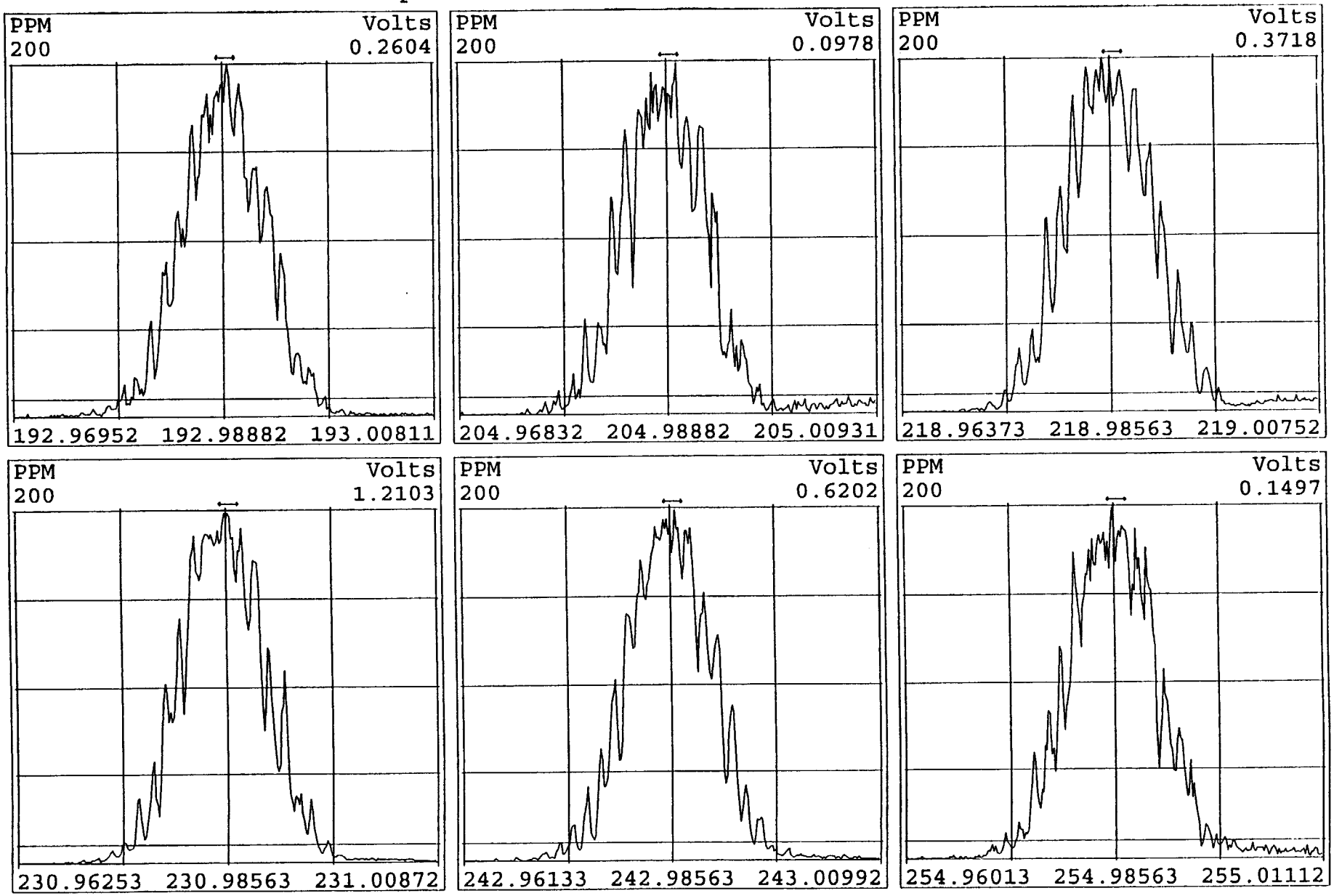
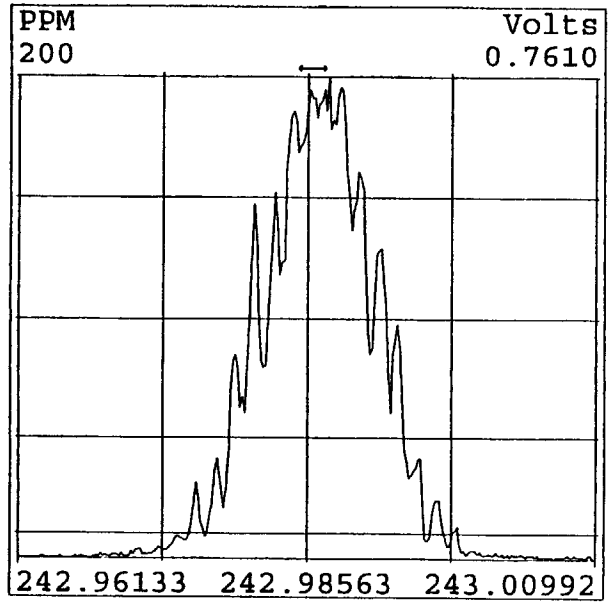
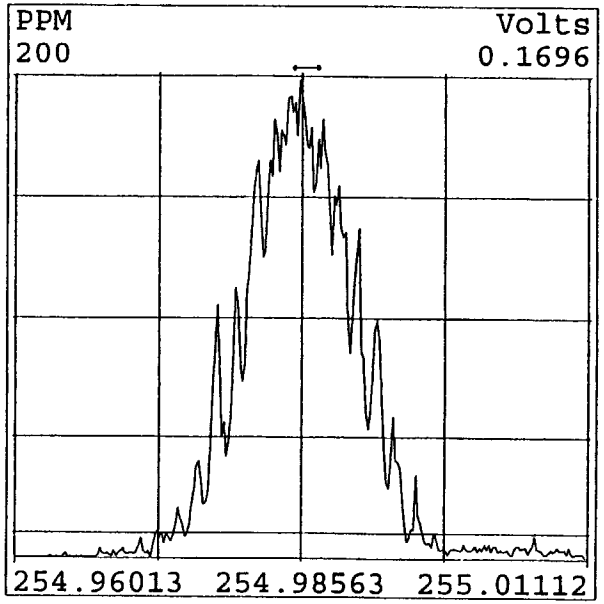
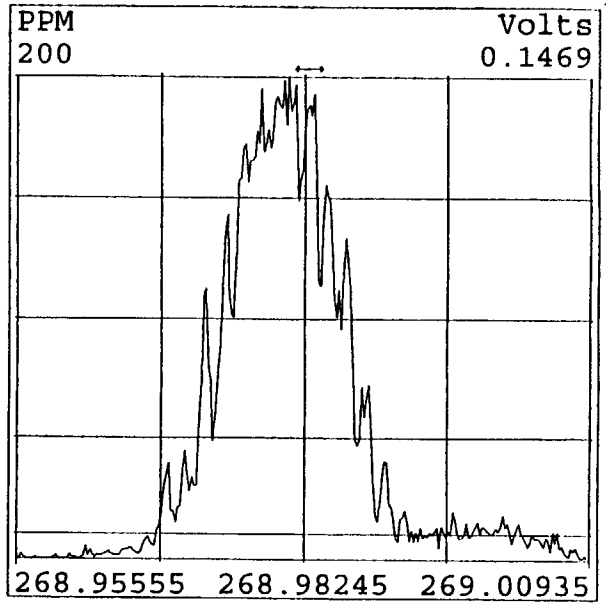
Peak Locate Examination:30-OCT-1998:16:40 File:30OC98V4
Experiment:PAHAIR Function:3 Reference:PFK

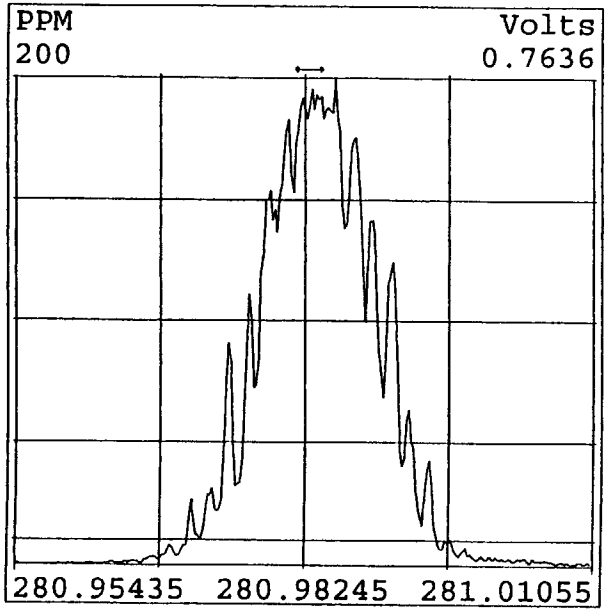


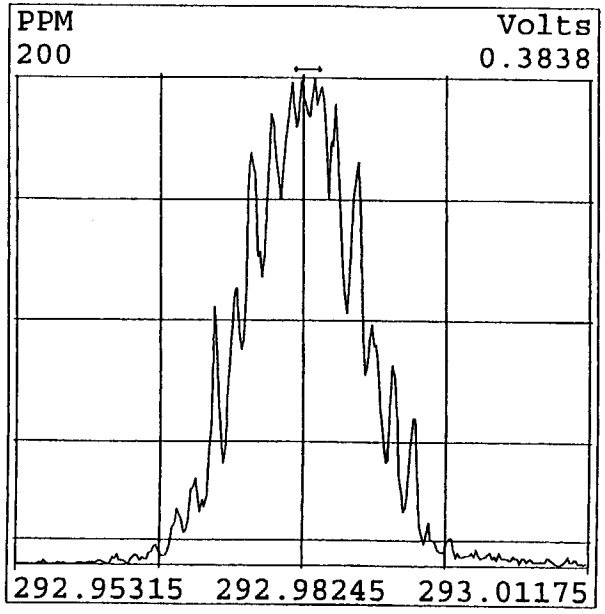
Peak Locate Examination:30-OCT-1998:16:41 File:30OC98V4
Experiment:PAHAIR Function:4 Reference:PFK











02-NOV-1998 08:06:34 AM

Dioxin Furan CALIBRATION TABLE

Mass Spec : VG-4
GC Column : DB-5
265-04A,B,D,E,956-64

File name : PAHAIR102998V4.RRF
Date analyzed : 29-OCT-98

INITIAL CALIBRATION CURVE

Mult.: 350

		Mean	S.D.	%RSD	1	2	3	4	5	6	7	8	9	10
d8-Naphthalene	Amount				100.00	100.00	100.00	100.00	100.00					
	RF				185.11	205.87	228.31	244.46	256.61					
	RRF	2.24	0.289	12.900	1.85	2.06	2.28	2.44	2.57					
Naphthalene	Amount				10.00	50.00	100.00	200.00	500.00					
	RF				13.76	61.93	113.47	231.43	609.70					
	RRF	1.23	0.094	7.707	1.38	1.24	1.13	1.16	1.22					
2-Methylnaphthalene	Amount				10.00	50.00	100.00	200.00	500.00					
	RF				6.91	29.85	51.39	97.93	255.67					
	RRF	0.56	0.084	14.909	0.69	0.60	0.51	0.49	0.51					
d8-Acenaphthylene	Amount				100.00	100.00	100.00	100.00	100.00					
	RF				131.95	128.38	114.60	122.45	109.50					
	RRF	1.21	0.093	7.696	1.32	1.28	1.15	1.22	1.10					
Acenaphthylene	Amount				10.00	50.00	100.00	200.00	500.00					
	RF				9.55	48.30	90.68	178.19	500.84					
	RRF	0.94	0.045	4.773	0.95	0.97	0.91	0.89	1.00					
d10-Acenaphthene	Amount				100.00	100.00	100.00	100.00	100.00					
	RF				83.11	77.72	76.15	77.96	57.36					
	RRF	0.74	0.099	13.310	0.83	0.78	0.76	0.78	0.57					
Acenaphthene	Amount				10.00	50.00	100.00	200.00	500.00					
	RF				10.98	62.63	151.76	215.88	641.50					
	RRF	1.25	0.177	14.178	1.10	1.25	1.52	1.08	1.28					
d10-Fluorene	Amount				100.00	100.00	100.00	100.00	100.00					
	RF				153.24	135.78	140.61	141.09	139.72					
	RRF	1.42	0.066	4.625	1.53	1.36	1.41	1.41	1.40					
Fluorene	Amount				10.00	50.00	100.00	200.00	500.00					
	RF				8.53	58.18	117.21	249.15	684.13					
	RRF	1.16	0.191	16.420	0.85	1.16	1.17	1.25	1.37					
d10-Phenanthrene	Amount				100.00	100.00	100.00	100.00	100.00					
	RF				308.98	263.63	276.27	272.04	282.87					
	RRF	2.81	0.173	6.145	3.09	2.64	2.76	2.72	2.83					
Phenanthrene	Amount				10.00	50.00	100.00	200.00	500.00					
	RF				9.70	46.13	81.87	168.14	460.23					
	RRF	0.89	0.063	7.028	0.97	0.92	0.82	0.84	0.92					
Anthracene	Amount				10.00	50.00	100.00	200.00	500.00					
	RF				8.13	42.20	77.06	153.96	402.42					
	RRF	0.80	0.031	3.901	0.81	0.84	0.77	0.77	0.80					
d10-Fluoranthene	Amount				100.00	100.00	100.00	100.00	100.00					
	RF				118.94	136.07	145.72	150.34	154.31					
	RRF	1.41	0.141	10.009	1.19	1.36	1.46	1.50	1.54					
Fluoranthene	Amount				10.00	50.00	100.00	200.00	500.00					
	RF				14.14	55.12	99.77	200.49	521.18					
	RRF	1.11	0.174	15.653	1.41	1.10	1.00	1.00	1.04					
d10-Pyrene	Amount				100.00	100.00	100.00	100.00	100.00					
	RF				129.03	143.24	158.81	161.45	166.55					
	RRF	1.52	0.154	10.160	1.29	1.43	1.59	1.61	1.67					
Pyrene	Amount				10.00	50.00	100.00	200.00	500.00					
	RF				16.74	59.11	104.58	204.18	551.22					
	RRF	1.21	0.269	22.353	1.67	1.18	1.05	1.02	1.10					

Mass Spec : VG-4
GC Column : DB-5
265-04A,B,D,E,956-64

File name : PAHAIR102998V4.RRF
Date analyzed : 29-OCT-98

INITIAL CALIBRATION CURVE

Mult.: 350

		Mean	S.D.	%RSD	1	2	3	4	5	6	7	8	9	10
d12-Benzo(a)anthracene	Amount				100.00	100.00	100.00	100.00	100.00					
	RF				68.20	70.96	127.65	89.95	93.26					
	RRF	0.90	0.238	26.446	0.68	0.71	1.28	0.90	0.93					
Benzo(a)anthracene	Amount				10.00	50.00	100.00	200.00	500.00					
	RF				11.85	64.84	102.61	234.26	671.78					
	RRF	1.20	0.124	10.269	1.18	1.30	1.03	1.17	1.34					
d12-Chrysene	Amount				100.00	100.00	100.00	100.00	100.00					
	RF				109.94	119.85	127.65	136.79	145.35					
	RRF	1.28	0.139	10.855	1.10	1.20	1.28	1.37	1.45					
Chrysene	Amount				10.00	50.00	100.00	200.00	500.00					
	RF				10.44	56.47	102.61	215.75	571.04					
	RRF	1.08	0.051	4.716	1.04	1.13	1.03	1.08	1.14					
d12-Benzo(b)fluoranthene	Amount				100.00	100.00	100.00	100.00	100.00					
	RF				41.05	45.84	49.22	45.10	45.72					
	RRF	0.45	0.029	6.414	0.41	0.46	0.49	0.45	0.46					
Benzo(b)fluoranthene	Amount				10.00	50.00	100.00	200.00	500.00					
	RF				12.56	61.73	95.82	228.66	622.27					
	RRF	1.17	0.125	10.717	1.26	1.23	0.96	1.14	1.24					
d12-Benzo(k)fluoranthene	Amount				100.00	100.00	100.00	100.00	100.00					
	RF				91.66	94.95	96.52	94.09	96.82					
	RRF	0.95	0.021	2.203	0.92	0.95	0.97	0.94	0.97					
Benzo(k)fluoranthene	Amount				10.00	50.00	100.00	200.00	500.00					
	RF				12.71	63.16	119.14	210.18	522.11					
	RRF	1.16	0.111	9.525	1.27	1.26	1.19	1.05	1.04					
d12-Benzo(a)pyrene	Amount				100.00	100.00	100.00	100.00	100.00					
	RF				65.24	66.86	69.56	67.87	68.82					
	RRF	0.68	0.017	2.504	0.65	0.67	0.70	0.68	0.69					
Benzo(e)pyrene	Amount				10.00	50.00	100.00	200.00	500.00					
	RF				18.05	89.03	157.16	302.58	767.23					
	RRF	1.64	0.140	8.557	1.80	1.78	1.57	1.51	1.53					
Benzo(a)pyrene	Amount				10.00	50.00	100.00	200.00	500.00					
	RF				11.71	60.46	102.44	200.46	476.32					
	RRF	1.07	0.112	10.437	1.17	1.21	1.02	1.00	0.95					
d12-Perylene	Amount				100.00	100.00	100.00	100.00	100.00					
	RF				64.89	58.55	68.21	62.00	61.45					
	RRF	0.63	0.037	5.829	0.65	0.59	0.68	0.62	0.61					
Perylene	Amount				10.00	50.00	100.00	200.00	500.00					
	RF				16.93	98.08	162.24	324.02	835.41					
	RRF	1.71	0.142	8.297	1.69	1.96	1.62	1.62	1.67					
d12-Indeno(123-cd)pyrene	Amount				100.00	100.00	100.00	100.00	100.00					
	RF				44.86	44.54	44.08	43.39	45.40					
	RRF	0.44	0.008	1.722	0.45	0.45	0.44	0.43	0.45					
Indeno(123-cd)pyrene	Amount				10.00	50.00	100.00	200.00	500.00					
	RF				5.85	35.13	60.26	127.89	287.53					
	RRF	0.62	0.052	8.352	0.59	0.70	0.60	0.64	0.58					
d14-Dibenz(ah)anthracene	Amount				100.00	100.00	100.00	100.00	100.00					
	RF				20.73	24.39	25.35	26.10	26.33					
	RRF	0.25	0.023	9.286	0.21	0.24	0.25	0.26	0.26					

02-NOV-1998 08:06:41 AM

Dioxin Furan CALIBRATION TABLE

Mass Spec : VG-4
GC Column : DB-5
265-04A,B,D,E,956-64

File name : PAHAIR102998V4.RRF
Date analyzed : 29-OCT-98

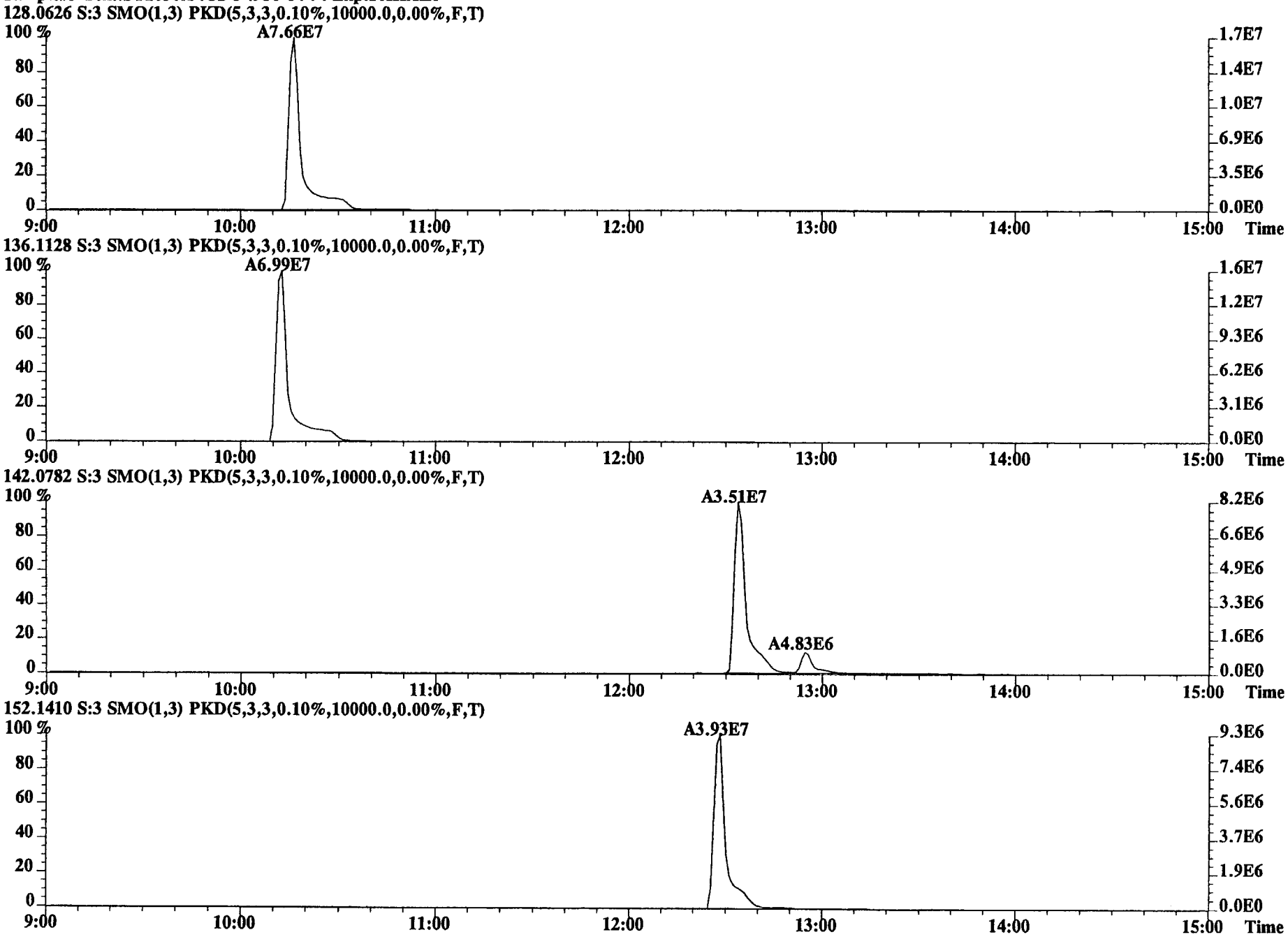
Mult.: 350

INITIAL CALIBRATION CURVE

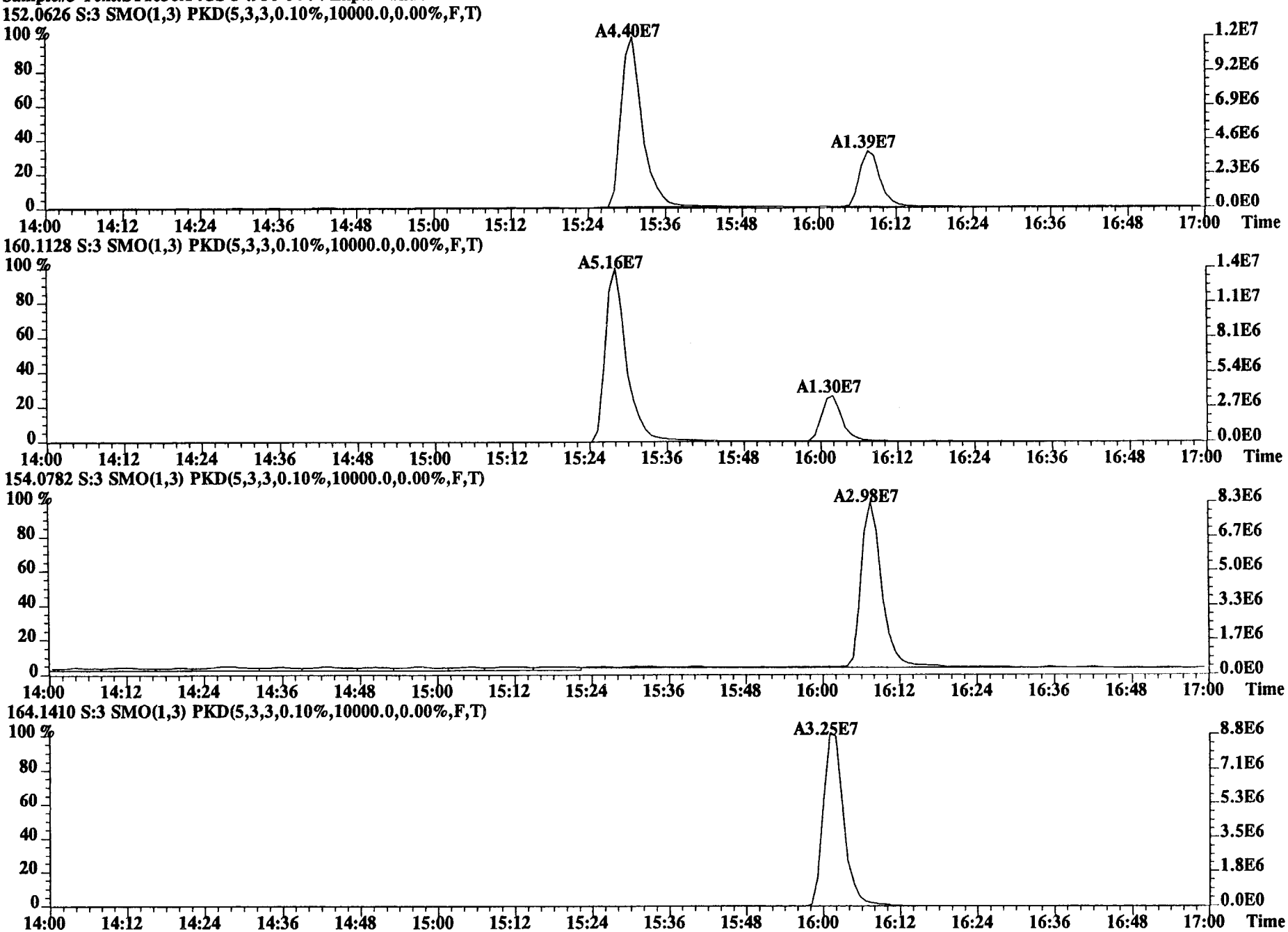
		Mean	S.D.	%RSD	1	2	3	4	5	6	7	8	9	10
Dibenz(ah)anthracene	Amount				10.00	50.00	100.00	200.00	500.00					
	RF				12.92	69.25	143.15	281.33	751.34					
	RRF	1.40	0.077	5.452	1.29	1.38	1.43	1.41	1.50					
d12-Benzo(ghi)perylene	Amount				100.00	100.00	100.00	100.00	100.00					
	RF				59.24	54.17	59.73	58.78	57.94					
	RRF	0.58	0.022	3.838	0.59	0.54	0.60	0.59	0.58					
Benzo(ghi)perylene	Amount				10.00	50.00	100.00	200.00	500.00					
	RF				8.58	51.44	109.18	211.25	522.58					
	RRF	1.02	0.091	8.984	0.86	1.03	1.09	1.06	1.05					
	Amount													
	RF				0	0	0	0	0					
	RRF	0	0	0										

009

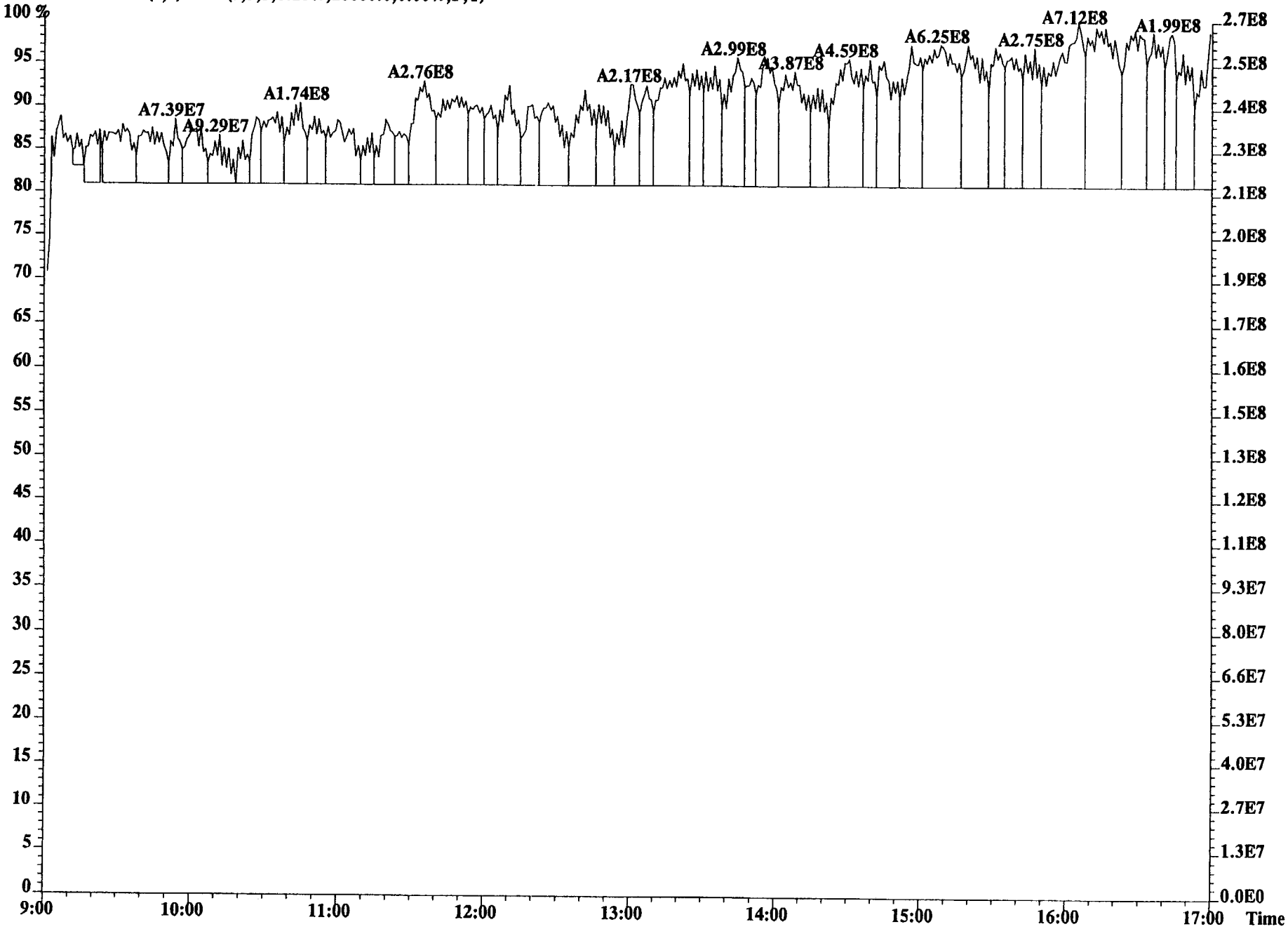
File:30OC98V4 #1-510 Acq:30-OCT-1998 18:23:22 GC EI+ Voltage SIR 70SE
Sample#3 Text:ST1030A :CS-3 :956-64 : : Exp:PAHAIR



File:30OC98V4 #1-510 Acq:30-OCT-1998 18:23:22 GC EI+ Voltage SIR 70SE
Sample#3 Text:ST1030A :CS-3 :956-64 : : Exp:PAHAIR

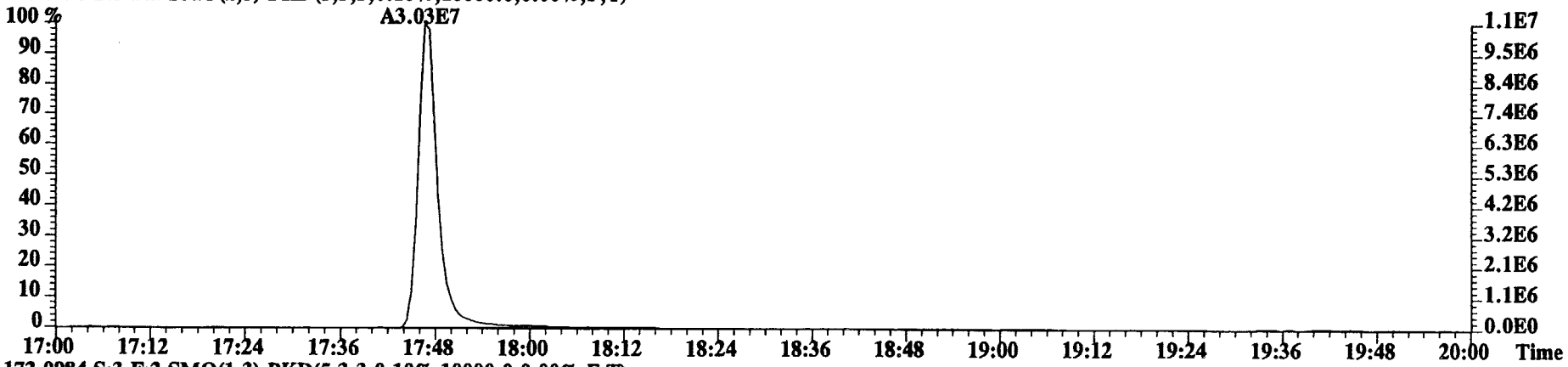


File:30OC98V4 #1-510 Acq:30-OCT-1998 18:23:22 GC EI+ Voltage SIR 70SE
Sample#3 Text:ST1030A :CS-3 :956-64 : : Exp:PAHAIR
130.9920 S:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

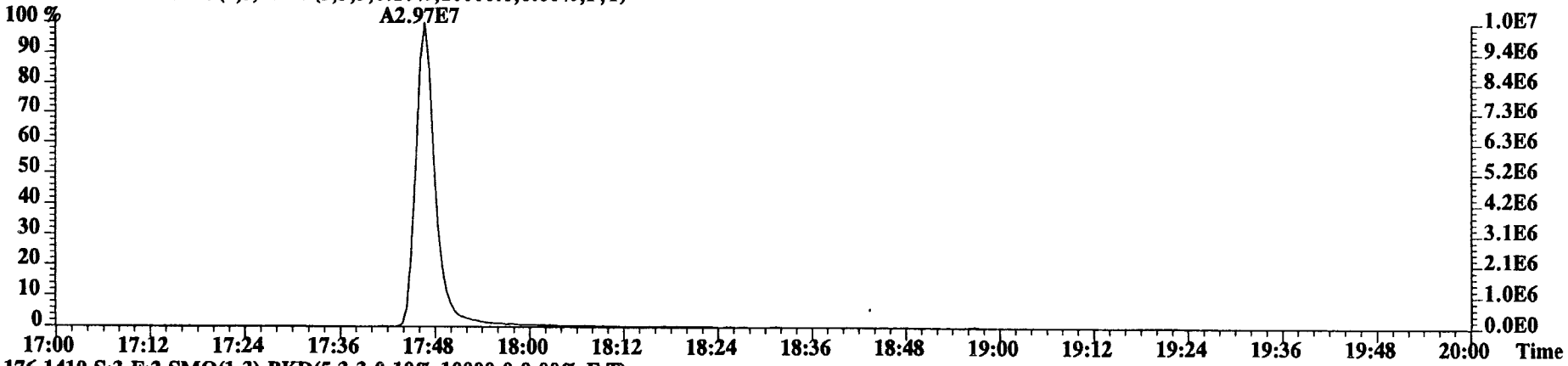


693

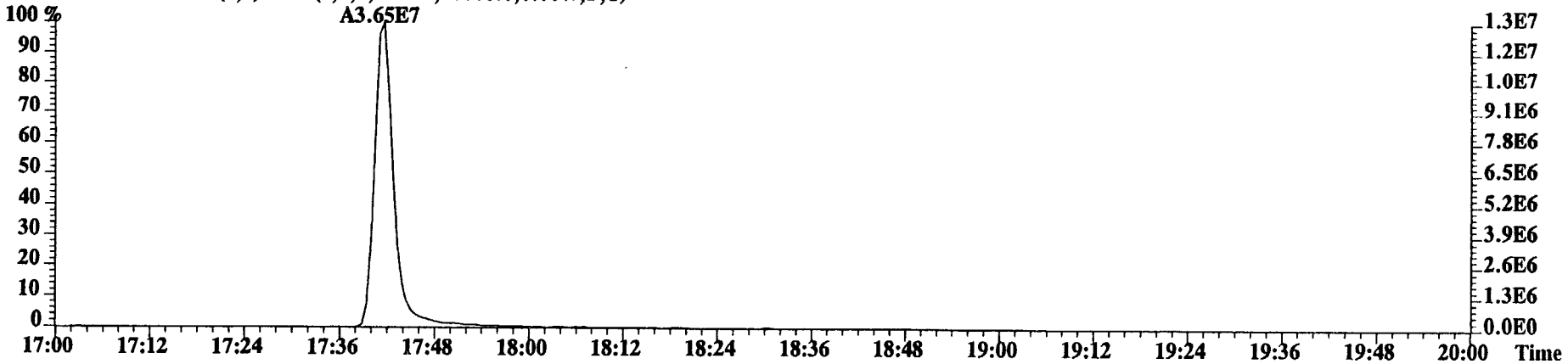
File:30OC98V4 #1-641 Acq:30-OCT-1998 18:23:22 GC EI+ Voltage SIR 70SE
Sample#3 Text:ST1030A :CS-3 :956-64 : : Exp:PAHAIR
166.0798 S:3 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



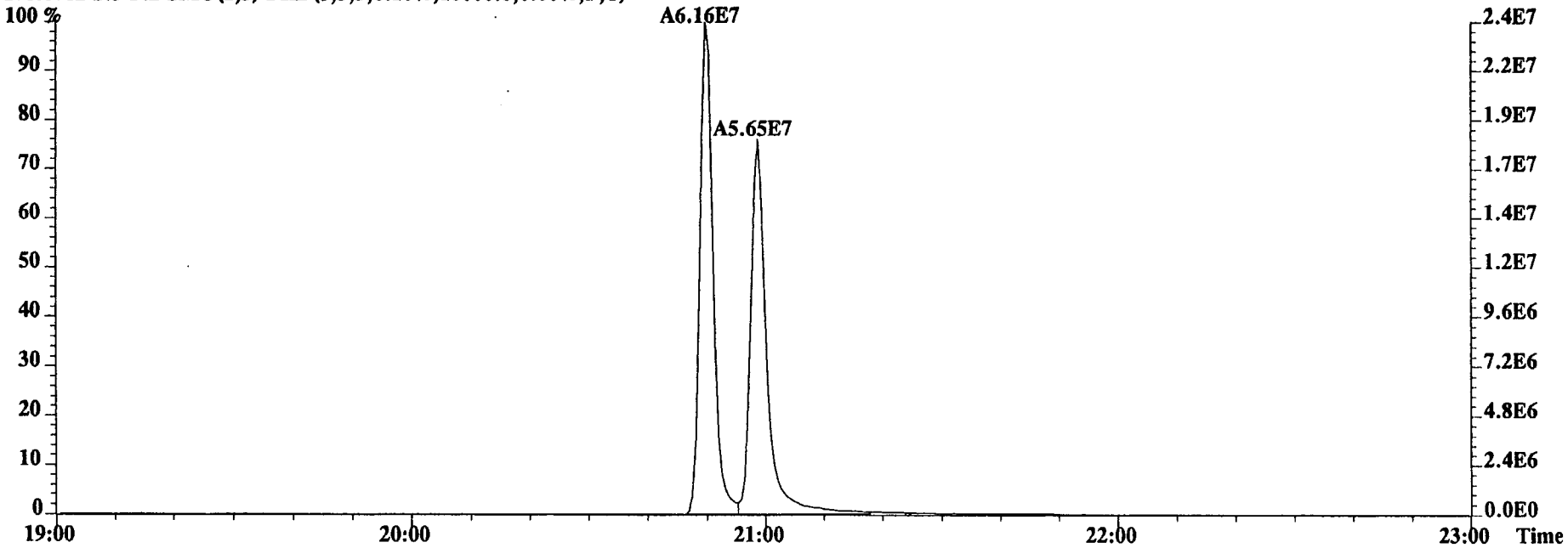
172.0984 S:3 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



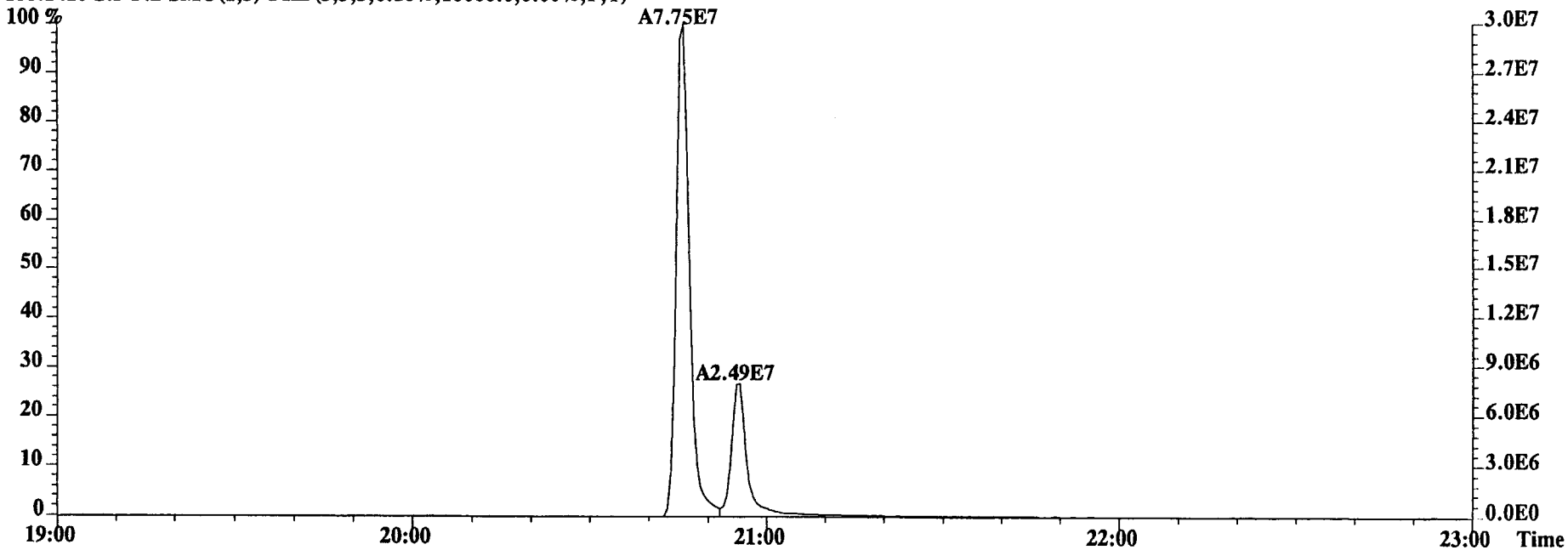
176.1410 S:3 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



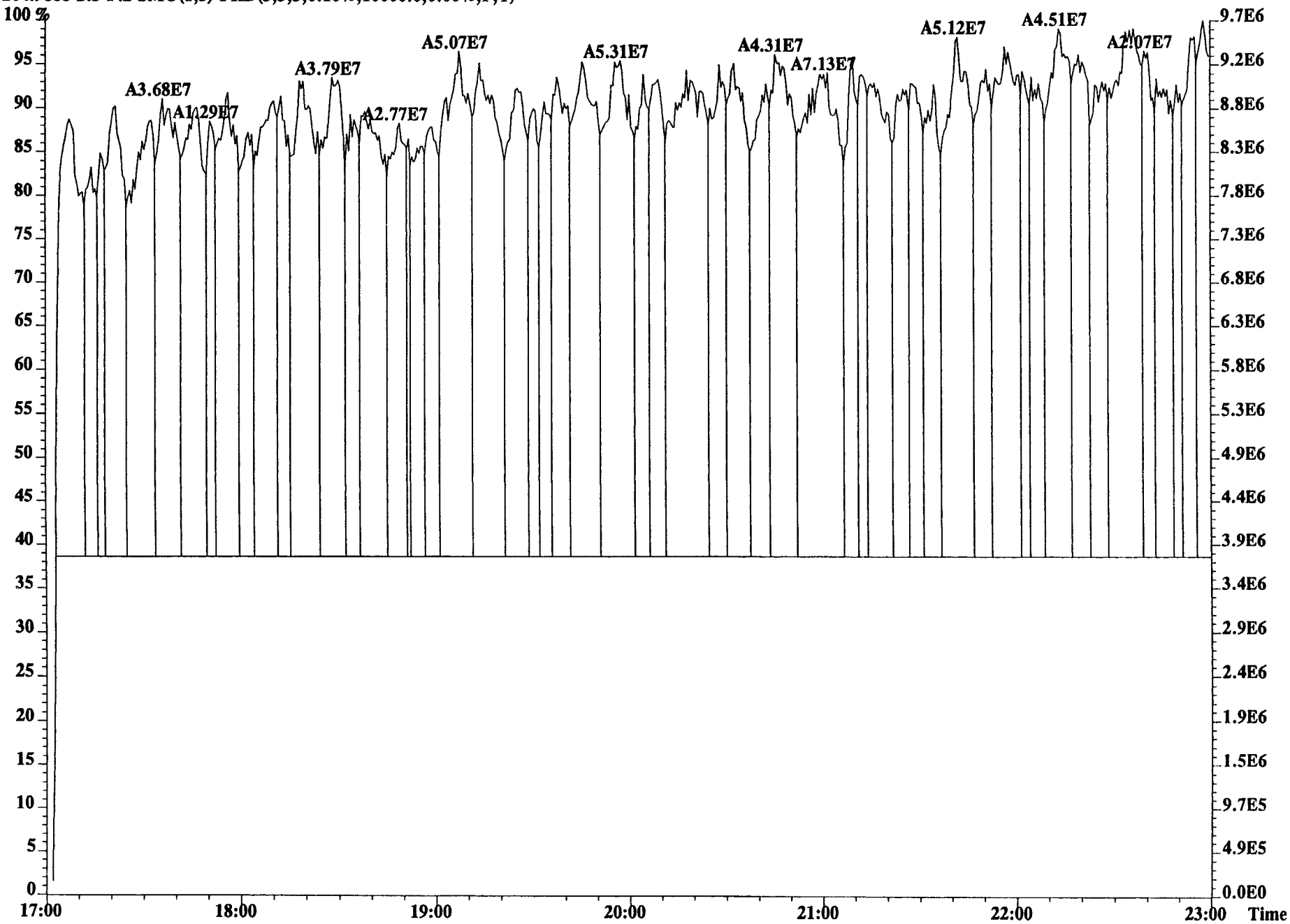
File:30OC98V4 #1-641 Acq:30-OCT-1998 18:23:22 GC EI+ Voltage SIR 70SE
Sample#3 Text:ST1030A :CS-3 :956-64 : : Exp:PAHAIR
178.0782 S:3 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



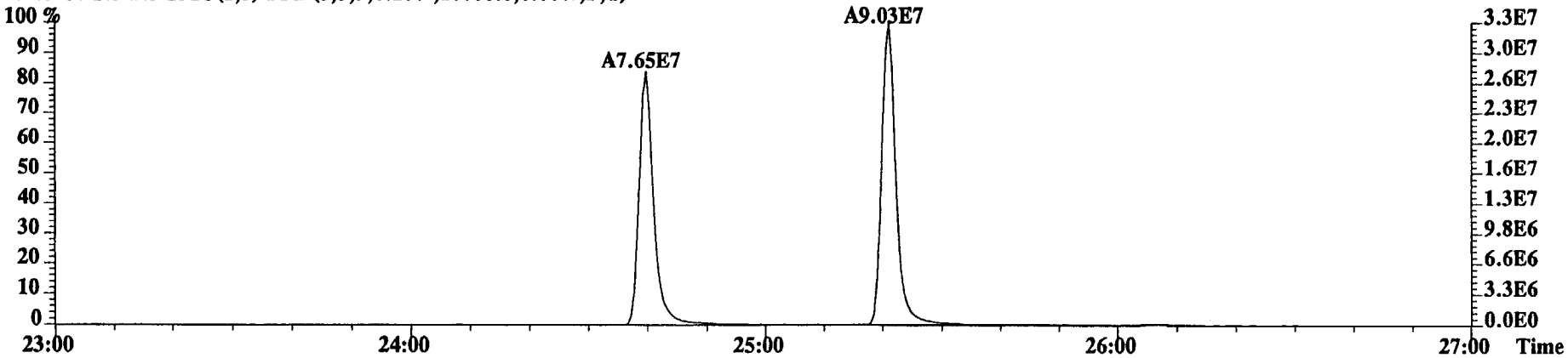
188.1410 S:3 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



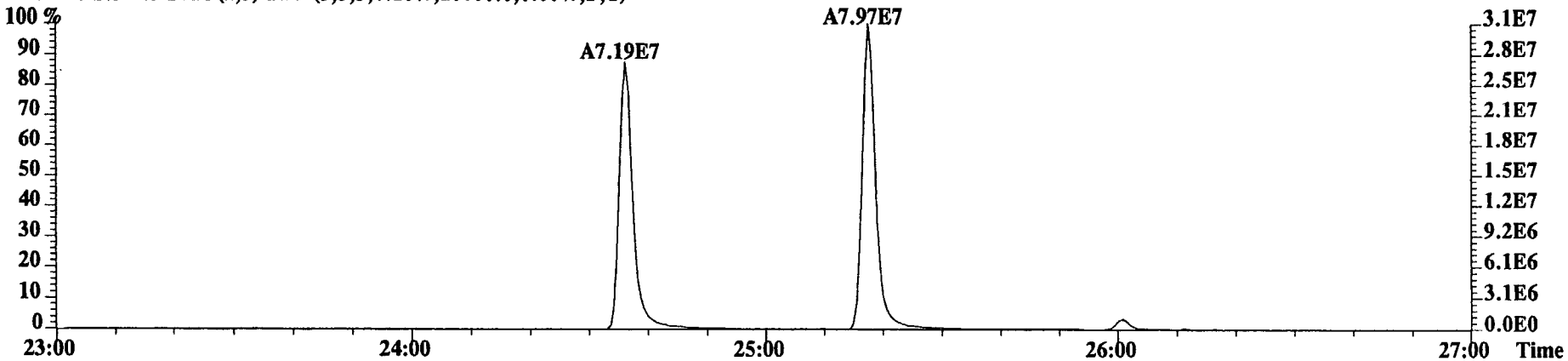
File:30OC98V4 #1-641 Acq:30-OCT-1998 18:23:22 GC EI+ Voltage SIR 70SE
Sample#3 Text:ST1030A :CS-3 :956-64 : : Exp:PAHAIR
204.9888 S:3 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



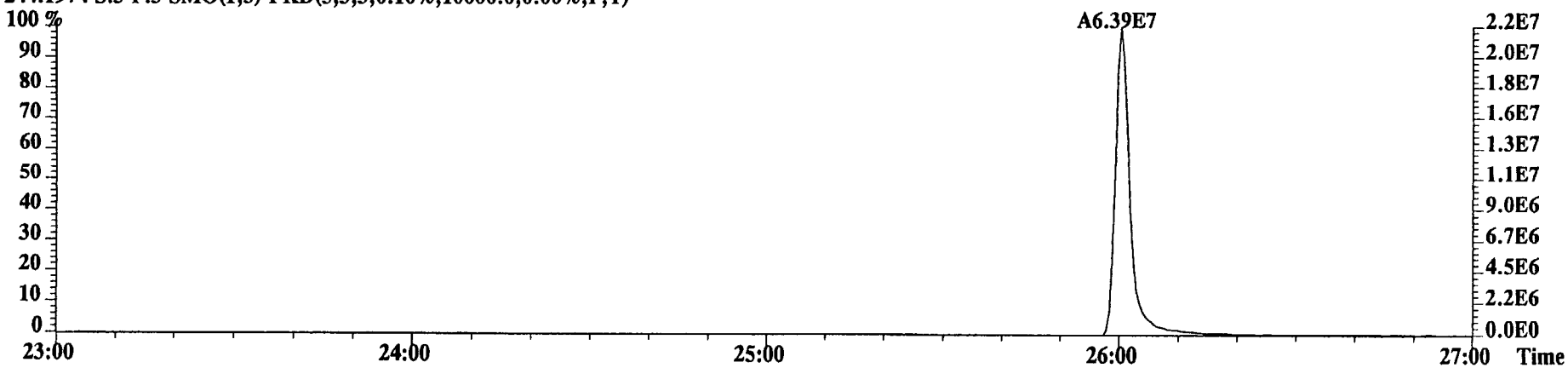
File:30OC98V4 #1-939 Acq:30-OCT-1998 18:23:22 GC EI+ Voltage SIR 70SE
Sample#3 Text:ST1030A :CS-3 :956-64 : : Exp:PAHAIR
202.0782 S:3 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



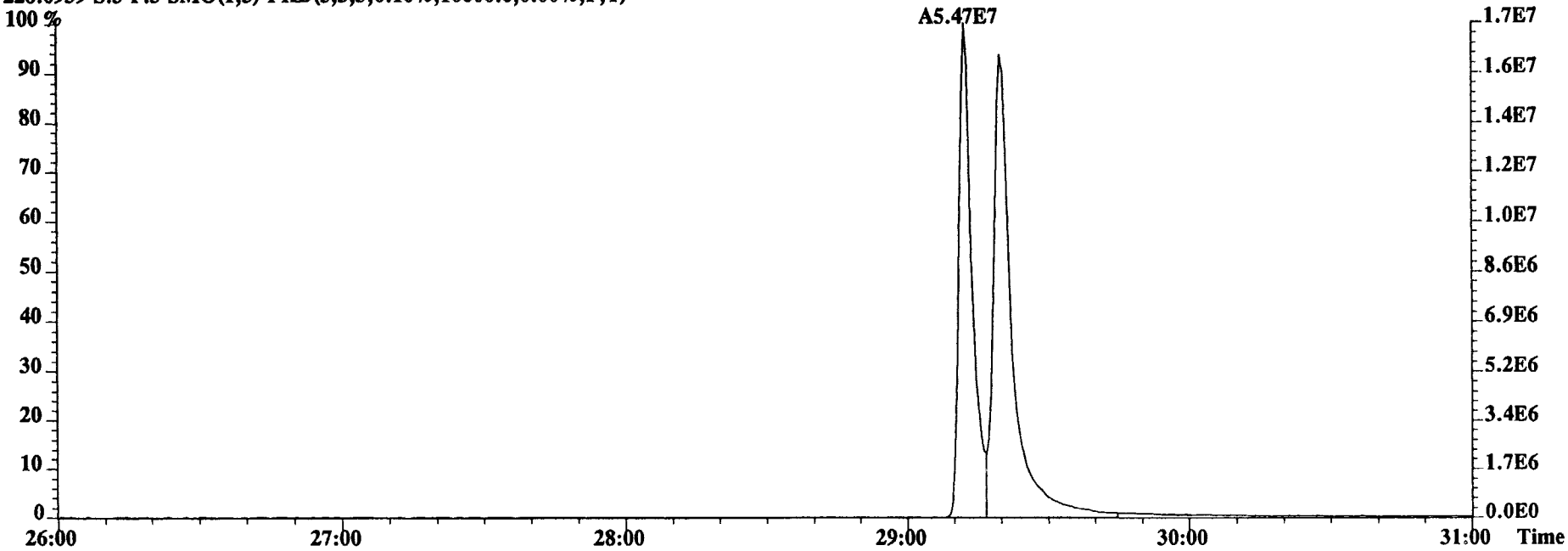
212.1410 S:3 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



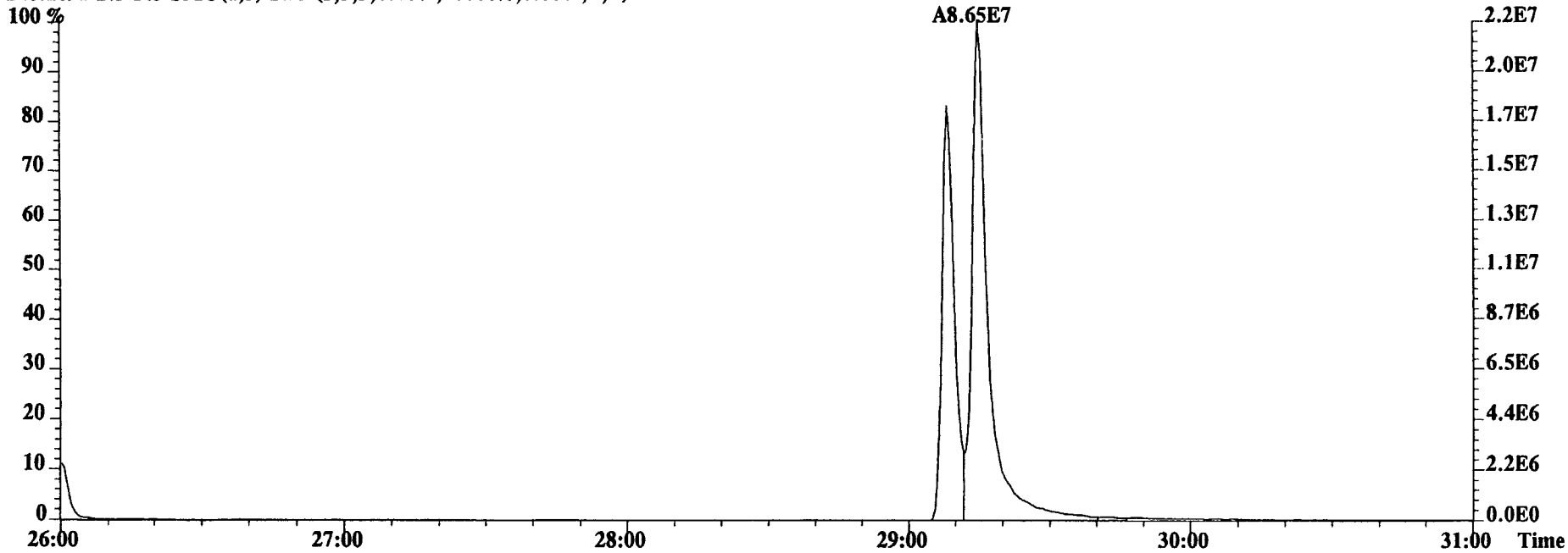
244.1974 S:3 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



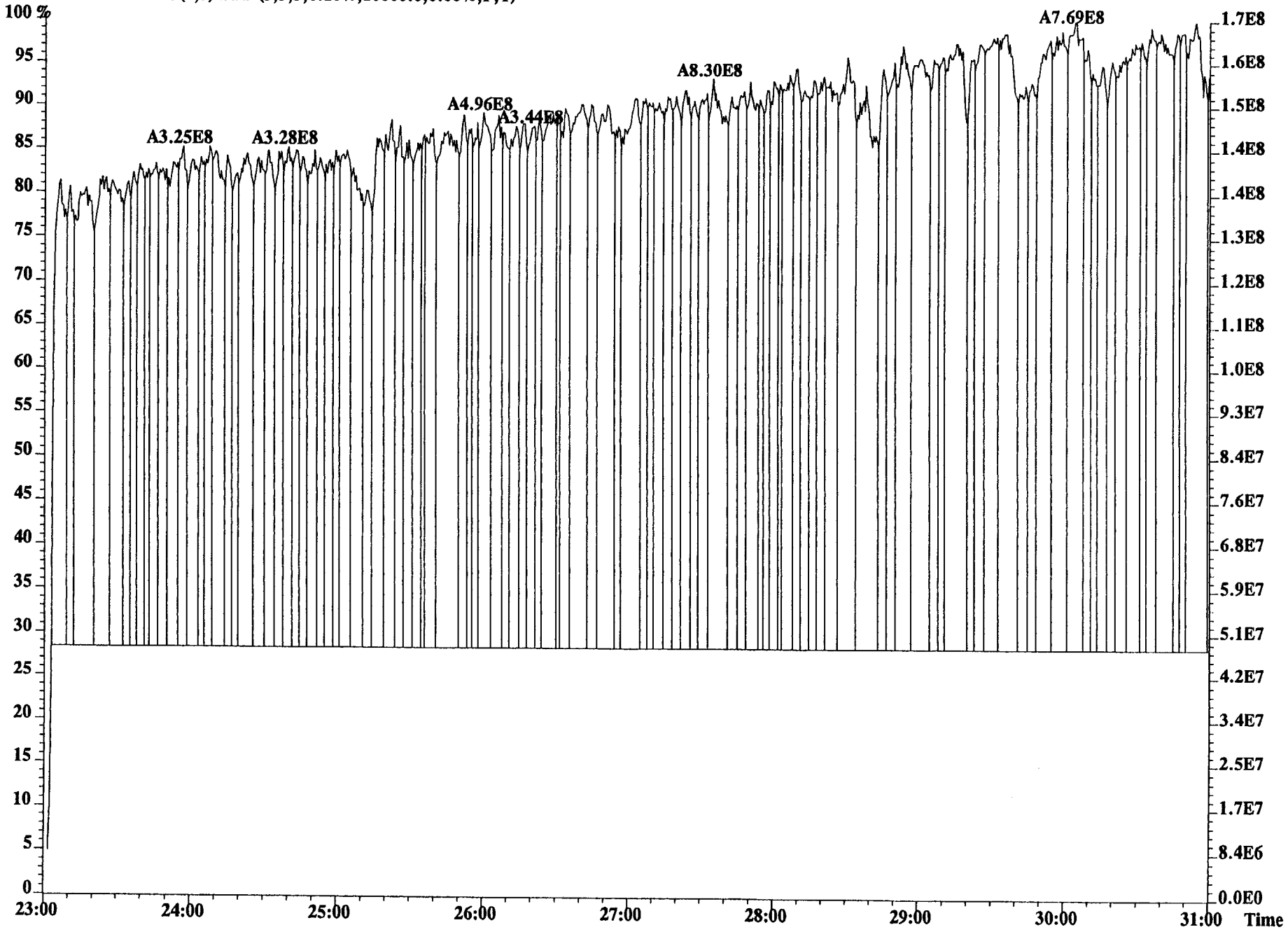
File:30OC98V4 #1-939 Acq:30-OCT-1998 18:23:22 GC EI+ Voltage SIR 70SE
Sample#3 Text:ST1030A :CS-3 :956-64 : : Exp:PAHAIR
228.0939 S:3 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



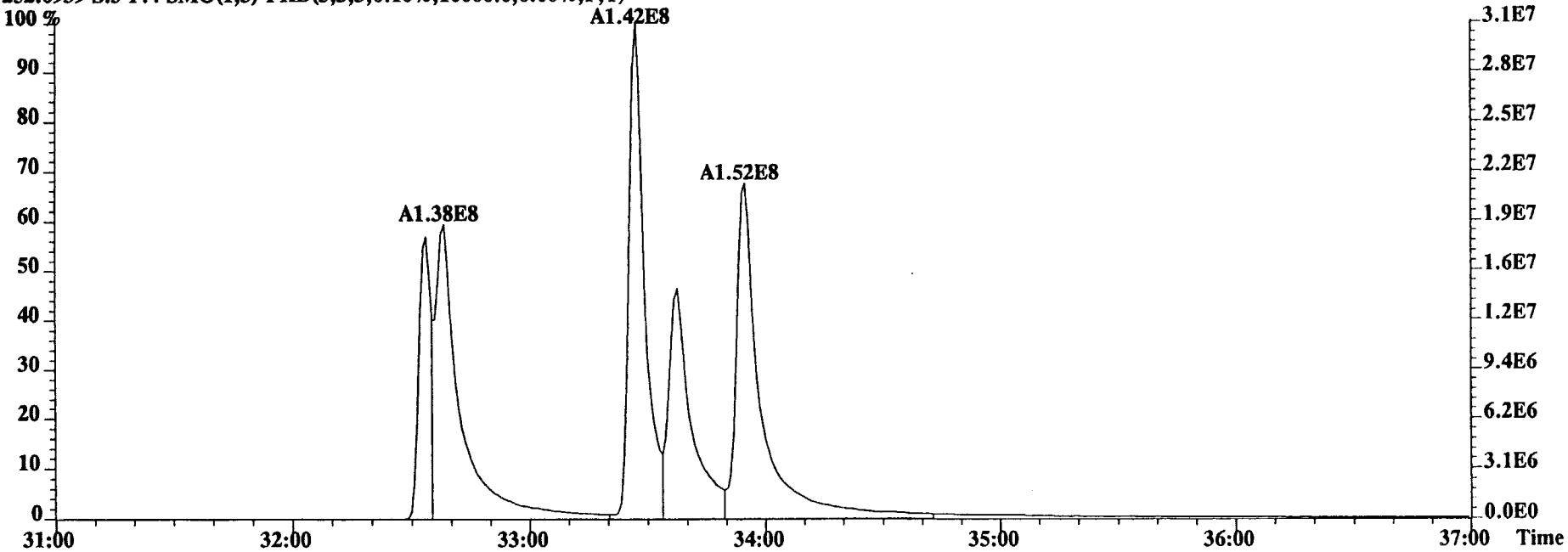
240.1692 S:3 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



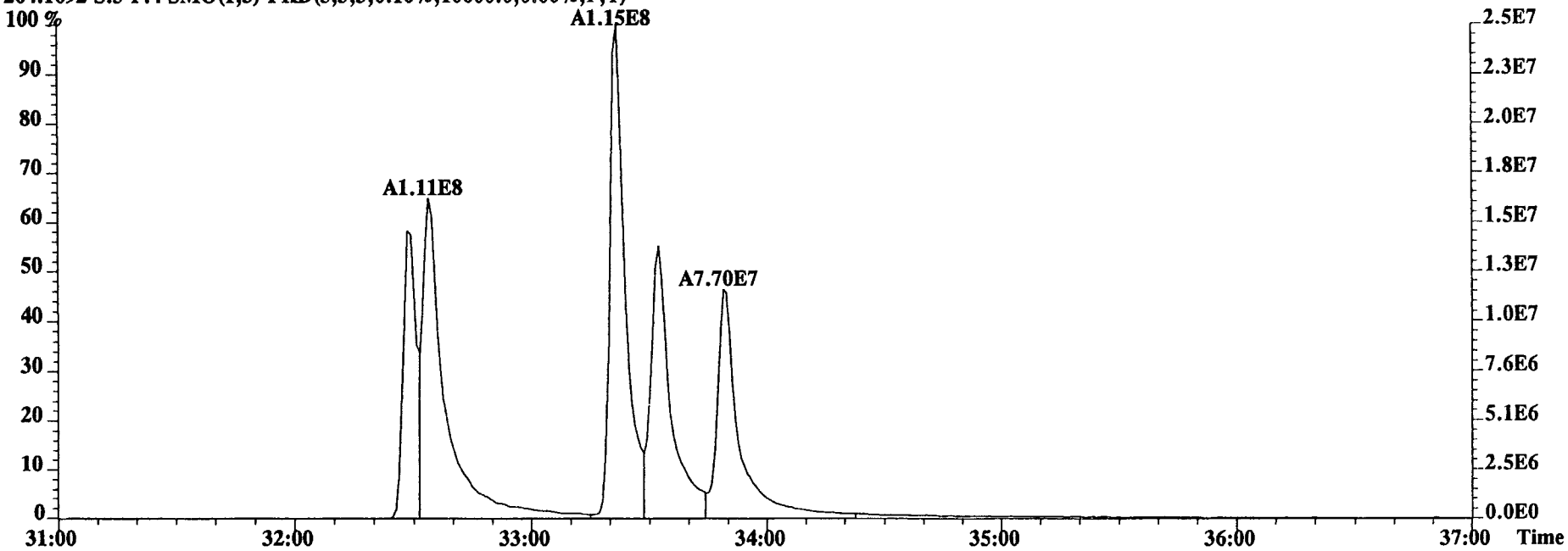
File:30OC98V4 #1-939 Acq:30-OCT-1998 18:23:22 GC EI+ Voltage SIR 70SE
Sample#3 Text:ST1030A :CS-3 :956-64 : : Exp:PAHAIR
230.9856 S:3 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



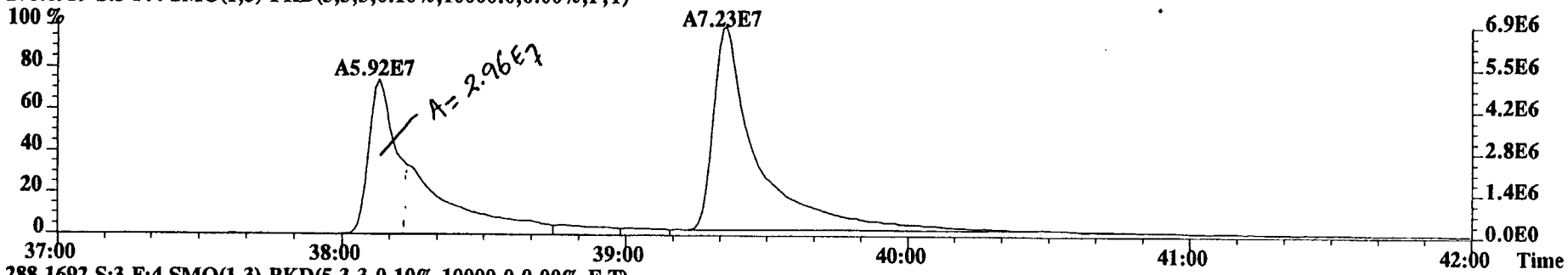
File:30OC98V4 #1-878 Acq:30-OCT-1998 18:23:22 GC EI+ Voltage SIR 70SE
Sample#3 Text:ST1030A :CS-3 :956-64 : : Exp:PAHAIR
252.0939 S:3 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



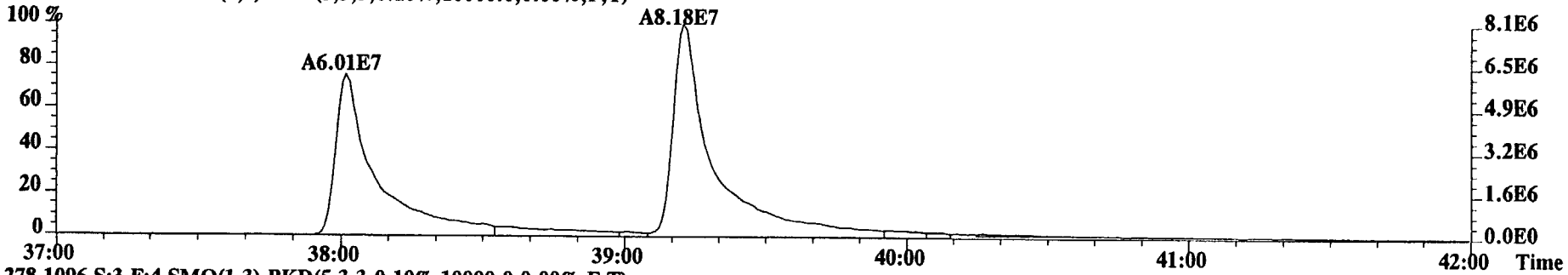
264.1692 S:3 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



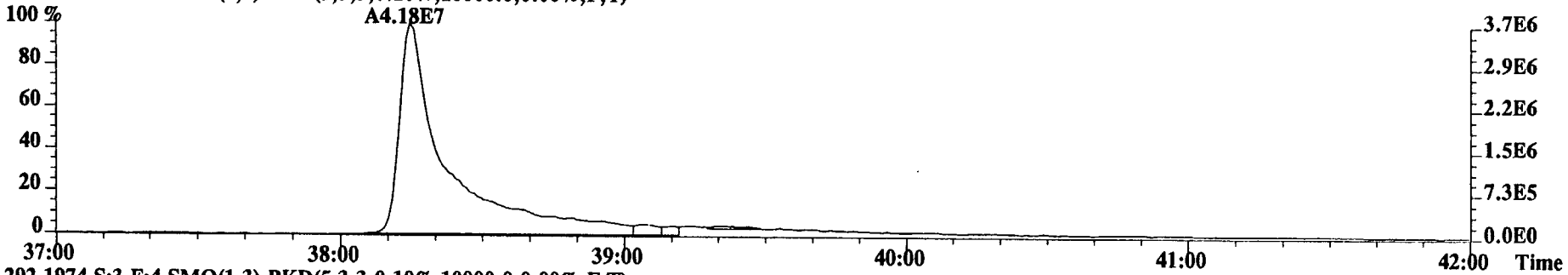
File:30OC98V4 #1-878 Acq:30-OCT-1998 18:23:22 GC EI+ Voltage SIR 70SE
Sample#3 Text:ST1030A :CS-3 :956-64 : : Exp:PAHAIR
276.0939 S:3 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



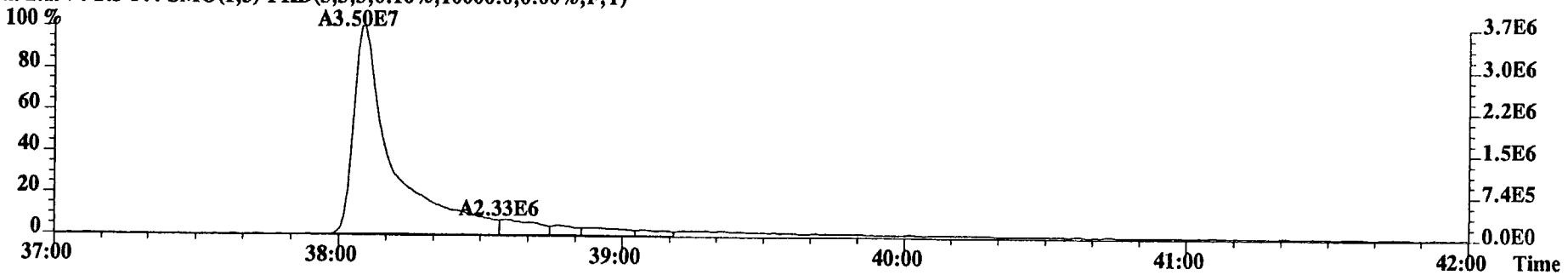
288.1692 S:3 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



278.1096 S:3 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

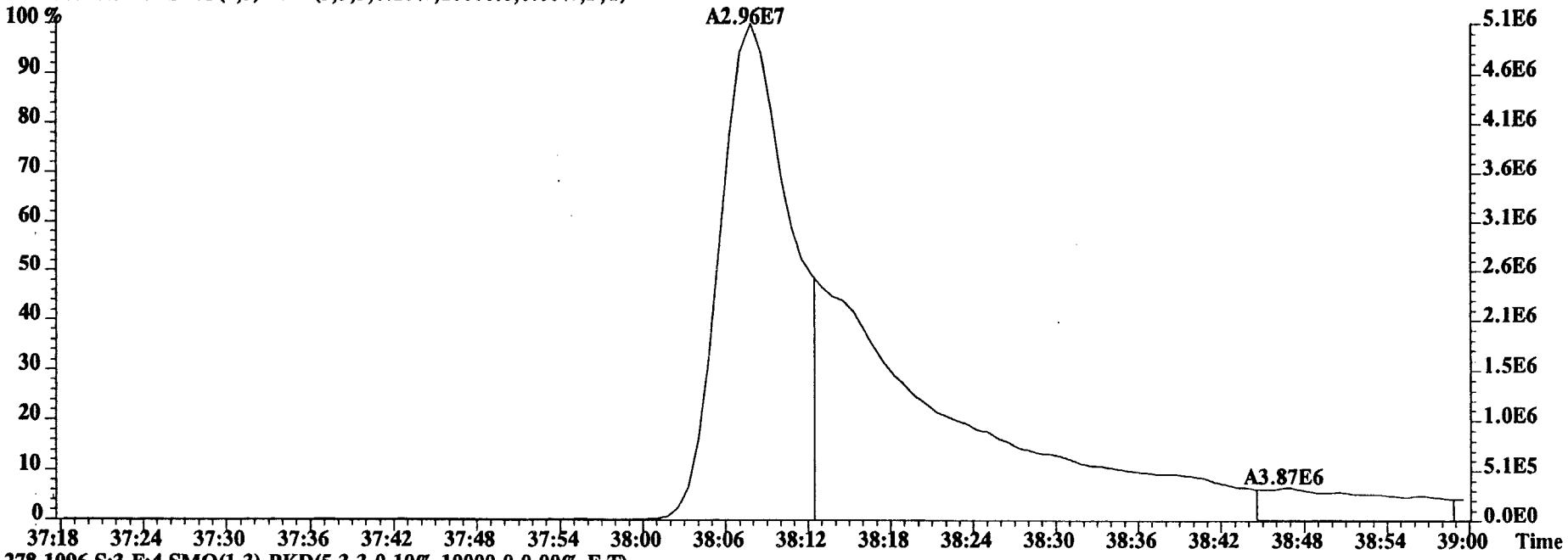


292.1974 S:3 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

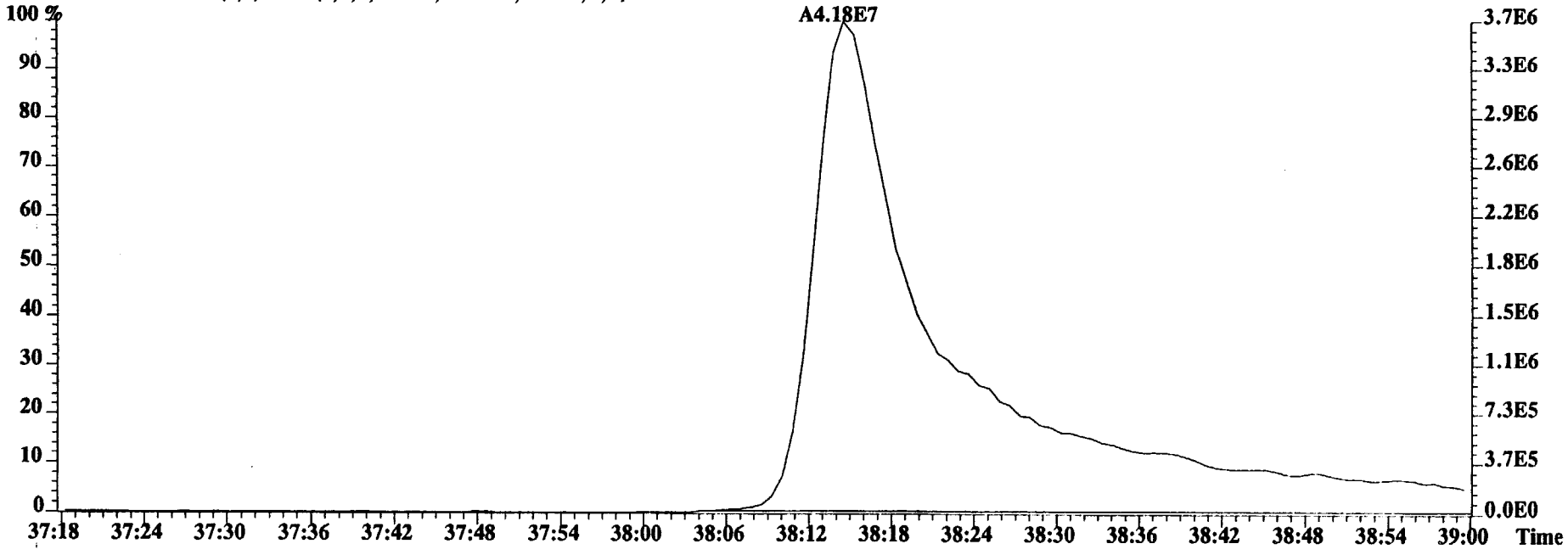


611

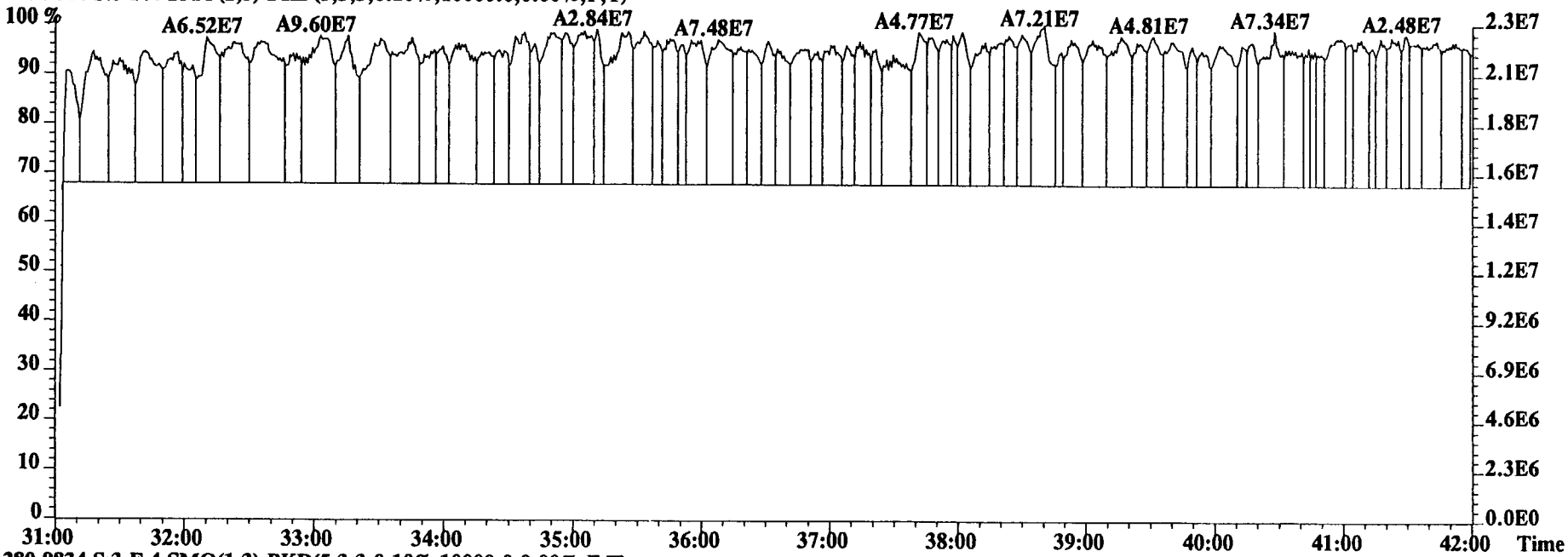
File:30OC98V4 #1-878 Acq:30-OCT-1998 18:23:22 GC EI+ Voltage SIR 70SE
Sample#3 Text:ST1030A :CS-3 :956-64 : : Exp:PAHAIR
276.0939 S:3 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



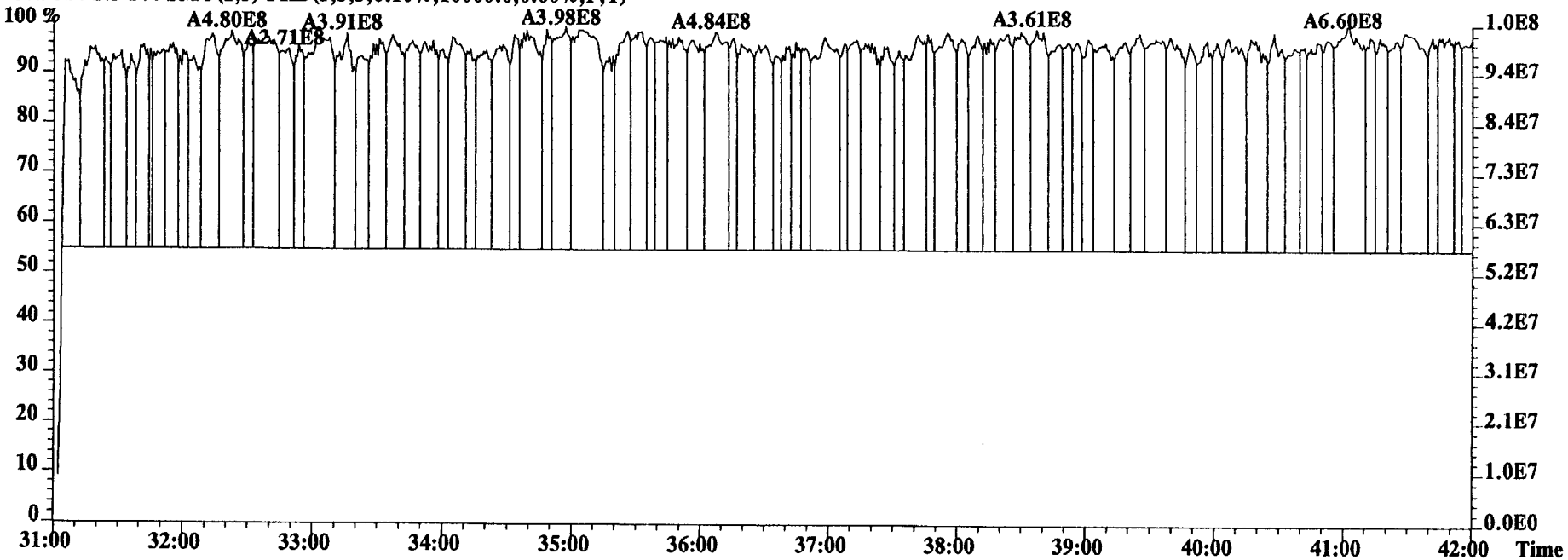
278.1096 S:3 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



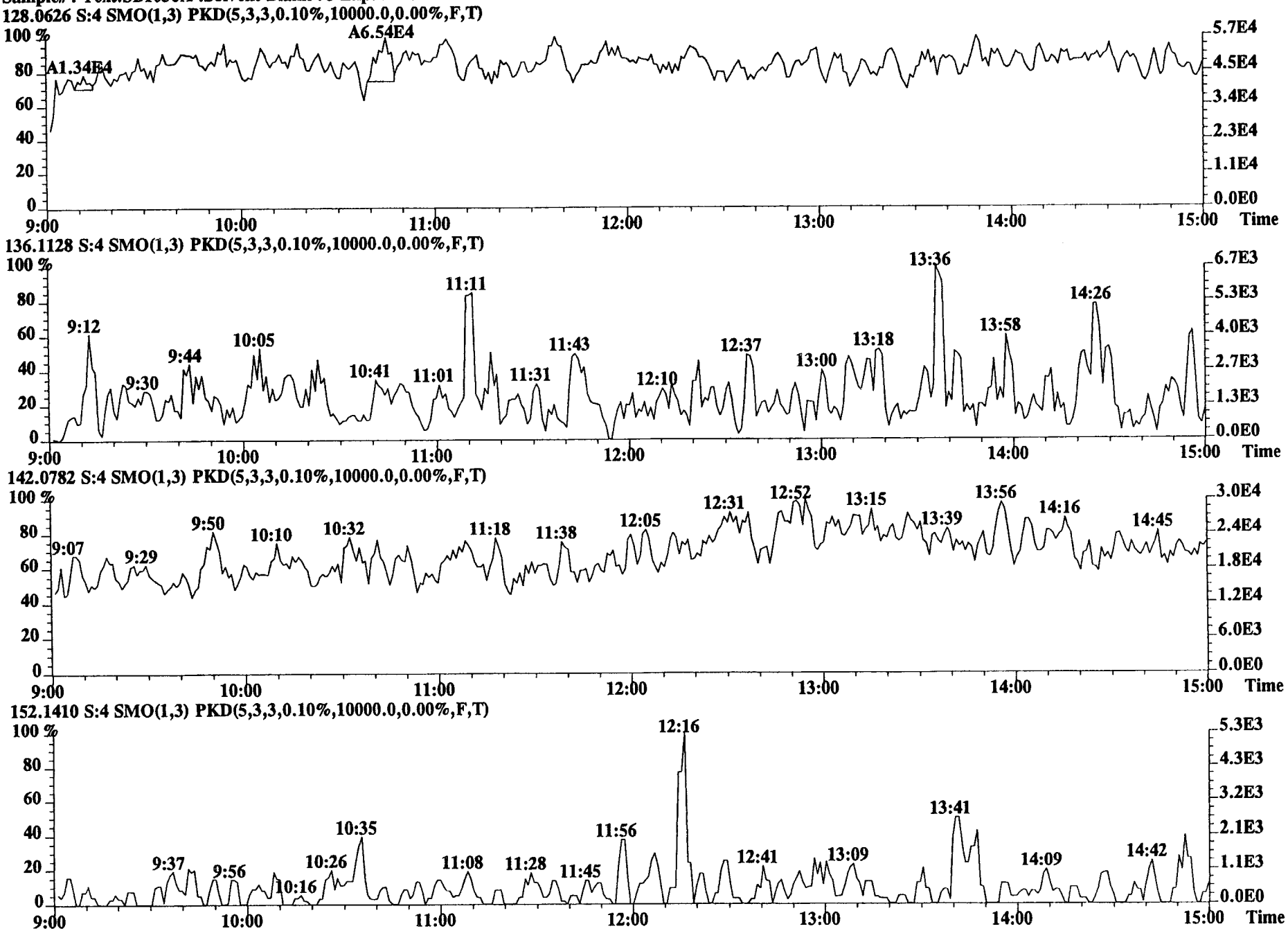
File:30OC98V4 #1-878 Acq:30-OCT-1998 18:23:22 GC EI+ Voltage SIR 70SE
Sample#3 Text:ST1030A :CS-3 :956-64 : : Exp:PAHAIR
268.9824 S:3 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



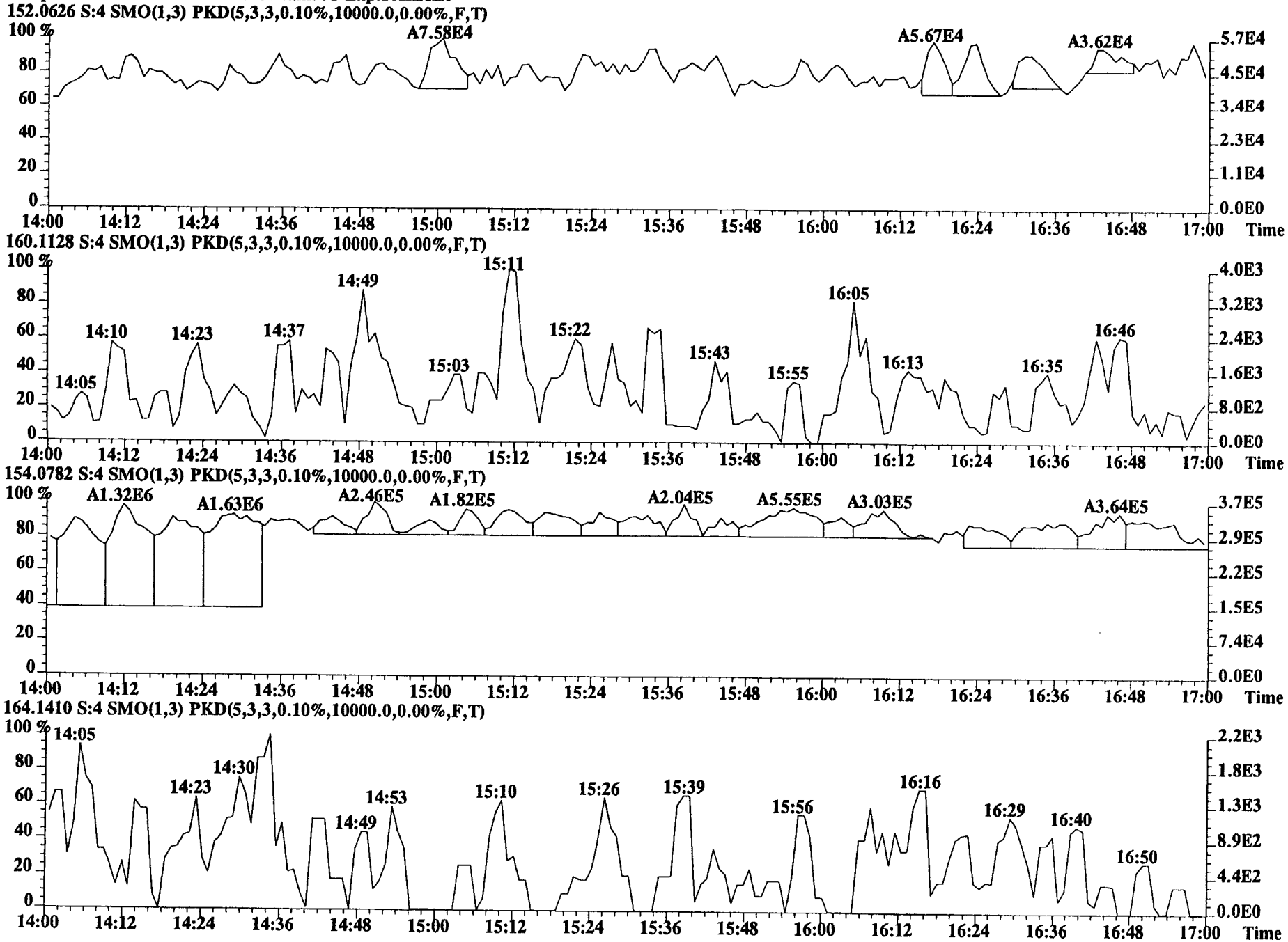
280.9824 S:3 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



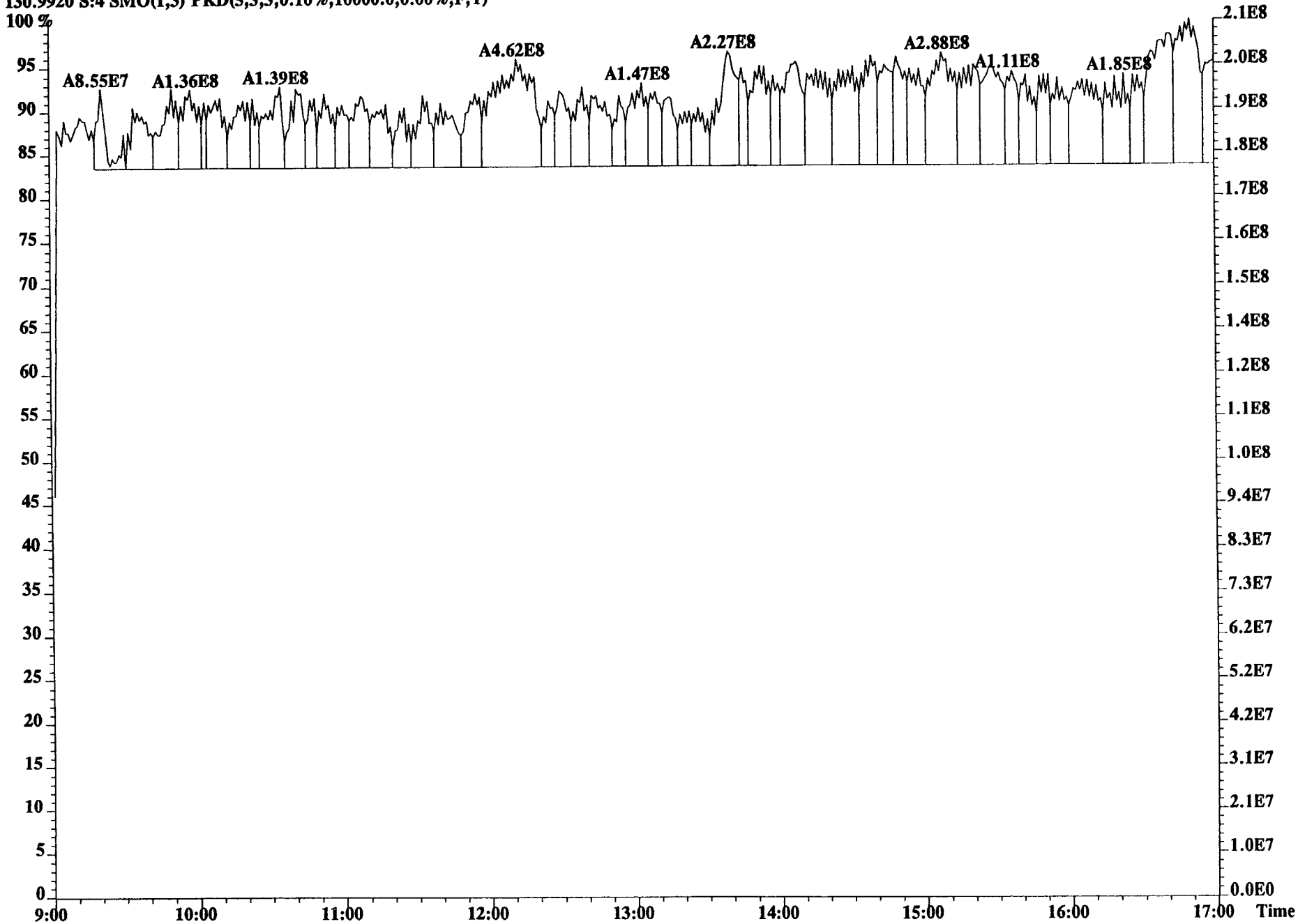
File:30OC98V4 #1-510 Acq:30-OCT-1998 19:12:25 GC EI+ Voltage SIR 70SE
Sample#4 Text:SB1030A :Solvent Blank :C Exp:PAHAIR



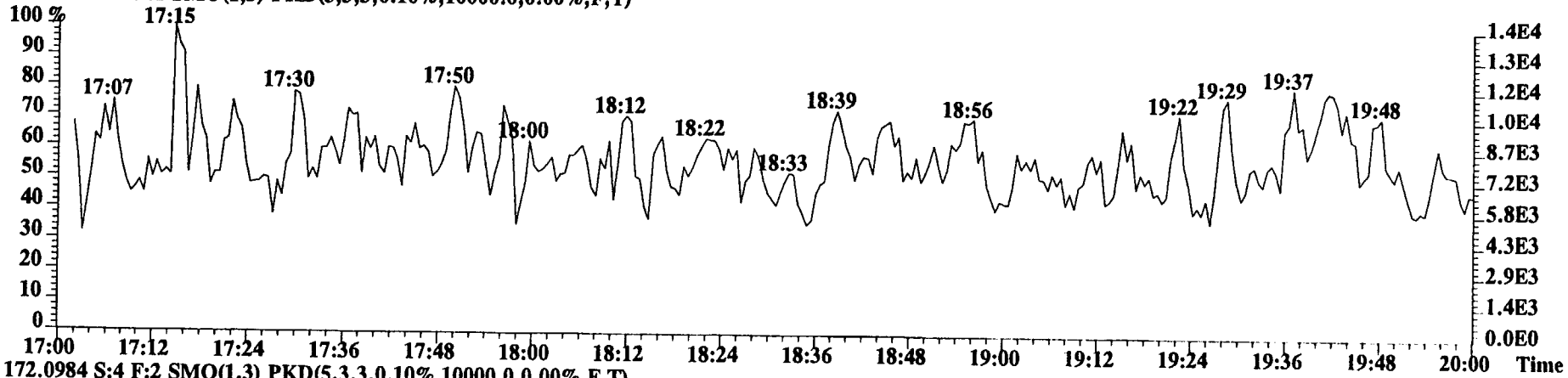
File:30OC98V4 #1-510 Acq:30-OCT-1998 19:12:25 GC EI+ Voltage SIR 70SE
Sample#4 Text:SB1030A :Solvent Blank :C Exp:PAHAIR



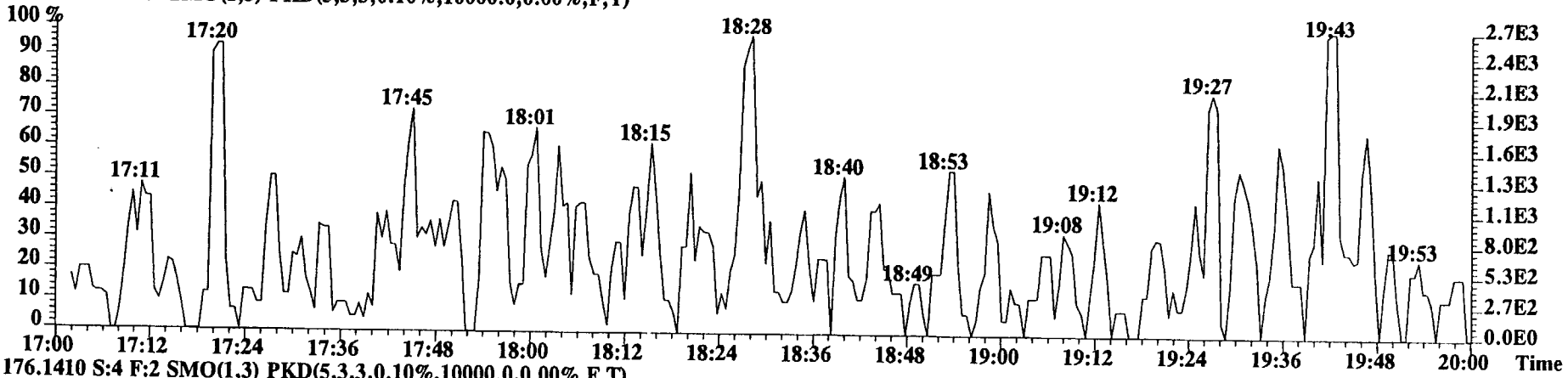
File:30OC98V4 #1-510 Acq:30-OCT-1998 19:12:25 GC EI+ Voltage SIR 70SE
Sample#4 Text:SB1030A :Solvent Blank :C Exp:PAHAIR
130.9920 S:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



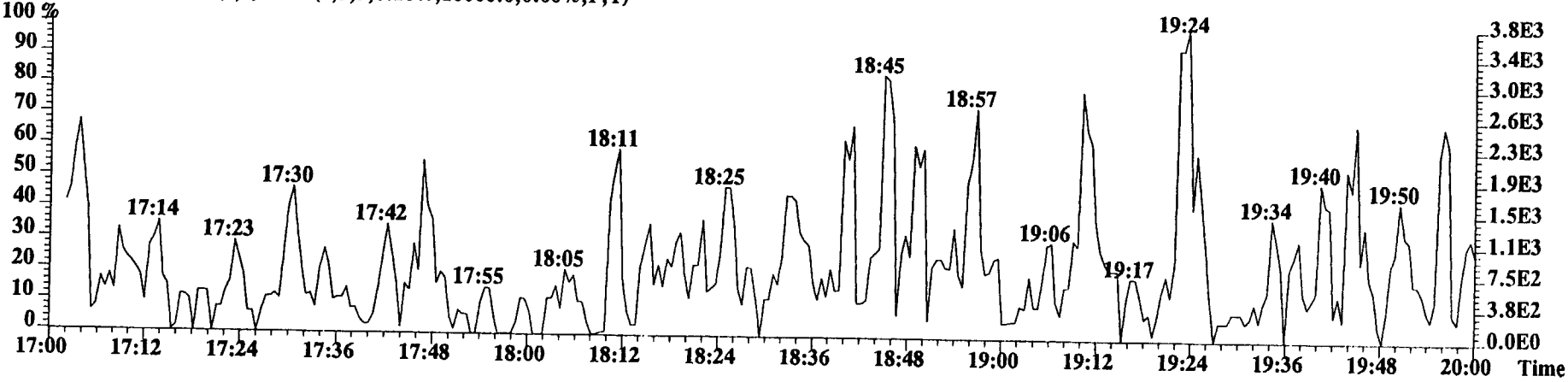
File:30OC98V4 #1-641 Acq:30-OCT-1998 19:12:25 GC EI+ Voltage SIR 70SE
Sample#4 Text:SB1030A :Solvent Blank :C Exp:PAHAIR
166.0798 S:4 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



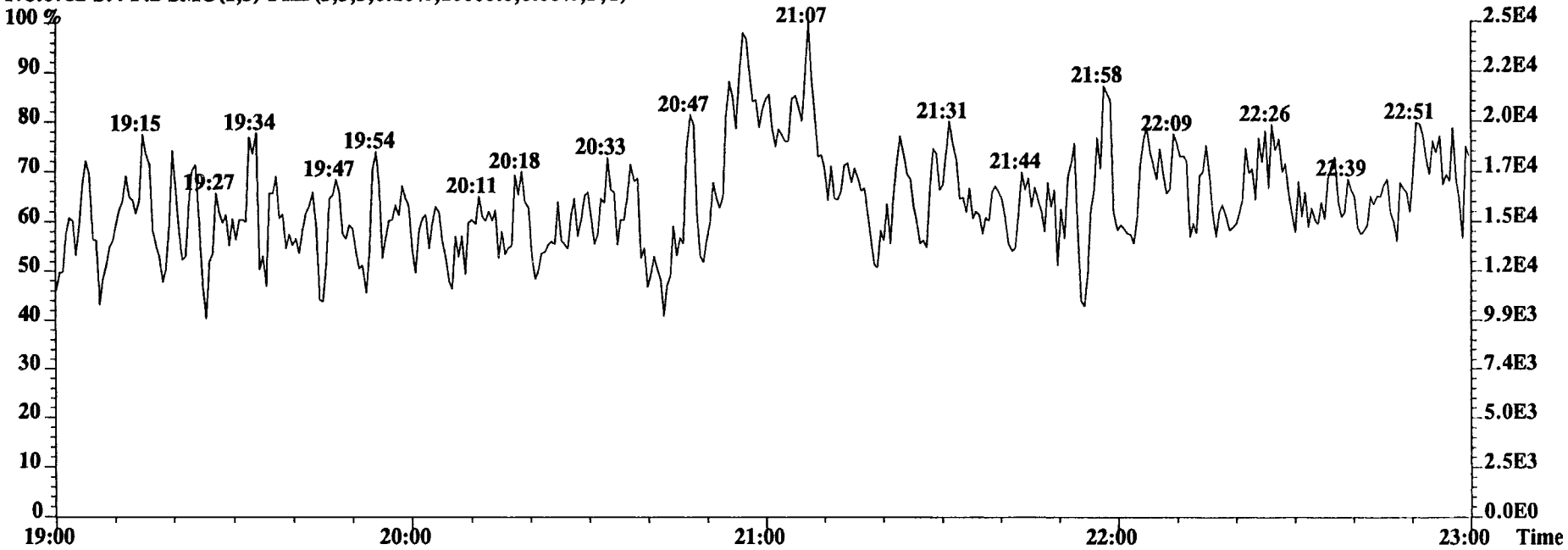
172.0984 S:4 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



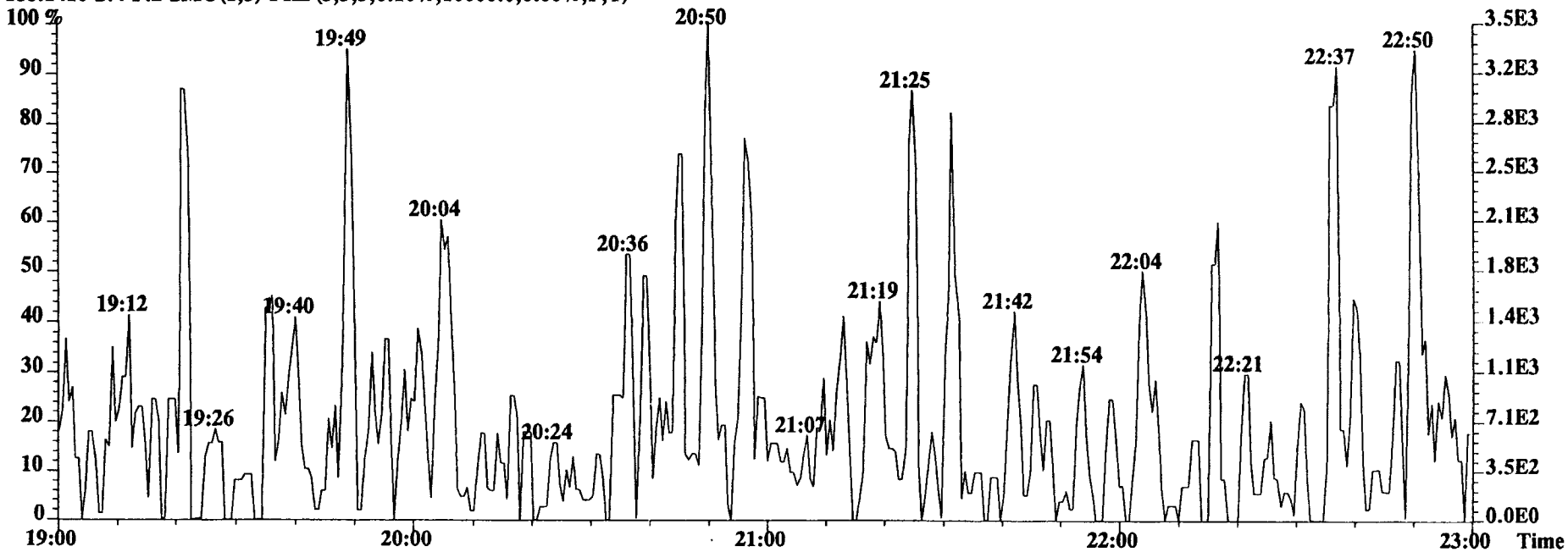
176.1410 S:4 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



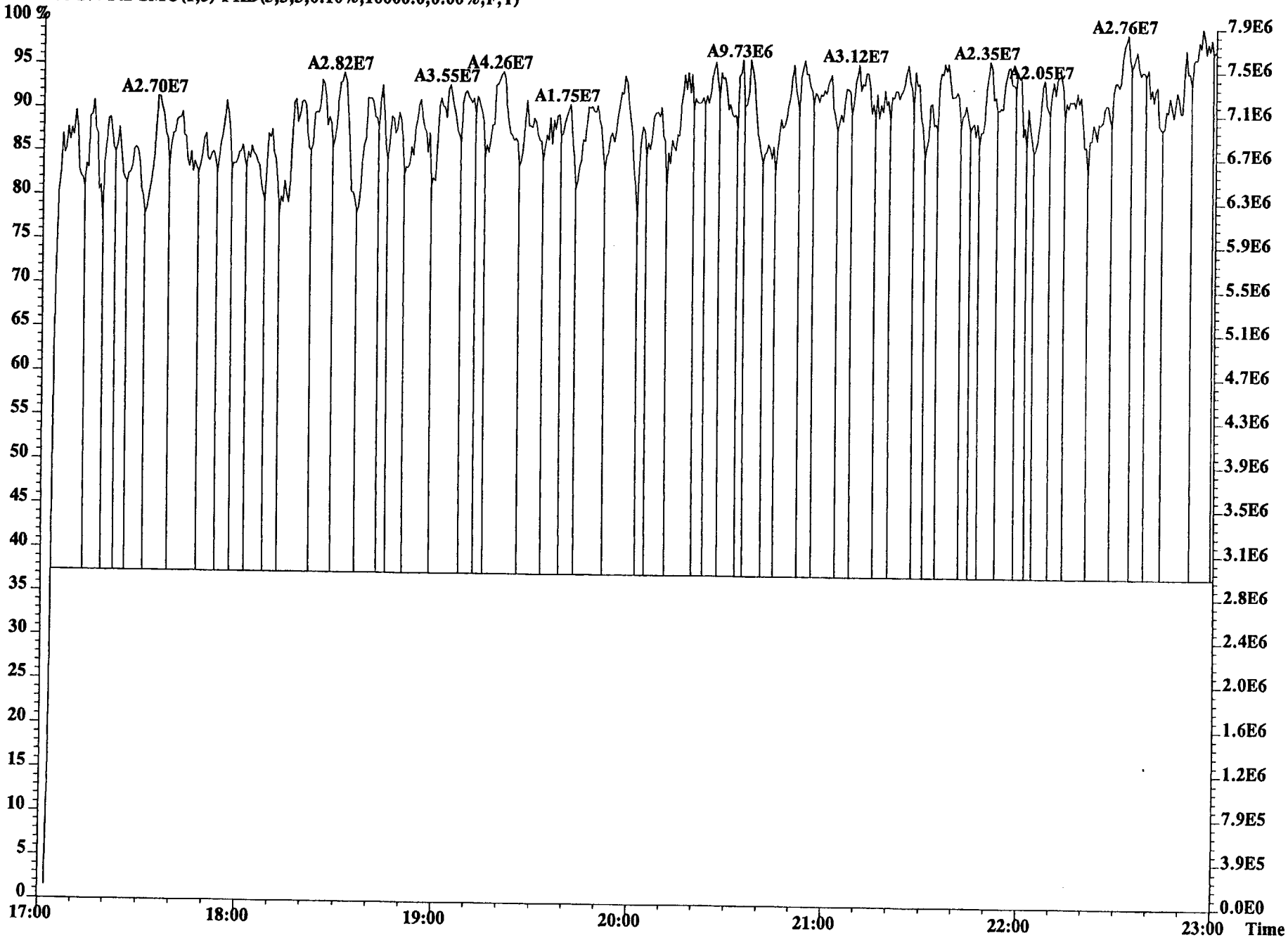
File:30OC98V4 #1-641 Acq:30-OCT-1998 19:12:25 GC EI+ Voltage SIR 70SE
Sample#4 Text:SB1030A :Solvent Blank :C Exp:PAHAIR
178.0782 S:4 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



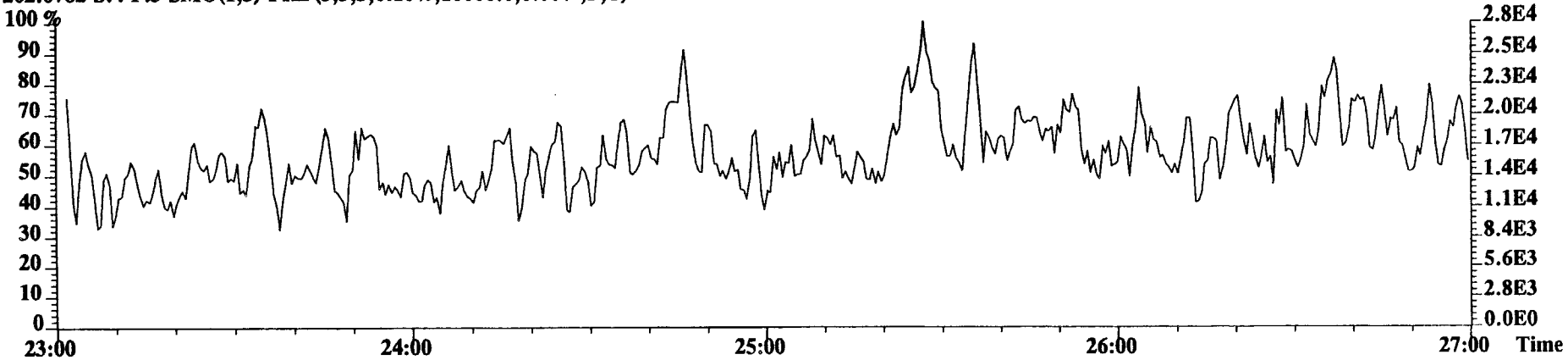
188.1410 S:4 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



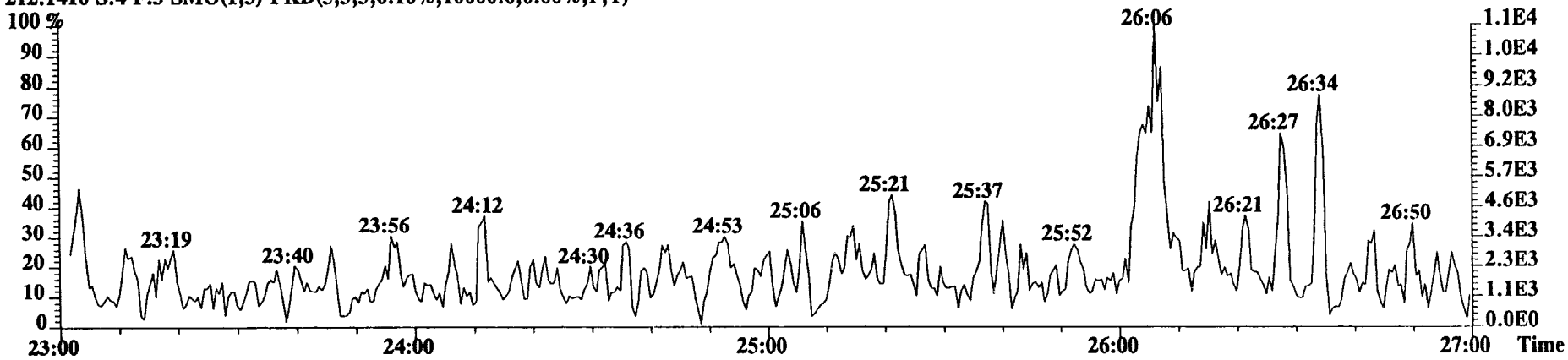
File:30OC98V4 #1-641 Acq:30-OCT-1998 19:12:25 GC EI+ Voltage SIR 70SE
Sample#4 Text:SB1030A :Solvent Blank :C Exp:PAHAIR
204.9888 S:4 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



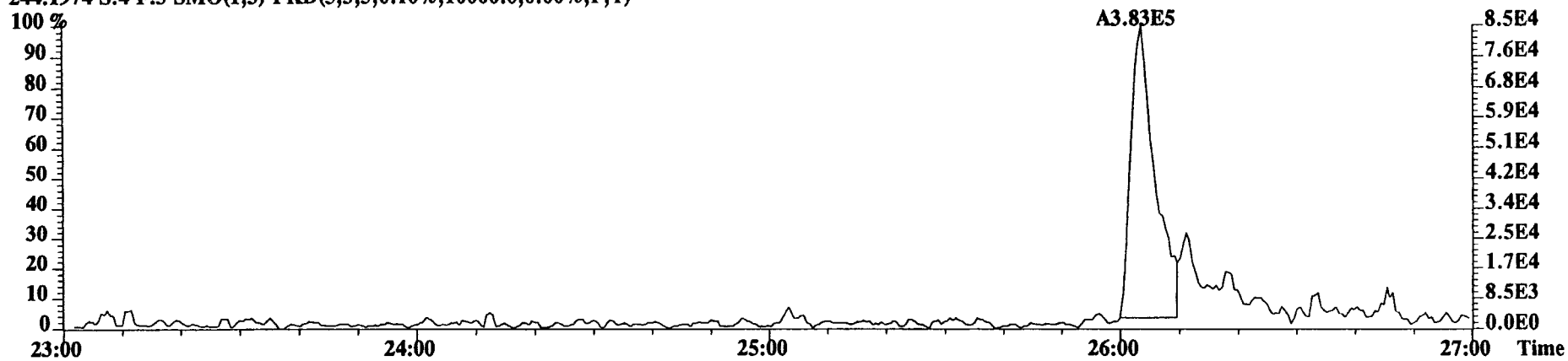
File:30OC98V4 #1-939 Acq:30-OCT-1998 19:12:25 GC EI+ Voltage SIR 70SE
Sample#4 Text:SB1030A :Solvent Blank :C Exp:PAHAIR
202.0782 S:4 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



212.1410 S:4 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

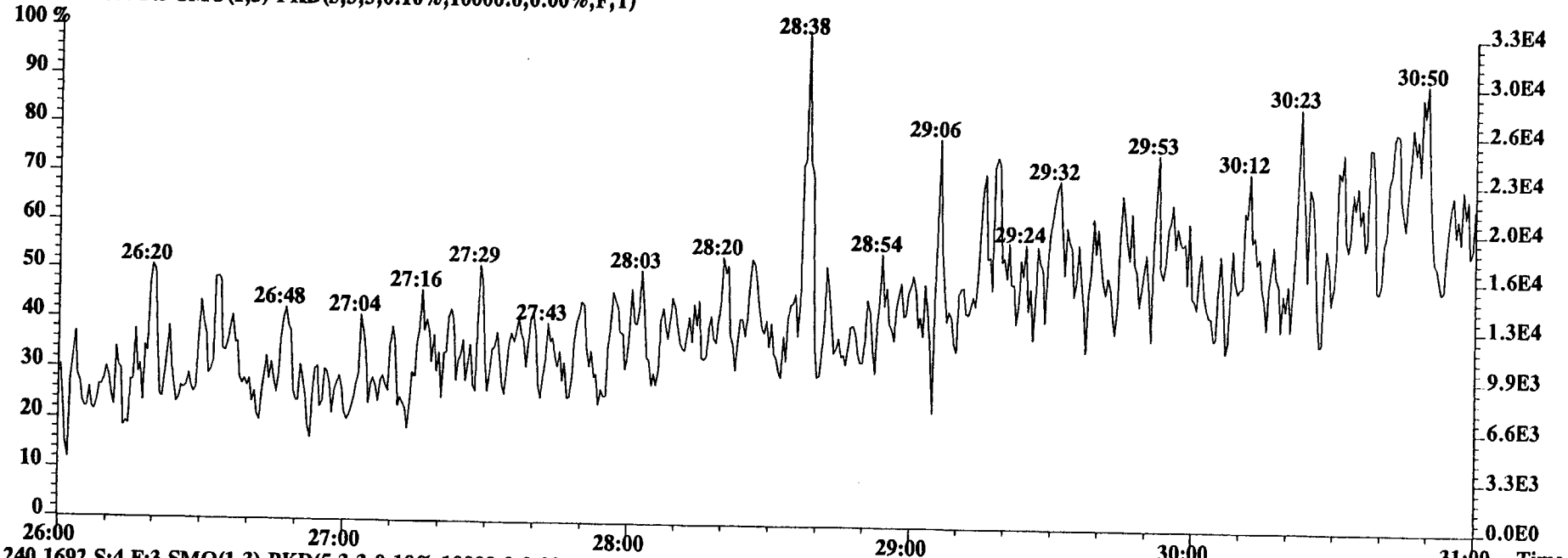


244.1974 S:4 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

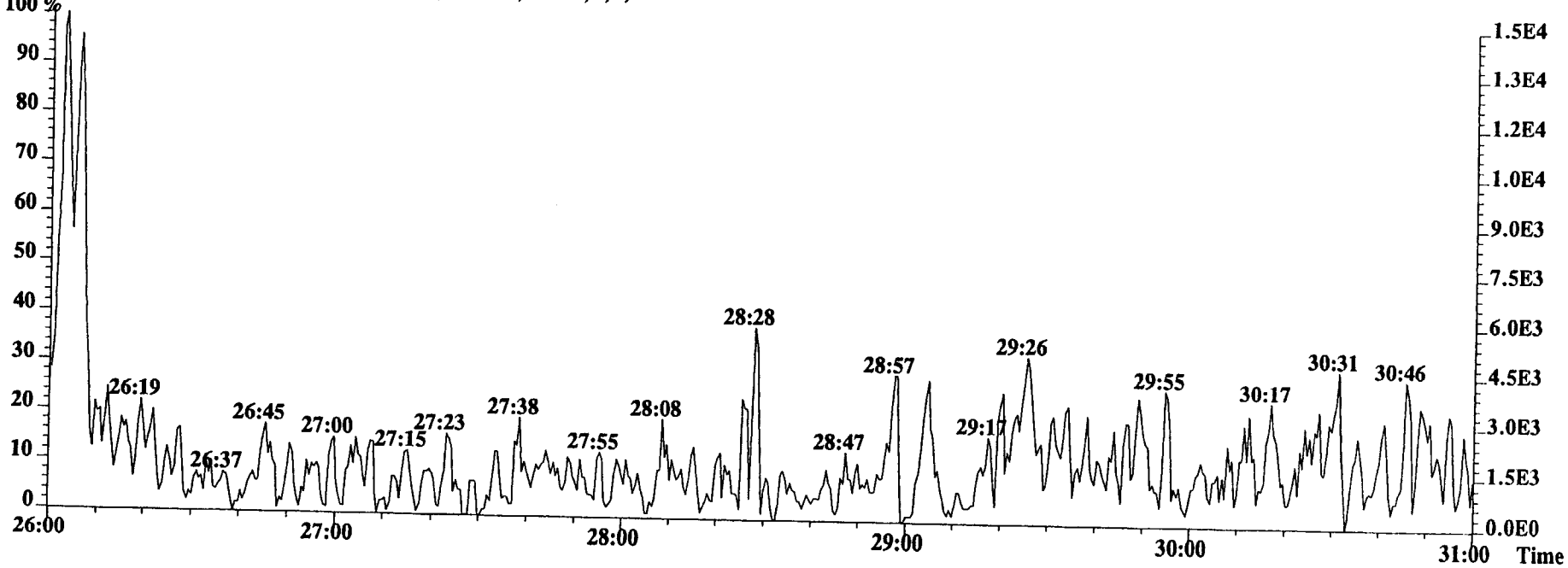


023 620

File:30OC98V4 #1-939 Acq:30-OCT-1998 19:12:25 GC EI+ Voltage SIR 70SE
Sample#4 Text:SB1030A :Solvent Blank :C Exp:PAHAIR
228.0939 S:4 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

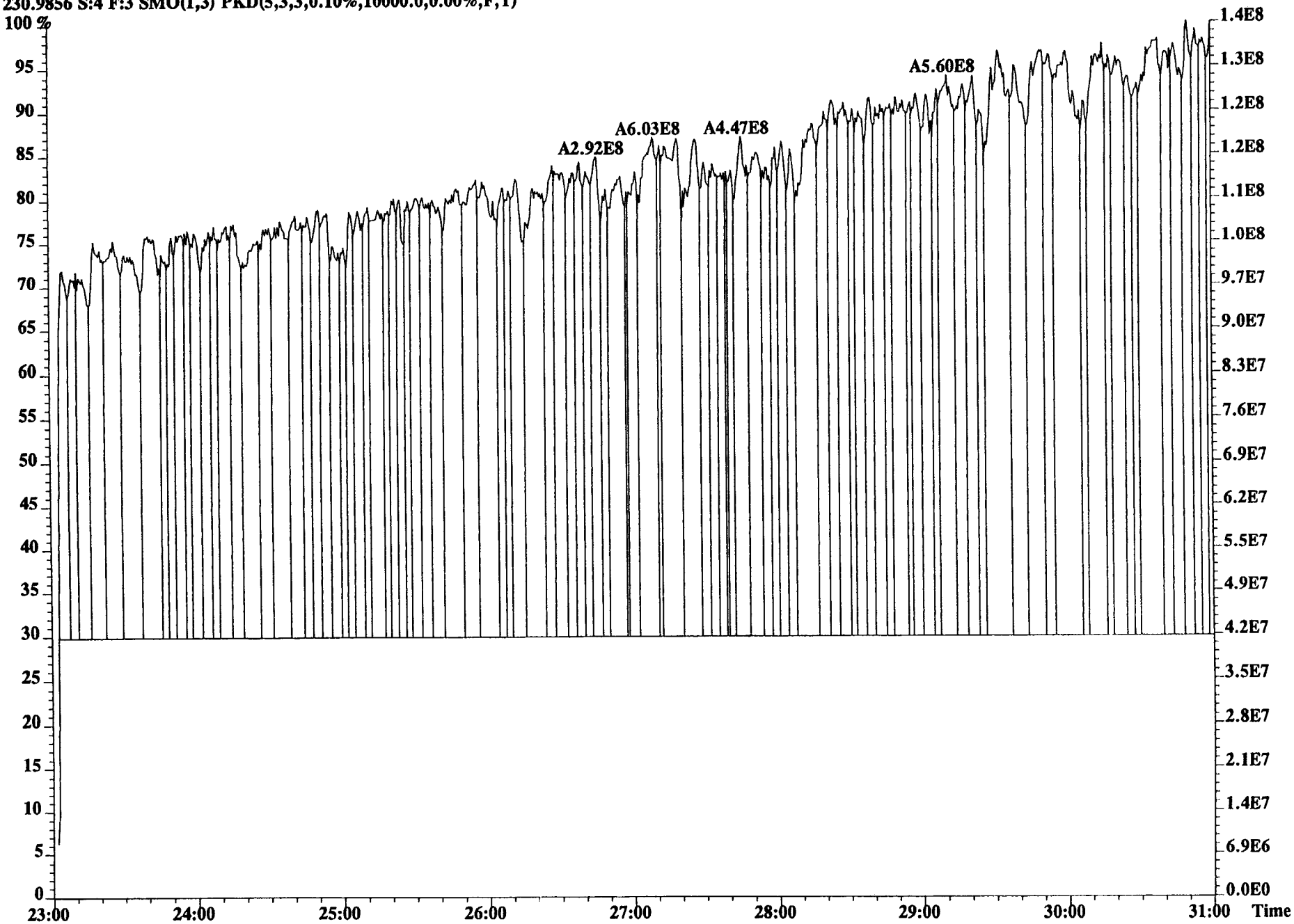


240.1692 S:4 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



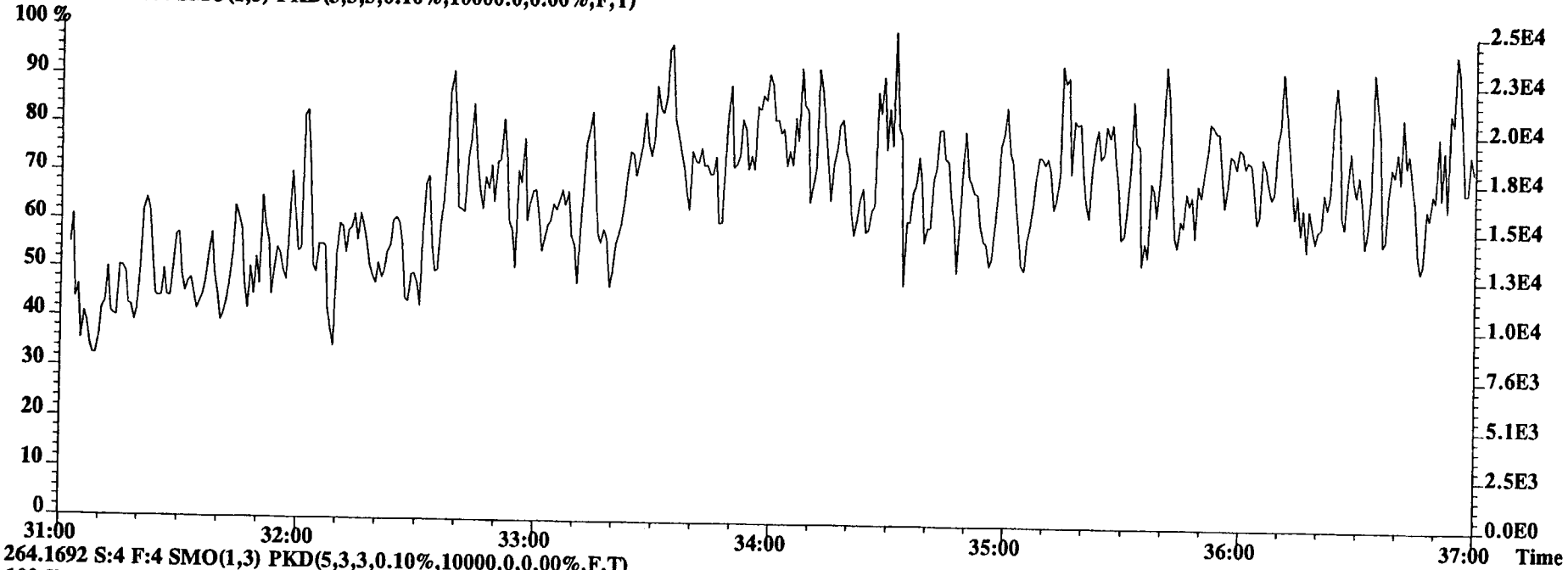
129 621

File:30OC98V4 #1-939 Acq:30-OCT-1998 19:12:25 GC EI+ Voltage SIR 70SE
Sample#4 Text:SB1030A :Solvent Blank :C Exp:PAHAIR
230.9856 S:4 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

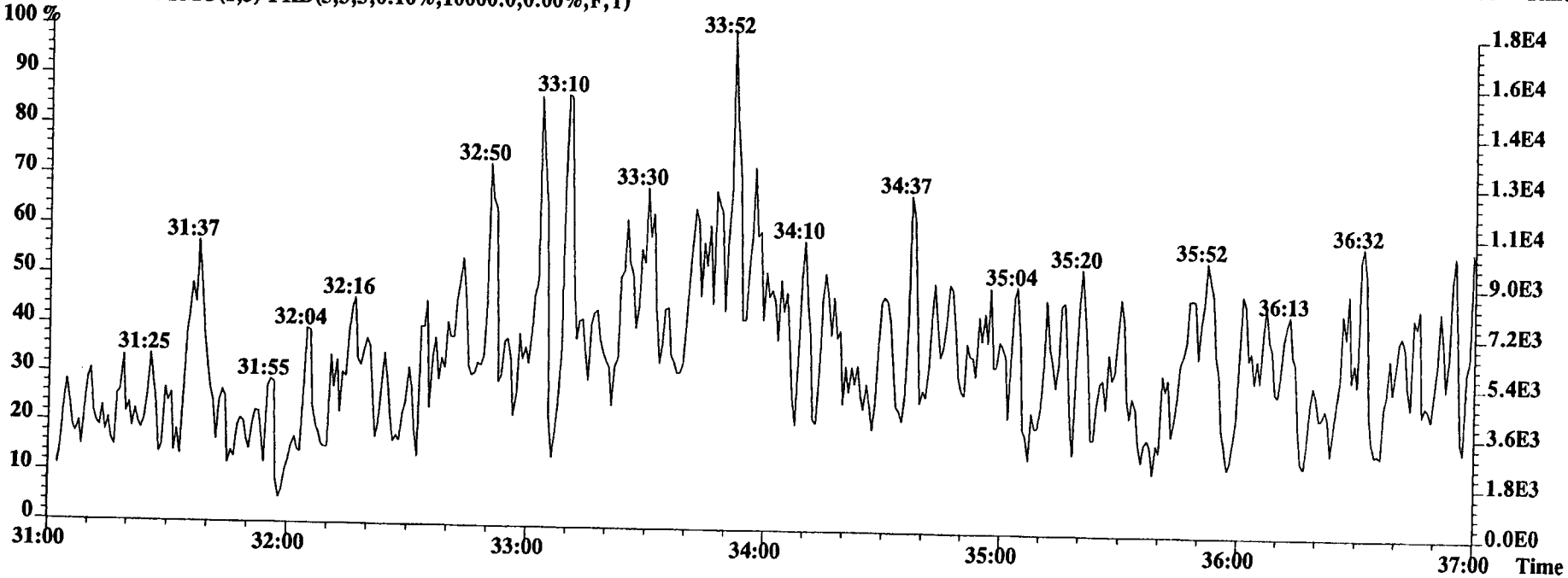


223

File:30OC98V4 #1-878 Acq:30-OCT-1998 19:12:25 GC EI+ Voltage SIR 70SE
Sample#4 Text:SB1030A :Solvent Blank :C Exp:PAHAIR
252.0939 S:4 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

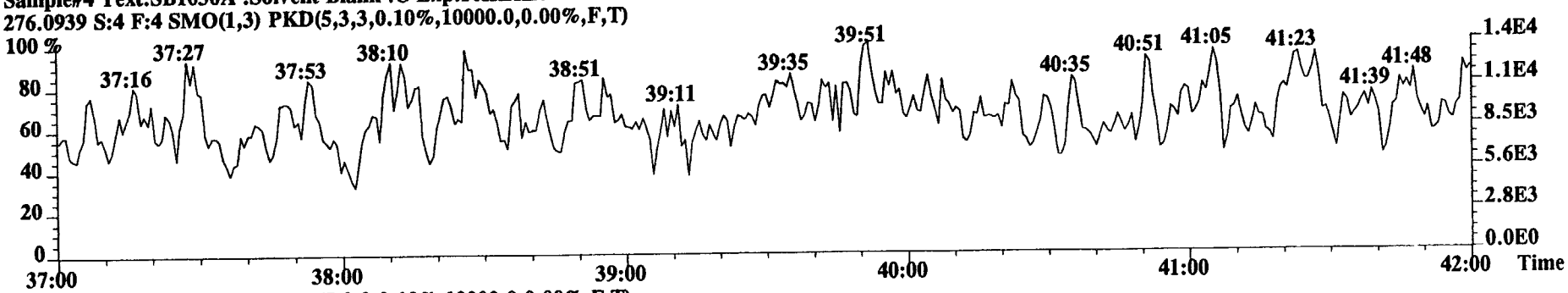


264.1692 S:4 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

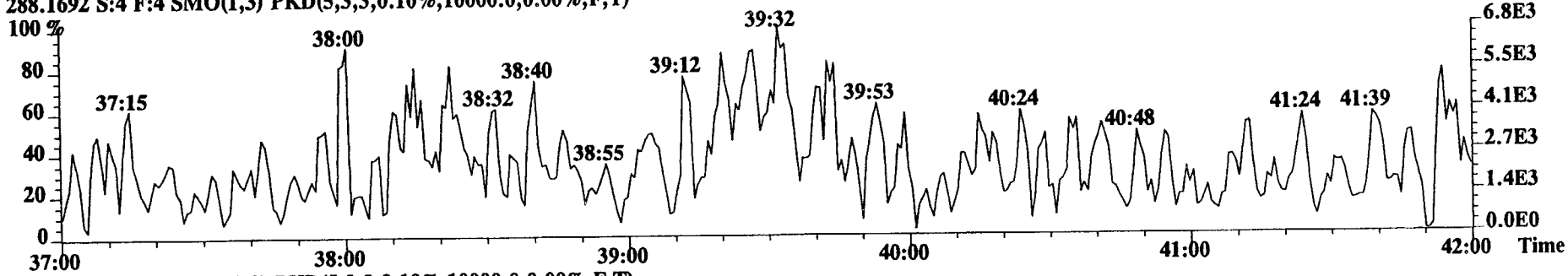


623

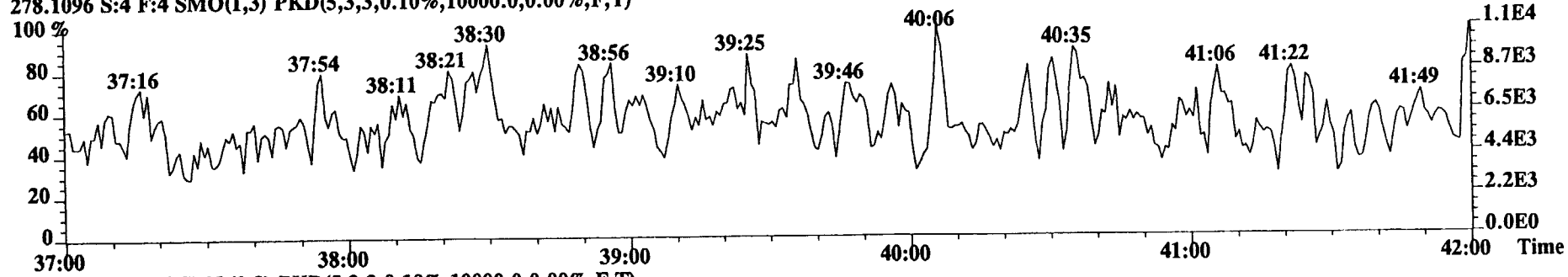
File:30OC98V4 #1-878 Acq:30-OCT-1998 19:12:25 GC EI+ Voltage SIR 70SE
Sample#4 Text:SB1030A :Solvent Blank :C Exp:PAHAIR
276.0939 S:4 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



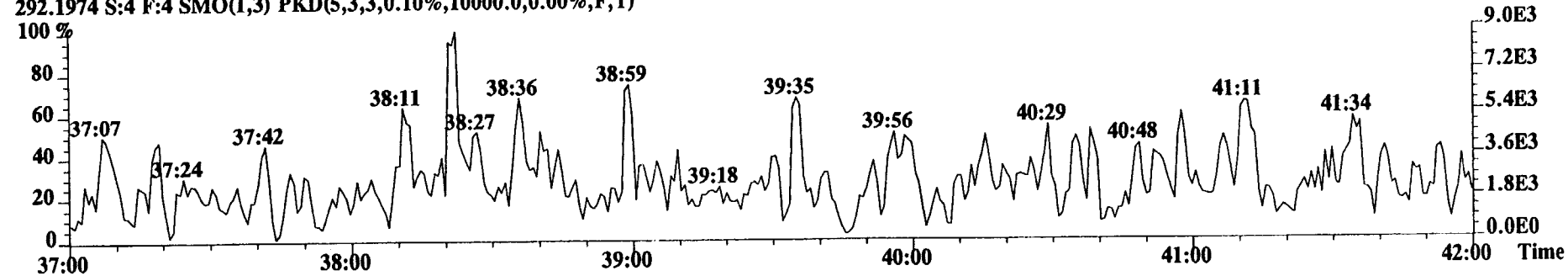
288.1692 S:4 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



278.1096 S:4 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

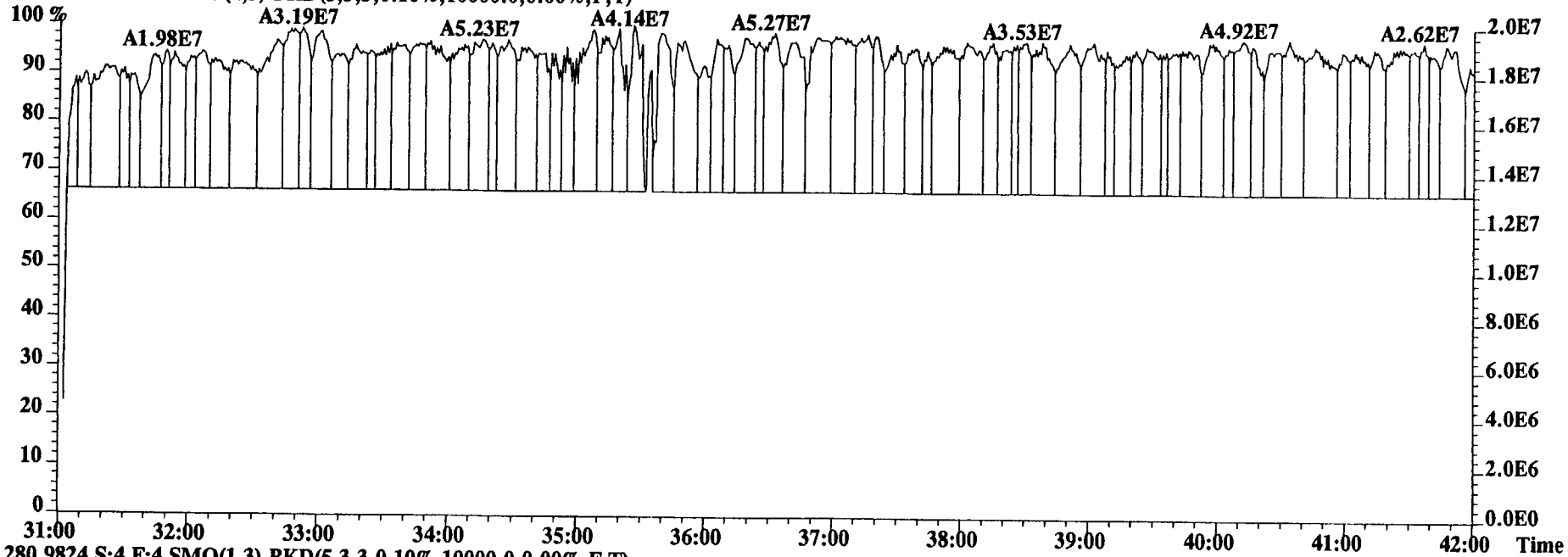


292.1974 S:4 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

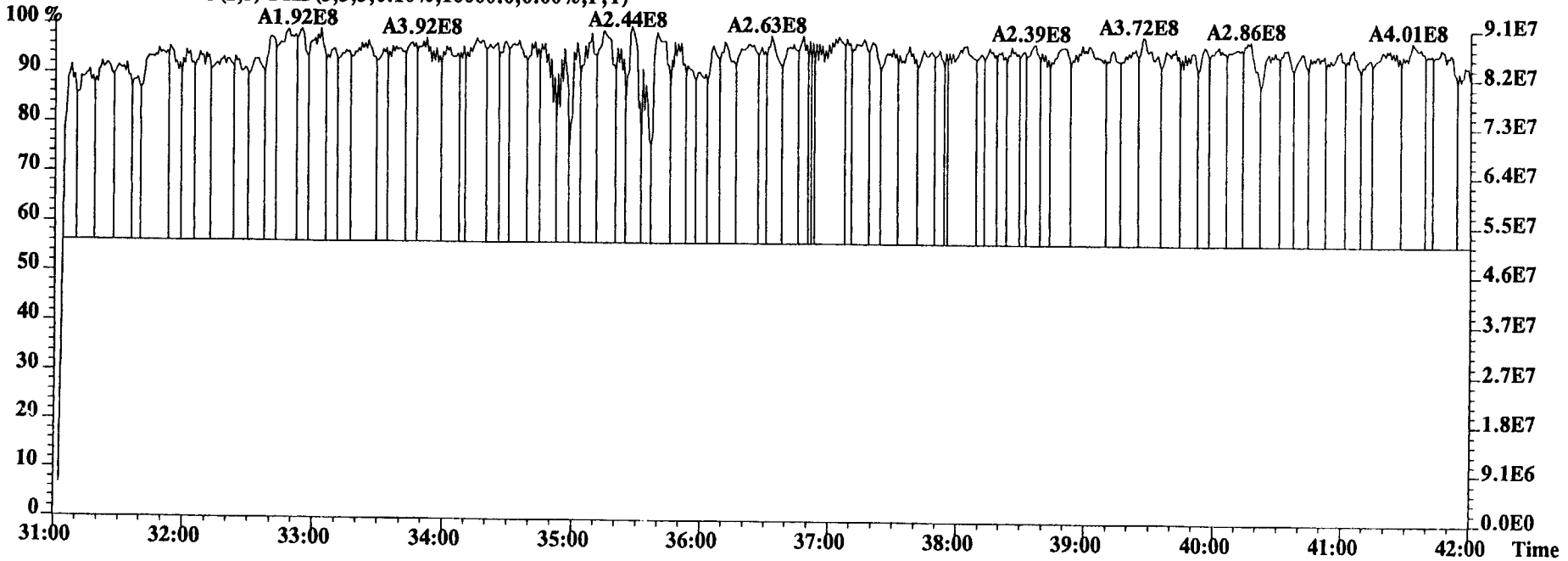


624

File:30OC98V4 #1-878 Acq:30-OCT-1998 19:12:25 GC EI+ Voltage SIR 70SE
Sample#4 Text:SB1030A :Solvent Blank :C Exp:PAHAIR
268.9824 S:4 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



280.9824 S:4 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



QUANTERRA INCORPORATED
West Sacramento

Daily Standard Checklist
Dioxin/Furan High Res

STD ID ST1102 Method ID 429-air Column ID DB-5 Instr ID VG-4

Standard Solution 956-64 Prepared By SMA Prepared Date 11-03-98

Analyzed By SMA Date Analyzed 11-02-98

Reviewed By Deri Stone Date Reviewed 11/3/98

ANALYSIS OF DAILY STANDARD	INITIATED	REVIEWED
Standard, CPSM, and solvent blank present?	✓/NA	✓/NA
Copy of Instrument logfile present?	✓	✓
CPSM blow up and peak profile present?	NA/✓	NA/✓
Curve summary present?	✓	✓
Summary of 1613A criteria present?	NA	NA
Daily standard within method specified limits*?	✓*	✓*
Daily ion abundance ratios within limits?	NA	NA
CPSM valley < 25%?	NA	NA
CPSM window correct?	✓	✓
Samples analyzed within 12 hrs of daily standard?	✓	✓

COMMENTS:
* All the samples except MB & LCS were the dilution of the original extracts and analyzed only Naphthalene which the std meets all the criteria for these analytes. (MB/LCS being RI'd)

* For NCASI 551, Control Limit (CL) = +/- 20% from curve RRFs for all analytes.
For Method 8290, CL = +/- 20% from curve RRFs for native analytes, CL = +/- 30% from curve RRFs for labeled compounds.
For Method 1613A, see 3rd Revision to Method 1613 Performance Specifications, Table 7.

02-NOV-1998 02:17:04 PM Dioxin Furan ConCal RESULTS

Mass Spec : VG-4 Results : 02NO98V4011.RES : PAHAIRCAL3.TRG
GC Column : DB-5 Date analyzed : 02-NOV-98
Data file : 02NO98V4 ST1102 :CS-3 :956-64 : : Ex
Weight : 1

Name	Total Response	Isotope Ratio	R. T. mm:ss	RRF	pg	% Dev
d10-2-Methylnaphthalene	245650000	1.00 Y	12: 27 Y	-2.00	100.00	
d8-Naphthalene	392372000	1.00 Y	10: 12 Y	1.60	100.00	-29
Naphthalene	376806000	1.00 Y	10: 15 Y	0.96	100.00	-22
2-Methylnaphthalene	233866000	1.00 Y	12: 33 Y	0.60	100.00	6
d8-Acenaphthylene	311446000	1.00 Y	15: 27 Y	1.27	100.00	4
Acenaphthylene	274072000	1.00 Y	15: 30 Y	0.88	100.00	-7
d10-Acenaphthene	187525800	1.00 Y	16: 1 Y	0.76	100.00	3
Acenaphthene	173015800	1.00 Y	16: 7 Y	0.92	100.00	-26
d10-Anthracene	146180800	1.00 Y	20: 55 Y	-1.00	100.00	
d10-Fluorene	200060000	1.00 Y	17: 41 Y	1.37	100.00	-4
Fluorene	153632400	1.00 Y	17: 47 Y	0.77	100.00	34
d10-Phenanthrene	486852000	1.00 Y	20: 45 Y	3.33	100.00	19
Phenanthrene	390094000	1.00 Y	20: 50 Y	0.80	100.00	-10
Anthracene	327574000	1.00 Y	20: 58 Y	0.67	100.00	-16
d14-Terphenyl	354414000	1.00 Y	26: 0 Y	-2.00	100.00	
d10-Fluoranthene	401422000	1.00 Y	24: 36 Y	1.13	100.00	-20
Fluoranthene	401064000	1.00 Y	24: 39 Y	1.00	100.00	-10
d10-Pyrene	430946000	1.00 Y	25: 18 Y	1.22	100.00	-20
Pyrene	432528000	1.00 Y	25: 21 Y	1.00	100.00	-17
d12-Benzo(a)anthracene	257072000	1.00 Y	29: 8 Y	0.73	100.00	-19
Benzo(a)anthracene	261228000	1.00 Y	29: 12 Y	1.02	100.00	-16
d12-Chrysene	376372000	1.00 Y	29: 15 Y	1.06	100.00	-17
Chrysene	334774000	1.00 Y	29: 20 Y	0.89	100.00	-18
d12-Benzo(e)pyrene	432370000	1.00 Y	33: 22 Y	0.00	100.00	
d12-Benzo(b)fluoranthene	224986000	1.00 Y	32: 29 Y	0.52	100.00	15
Benzo(b)fluoranthene	261590000	1.00 Y	32: 33 Y	1.16	100.00	0
d12-Benzo(k)fluoranthene	511774000	1.00 Y	32: 33 Y	1.18	100.00	25
Benzo(k)fluoranthene	508994000	1.00 Y	32: 38 Y	0.99	100.00	-15
d12-Benzo(a)pyrene	306100000	1.00 Y	33: 32 Y	0.71	100.00	5
Benzo(e)pyrene	448584000	1.00 Y	33: 27 Y	1.47	100.00	-11
Benzo(a)pyrene	302732000	1.00 Y	33: 37 Y	0.99	100.00	-8
d12-Perylene	267180000	1.00 Y	33: 49 Y	0.62	100.00	-2
Perylene	458194000	1.00 Y	33: 55 Y	1.71	100.00	0
d12-Indeno(123-cd)pyrene	231944000	1.00 Y	38: 1 Y	0.54	100.00	21
Indeno(123-cd)pyrene	118200000	1.00 Y	38: 8 Y	0.51	100.00	-18
d14-Dibenz(ah)anthracene	138739800	1.00 Y	38: 5 Y	0.32	100.00	31
Dibenz(ah)anthracene	141252600	1.00 Y	38: 14 Y	1.02	100.00	-27
d12-Benzo(ghi)perylene	299526000	1.00 Y	39: 12 Y	0.69	100.00	19
Benzo(ghi)perylene	252360000	1.00 Y	39: 21 Y	0.84	100.00	-17
d10-Fluorene	200060000	1.00 Y	17: 41 Y	0.46	100.00	
13C-Fluorene	160217000	1.00 Y	17: 46 Y	0.80	100.00	

:0m¢?20 J

FILE	SAMP No. (1)	LAB. SAMP No	CUSTOMER ID	CLEAN UP 1 (SDS)	CLEAN UP 2 (D2)	TYPE (1)	CONCn.
02NO98V4	1	ST1102	CS-3	956-64			1
02NO98V4	2	SB1102	Solvent Blank	C-8			1
02NO98V4	3	301802-1MB	METHOD BLANK	AIR	PAH	VSE-26	0.50
02NO98V4	4	301802-1LC	LCS				0.50
02NO98V4	5	302050-1	CLXTM 1:20 DL	AIR	PAH	VSE-25	0.333
02NO98V4	6	302050-3	CLXTQ 1:40 DL				0.333
02NO98V4	7	302050-5	CLXTV 1:20 DL				0.333
02NO98V4	8	302050-7	CLXTX 1:40 DL				0.333
02NO98V4	9	301802-1	100X DIL.	AIR	PAH	VSE-26	0.50
02NO98V4	10	301802-2	100X DIL.				0.50
02NO98V4	11	301802-3	100X DIL.				0.50
02NO98V4	12	301802-4	100X DIL.				0.50
02NO98V4	13	301802-6	100X DIL.				0.50
02NO98V4	14	302050-2	002CLXTP	STRAIN	PAH	VSE-25	0.333
02NO98V4	15	302050-8	006 CLXV0				0.333
02NO98V4	16	ST1102A	CS-3	956-64			1 std out
02NO98V4	17	SB1102A	Solvent Blank	C-8			1
02NO98V4	18	302050-1MB	METHOD BLANK L	STRAIN	PAH	VSE-25	0.333
02NO98V4	19	302050-1LA	302050-1LCS L				0.333
02NO98V4	20	302050-1M	METHOD BLANK J	STRAIN	PAH	VSE-25	0.333
02NO98V4	21	302050-1LC	302050-1LCS J				0.333
02NO98V4	22	302050-4	004 CLXTR	STRAIN	PAH	VSE-25	0.333
02NO98V4	23	302050-6	006 CLXTW				0.333
02NO98V4	24						
02NO98V4	25						
02NO98V4	26						
02NO98V4	27						
02NO98V4	28						
02NO98V4	29						
02NO98V4	30						
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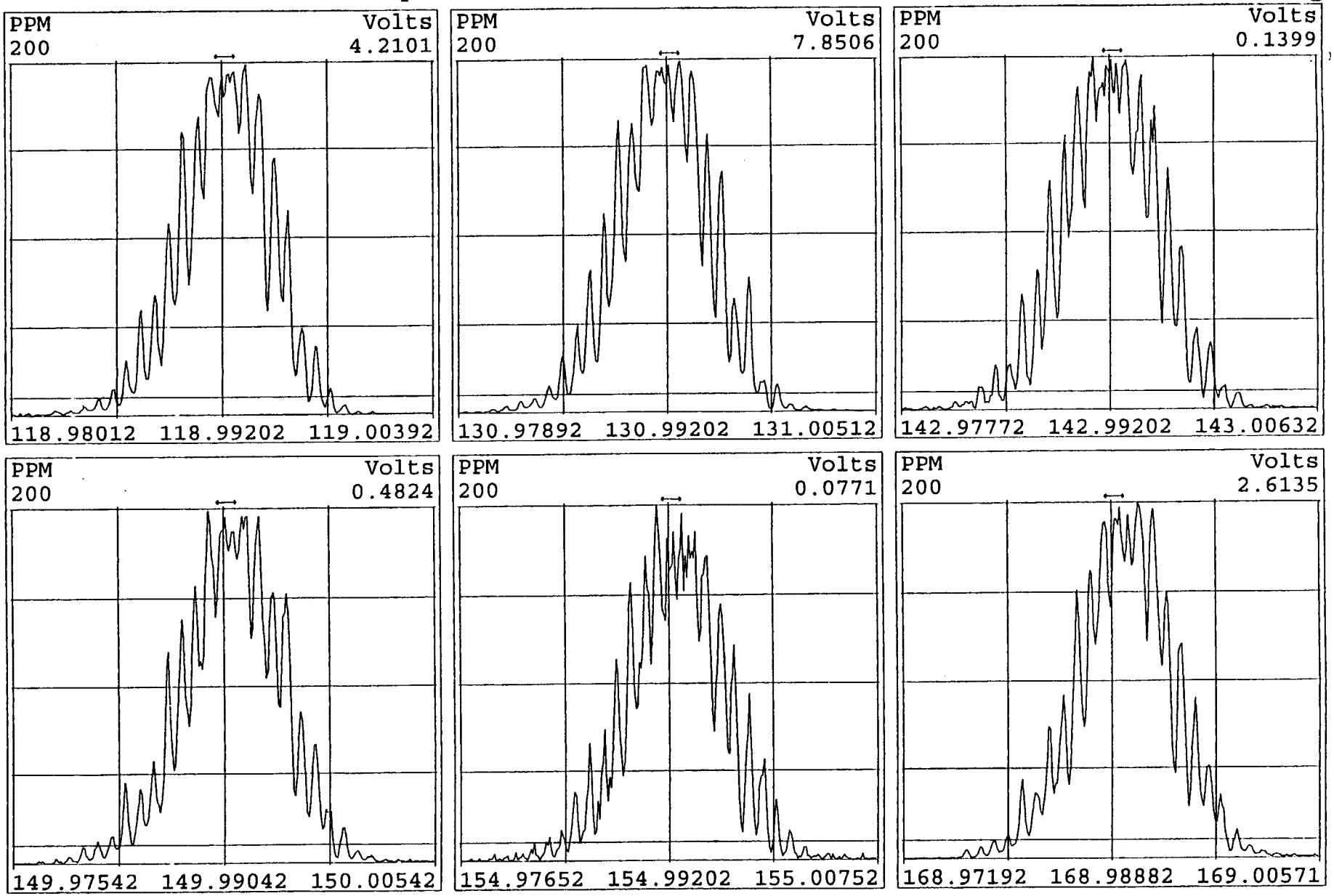
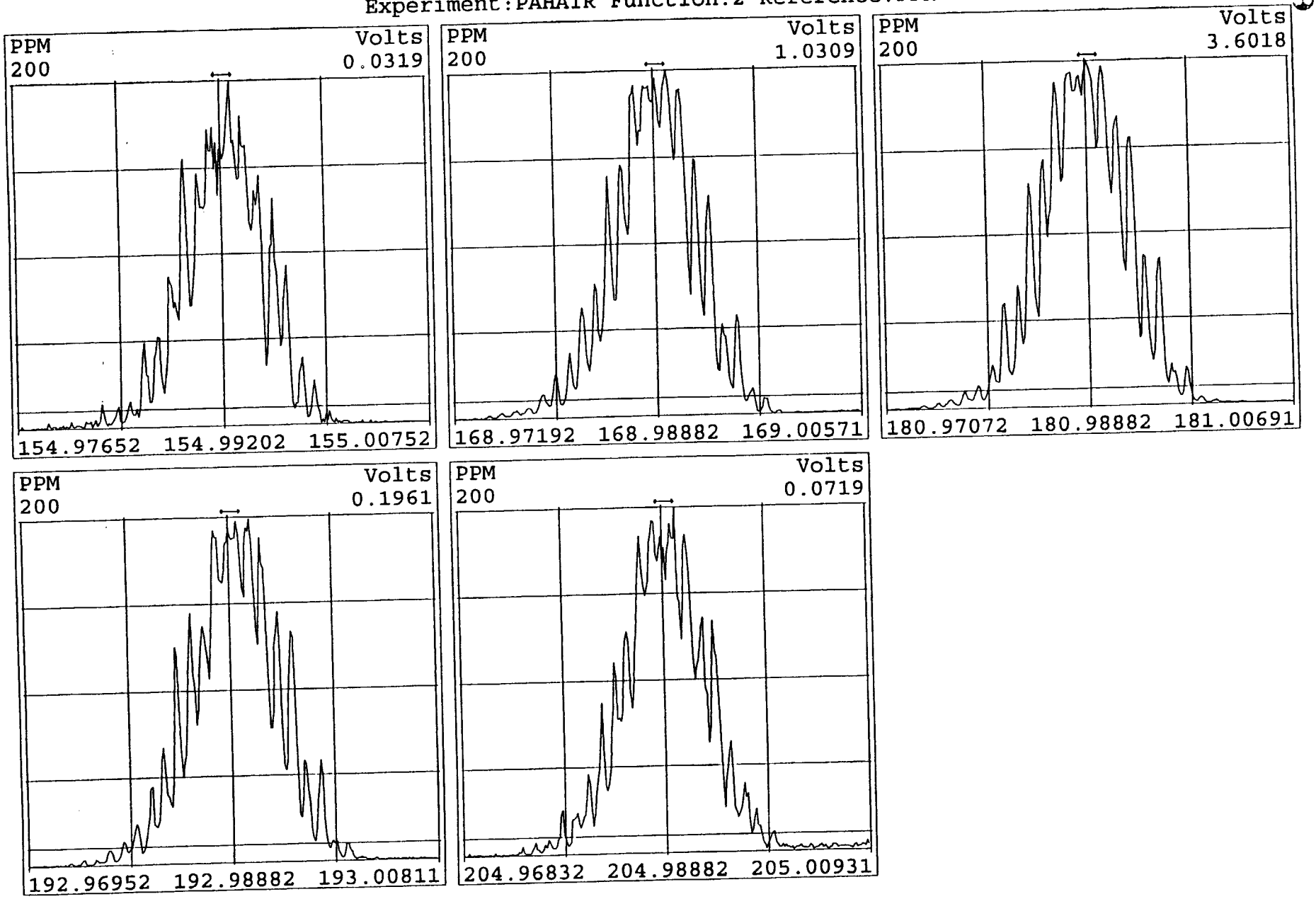
02NO98V4	41						
02NO98V4	42						
02NO98V4	43						
02NO98V4	44						
02NO98V4	45						
02NO98V4	46		SMA, 11-02-98				
02NO98V4	47						
02NO98V4	48						
02NO98V4	49						
02NO98V4	50						

Peak Locate Examination: 2-NOV-1998:13:07 File:02NO98V4
Experiment:PAHAIR Function:1 Reference:PFK



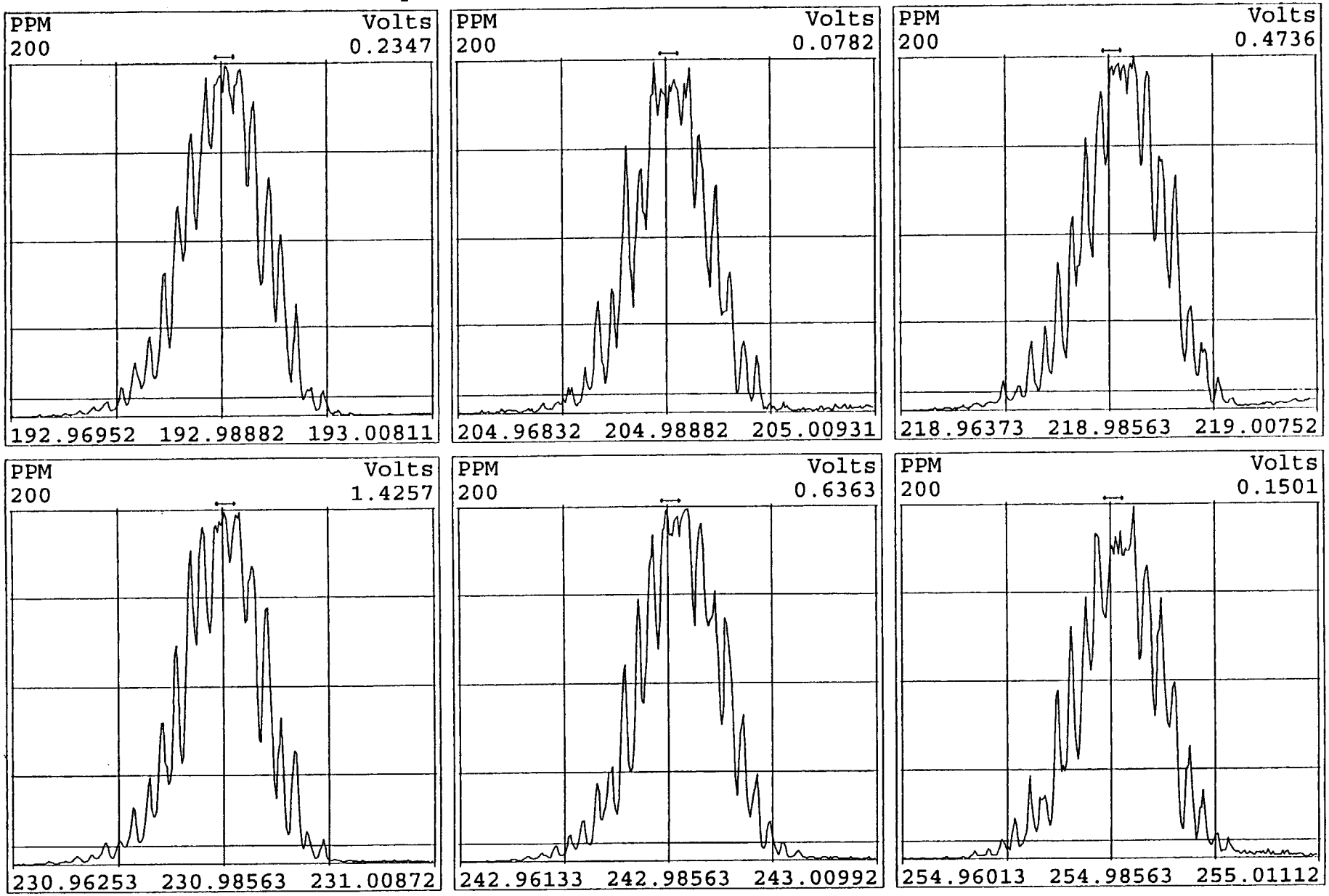
629

Peak Locate Examination: 2-NOV-1998:13:10 File:02NO98V4
Experiment:PAHAIR Function:2 Reference:PFK

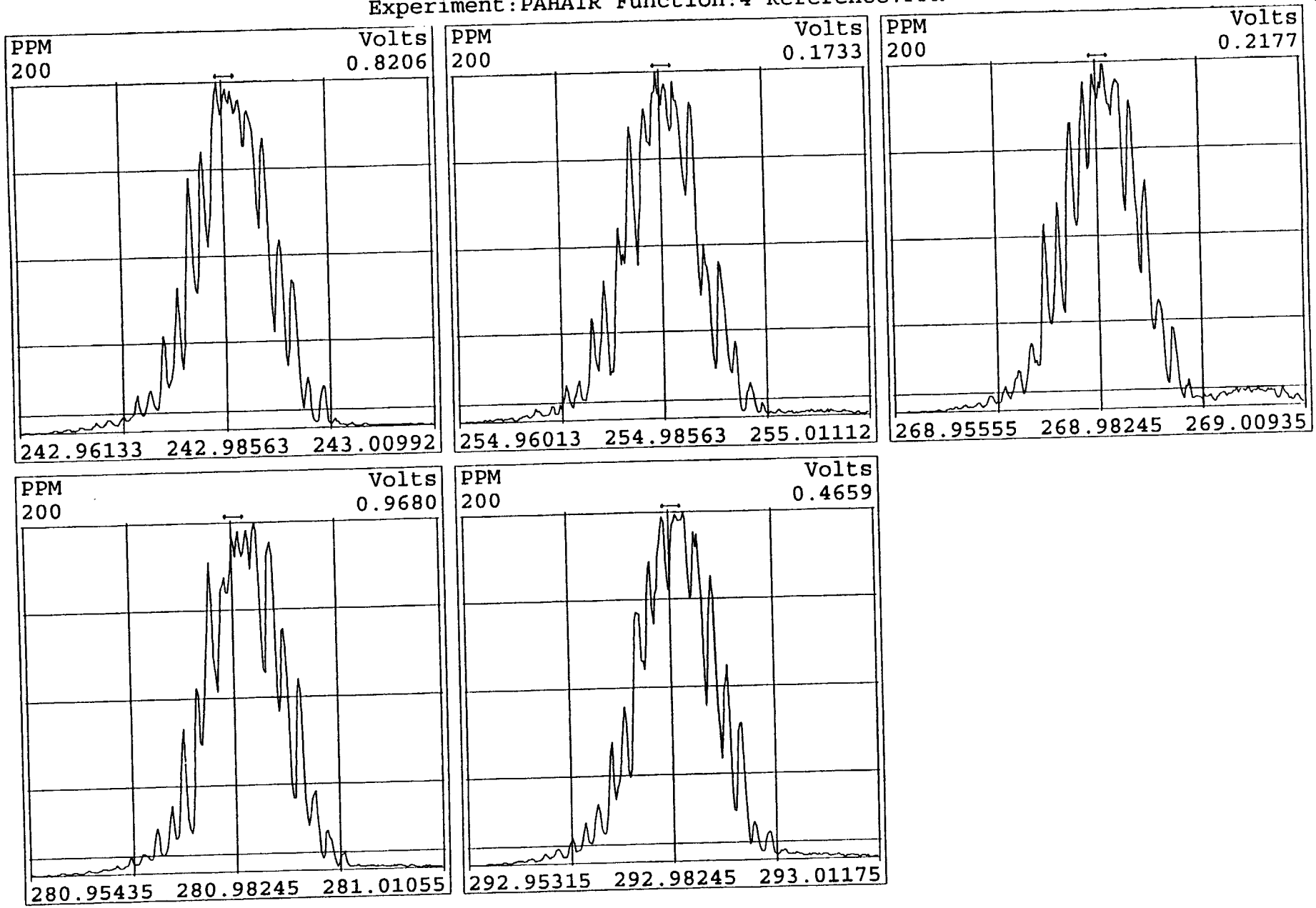


630

Peak Locate Examination: 2-NOV-1998:13:11 File:02NO98V4
Experiment:PAHAIR Function:3 Reference:PFK



Peak Locate Examination: 2-NOV-1998:13:12 File:02NO98V4
Experiment:PAHAIR Function:4 Reference:PFK



Dioxin Furan CALIBRATION TABLE

Mass Spec : VG-4
GC Column : DB-5
265-04A,B,D,E,956-64

File name : PAHAIR102998V4.RRF
Date analyzed : 29-OCT-98

633

INITIAL CALIBRATION CURVE

Mult.: 350

		Mean	S.D.	%RSD	1	2	3	4	5	6	7	8	9	10
d8-Naphthalene	Amount				100.00	100.00	100.00	100.00	100.00					
	RF				185.11	205.87	228.31	244.46	256.61					
	RRF	2.24	0.289	12.900	1.85	2.06	2.28	2.44	2.57					
Naphthalene	Amount				10.00	50.00	100.00	200.00	500.00					
	RF				13.76	61.93	113.47	231.43	609.70					
	RRF	1.23	0.094	7.707	1.38	1.24	1.13	1.16	1.22					
2-Methylnaphthalene	Amount				10.00	50.00	100.00	200.00	500.00					
	RF				6.91	29.85	51.39	97.93	255.67					
	RRF	0.56	0.084	14.909	0.69	0.60	0.51	0.49	0.51					
d8-Acenaphthylene	Amount				100.00	100.00	100.00	100.00	100.00					
	RF				131.95	128.38	114.60	122.45	109.50					
	RRF	1.21	0.093	7.696	1.32	1.28	1.15	1.22	1.10					
Acenaphthylene	Amount				10.00	50.00	100.00	200.00	500.00					
	RF				9.55	48.30	90.68	178.19	500.84					
	RRF	0.94	0.045	4.773	0.95	0.97	0.91	0.89	1.00					
d10-Acenaphthene	Amount				100.00	100.00	100.00	100.00	100.00					
	RF				83.11	77.72	76.15	77.96	57.36					
	RRF	0.74	0.099	13.310	0.83	0.78	0.76	0.78	0.57					
Acenaphthene	Amount				10.00	50.00	100.00	200.00	500.00					
	RF				10.98	62.63	151.76	215.88	641.50					
	RRF	1.25	0.177	14.178	1.10	1.25	1.52	1.08	1.28					
d10-Fluorene	Amount				100.00	100.00	100.00	100.00	100.00					
	RF				153.24	135.78	140.61	141.09	139.72					
	RRF	1.42	0.066	4.625	1.53	1.36	1.41	1.41	1.40					
Fluorene	Amount				10.00	50.00	100.00	200.00	500.00					
	RF				8.53	58.18	117.21	249.15	684.13					
	RRF	1.16	0.191	16.420	0.85	1.16	1.17	1.25	1.37					
d10-Phenanthrene	Amount				100.00	100.00	100.00	100.00	100.00					
	RF				308.98	263.63	276.27	272.04	282.87					
	RRF	2.81	0.173	6.145	3.09	2.64	2.76	2.72	2.83					
Phenanthrene	Amount				10.00	50.00	100.00	200.00	500.00					
	RF				9.70	46.13	81.87	168.14	460.23					
	RRF	0.89	0.063	7.028	0.97	0.92	0.82	0.84	0.92					
Anthracene	Amount				10.00	50.00	100.00	200.00	500.00					
	RF				8.13	42.20	77.06	153.96	402.42					
	RRF	0.80	0.031	3.901	0.81	0.84	0.77	0.77	0.80					
d10-Fluoranthene	Amount				100.00	100.00	100.00	100.00	100.00					
	RF				118.94	136.07	145.72	150.34	154.31					
	RRF	1.41	0.141	10.009	1.19	1.36	1.46	1.50	1.54					
Fluoranthene	Amount				10.00	50.00	100.00	200.00	500.00					
	RF				14.14	55.12	99.77	200.49	521.18					
	RRF	1.11	0.174	15.653	1.41	1.10	1.00	1.00	1.04					
d10-Pyrene	Amount				100.00	100.00	100.00	100.00	100.00					
	RF				129.03	143.24	158.81	161.45	166.55					
	RRF	1.52	0.154	10.160	1.29	1.43	1.59	1.61	1.67					
Pyrene	Amount				10.00	50.00	100.00	200.00	500.00					
	RF				16.74	59.11	104.58	204.18	551.22					
	RRF	1.21	0.269	22.353	1.67	1.18	1.05	1.02	1.10					

02-NOV-1998 02:20:08 PM

Dioxin Furan CALIBRATION TABLE

Mass Spec : VG-4
GC Column : DB-5
265-04A,B,D,E,956-64

File name : PAHAIR102998V4.RRF
Date analyzed : 29-OCT-98

634

INITIAL CALIBRATION CURVE

Mult.: 350

		Mean	S.D.	%RSD	1	2	3	4	5	6	7	8	9	10
d12-Benzo(a)anthracene	Amount				100.00	100.00	100.00	100.00	100.00					
	RF				68.20	70.96	127.65	89.95	93.26					
	RRF	0.90	0.238	26.446	0.68	0.71	1.28	0.90	0.93					
Benzo(a)anthracene	Amount				10.00	50.00	100.00	200.00	500.00					
	RF				11.85	64.84	102.61	234.26	671.78					
	RRF	1.20	0.124	10.269	1.18	1.30	1.03	1.17	1.34					
d12-Chrysene	Amount				100.00	100.00	100.00	100.00	100.00					
	RF				109.94	119.85	127.65	136.79	145.35					
	RRF	1.28	0.139	10.855	1.10	1.20	1.28	1.37	1.45					
Chrysene	Amount				10.00	50.00	100.00	200.00	500.00					
	RF				10.44	56.47	102.61	215.75	571.04					
	RRF	1.08	0.051	4.716	1.04	1.13	1.03	1.08	1.14					
d12-Benzo(b)fluoranthene	Amount				100.00	100.00	100.00	100.00	100.00					
	RF				41.05	45.84	49.22	45.10	45.72					
	RRF	0.45	0.029	6.414	0.41	0.46	0.49	0.45	0.46					
Benzo(b)fluoranthene	Amount				10.00	50.00	100.00	200.00	500.00					
	RF				12.56	61.73	95.82	228.66	622.27					
	RRF	1.17	0.125	10.717	1.26	1.23	0.96	1.14	1.24					
d12-Benzo(k)fluoranthene	Amount				100.00	100.00	100.00	100.00	100.00					
	RF				91.66	94.95	96.52	94.09	96.82					
	RRF	0.95	0.021	2.203	0.92	0.95	0.97	0.94	0.97					
Benzo(k)fluoranthene	Amount				10.00	50.00	100.00	200.00	500.00					
	RF				12.71	63.16	119.14	210.18	522.11					
	RRF	1.16	0.111	9.525	1.27	1.26	1.19	1.05	1.04					
d12-Benzo(a)pyrene	Amount				100.00	100.00	100.00	100.00	100.00					
	RF				65.24	66.86	69.56	67.87	68.82					
	RRF	0.68	0.017	2.504	0.65	0.67	0.70	0.68	0.69					
Benzo(e)pyrene	Amount				10.00	50.00	100.00	200.00	500.00					
	RF				18.05	89.03	157.16	302.58	767.23					
	RRF	1.64	0.140	8.557	1.80	1.78	1.57	1.51	1.53					
Benzo(a)pyrene	Amount				10.00	50.00	100.00	200.00	500.00					
	RF				11.71	60.46	102.44	200.46	476.32					
	RRF	1.07	0.112	10.437	1.17	1.21	1.02	1.00	0.95					
d12-Perylene	Amount				100.00	100.00	100.00	100.00	100.00					
	RF				64.89	58.55	68.21	62.00	61.45					
	RRF	0.63	0.037	5.829	0.65	0.59	0.68	0.62	0.61					
Perylene	Amount				10.00	50.00	100.00	200.00	500.00					
	RF				16.93	98.08	162.24	324.02	835.41					
	RRF	1.71	0.142	8.297	1.69	1.96	1.62	1.62	1.67					
d12-Indeno(123-cd)pyrene	Amount				100.00	100.00	100.00	100.00	100.00					
	RF				44.86	44.54	44.08	43.39	45.40					
	RRF	0.44	0.008	1.722	0.45	0.45	0.44	0.43	0.45					
Indeno(123-cd)pyrene	Amount				10.00	50.00	100.00	200.00	500.00					
	RF				5.85	35.13	60.26	127.89	287.53					
	RRF	0.62	0.052	8.352	0.59	0.70	0.60	0.64	0.58					
d14-Dibenz(ah)anthracene	Amount				100.00	100.00	100.00	100.00	100.00					
	RF				20.73	24.39	25.35	26.10	26.33					
	RRF	0.25	0.023	9.286	0.21	0.24	0.25	0.26	0.26					

Dioxin Furan CALIBRATION TABLE

635

Mass Spec : VG-4
GC Column : DB-5
265-04A,B,D,E,956-64

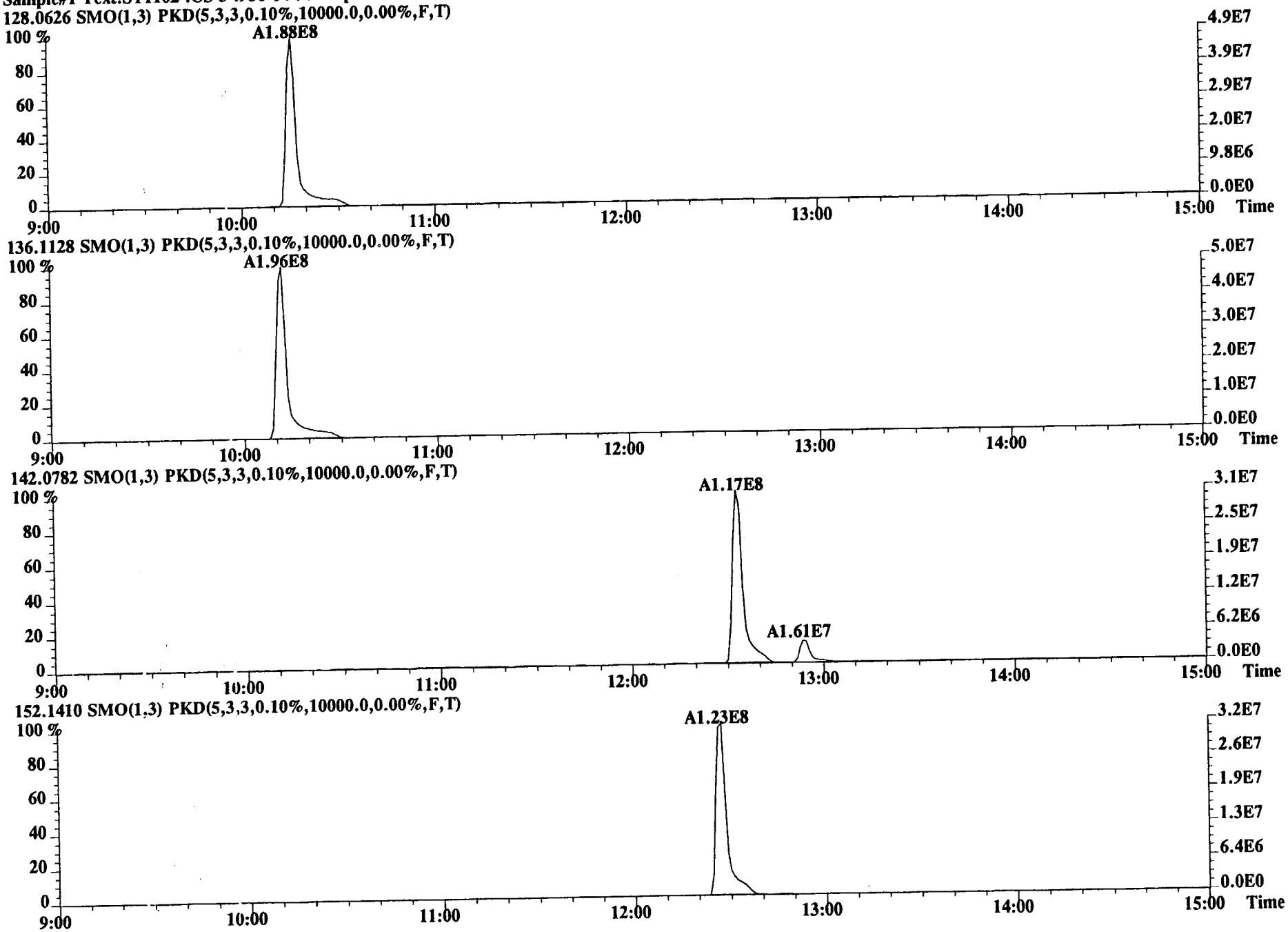
File name : PAHAIR102998V4.RRF
Date analyzed : 29-OCT-98

INITIAL CALIBRATION CURVE

Mult.: 350

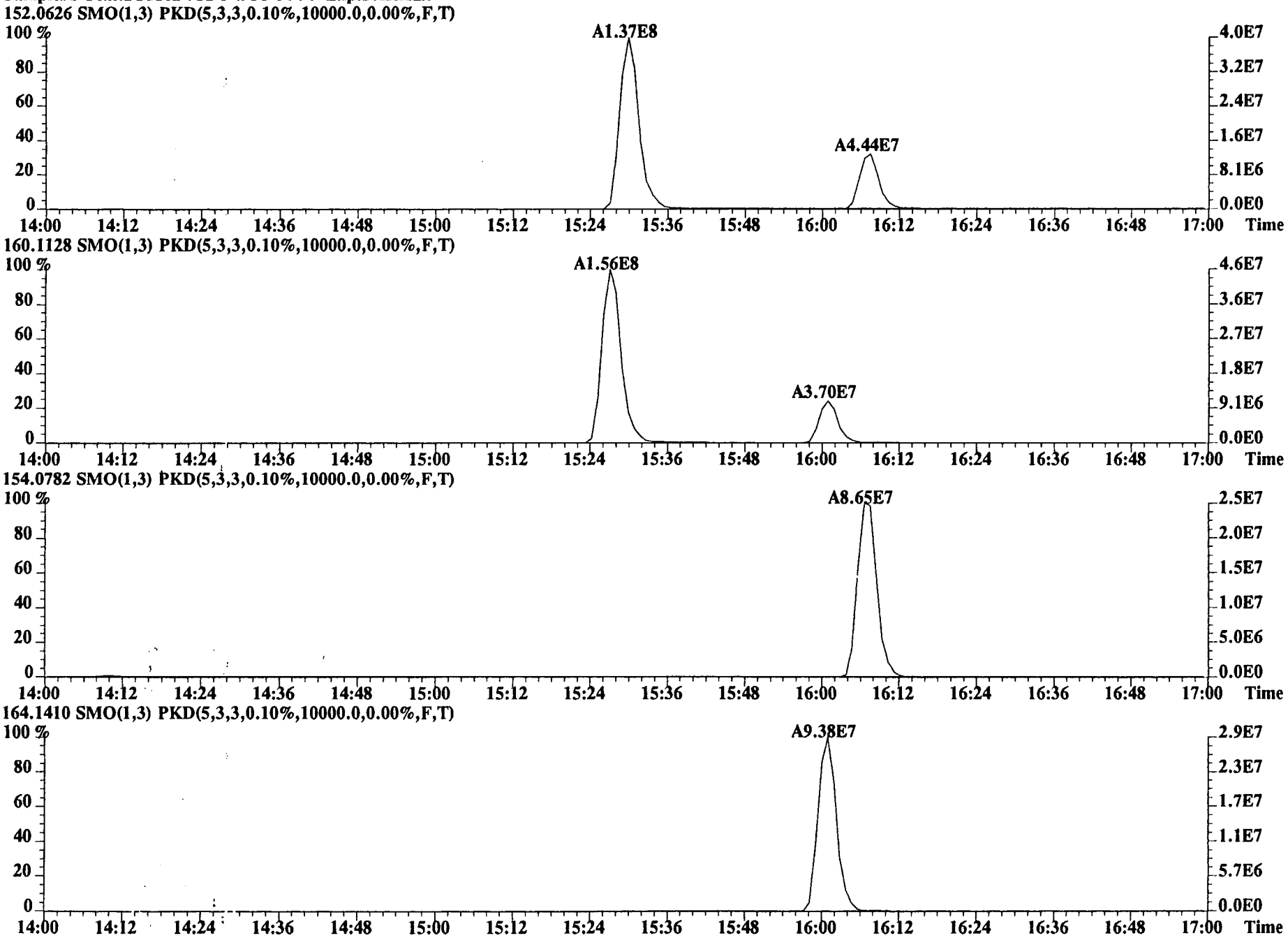
		Mean	S.D.	%RSD	1	2	3	4	5	6	7	8	9	10
Dibenz(ah)anthracene	Amount				10.00	50.00	100.00	200.00	500.00					
	RF				12.92	69.25	143.15	281.33	751.34					
	RRF	1.40	0.077	5.452	1.29	1.38	1.43	1.41	1.50					
d12-Benzo(ghi)perylene	Amount				100.00	100.00	100.00	100.00	100.00					
	RF				59.24	54.17	59.73	58.78	57.94					
	RRF	0.58	0.022	3.838	0.59	0.54	0.60	0.59	0.58					
Benzo(ghi)perylene	Amount				10.00	50.00	100.00	200.00	500.00					
	RF				8.58	51.44	109.18	211.25	522.58					
	RRF	1.02	0.091	8.984	0.86	1.03	1.09	1.06	1.05					
	Amount													
	RF				0	0	0	0	0					
	RRF	0	0	0										

File:02NO98V4 #1-510 Acq: 2-NOV-1998 13:13:33 GC EI+ Voltage SIR 70SE
Sample#1 Text:ST1102 :CS-3 :956-64 : : Exp:PAHAIR



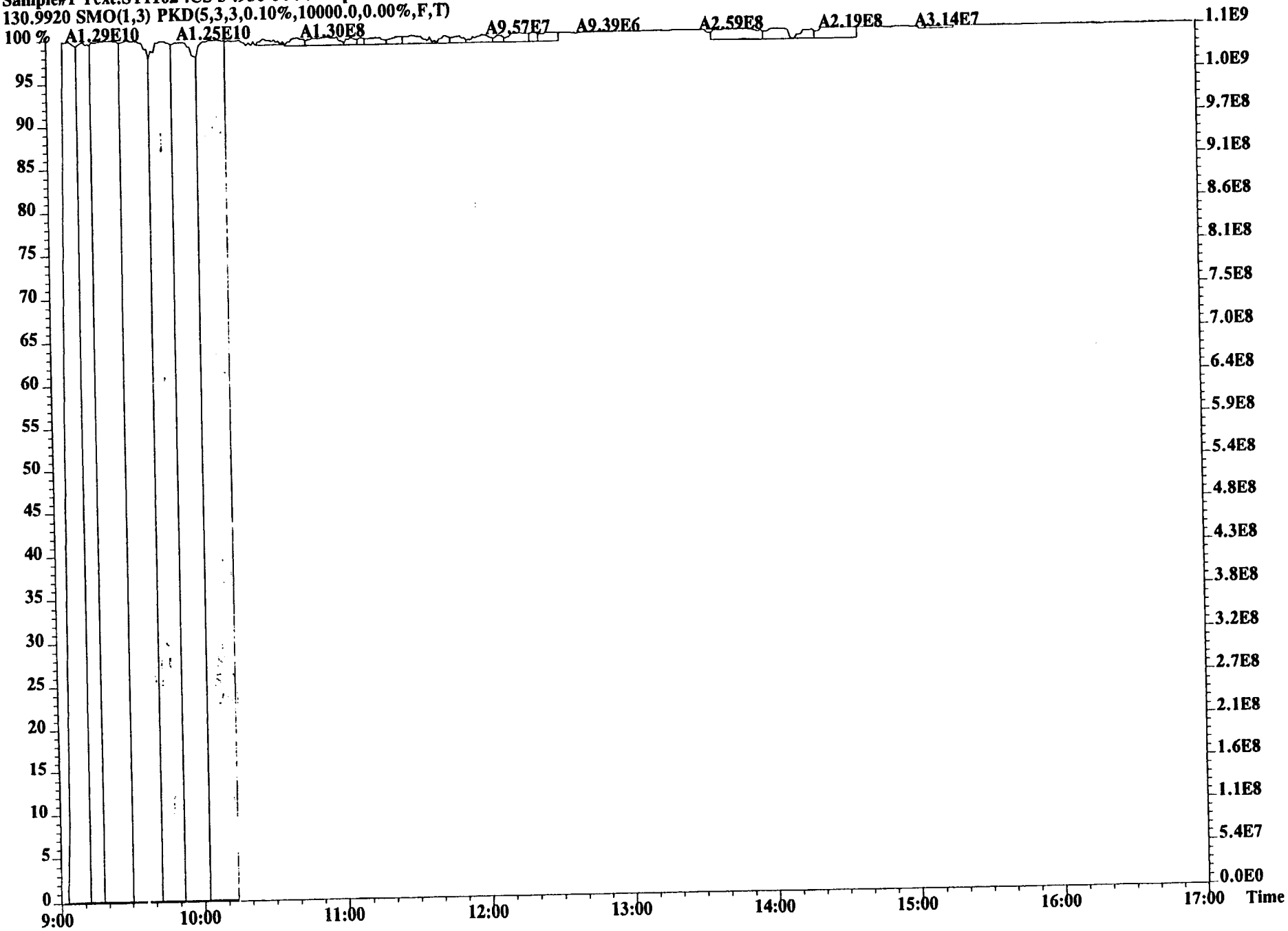
636

File:02NO98V4 #1-510 Acq: 2-NOV-1998 13:13:33 GC EI+ Voltage SIR 70SE
Sample#1 Text:ST1102 :CS-3 :956-64 : : Exp:PAHAIR

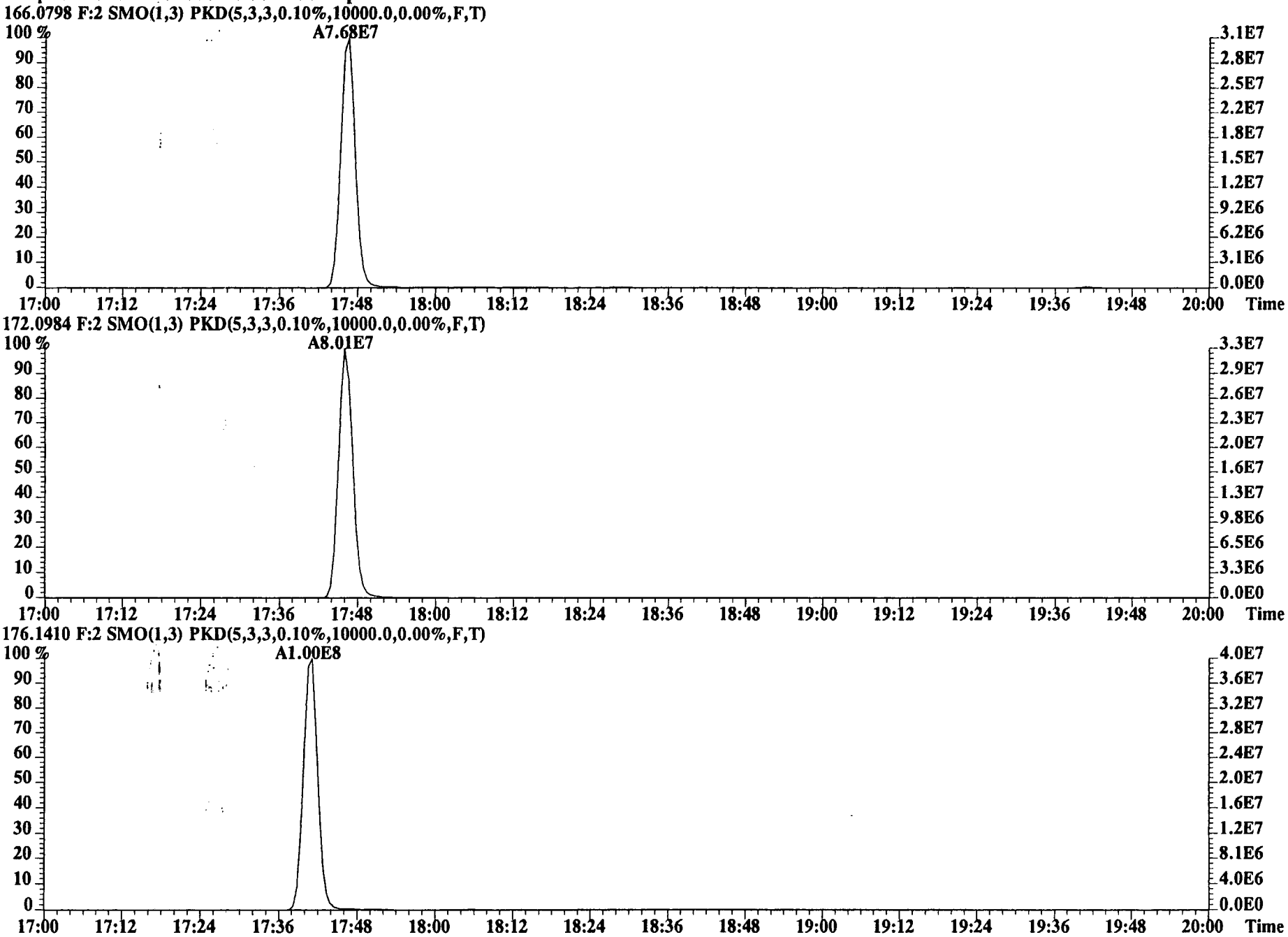


637

File:02NO98V4 #1-510 Acq: 2-NOV-1998 13:13:33 GC EI+ Voltage SIR 70SE
Sample#1 Text:ST1102 :CS-3 :956-64 : : Exp:PAHAIR
130.9920 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

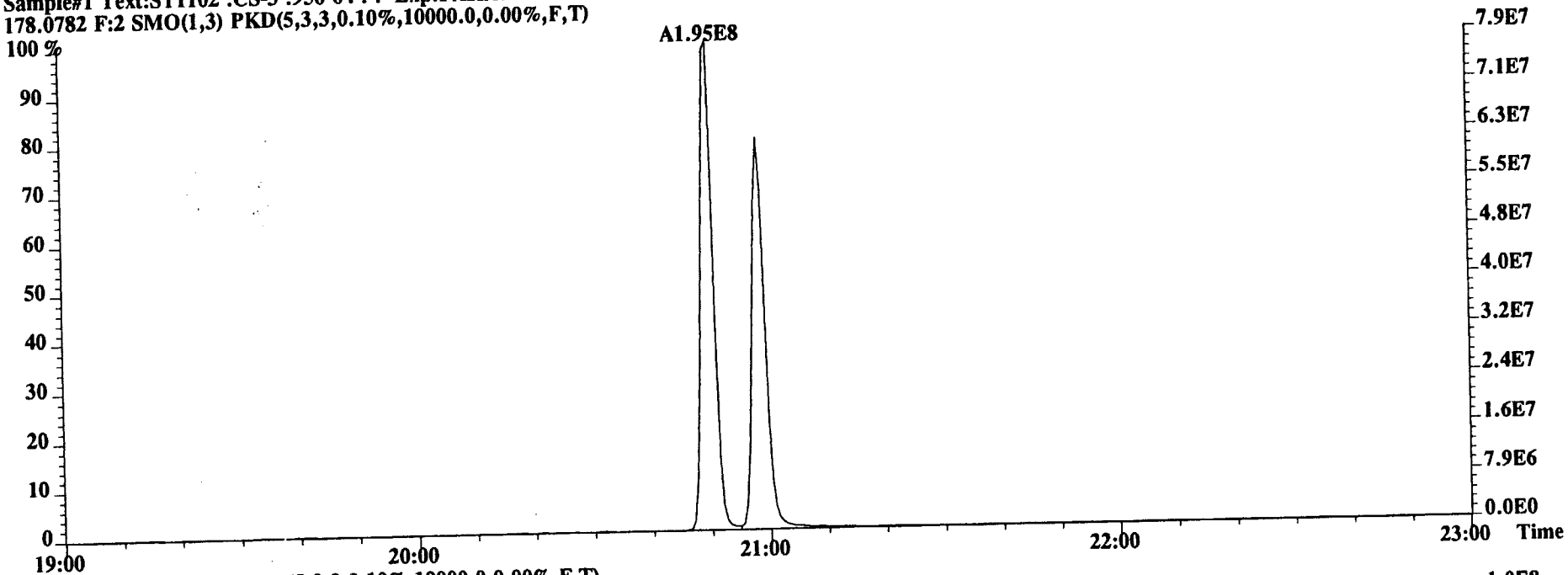


File:02NO98V4 #1-641 Acq: 2-NOV-1998 13:13:33 GC EI+ Voltage SIR 70SE
Sample#1 Text:ST1102 :CS-3 :956-64 : : Exp:PAHAIR

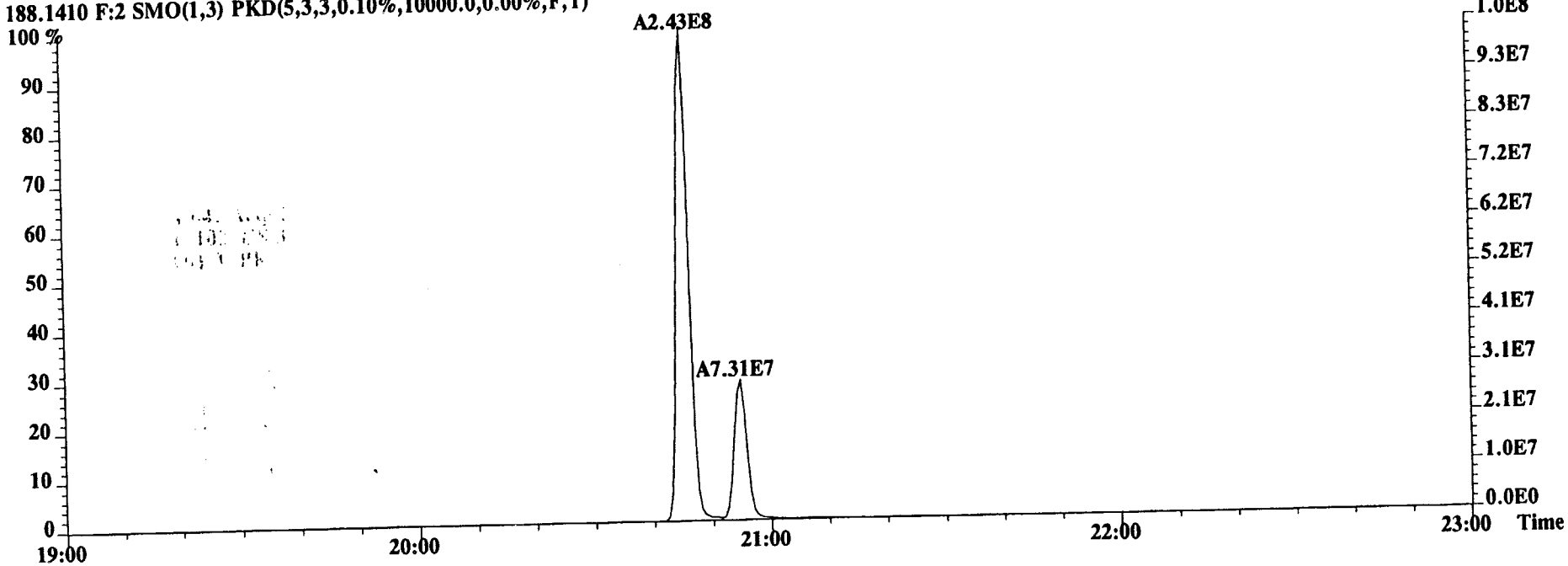


639

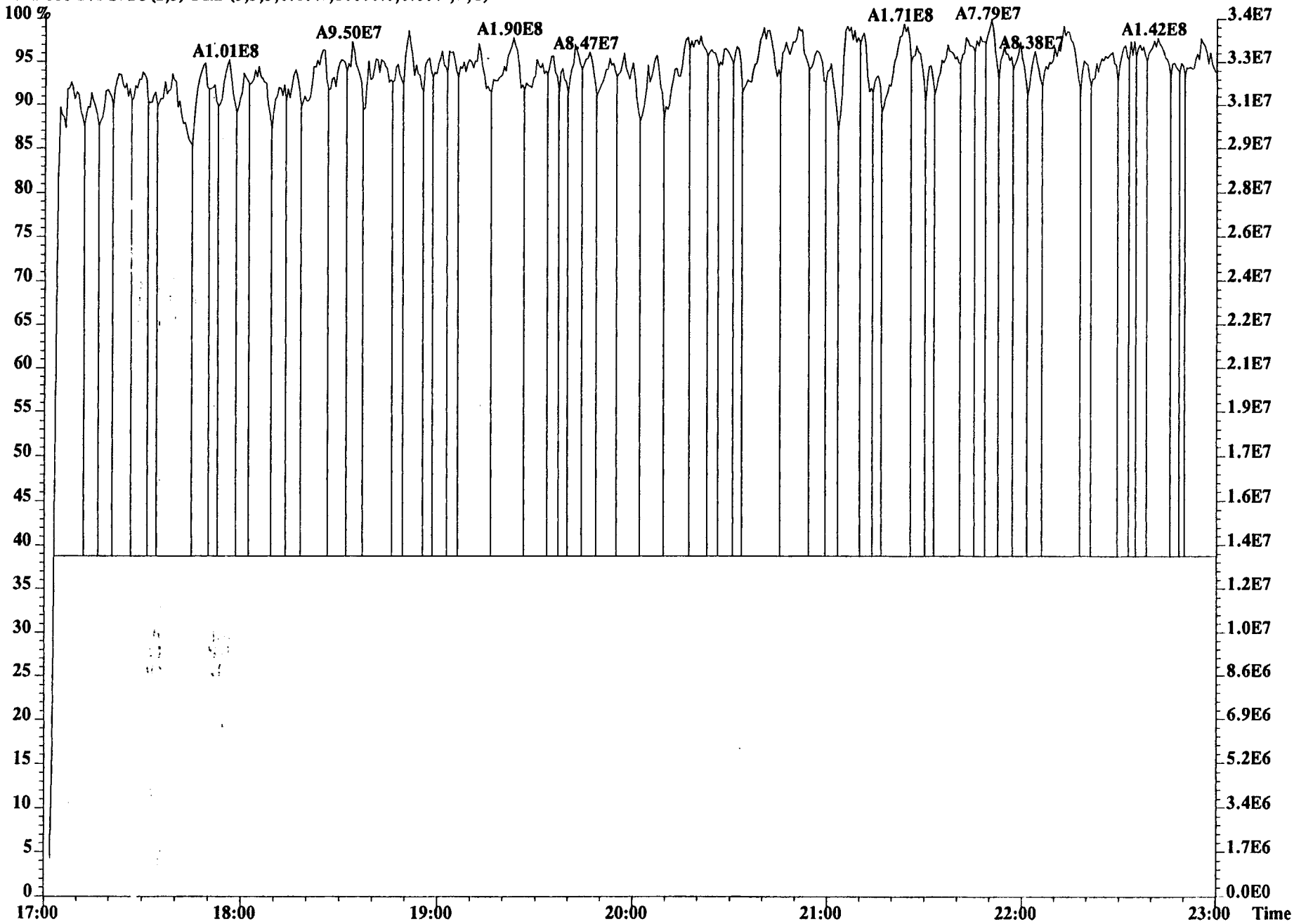
File:02NO98V4 #1-641 Acq: 2-NOV-1998 13:13:33 GC EI+ Voltage SIR 70SE
Sample#1 Text:ST1102 :CS-3 :956-64 : : Exp:PAHAIR
178.0782 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



188.1410 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

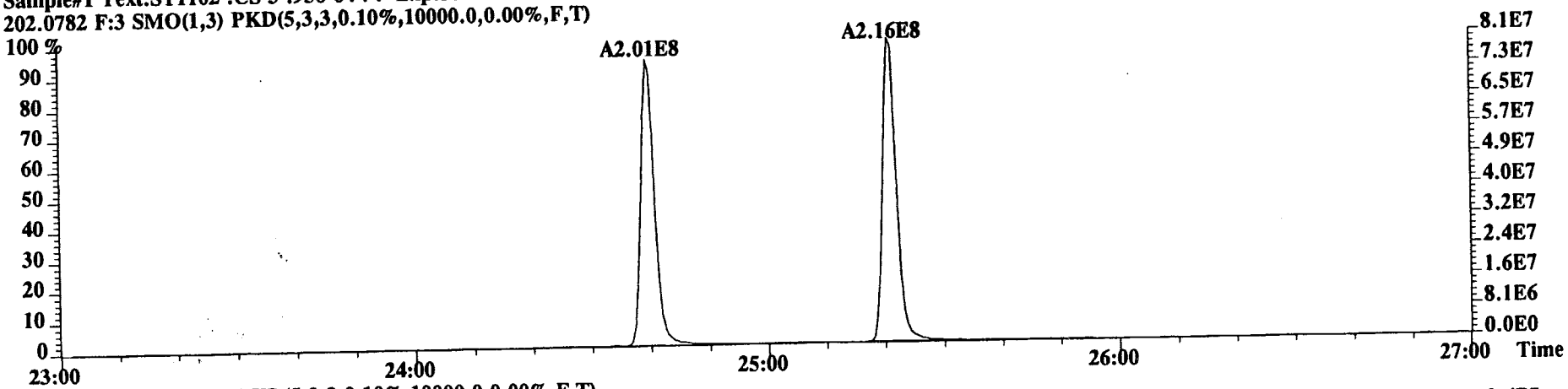


File:02NO98V4 #1-641 Acq: 2-NOV-1998 13:13:33 GC EI+ Voltage SIR 70SE
Sample#1 Text:ST1102 :CS-3 :956-64 : : Exp:PAHAIR
204.9888 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

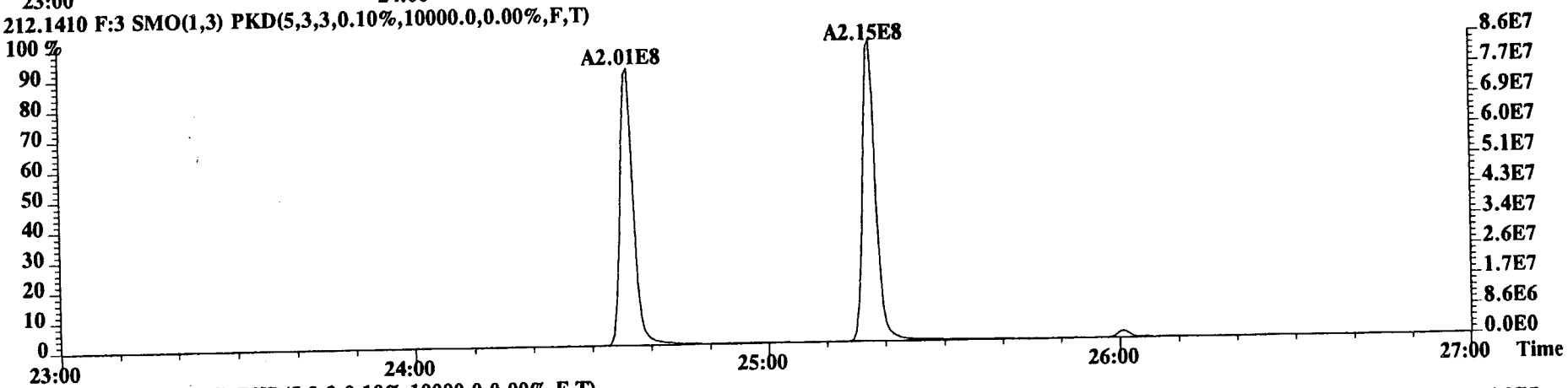


641

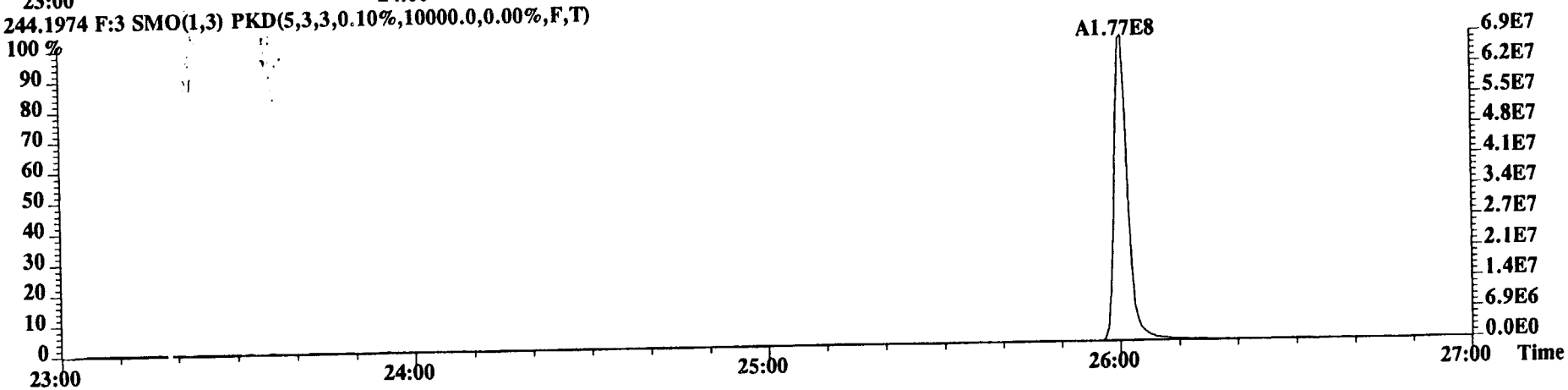
File:02NO98V4 #1-938 Acq: 2-NOV-1998 13:13:33 GC EI+ Voltage SIR 70SE
Sample#1 Text:ST1102 :CS-3 :956-64 : : Exp:PAHAIR
202.0782 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



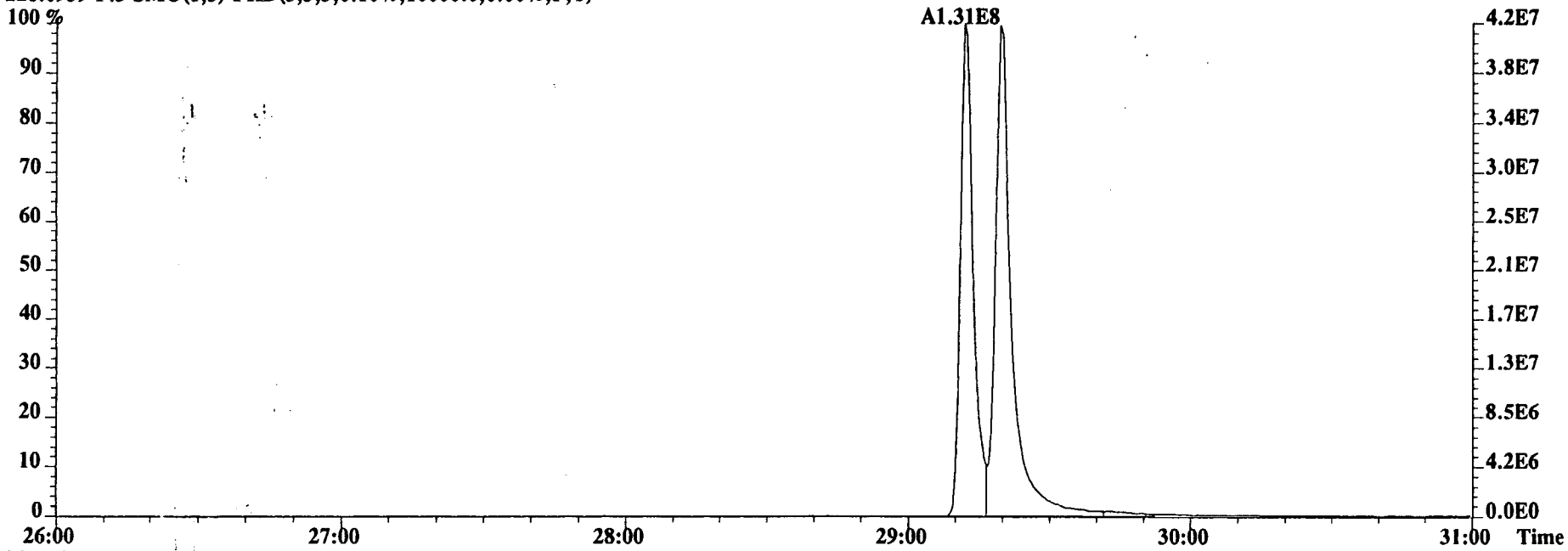
212.1410 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



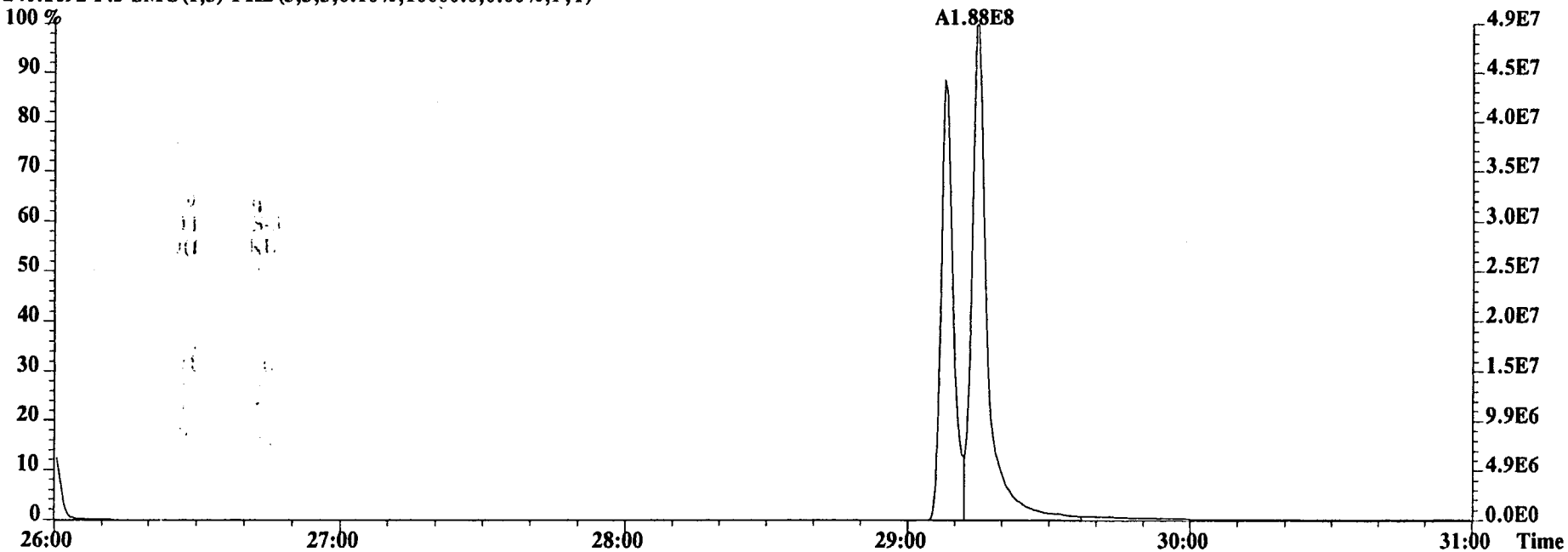
244.1974 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



File:02NO98V4 #1-938 Acq: 2-NOV-1998 13:13:33 GC EI+ Voltage SIR 70SE
Sample#1 Text:ST1102 :CS-3 :956-64 : : Exp:PAHAIR
228.0939 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

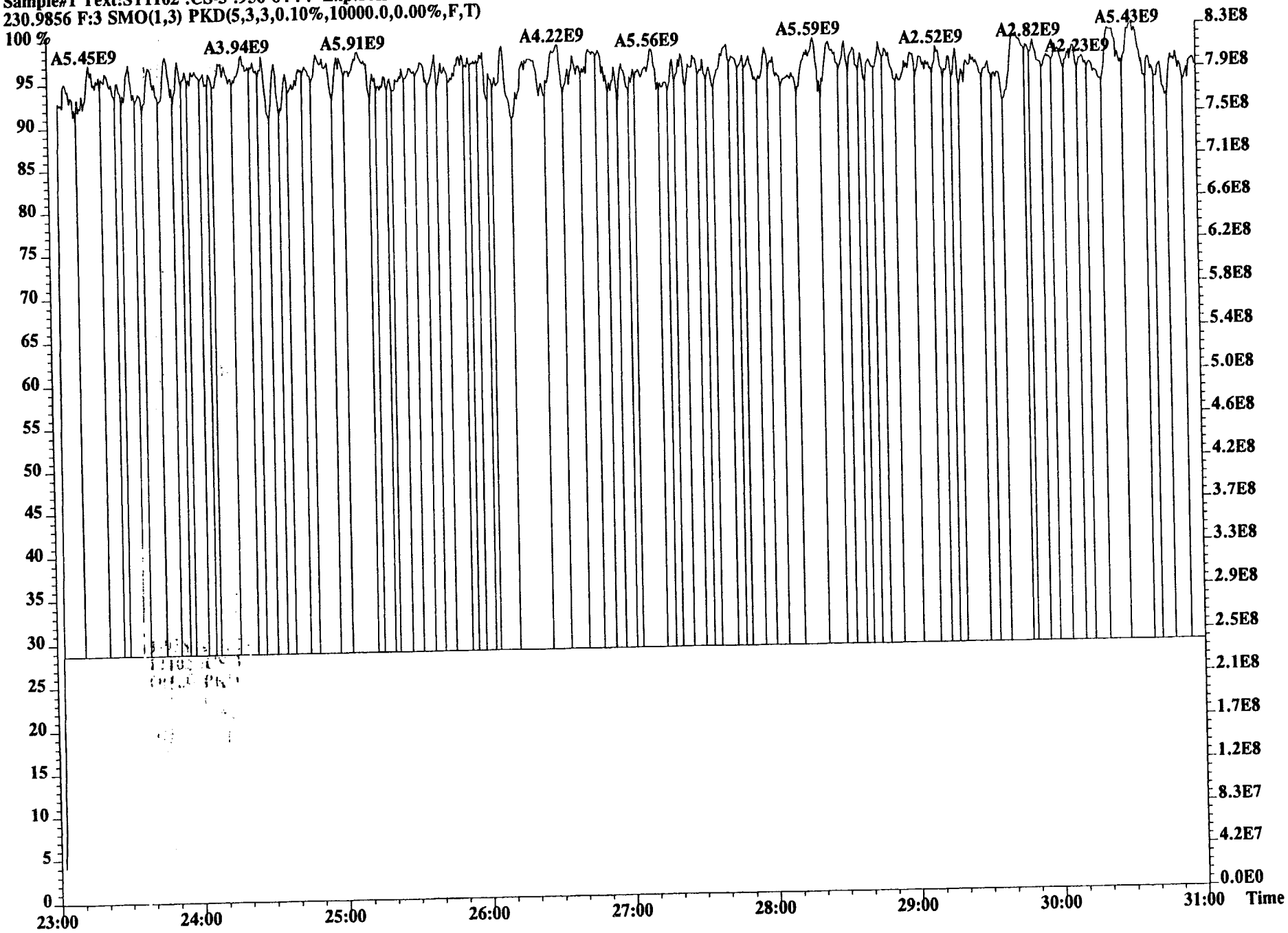


240.1692 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

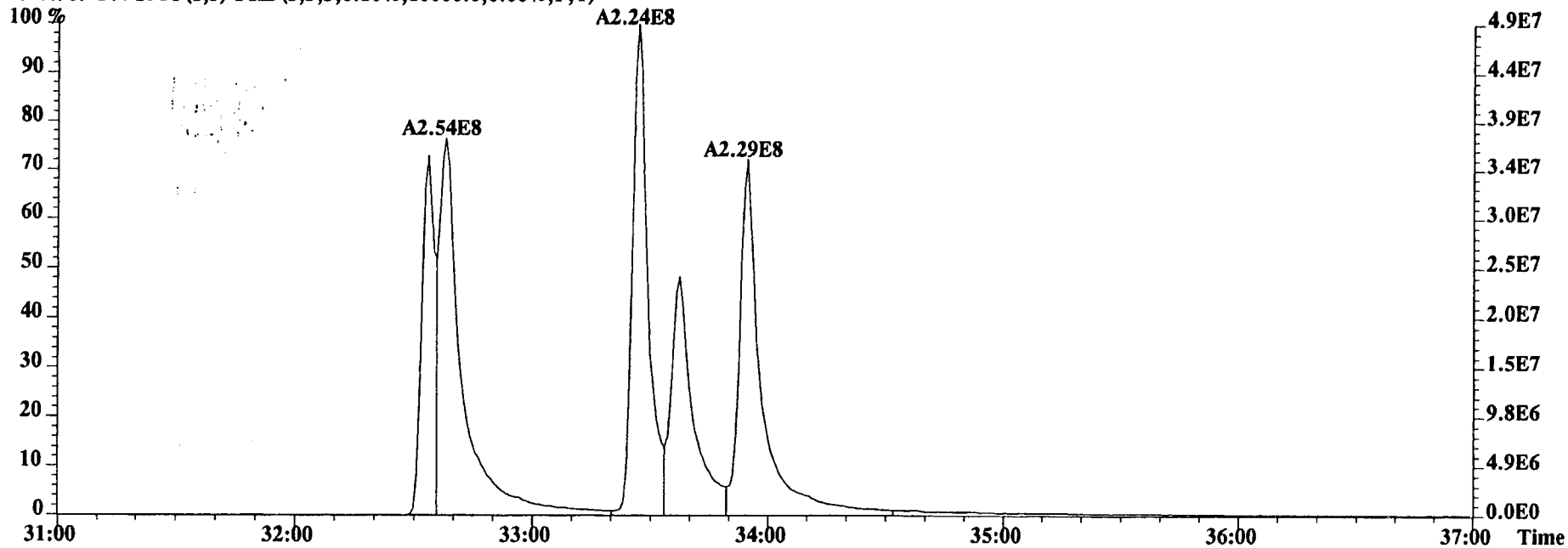


643

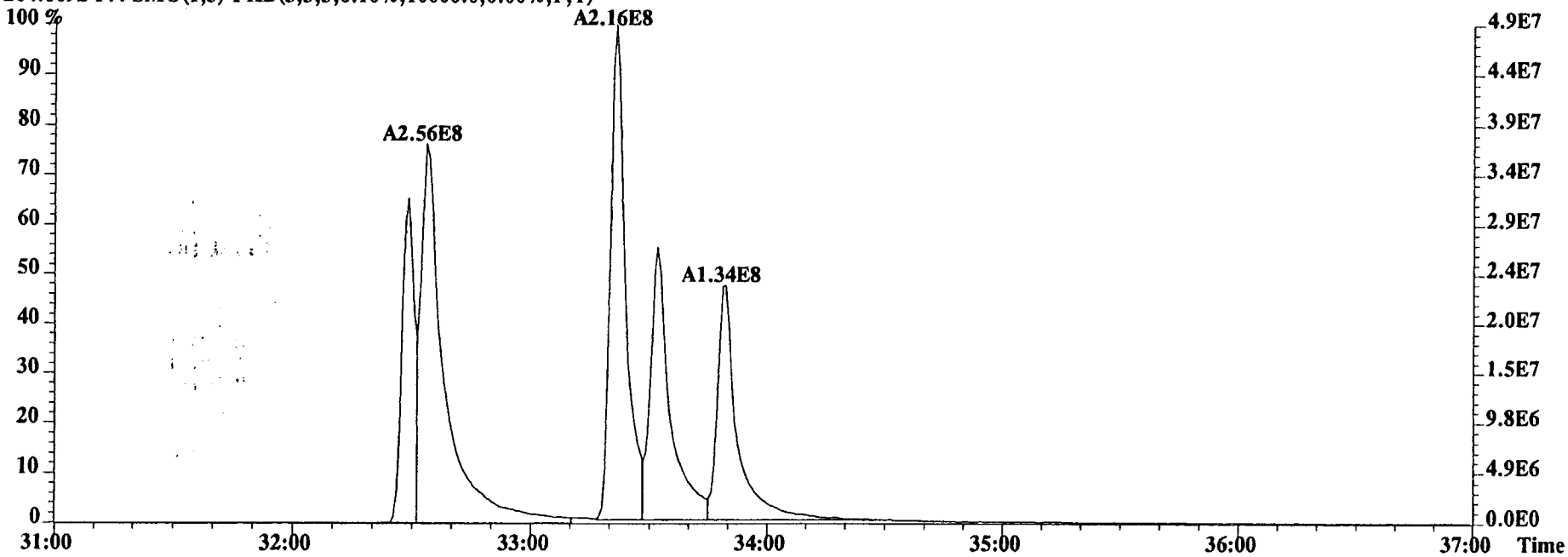
File:02NO98V4 #1-938 Acq: 2-NOV-1998 13:13:33 GC EI+ Voltage SIR 70SE
Sample#1 Text:ST1102 :CS-3 :956-64 : : Exp:PAHAIR
230.9856 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



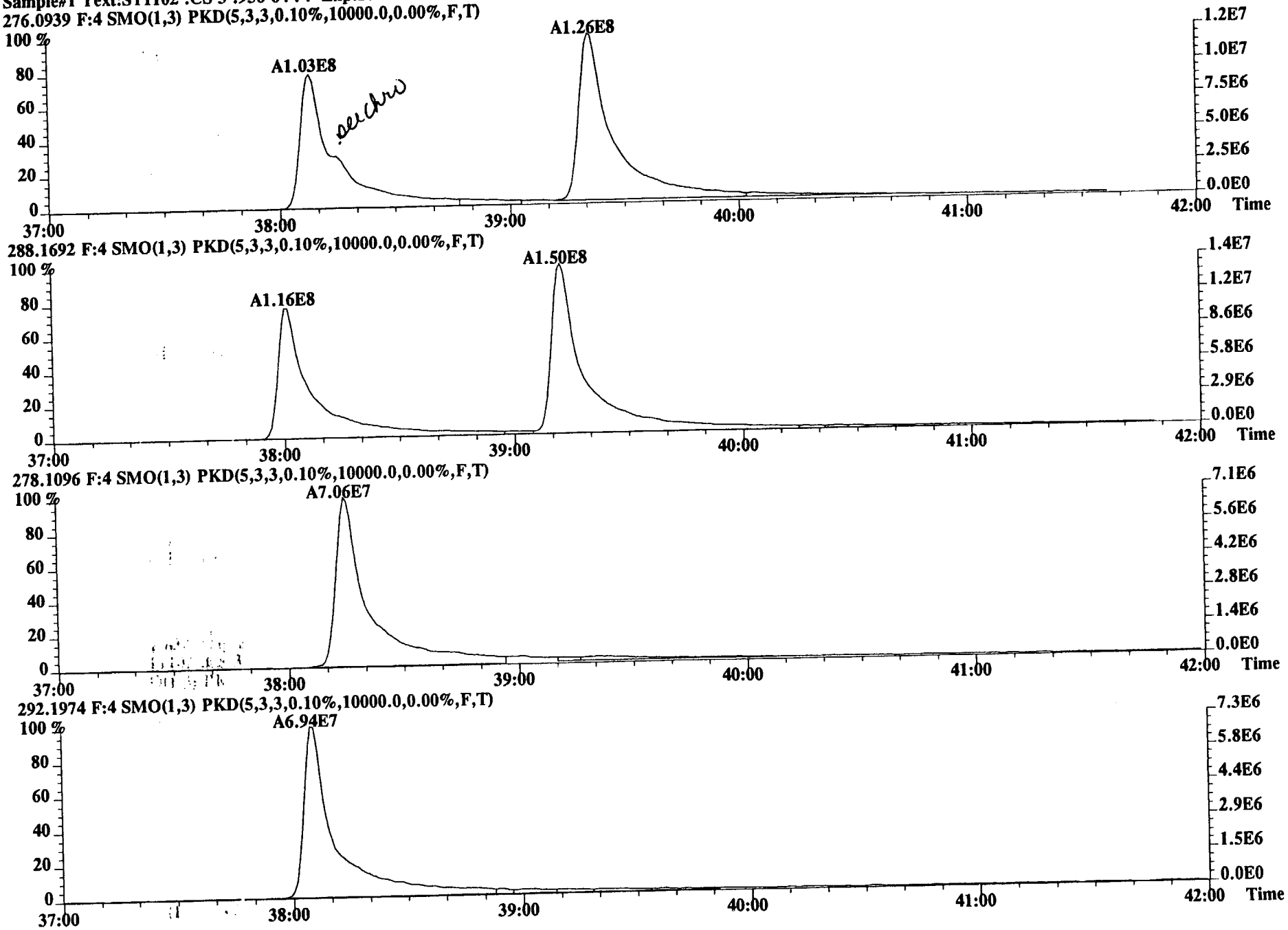
File:02NO98V4 #1-759 Acq: 2-NOV-1998 13:13:33 GC EI+ Voltage SIR 70SE
Sample#1 Text:ST1102 :CS-3 :956-64 : : Exp:PAHAIR
252.0939 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



264.1692 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

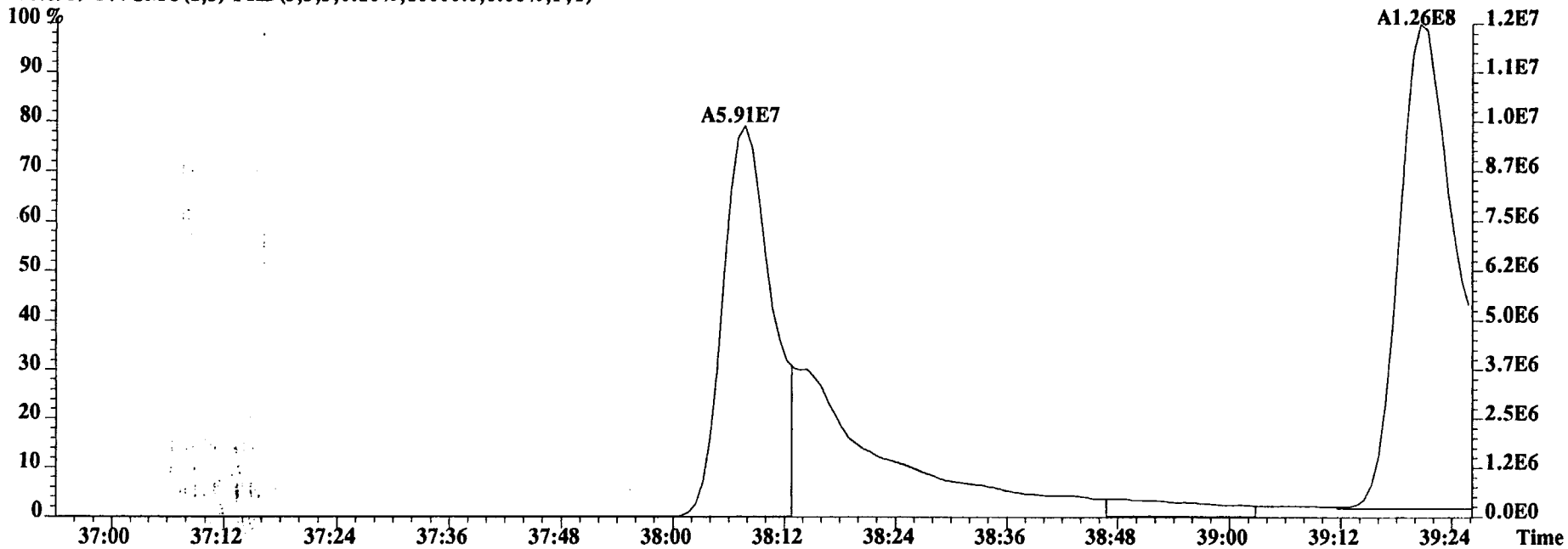


File:02NO98V4 #1-832 Acq: 2-NOV-1998 13:13:33 GC EI+ Voltage SIR 70SE
Sample#1 Text:ST1102 :CS-3 :956-64 : : Exp:PAHAIR

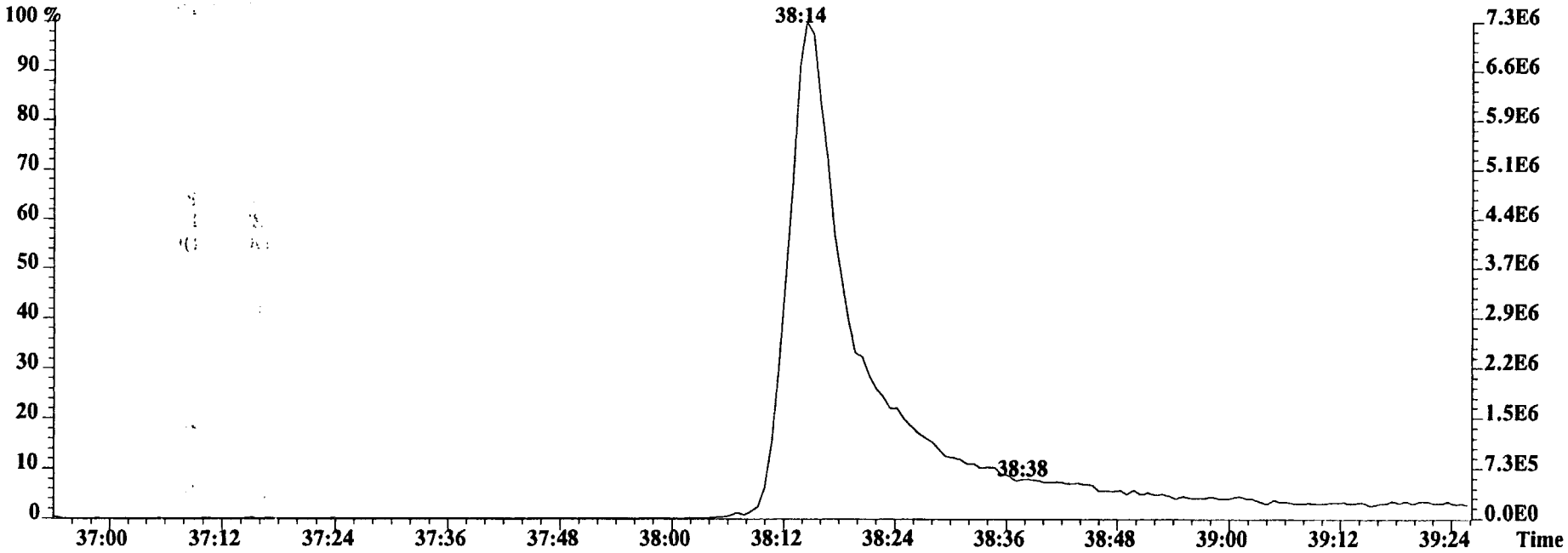


646

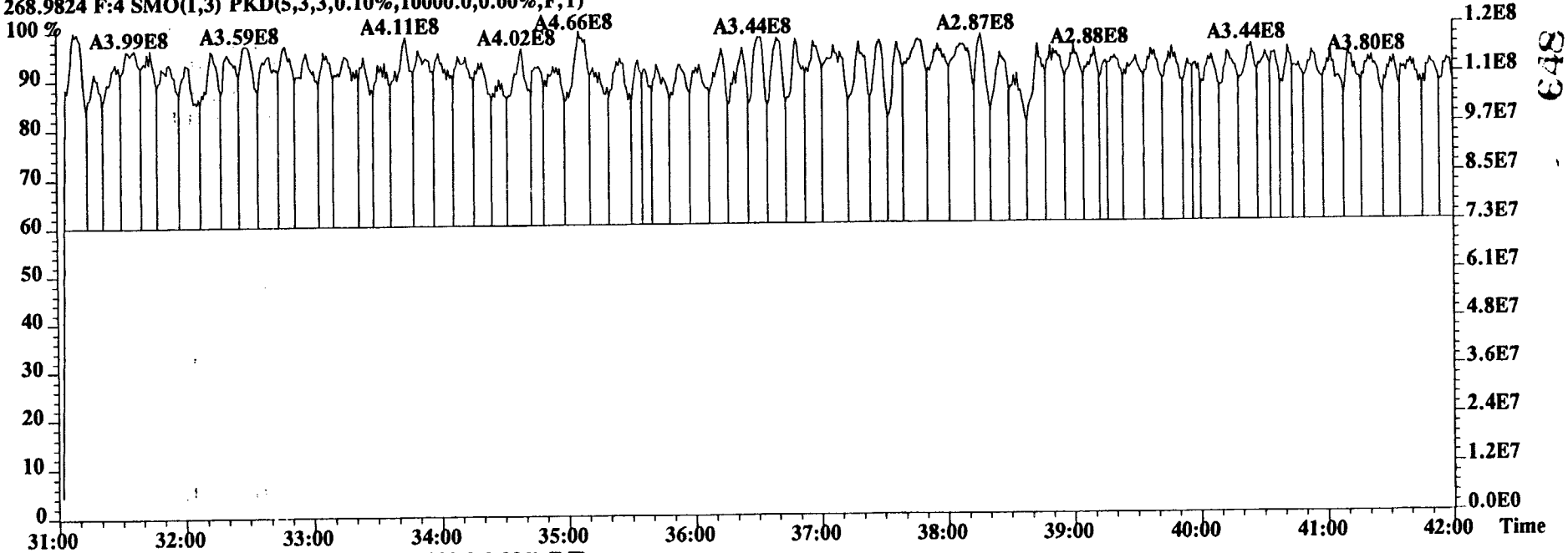
File:02NO98V4 #1-878 Acq: 2-NOV-1998 13:13:33 GC EI+ Voltage SIR 70SE
Sample#1 Text:ST1102 :CS-3 :956-64 : : Exp:PAHAIR
276.0939 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



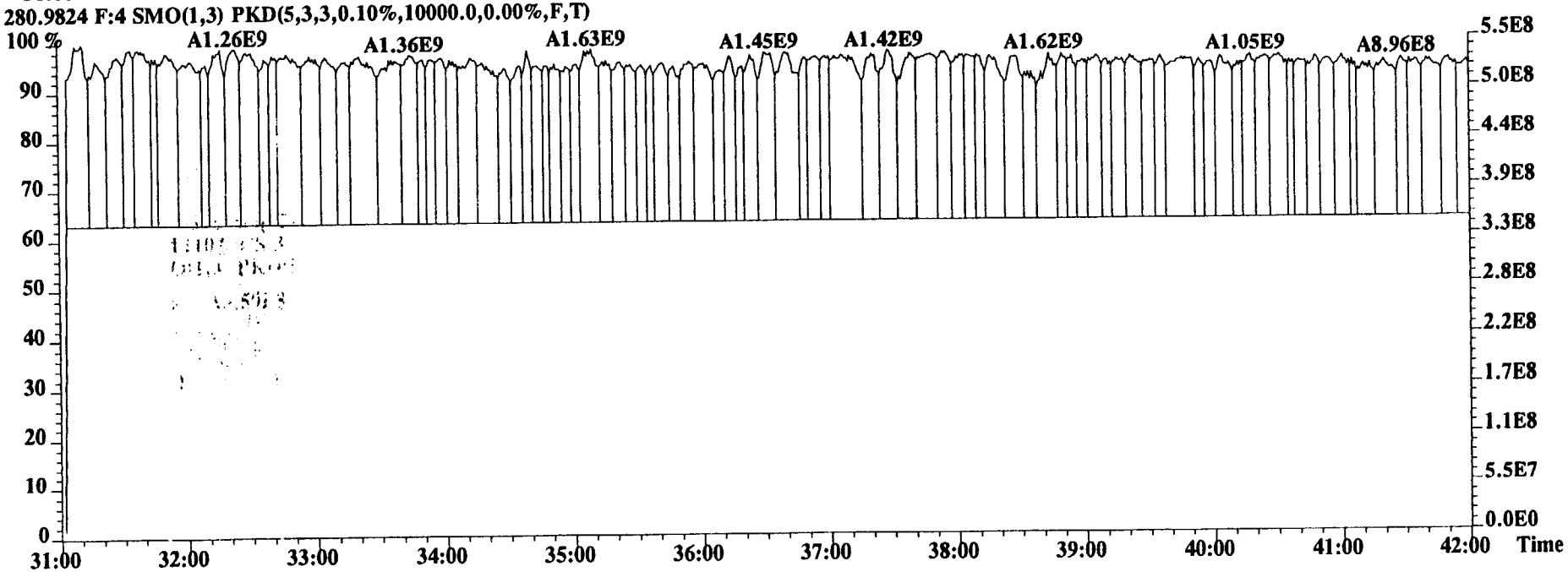
278.1096 F:4



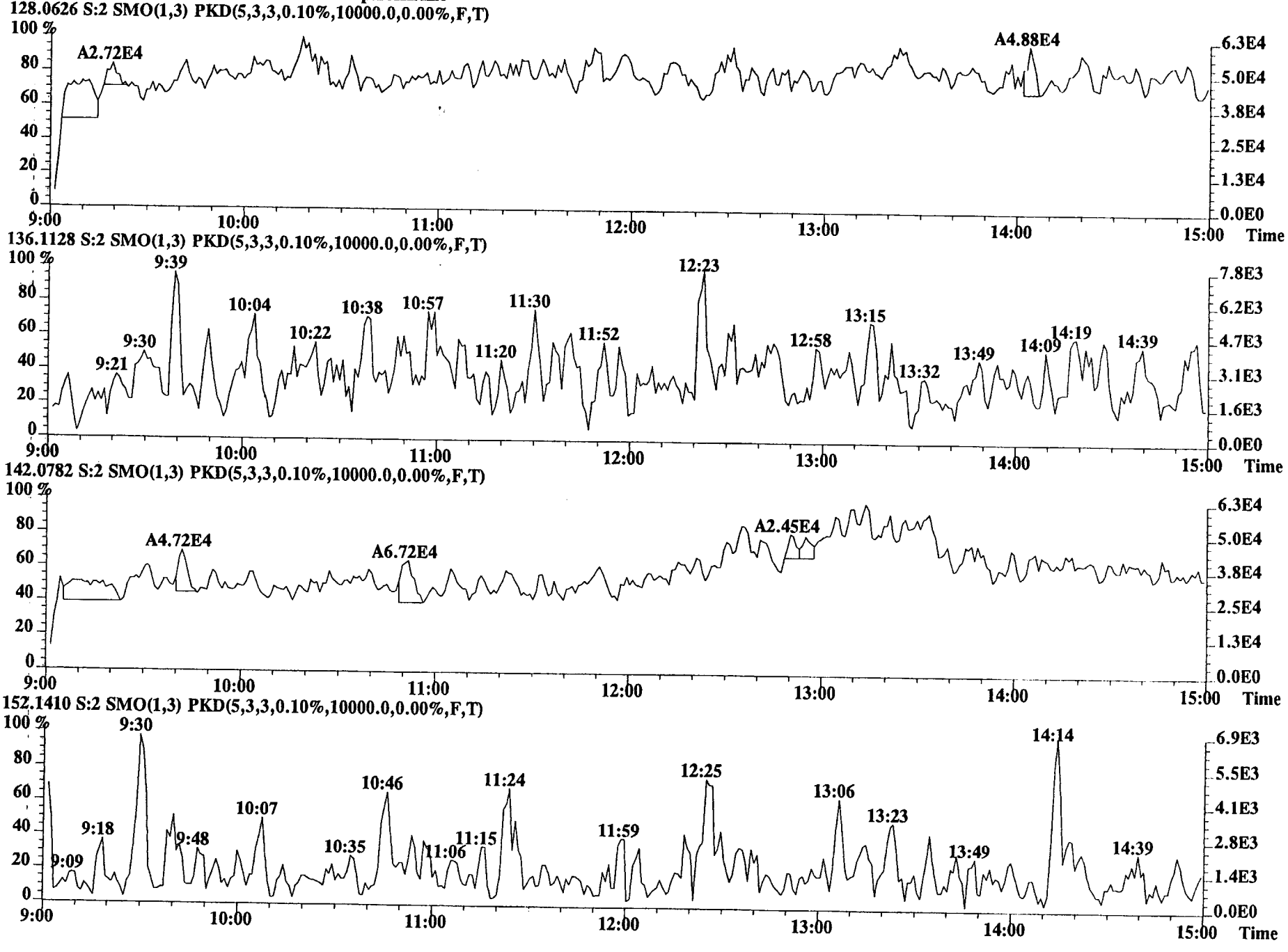
File:02NO98V4 #1-878 Acq: 2-NOV-1998 13:13:33 GC EI+ Voltage SIR 70SE
Sample#1 Text:ST1102 :CS-3 :956-64 : : Exp:PAHAIR
268.9824 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



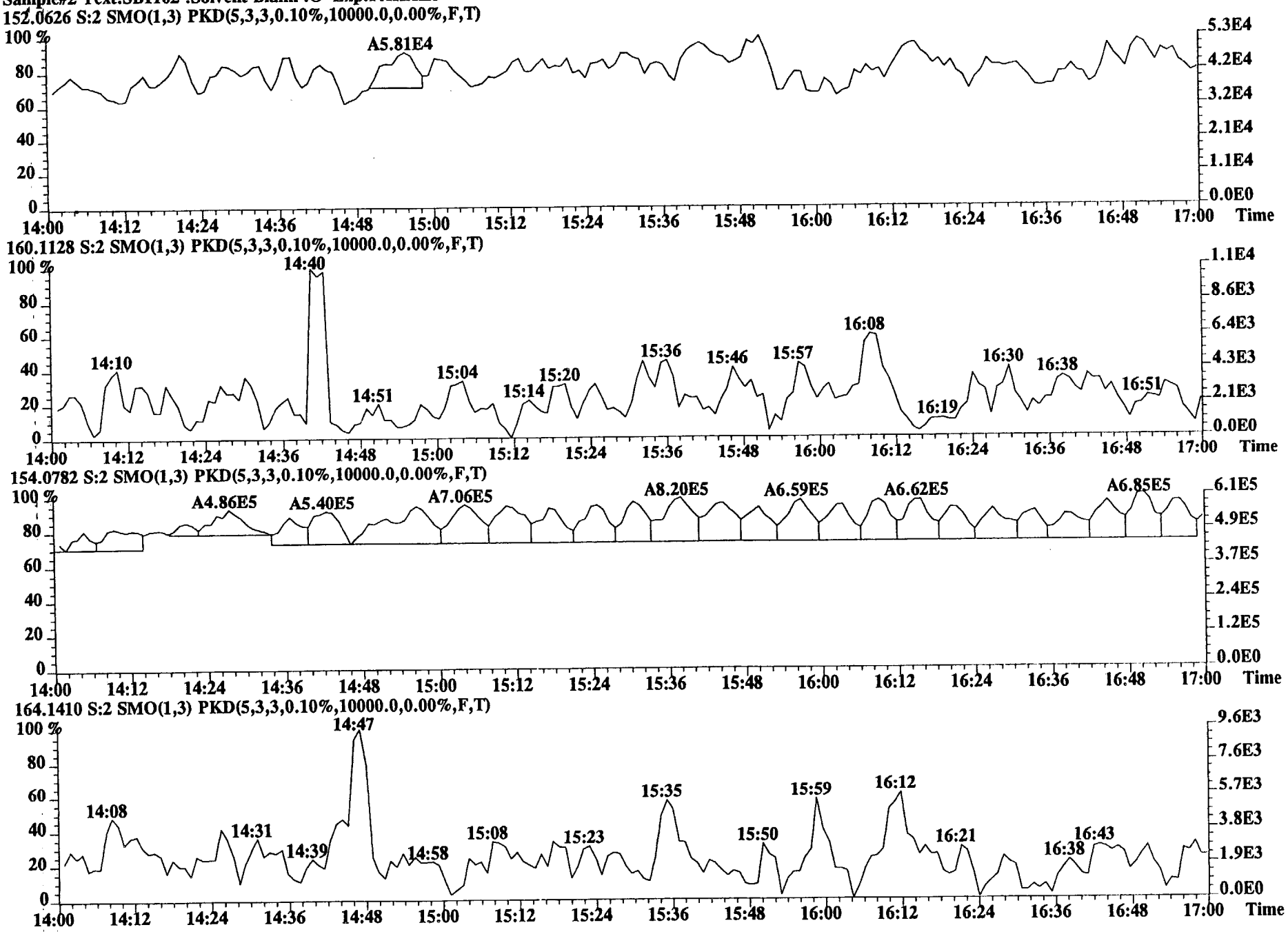
280.9824 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



File:02NO98V4 #1-510 Acq: 2-NOV-1998 14:02:30 GC EI+ Voltage SIR 70SE
Sample#2 Text:SB1102 :Solvent Blank :C- Exp:PAHAIR

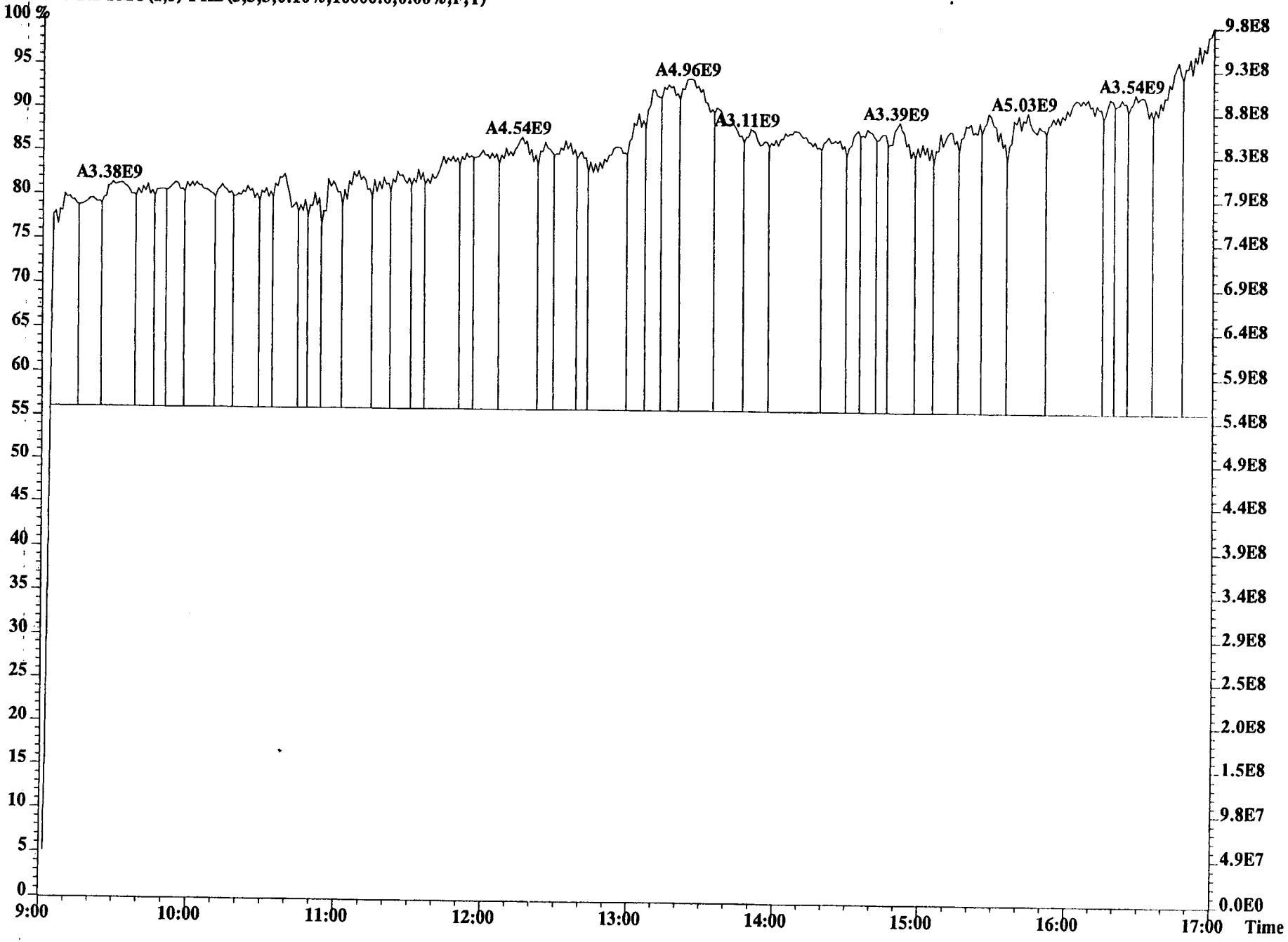


File:02NO98V4 #1-510 Acq: 2-NOV-1998 14:02:30 GC EI+ Voltage SIR 70SE
Sample#2 Text:SB1102 :Solvent Blank :C- Exp:PAHAIR



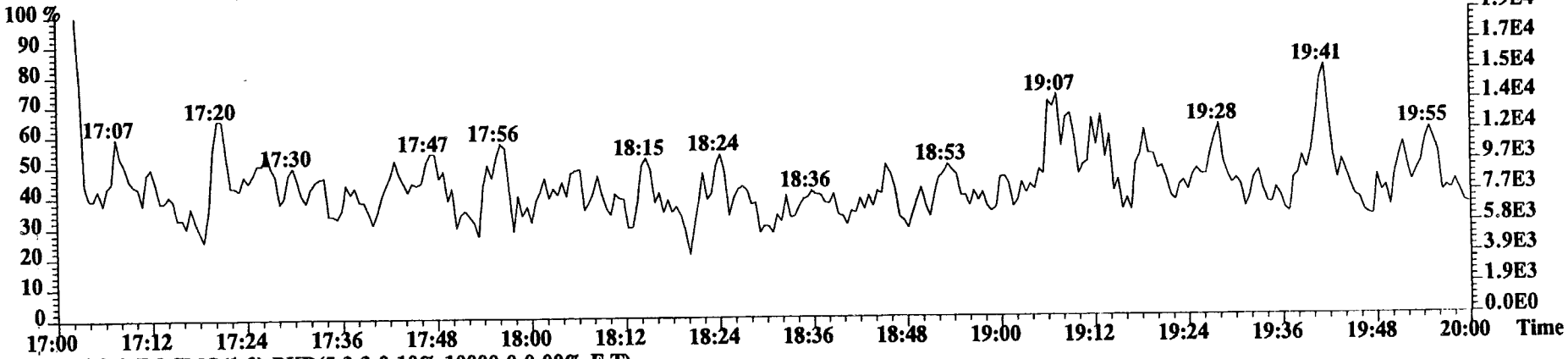
650

File:02NO98V4 #1-510 Acq: 2-NOV-1998 14:02:30 GC EI+ Voltage SIR 70SE
Sample#2 Text:SB1102 :Solvent Blank :C- Exp:PAHAIR
130.9920 S:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

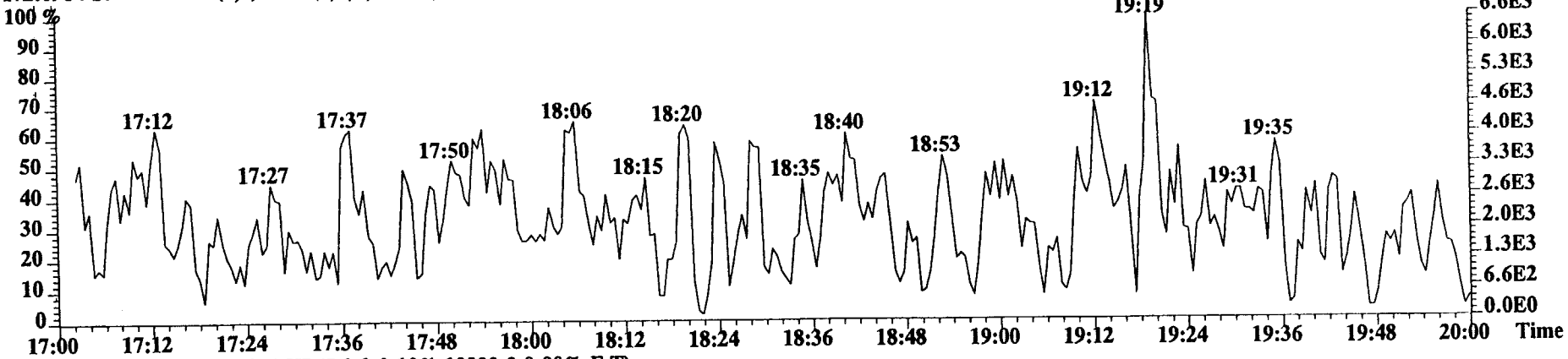


651

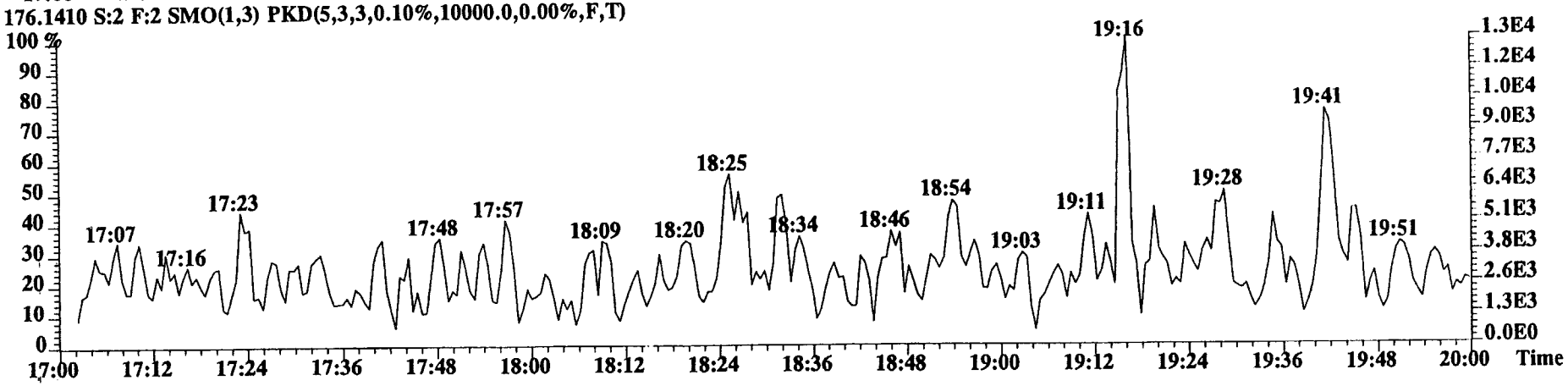
File:02NO98V4 #1-640 Acq: 2-NOV-1998 14:02:30 GC EI+ Voltage SIR 70SE
Sample#2 Text:SB1102 :Solvent Blank :C- Exp:PAHAIR
166.0798 S:2 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



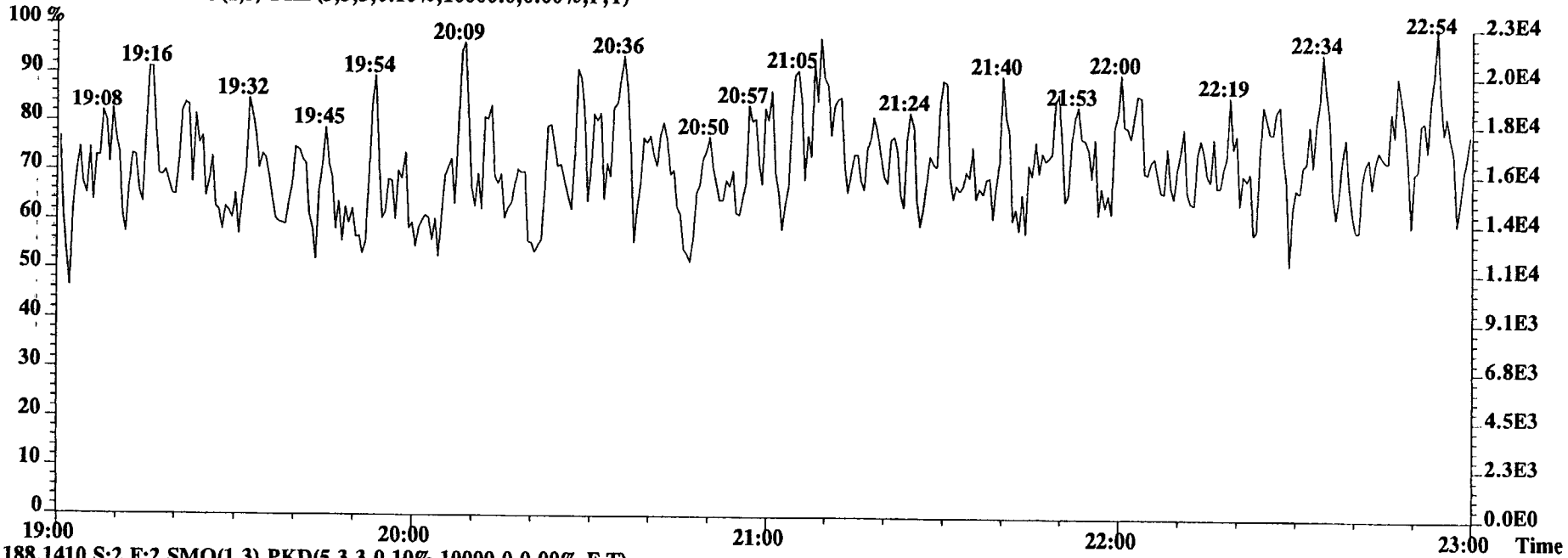
172.0984 S:2 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



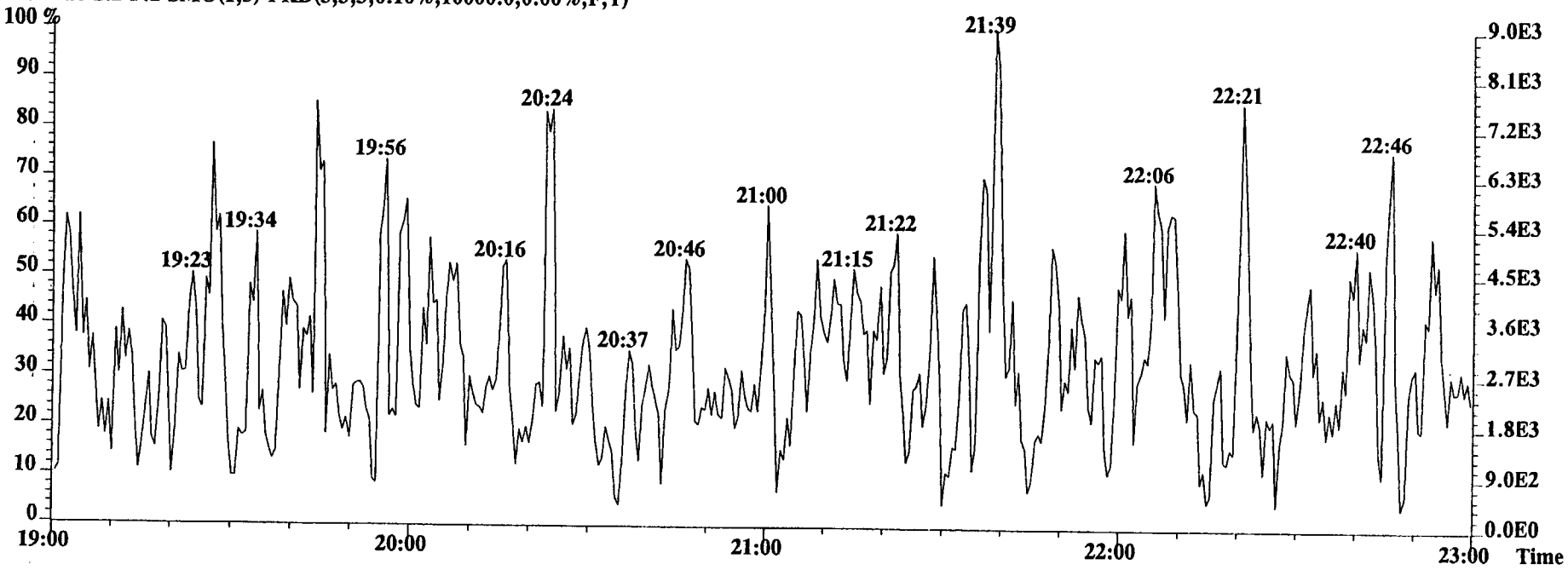
176.1410 S:2 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



File:02NO98V4 #1-640 Acq: 2-NOV-1998 14:02:30 GC EI+ Voltage SIR 70SE
Sample#2 Text:SB1102 :Solvent Blank :C- Exp:PAHAIR
178.0782 S:2 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

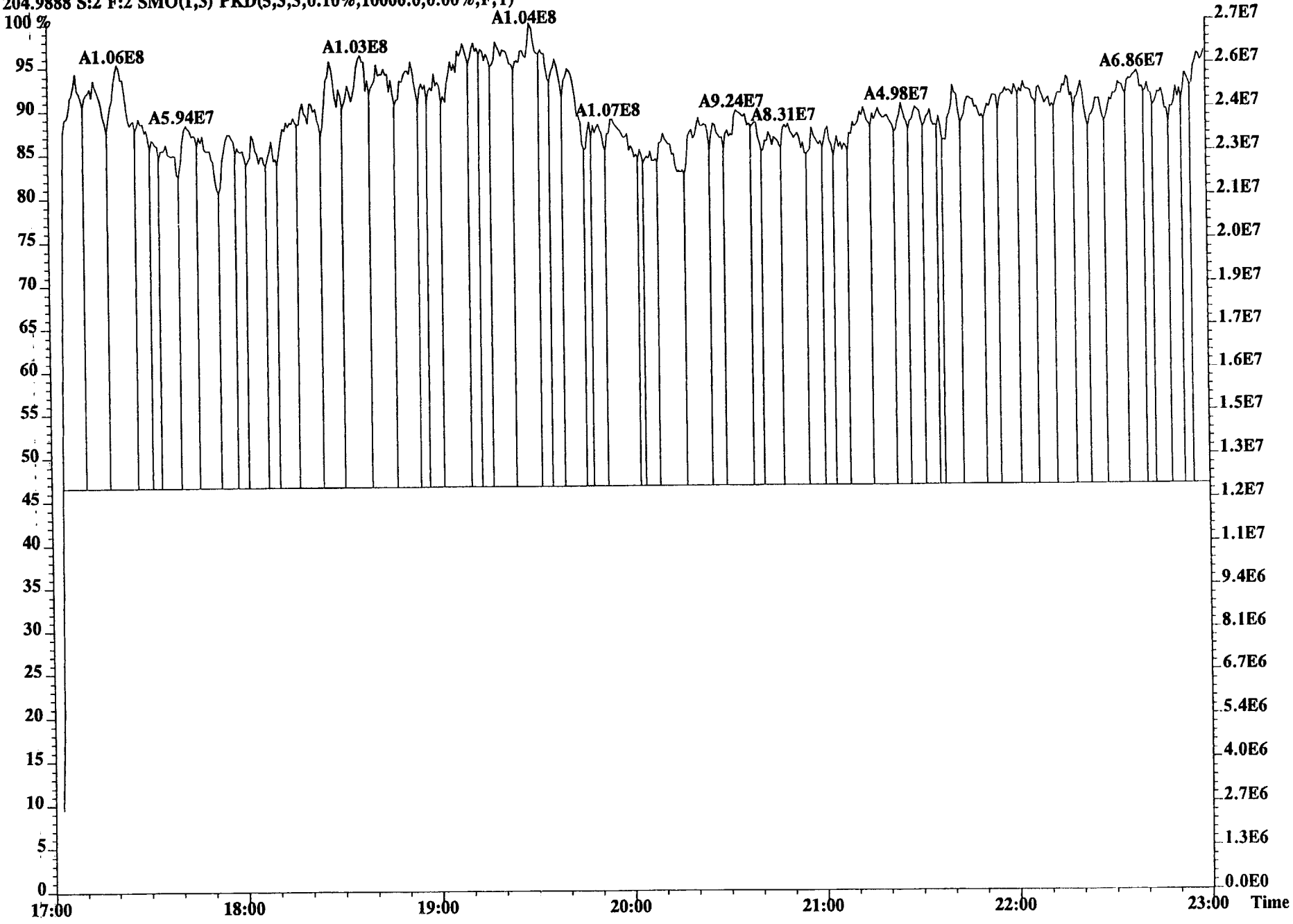


188.1410 S:2 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

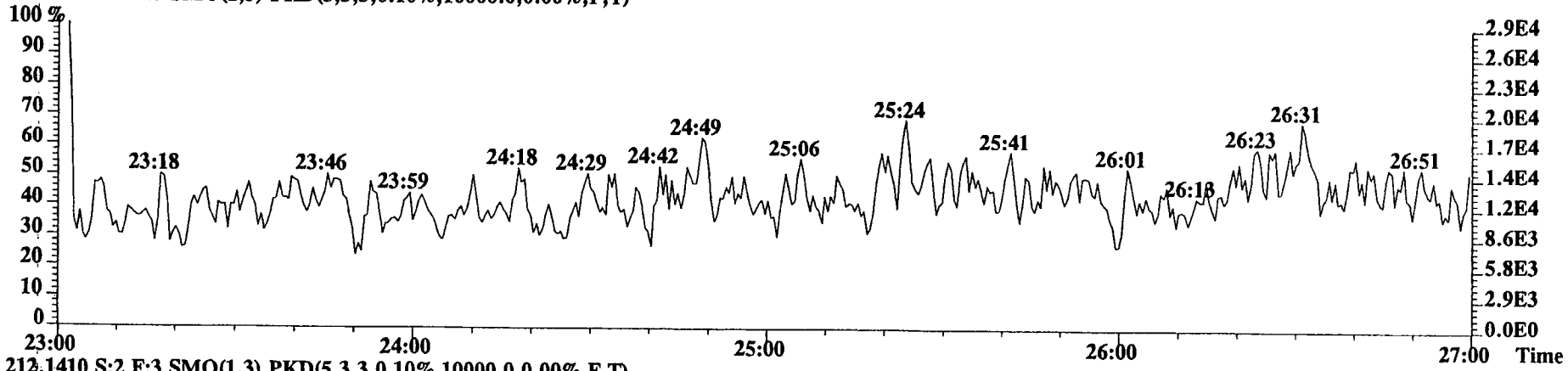


653

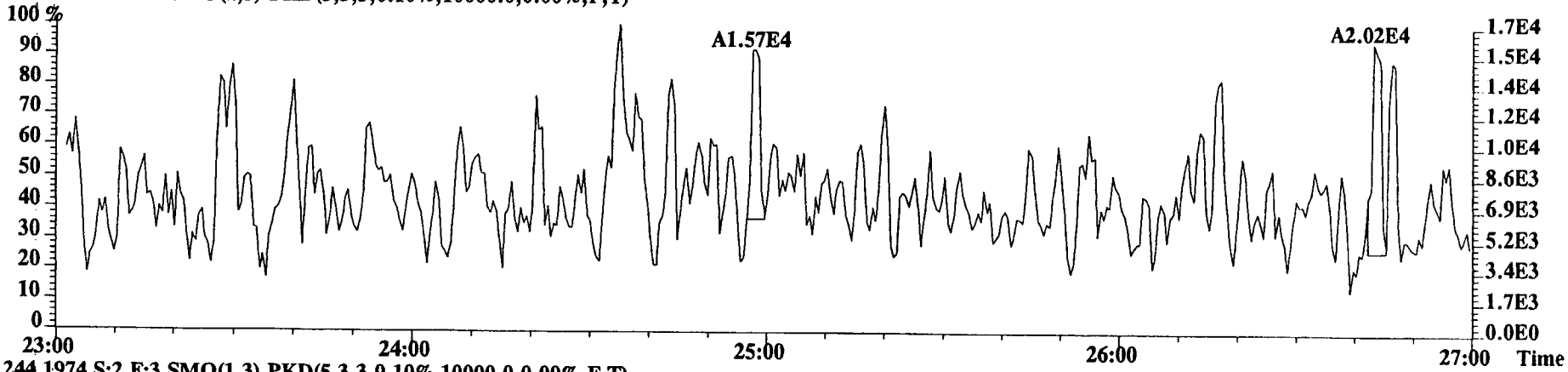
File:02NO98V4 #1-640 Acq: 2-NOV-1998 14:02:30 GC EI+ Voltage SIR 70SE
Sample#2 Text:SB1102 :Solvent Blank :C- Exp:PAHAIR
204.9888 S:2 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



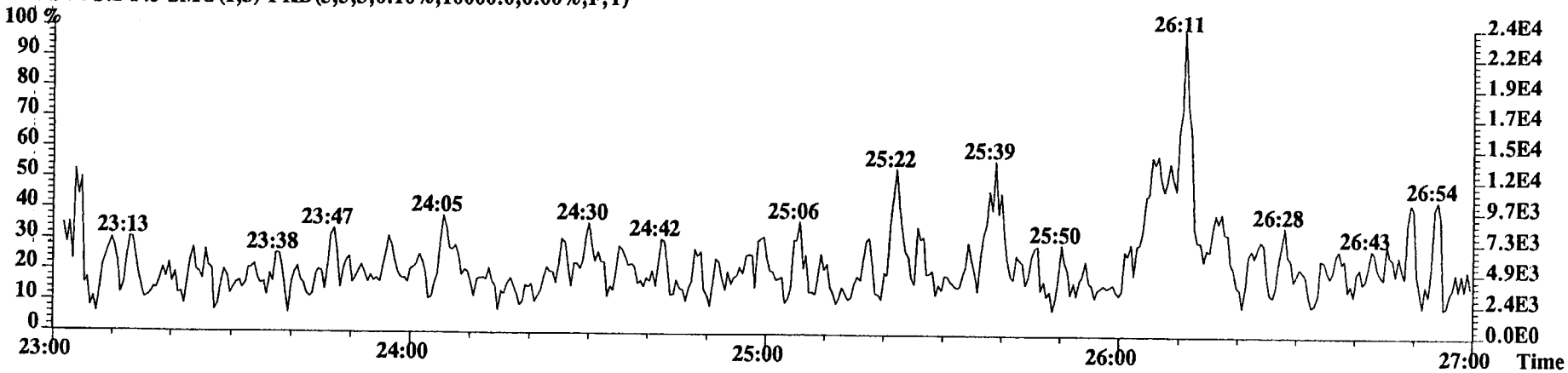
File:02NO98V4 #1-938 Acq: 2-NOV-1998 14:02:30 GC EI+ Voltage SIR 70SE
Sample#2 Text:SB1102 :Solvent Blank :C- Exp:PAHAIR
202.0782 S:2 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



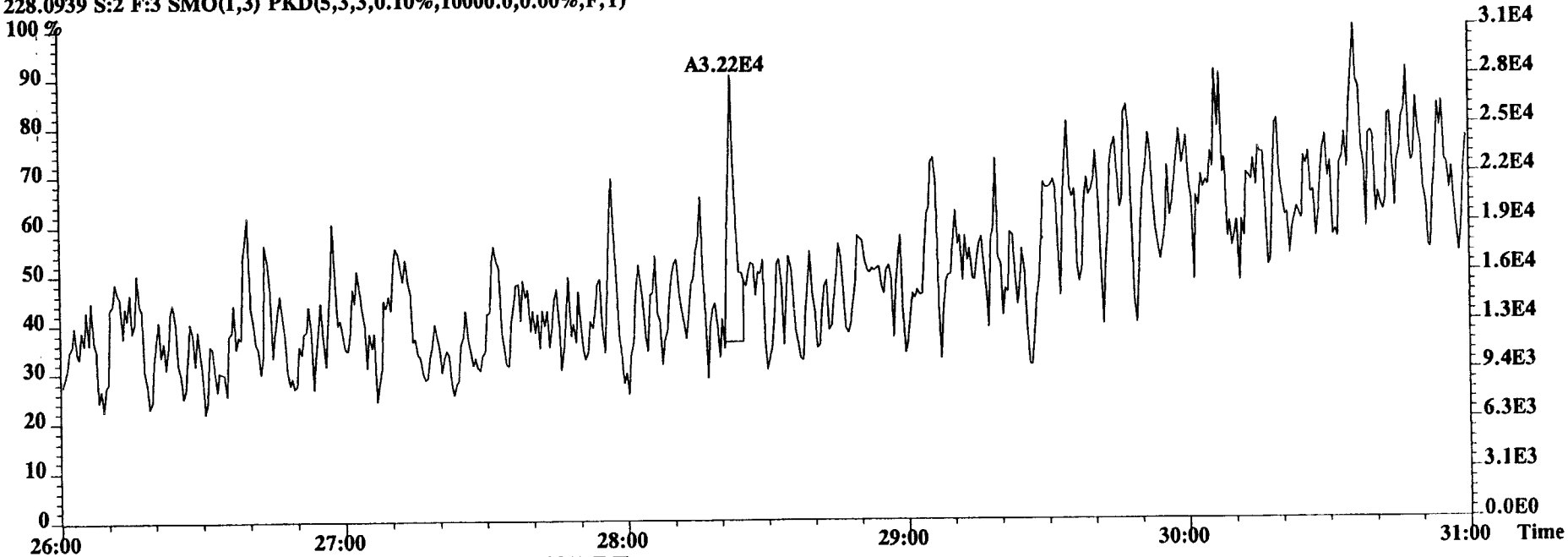
212.1410 S:2 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



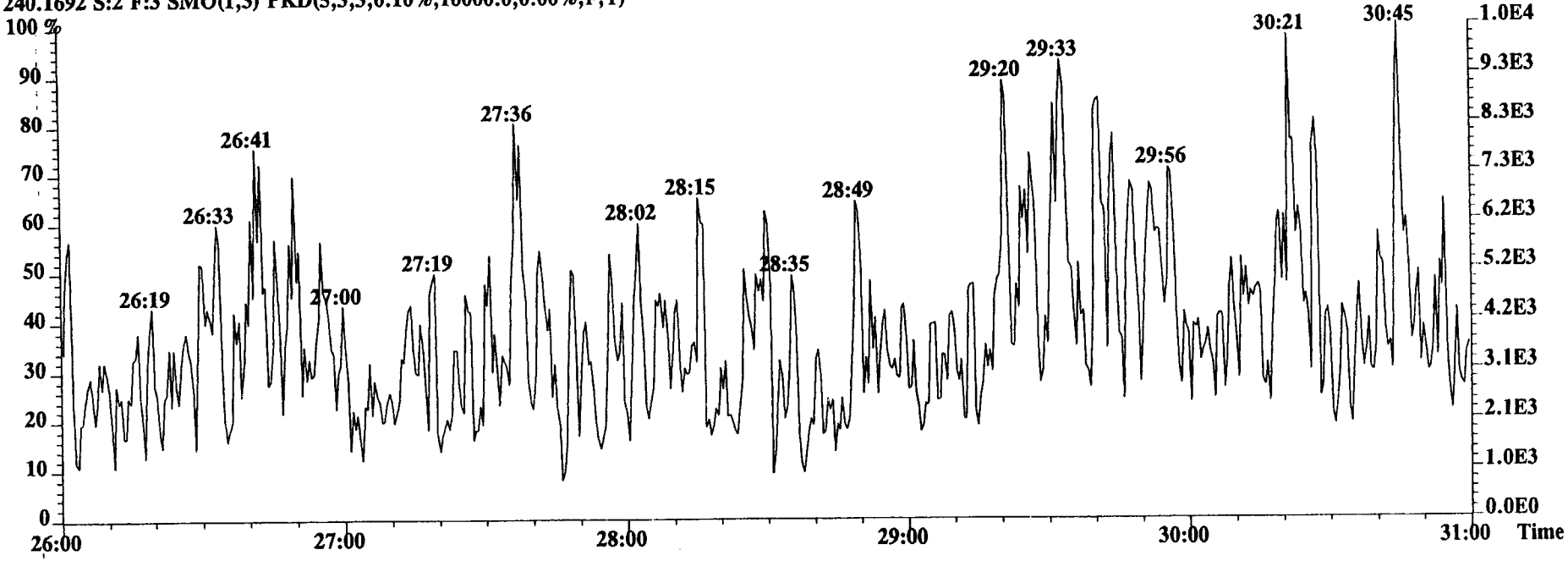
244.1974 S:2 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



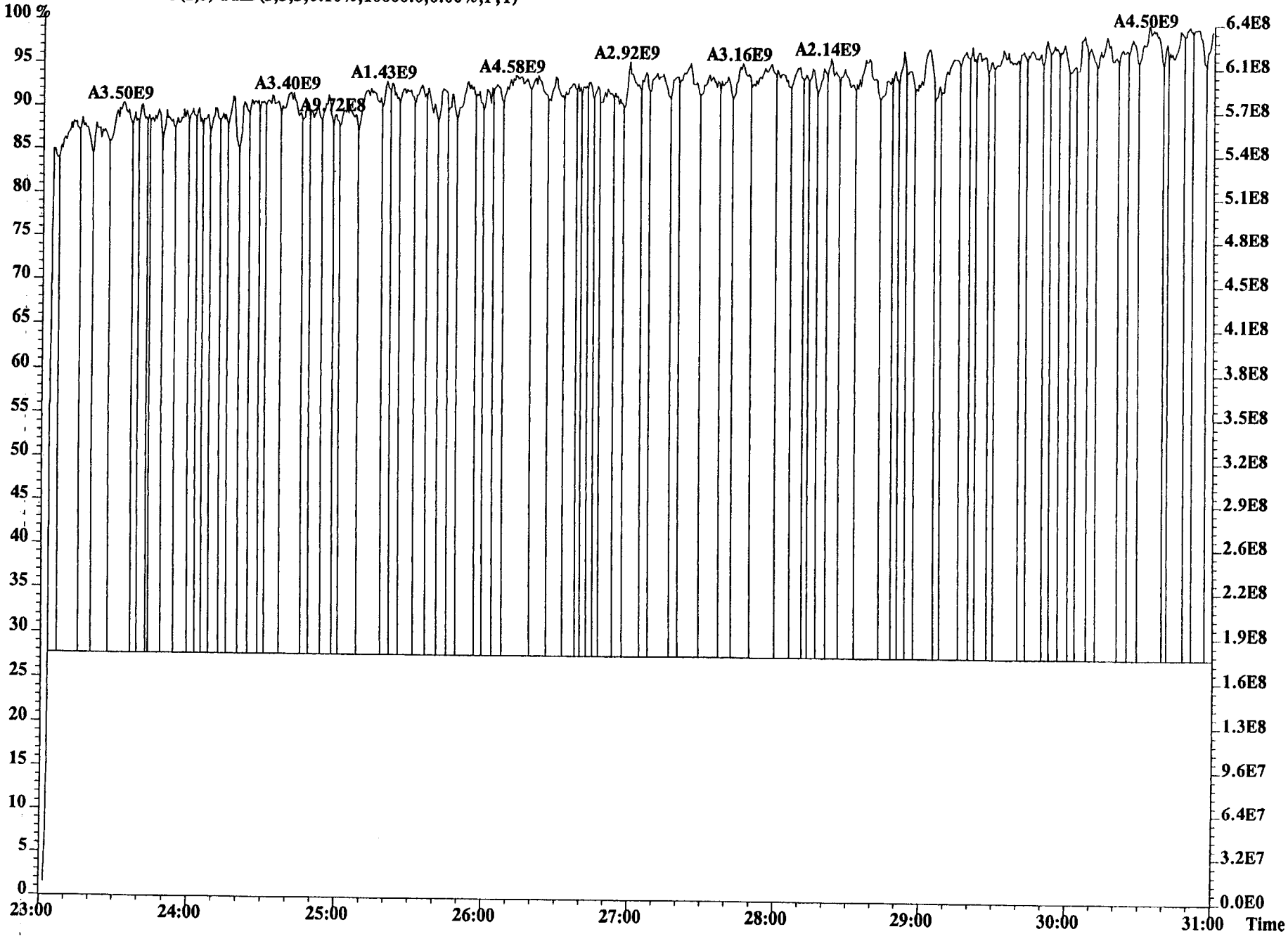
File:02NO98V4 #1-938 Acq: 2-NOV-1998 14:02:30 GC EI+ Voltage SIR 70SE
Sample#2 Text:SB1102 :Solvent Blank :C- Exp:PAHAIR
228.0939 S:2 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



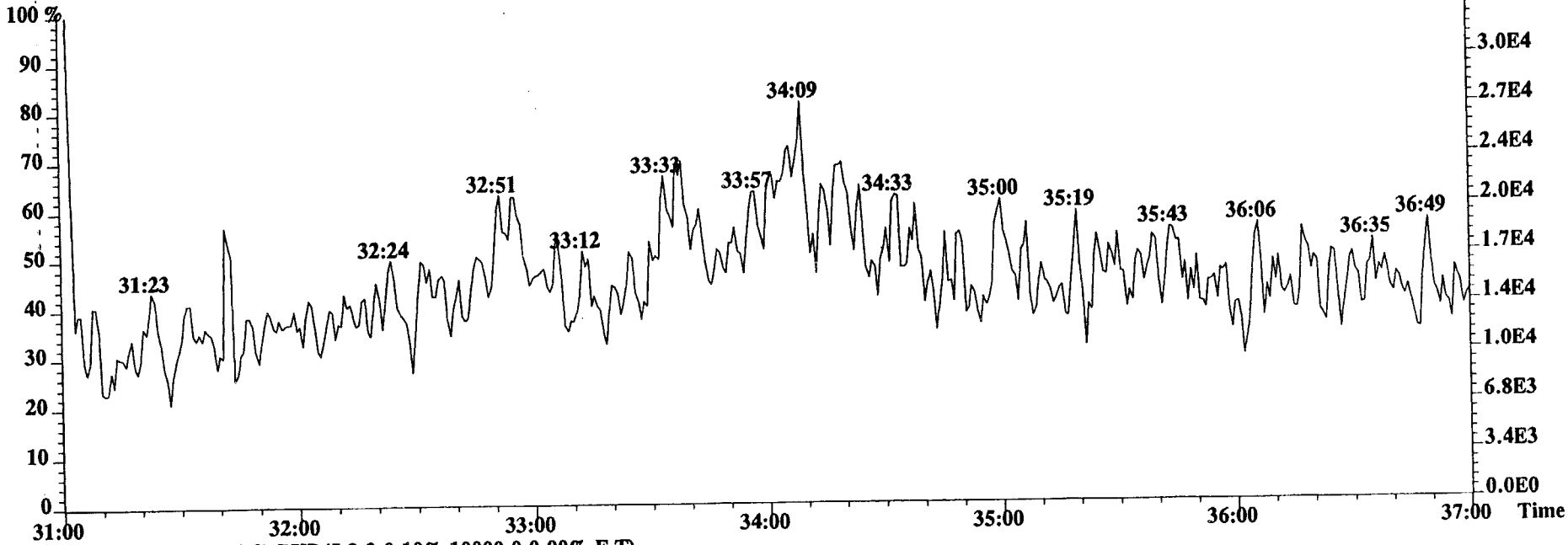
240.1692 S:2 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



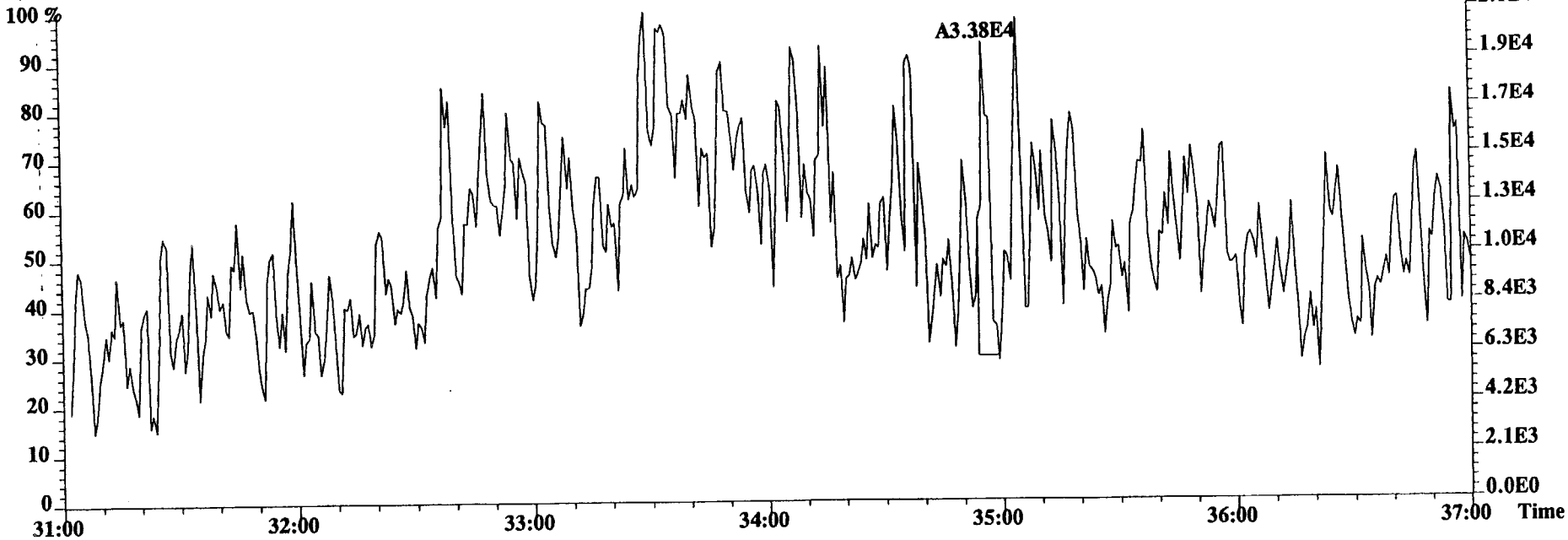
File:02NO98V4 #1-938 Acq: 2-NOV-1998 14:02:30 GC EI+ Voltage SIR 70SE
Sample#2 Text:SB1102 :Solvent Blank :C- Exp:PAHAIR
230.9856 S:2 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



File:02NO98V4 #1-878 Acq: 2-NOV-1998 14:02:30 GC EI+ Voltage SIR 70SE
Sample#2 Text:SB1102 :Solvent Blank :C- Exp:PAHAIR
252.0939 S:2 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

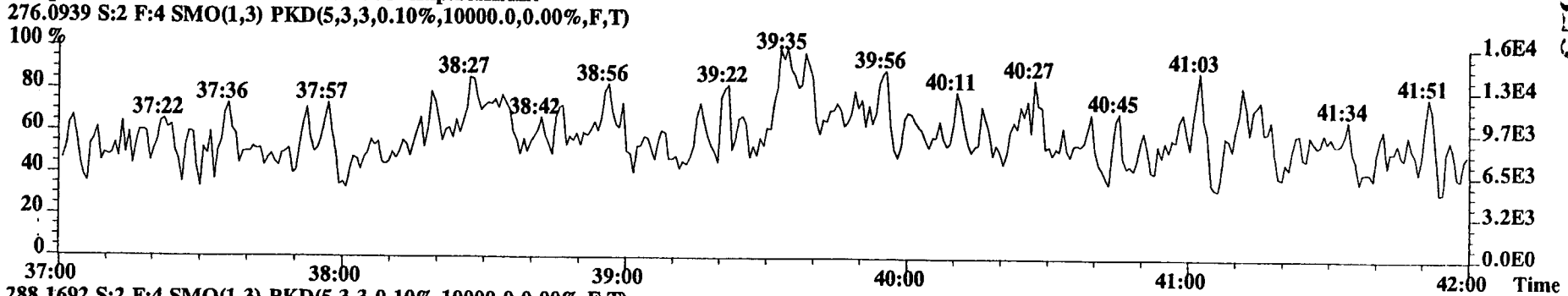


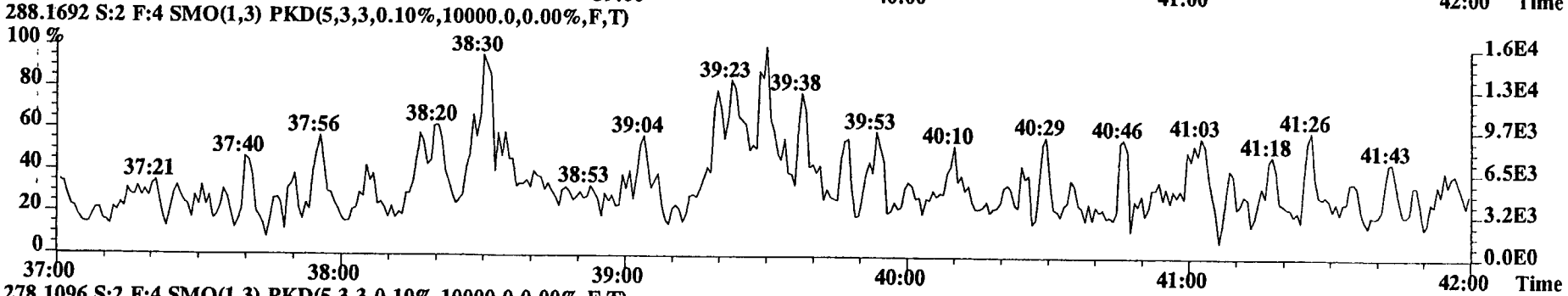
264.1692 S:2 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

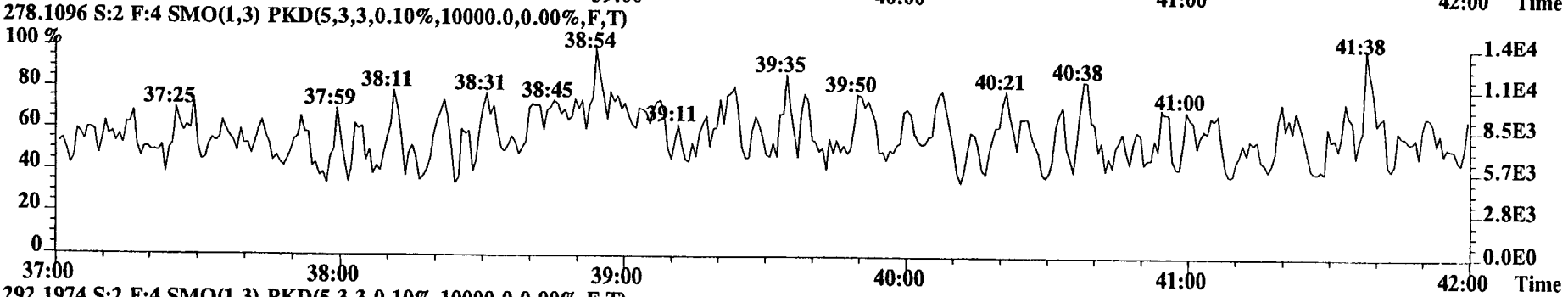


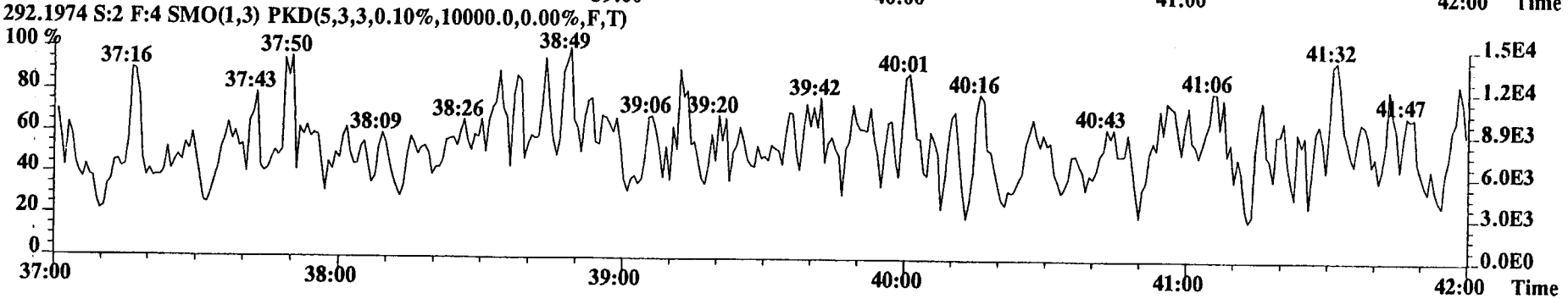
658

File:02NO98V4 #1-878 Acq: 2-NOV-1998 14:02:30 GC EI+ Voltage SIR 70SE
Sample#2 Text:SB1102 :Solvent Blank :C- Exp:PAHAIR



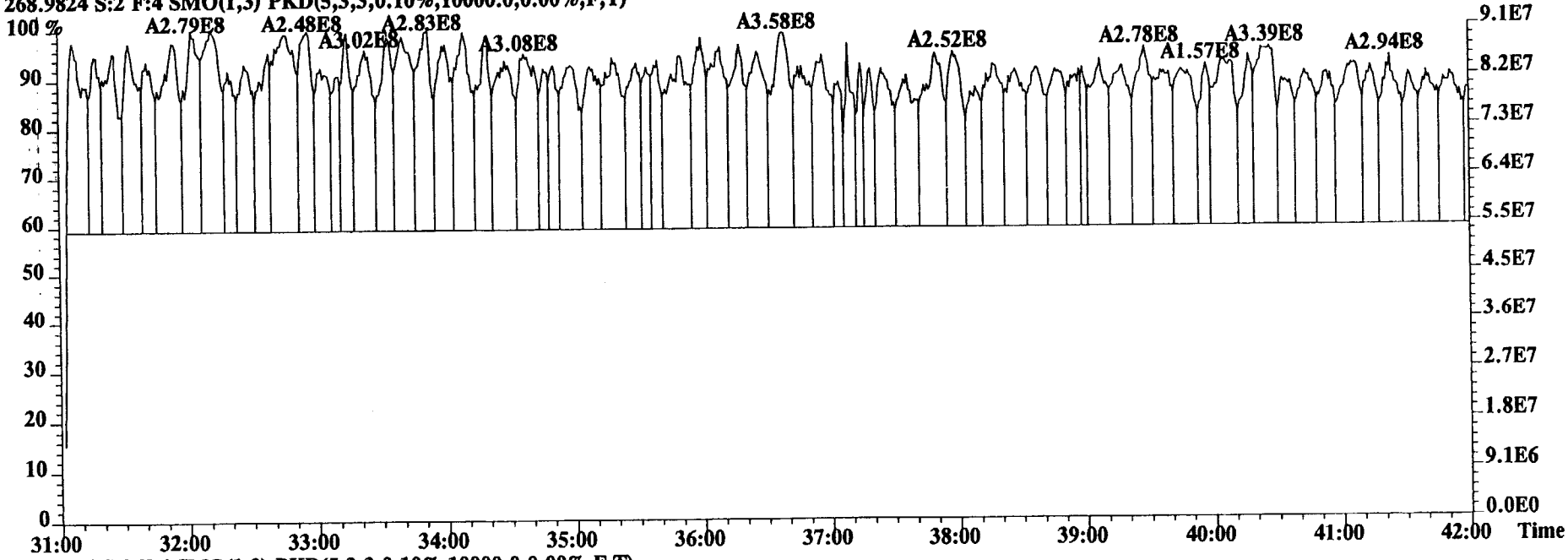




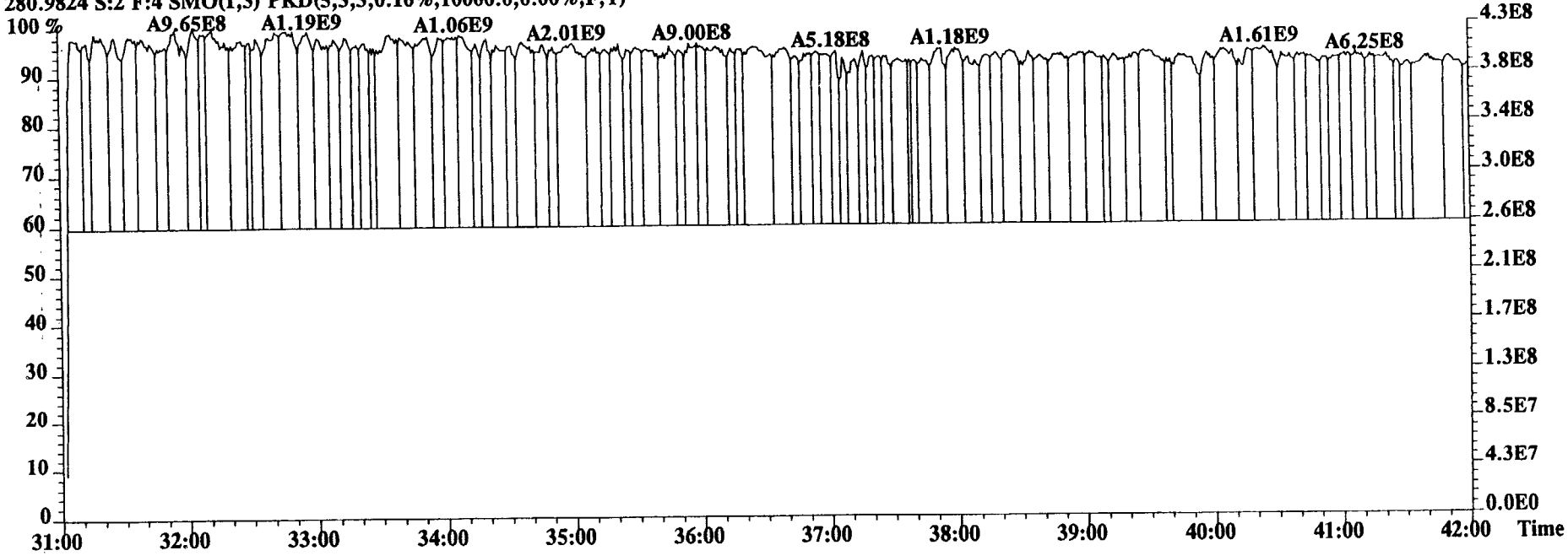


659

File:02NO98V4 #1-878 Acq: 2-NOV-1998 14:02:30 GC EI+ Voltage SIR 70SE
Sample#2 Text:SB1102 :Solvent Blank :C- Exp:PAHAIR
268.9824 S:2 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



280.9824 S:2 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



039

QUANTERRA INCORPORATED
West Sacramento

Daily Standard Checklist
Dioxin/Furan High Res

STD ID ST1103 **Method ID** 429-Air **Column ID** DB-5 **Instr ID** VG-4

Standard Solution 956-64 **Prepared By** SMA **Prepared Date** 11-03-98

Analyzed By SMA **Date Analyzed** 11-03-98

Reviewed By CPICKEU **Date Reviewed** 11-03-98

ANALYSIS OF DAILY STANDARD	INITIATED	REVIEWED
Standard, CPSM, and solvent blank present?	✓/NA	✓/NA
Copy of Instrument logfile present?	✓	✓
CPSM blow up and peak profile present?	NA/✓	NA/✓
Curve summary present?	✓	✓
Summary of 1613A criteria present?	NA	NA
Daily standard within method specified limits*?	*✓	*✓
Daily ion abundance ratios within limits?	NA	NA
CPSM valley < 25%?	NA	NA
CPSM window correct?	NA/✓	NA/✓
Samples analyzed within 12 hrs of daily standard?	✓	✓

COMMENTS:
The std meets the target analyte Fluoranthene criteria for the daily std. The Samples associated with this std were analyzed only for Fluoranthene.

* For NCASI 551, Control Limit (CL) = +/- 20% from curve RRFs for all analytes.
For Method 8290, CL = +/- 20% from curve RRFs for native analytes, CL = +/- 30% from curve RRFs for labeled compounds.
For Method 1613A, see 3rd Revision to Method 1613 Performance Specifications, Table 7.

QA-231 gcc 1

03-NOV-1998 05:27:38 PM 429AIR ConCal RESULTS

Mass Spec : VG-4 Results : 03NO98V4011.RES : PAHAIRCAL3.TRG
GC Column : DB-5 Date analyzed : 03-NOV-98
Data file : 03NO98V4 ST1103 :CS-3 :956-64 : : Ex
Weight : 1

Name	Total Response	Isotope Ratio		R. T. mm:ss		RRF	ng	% Dev
d10-2-Methylnaphthalene	70790000	1.00	Y	12: 27	Y	-2.00	100.00	
d8-Naphthalene	118823800	1.00	Y	10: 11	Y	1.68	100.00	-25
Naphthalene	115287400	1.00	Y	10: 15	Y	0.97	100.00	-21
2-Methylnaphthalene	64625200	1.00	Y	12: 33	Y	0.54	100.00	-3
d8-Acenaphthylene	96372400	1.00	Y	15: 27	Y	1.36	100.00	12
Acenaphthylene	80647200	1.00	Y	15: 30	Y	0.84	100.00	-11
d10-Acenaphthene	57510000	1.00	Y	16: 1	Y	0.81	100.00	9
Acenaphthene	50136600	1.00	Y	16: 6	Y	0.87	100.00	-30
d10-Anthracene	36704600	1.00	Y	20: 54	Y	-2.00	100.00	
d10-Fluorene	52431800	1.00	Y	17: 41	Y	1.43	100.00	1
Fluorene	46997200	1.00	Y	17: 46	Y	0.90	100.00	-23
d10-Phenanthrene	116505600	1.00	Y	20: 45	Y	3.17	100.00	13
Phenanthrene	88536400	1.00	Y	20: 49	Y	0.76	100.00	-15
Anthracene	73569400	1.00	Y	20: 58	Y	0.63	100.00	-21
d14-Terphenyl	86874000	1.00	Y	25: 59	Y	-3.00	100.00	
d10-Fluoranthene	110307800	1.00	Y	24: 35	Y	1.27	100.00	-10
Fluoranthene	112977400	1.00	Y	24: 39	Y	1.02	100.00	-8
d10-Pyrene	113083200	1.00	Y	25: 17	Y	1.30	100.00	-14
Pyrene	122321400	1.00	Y	25: 20	Y	1.08	100.00	-10
d12-Benzo(a)anthracene	40504200	1.00	Y	29: 7	Y	0.47	100.00	-48
Benzo(a)anthracene	41743600	1.00	Y	29: 11	Y	1.03	100.00	-14
d12-Chrysene	77813200	1.00	Y	29: 14	Y	0.90	100.00	-30
Chrysene	67356200	1.00	Y	29: 19	Y	0.87	100.00	-20
d12-Benzo(e)pyrene	80135800	1.00	Y	33: 20	Y	-2.00	100.00	
d12-Benzo(b)fluoranthene	31441000	1.00	Y	32: 28	Y	0.39	100.00	-14
Benzo(b)fluoranthene	35896600	1.00	Y	32: 32	Y	1.14	100.00	-2
12-Benzo(k)fluoranthene	75922000	1.00	Y	32: 33	Y	0.95	100.00	0
Benzo(k)fluoranthene	76458000	1.00	Y	32: 37	Y	1.01	100.00	-13
d12-Benzo(a)pyrene	57249200	1.00	Y	33: 31	Y	0.71	100.00	6
Benzo(e)pyrene	88390600	1.00	Y	33: 25	Y	1.54	100.00	-6
Benzo(a)pyrene	56401000	1.00	Y	33: 36	Y	0.99	100.00	-8
d12-Perylene	52279400	1.00	Y	33: 48	Y	0.65	100.00	4
Perylene	89970000	1.00	Y	33: 53	Y	1.72	100.00	0
12-Indeno(123-cd)pyrene	26244400	1.00	Y	37: 59	Y	0.33	100.00	-26
Indeno(123-cd)pyrene	16700000	1.00	Y	38: 6	Y	0.64	100.00	2
d14-Dibenz(ah)anthracene	12360580	1.00	Y	38: 3	Y	0.15	100.00	-37
Dibenz(ah)anthracene	13821380	1.00	Y	38: 13	Y	1.12	100.00	-20
d12-Benzo(ghi)perylene	36605200	1.00	Y	39: 10	Y	0.46	100.00	-21
Benzo(ghi)perylene	36434600	1.00	Y	39: 19	Y	1.00	100.00	-2
d10-Fluorene	52431800	1.00	Y	17: 41	Y	0.65	100.00	-54
13C-Fluorene	42648200	1.00	Y	17: 46	Y	0.81	100.00	NoData

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FILE	SAMP No. (1)	LAB. SAMP No	CUSTOMER ID	CLEAN UP 1 (SDS)	CLEAN UP 2 (D2)	TYPE (1)	CONCn.
03NO98V4	1	ST1103	CS-3	956-64			1
03NO98V4	2	SB1103	Solvent Blank	C-8			1
03NO98V4	3	301802-1MB	METHOD BLANK	AIR	PAH	VSE-26	0.50
03NO98V4	4	301802-1LC	LCS				0.50
03NO98V4	5						
03NO98V4	6						
03NO98V4	7						
03NO98V4	8						
03NO98V4	9						
03NO98V4	10						
03NO98V4	11						
03NO98V4	12						
03NO98V4	13						
03NO98V4	14						
03NO98V4	15						
03NO98V4	16						
03NO98V4	17						
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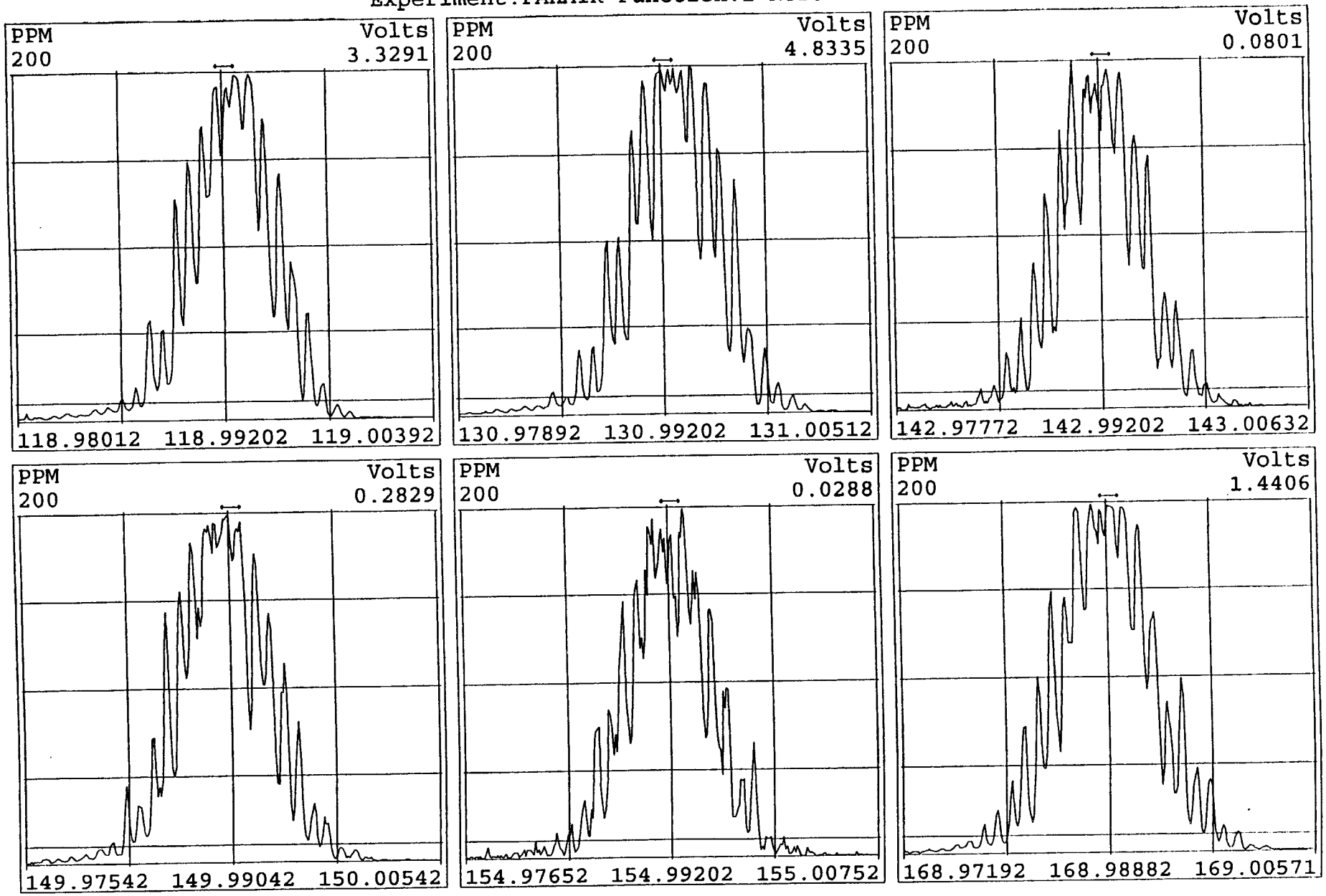
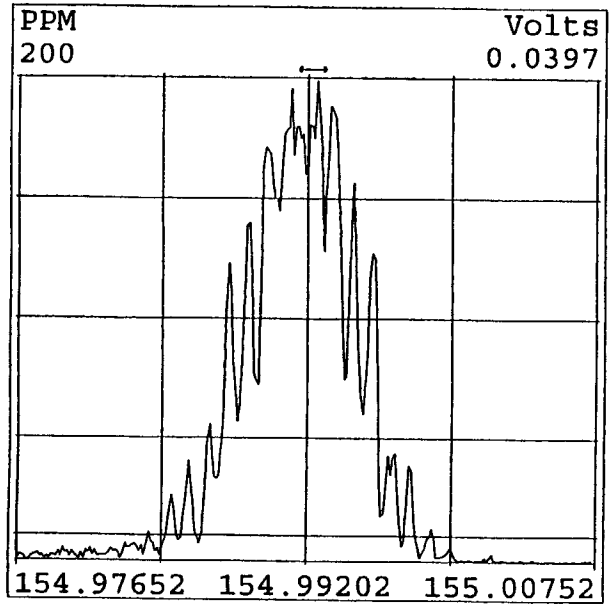
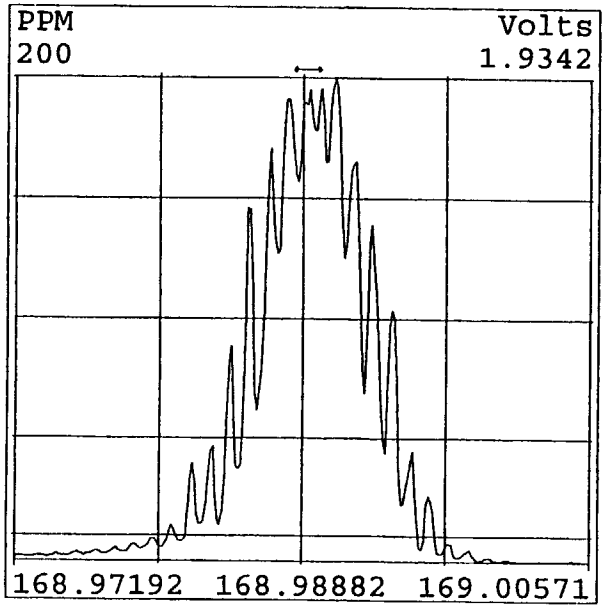
03NO98V4	41						
03NO98V4	42						
03NO98V4	43						
03NO98V4	44						
03NO98V4	45						
03NO98V4	46		SMA, 11-03-98				
03NO98V4	47						
03NO98V4	48						
03NO98V4	49						
03NO98V4	50						

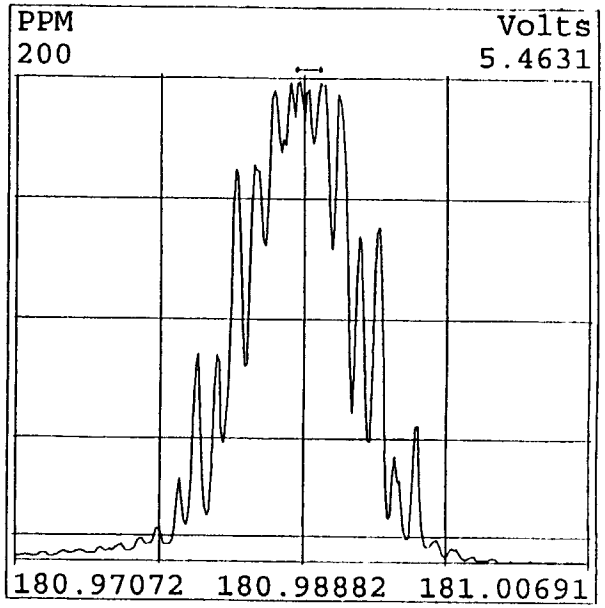
Peak Locate Examination: 3-NOV-1998:10:36 File:03NO98V4
Experiment:PAHAIR Function:1 Reference:PFK

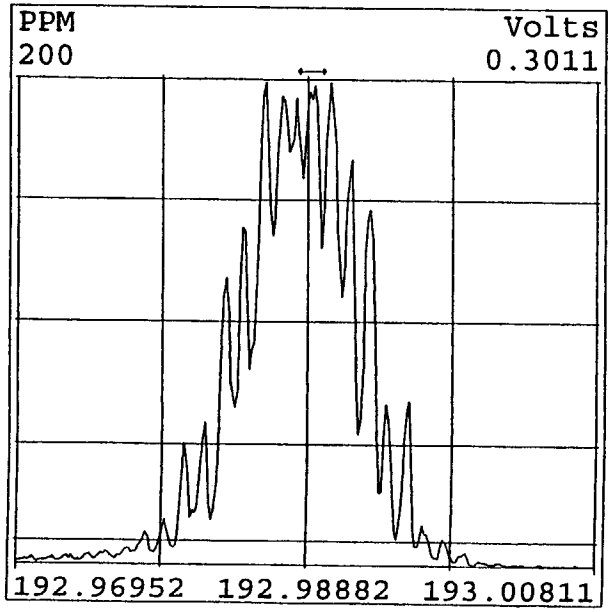


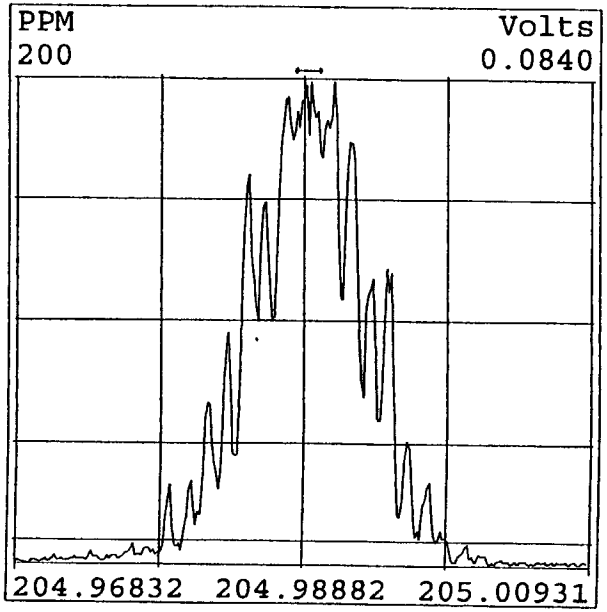
Peak Locate Examination: 3-NOV-1998:10:38 File:03NO98V4
Experiment:PAHAIR Function:2 Reference:PFK











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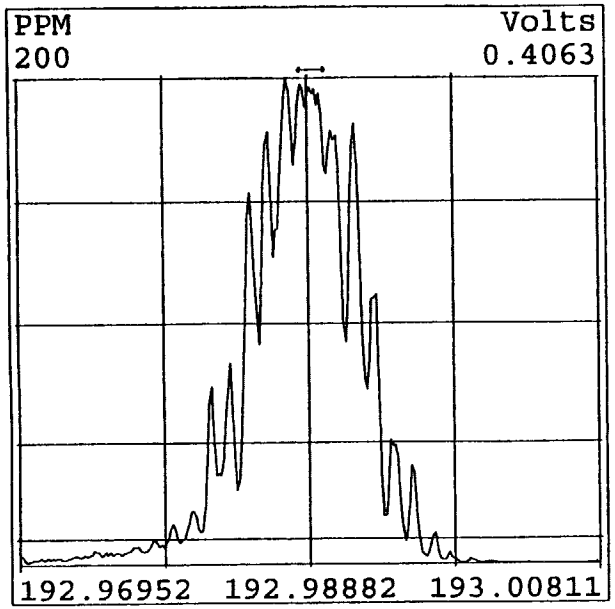
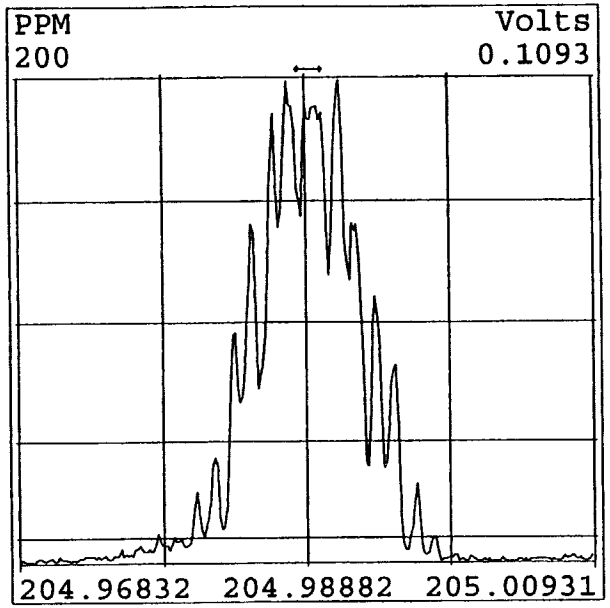
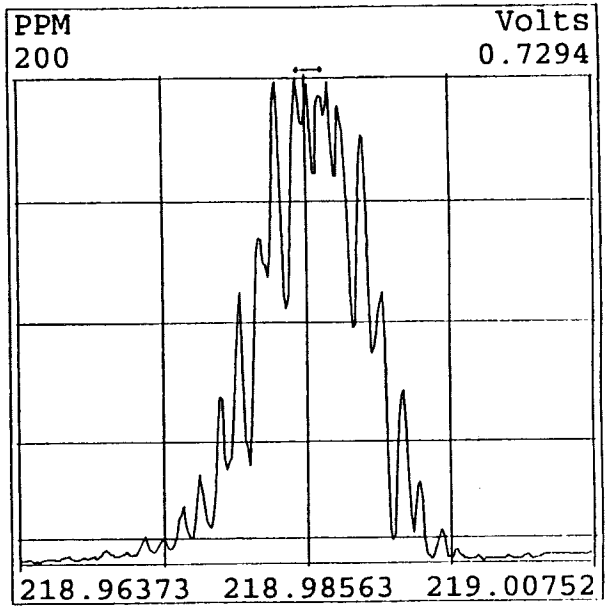
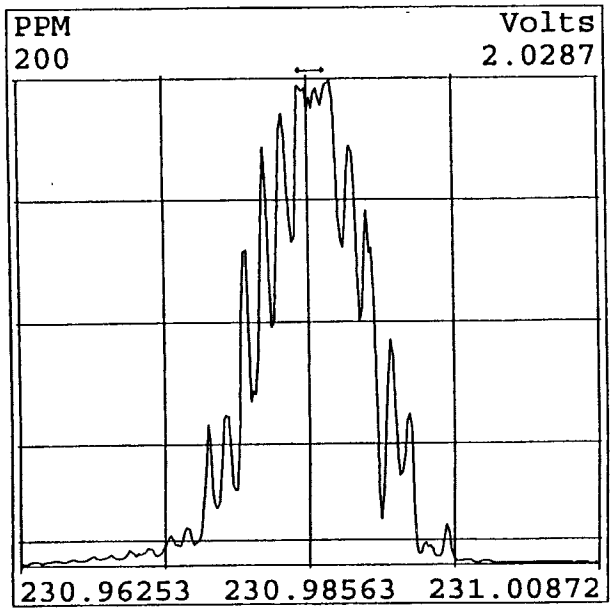
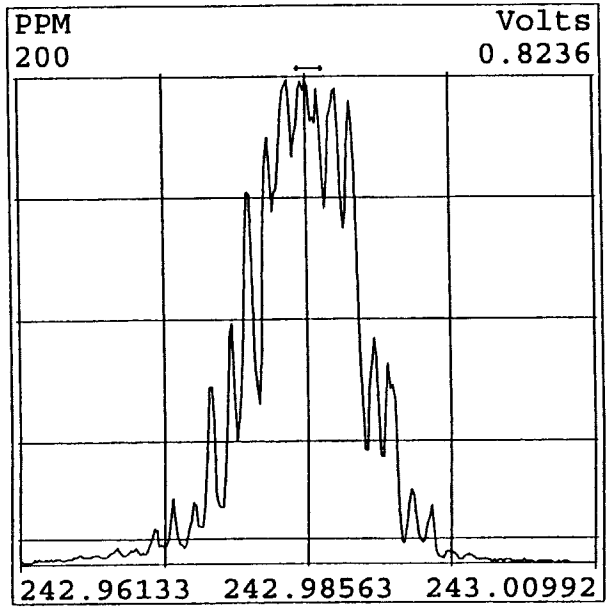
Experiment:PAHAIR Function:3 Reference:PFK

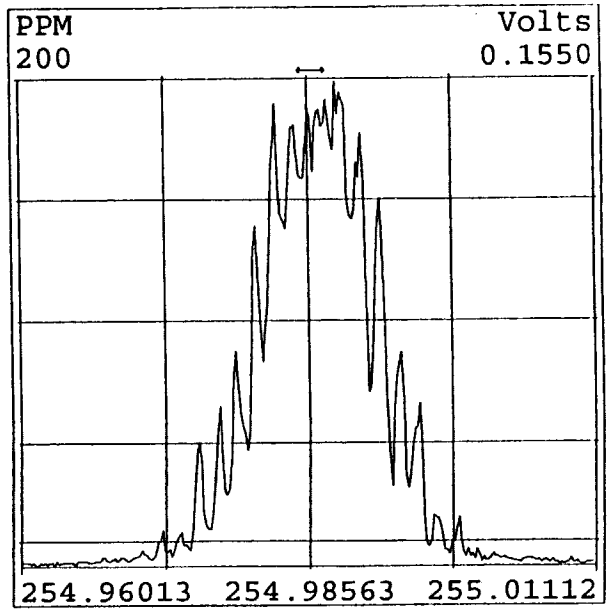




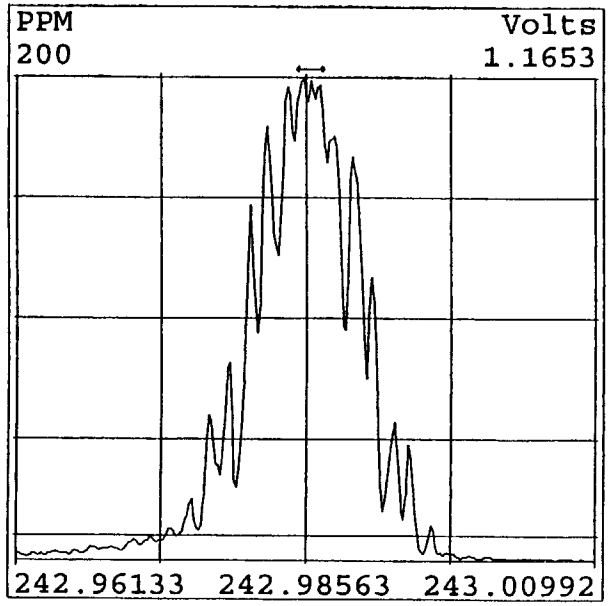


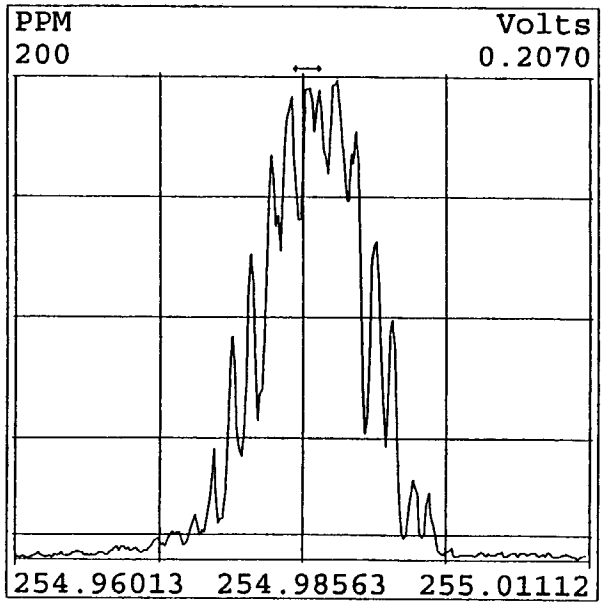


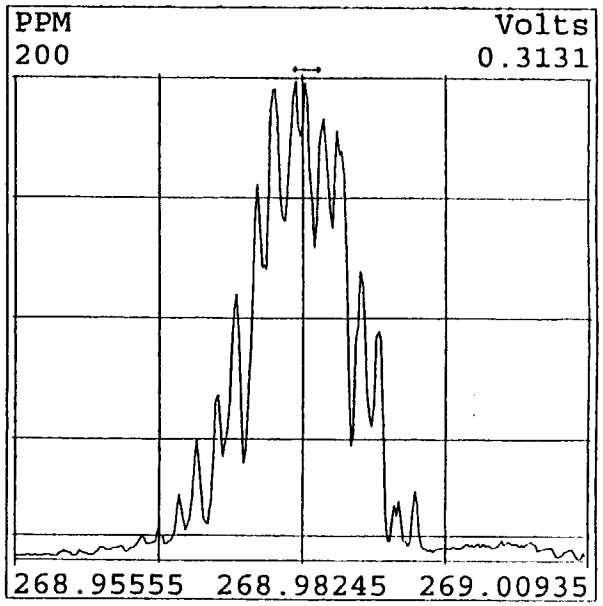


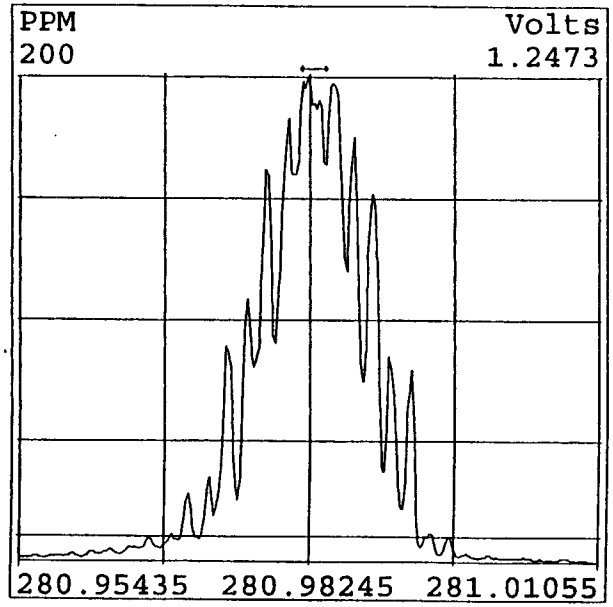


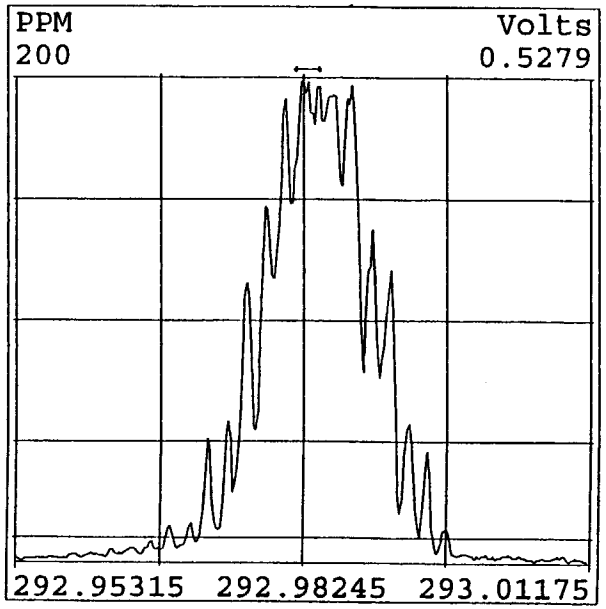
Peak Locate Examination: 3-NOV-1998:10:40 File:03NO98V4
Experiment:PAHAIR Function:4 Reference:PFK











02-NOV-1998 02:20:04 PM

Mass Spec : VG-4
GC Column : DB-5
265-04A,B,D,E,956-64

Mult.: 350

Dioxin Furan CALIBRATION TABLE

File name : PAHAIR102998V4.RRF
Date analyzed : 29-OCT-98

INITIAL CALIBRATION CURVE

		Mean	S.D.	%RSD	1	2	3	4	5	6	7	8	9	10
d8-Naphthalene	Amount				100.00	100.00	100.00	100.00	100.00					
	RF				185.11	205.87	228.31	244.46	256.61					
	RRF	2.24	0.289	12.900	1.85	2.06	2.28	2.44	2.57					
Naphthalene	Amount				10.00	50.00	100.00	200.00	500.00					
	RF				13.76	61.93	113.47	231.43	609.70					
	RRF	1.23	0.094	7.707	1.38	1.24	1.13	1.16	1.22					
2-Methylnaphthalene	Amount				10.00	50.00	100.00	200.00	500.00					
	RF				6.91	29.85	51.39	97.93	255.67					
	RRF	0.56	0.084	14.909	0.69	0.60	0.51	0.49	0.51					
d8-Acenaphthylene	Amount				100.00	100.00	100.00	100.00	100.00					
	RF				131.95	128.38	114.60	122.45	109.50					
	RRF	1.21	0.093	7.696	1.32	1.28	1.15	1.22	1.10					
Acenaphthylene	Amount				10.00	50.00	100.00	200.00	500.00					
	RF				9.55	48.30	90.68	178.19	500.84					
	RRF	0.94	0.045	4.773	0.95	0.97	0.91	0.89	1.00					
d10-Acenaphthene	Amount				100.00	100.00	100.00	100.00	100.00					
	RF				83.11	77.72	76.15	77.96	57.36					
	RRF	0.74	0.099	13.310	0.83	0.78	0.76	0.78	0.57					
Acenaphthene	Amount				10.00	50.00	100.00	200.00	500.00					
	RF				10.98	62.63	151.76	215.88	641.50					
	RRF	1.25	0.177	14.178	1.10	1.25	1.52	1.08	1.28					
d10-Fluorene	Amount				100.00	100.00	100.00	100.00	100.00					
	RF				153.24	135.78	140.61	141.09	139.72					
	RRF	1.42	0.066	4.625	1.53	1.36	1.41	1.41	1.40					
Fluorene	Amount				10.00	50.00	100.00	200.00	500.00					
	RF				8.53	58.18	117.21	249.15	684.13					
	RRF	1.16	0.191	16.420	0.85	1.16	1.17	1.25	1.37					
d10-Phenanthrene	Amount				100.00	100.00	100.00	100.00	100.00					
	RF				308.98	263.63	276.27	272.04	282.87					
	RRF	2.81	0.173	6.145	3.09	2.64	2.76	2.72	2.83					
Phenanthrene	Amount				10.00	50.00	100.00	200.00	500.00					
	RF				9.70	46.13	81.87	168.14	460.23					
	RRF	0.89	0.063	7.028	0.97	0.92	0.82	0.84	0.92					
Anthracene	Amount				10.00	50.00	100.00	200.00	500.00					
	RF				8.13	42.20	77.06	153.96	402.42					
	RRF	0.80	0.031	3.901	0.81	0.84	0.77	0.77	0.80					
d10-Fluoranthene	Amount				100.00	100.00	100.00	100.00	100.00					
	RF				118.94	136.07	145.72	150.34	154.31					
	RRF	1.41	0.141	10.009	1.19	1.36	1.46	1.50	1.54					
Fluoranthene	Amount				10.00	50.00	100.00	200.00	500.00					
	RF				14.14	55.12	99.77	200.49	521.18					
	RRF	1.11	0.174	15.653	1.41	1.10	1.00	1.00	1.04					
d10-Pyrene	Amount				100.00	100.00	100.00	100.00	100.00					
	RF				129.03	143.24	158.81	161.45	166.55					
	RRF	1.52	0.154	10.160	1.29	1.43	1.59	1.61	1.67					
Pyrene	Amount				10.00	50.00	100.00	200.00	500.00					
	RF				16.74	59.11	104.58	204.18	551.22					
	RRF	1.21	0.269	22.353	1.67	1.18	1.05	1.02	1.10					

658

Mass Spec : VG-4
GC Column : DB-5
265-04A,B,D,E,956-64

File name : PAHAIR102998V4.RRF
Date analyzed : 29-OCT-98

INITIAL CALIBRATION CURVE

Mult.: 350

		Mean	S.D.	%RSD	1	2	3	4	5	6	7	8	9	10
d12-Benzo(a)anthracene	Amount				100.00	100.00	100.00	100.00	100.00					
	RF				68.20	70.96	127.65	89.95	93.26					
	RRF	0.90	0.238	26.446	0.68	0.71	1.28	0.90	0.93					
Benzo(a)anthracene	Amount				10.00	50.00	100.00	200.00	500.00					
	RF				11.85	64.84	102.61	234.26	671.78					
	RRF	1.20	0.124	10.269	1.18	1.30	1.03	1.17	1.34					
d12-Chrysene	Amount				100.00	100.00	100.00	100.00	100.00					
	RF				109.94	119.85	127.65	136.79	145.35					
	RRF	1.28	0.139	10.855	1.10	1.20	1.28	1.37	1.45					
Chrysene	Amount				10.00	50.00	100.00	200.00	500.00					
	RF				10.44	56.47	102.61	215.75	571.04					
	RRF	1.08	0.051	4.716	1.04	1.13	1.03	1.08	1.14					
d12-Benzo(b)fluoranthene	Amount				100.00	100.00	100.00	100.00	100.00					
	RF				41.05	45.84	49.22	45.10	45.72					
	RRF	0.45	0.029	6.414	0.41	0.46	0.49	0.45	0.46					
Benzo(b)fluoranthene	Amount				10.00	50.00	100.00	200.00	500.00					
	RF				12.56	61.73	95.82	228.66	622.27					
	RRF	1.17	0.125	10.717	1.26	1.23	0.96	1.14	1.24					
d12-Benzo(k)fluoranthene	Amount				100.00	100.00	100.00	100.00	100.00					
	RF				91.66	94.95	96.52	94.09	96.82					
	RRF	0.95	0.021	2.203	0.92	0.95	0.97	0.94	0.97					
Benzo(k)fluoranthene	Amount				10.00	50.00	100.00	200.00	500.00					
	RF				12.71	63.16	119.14	210.18	522.11					
	RRF	1.16	0.111	9.525	1.27	1.26	1.19	1.05	1.04					
d12-Benzo(a)pyrene	Amount				100.00	100.00	100.00	100.00	100.00					
	RF				65.24	66.86	69.56	67.87	68.82					
	RRF	0.68	0.017	2.504	0.65	0.67	0.70	0.68	0.69					
Benzo(e)pyrene	Amount				10.00	50.00	100.00	200.00	500.00					
	RF				18.05	89.03	157.16	302.58	767.23					
	RRF	1.64	0.140	8.557	1.80	1.78	1.57	1.51	1.53					
Benzo(a)pyrene	Amount				10.00	50.00	100.00	200.00	500.00					
	RF				11.71	60.46	102.44	200.46	476.32					
	RRF	1.07	0.112	10.437	1.17	1.21	1.02	1.00	0.95					
d12-Perylene	Amount				100.00	100.00	100.00	100.00	100.00					
	RF				64.89	58.55	68.21	62.00	61.45					
	RRF	0.63	0.037	5.829	0.65	0.59	0.68	0.62	0.61					
Perylene	Amount				10.00	50.00	100.00	200.00	500.00					
	RF				16.93	98.08	162.24	324.02	835.41					
	RRF	1.71	0.142	8.297	1.69	1.96	1.62	1.62	1.67					
d12-Indeno(123-cd)pyrene	Amount				100.00	100.00	100.00	100.00	100.00					
	RF				44.86	44.54	44.08	43.39	45.40					
	RRF	0.44	0.008	1.722	0.45	0.45	0.44	0.43	0.45					
Indeno(123-cd)pyrene	Amount				10.00	50.00	100.00	200.00	500.00					
	RF				5.85	35.13	60.26	127.89	287.53					
	RRF	0.62	0.052	8.352	0.59	0.70	0.60	0.64	0.58					
d14-Dibenz(ah)anthracene	Amount				100.00	100.00	100.00	100.00	100.00					
	RF				20.73	24.39	25.35	26.10	26.33					
	RRF	0.25	0.023	9.286	0.21	0.24	0.25	0.26	0.26					

02-NOV-1998 02:20:12 PM

Mass Spec : VG-4
GC Column : DB-5
265-04A,B,D,E,956-64

Mult.: 350

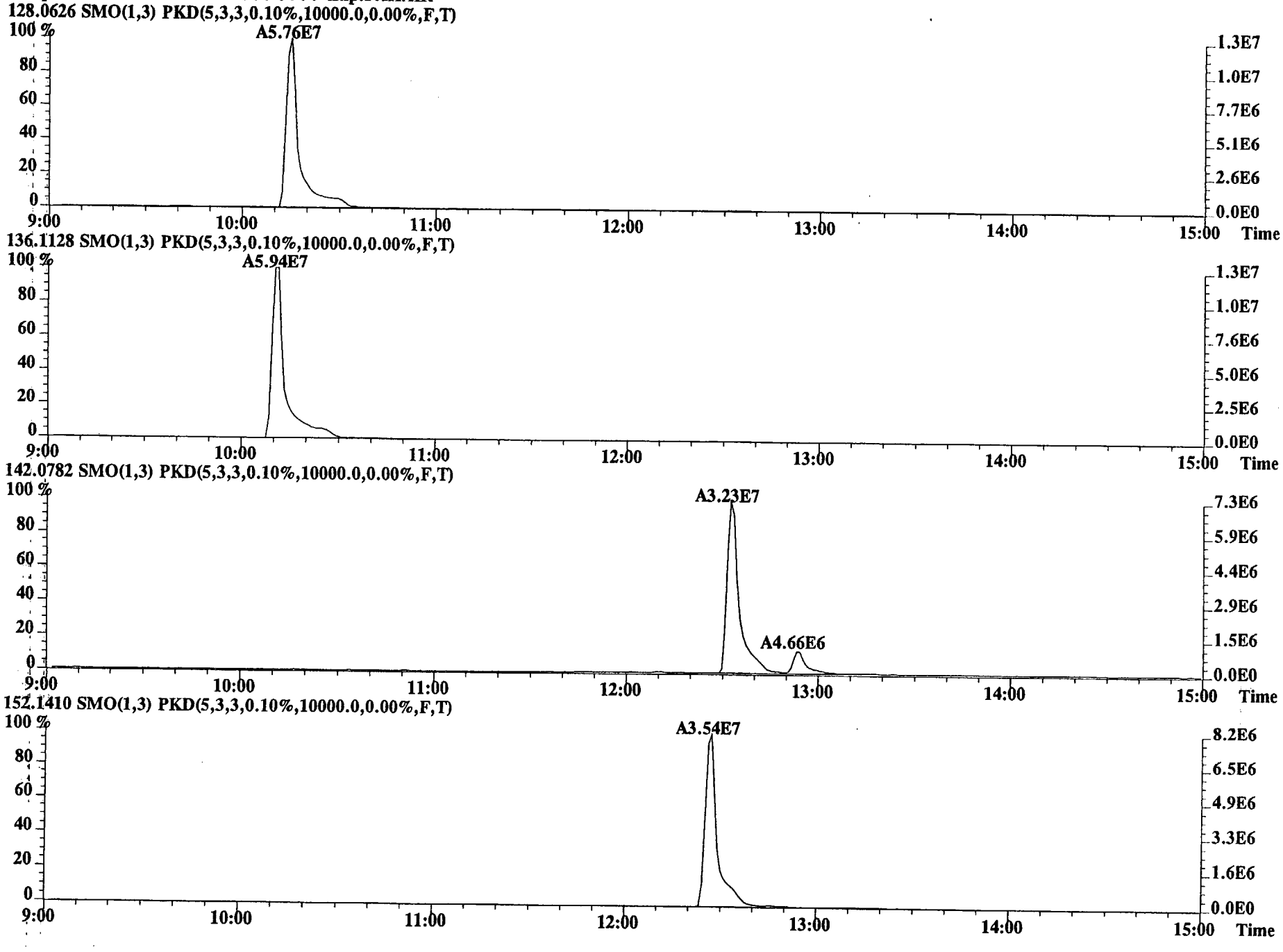
Dioxin Furan CALIBRATION TABLE

File name : PAHAIR102998V4.RRF
Date analyzed : 29-OCT-98

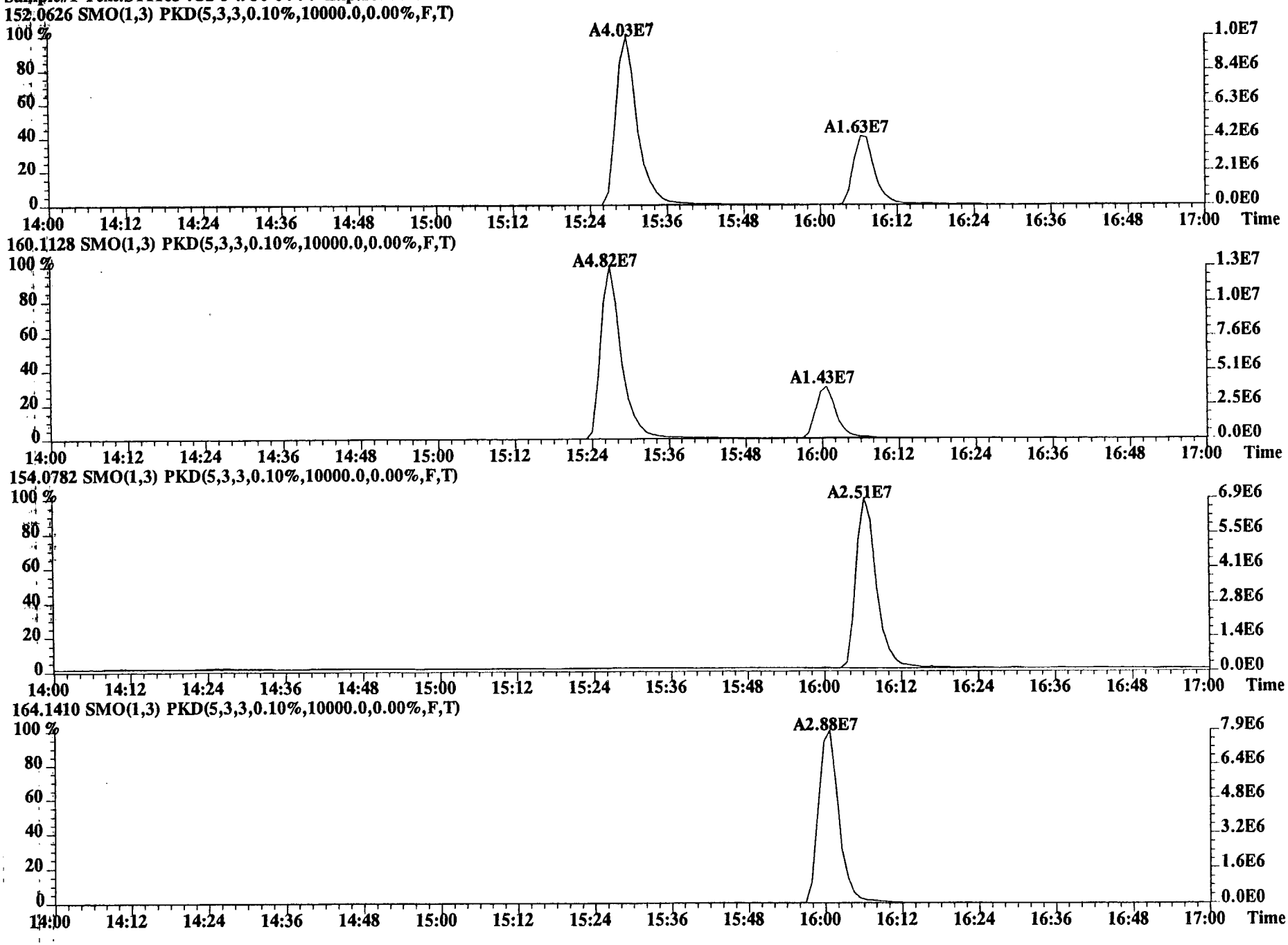
INITIAL CALIBRATION CURVE

		Mean	S.D.	%RSD	1	2	3	4	5	6	7	8	9	10
Dibenz(ah)anthracene	Amount				10.00	50.00	100.00	200.00	500.00					
	RF				12.92	69.25	143.15	281.33	751.34					
	RRF	1.40	0.077	5.452	1.29	1.38	1.43	1.41	1.50					
d12-Benzo(ghi)perylene	Amount				100.00	100.00	100.00	100.00	100.00					
	RF				59.24	54.17	59.73	58.78	57.94					
	RRF	0.58	0.022	3.838	0.59	0.54	0.60	0.59	0.58					
Benzo(ghi)perylene	Amount				10.00	50.00	100.00	200.00	500.00					
	RF				8.58	51.44	109.18	211.25	522.58					
	RRF	1.02	0.091	8.984	0.86	1.03	1.09	1.06	1.05					
	Amount				0	0	0	0	0					
	RF													
	RRF	0	0	0										

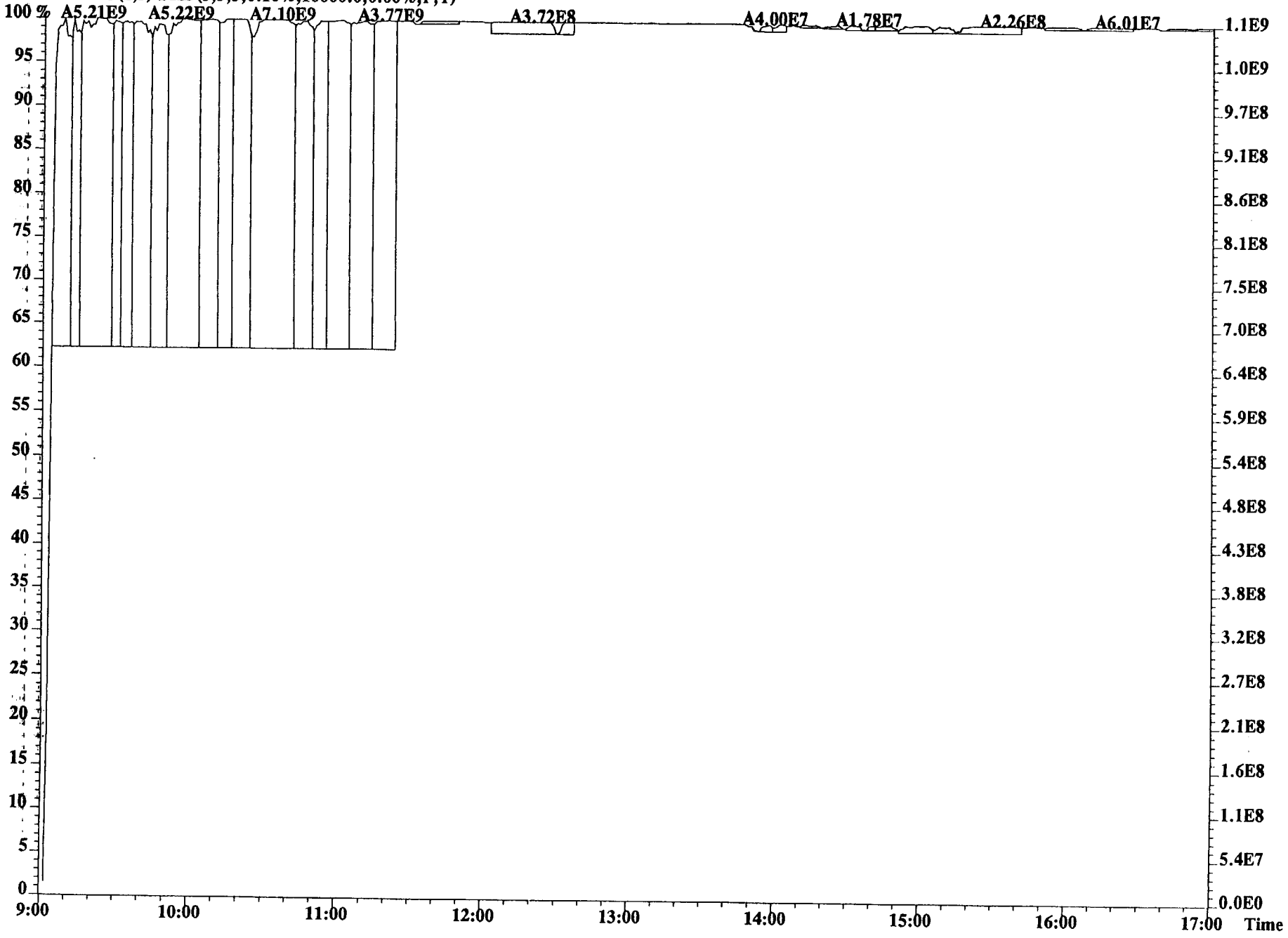
File:03NO98V4 #1-510 Acq: 3-NOV-1998 10:41:10 GC EI+ Voltage SIR 70SE
Sample#1 Text:ST1103 :CS-3 :956-64 : : Exp:PAHAIR



File:03NO98V4 #1-510 Acq: 3-NOV-1998 10:41:10 GC EI+ Voltage SIR 70SE
Sample#1 Text:ST1103 :CS-3 :956-64 : : Exp:PAHAIR

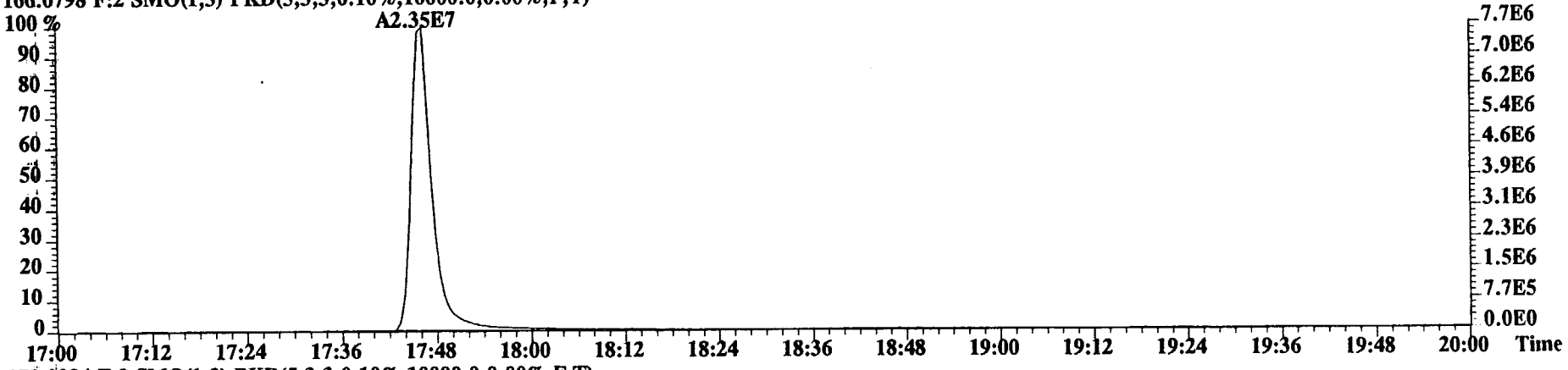


File:03NO98V4 #1-510 Acq: 3-NOV-1998 10:41:10 GC EI+ Voltage SIR 70SE
Sample#1 Text:ST1103 :CS-3 :956-64 : : Exp:PAHAIR
130.9920 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

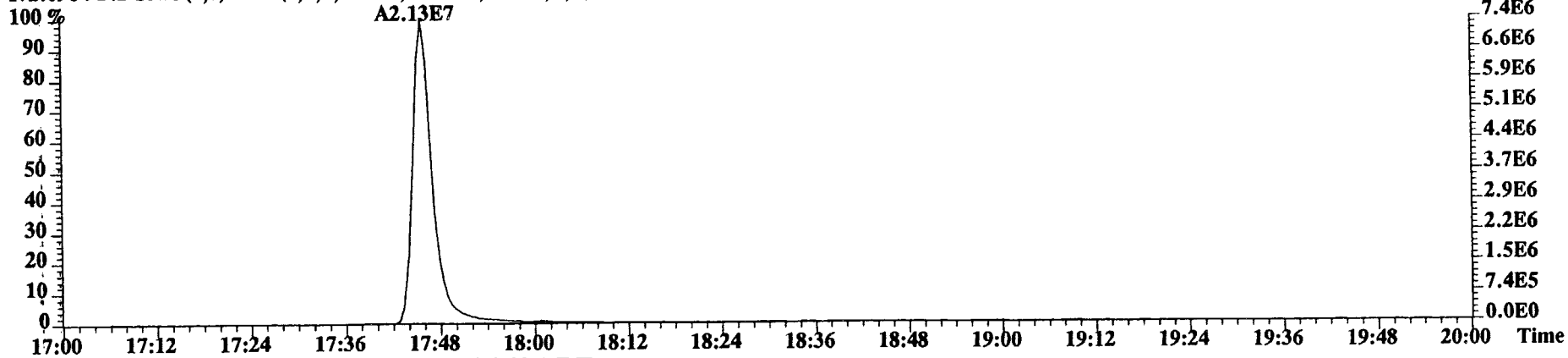


673

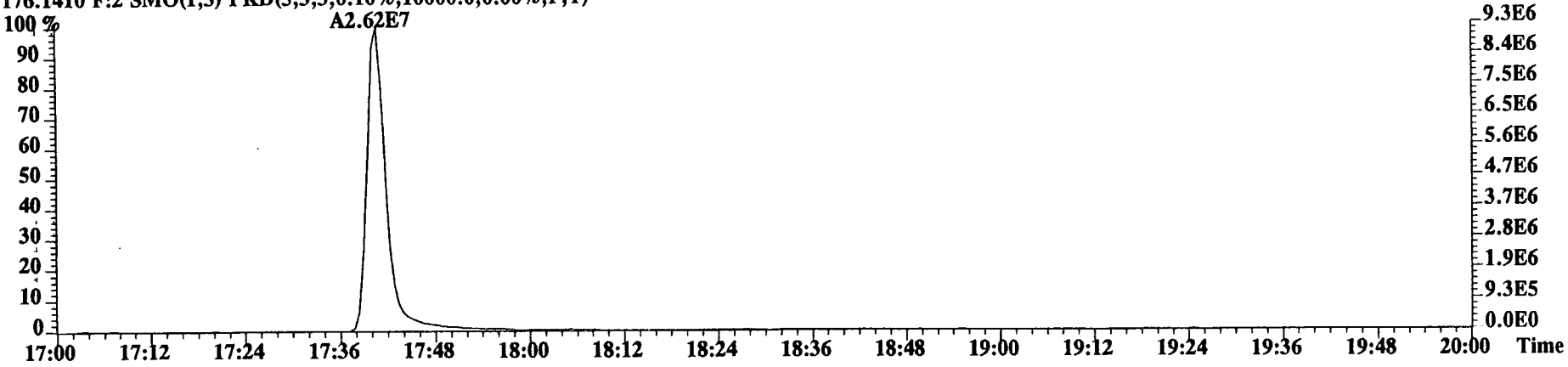
File:03NO98V4 #1-640 Acq: 3-NOV-1998 10:41:10 GC EI+ Voltage SIR 70SE
Sample#1 Text:ST1103 :CS-3 :956-64 : : Exp:PAHAIR
166.0798 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



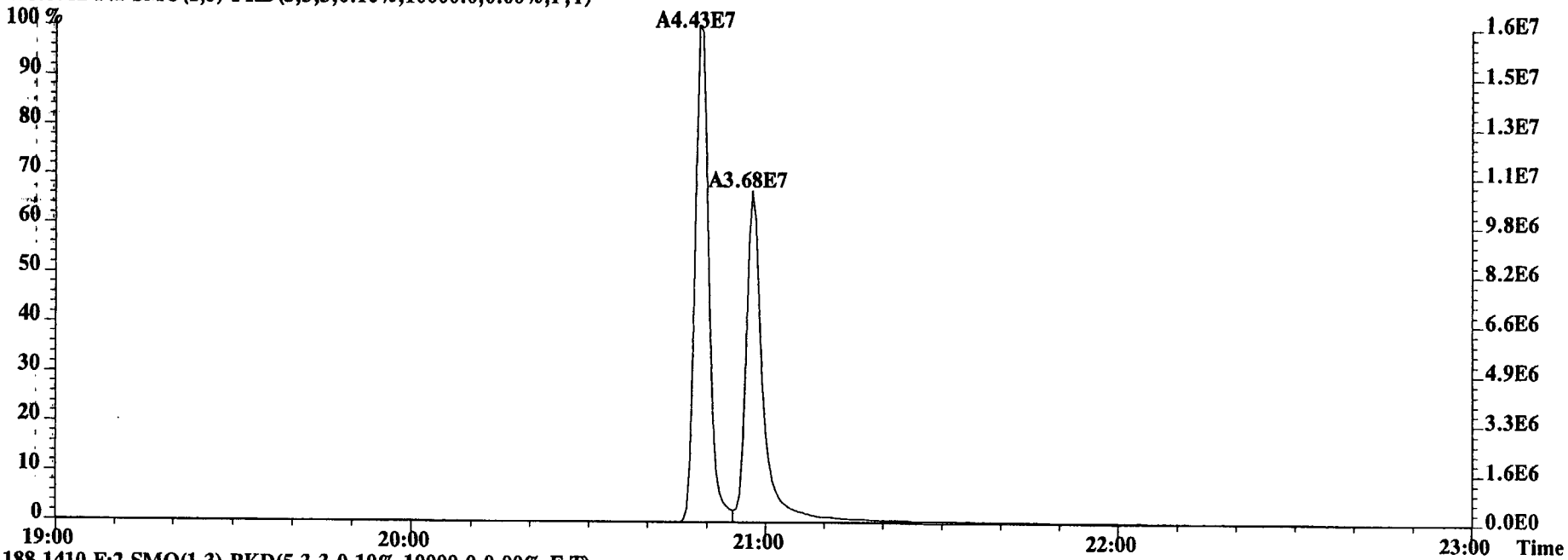
172.0984 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



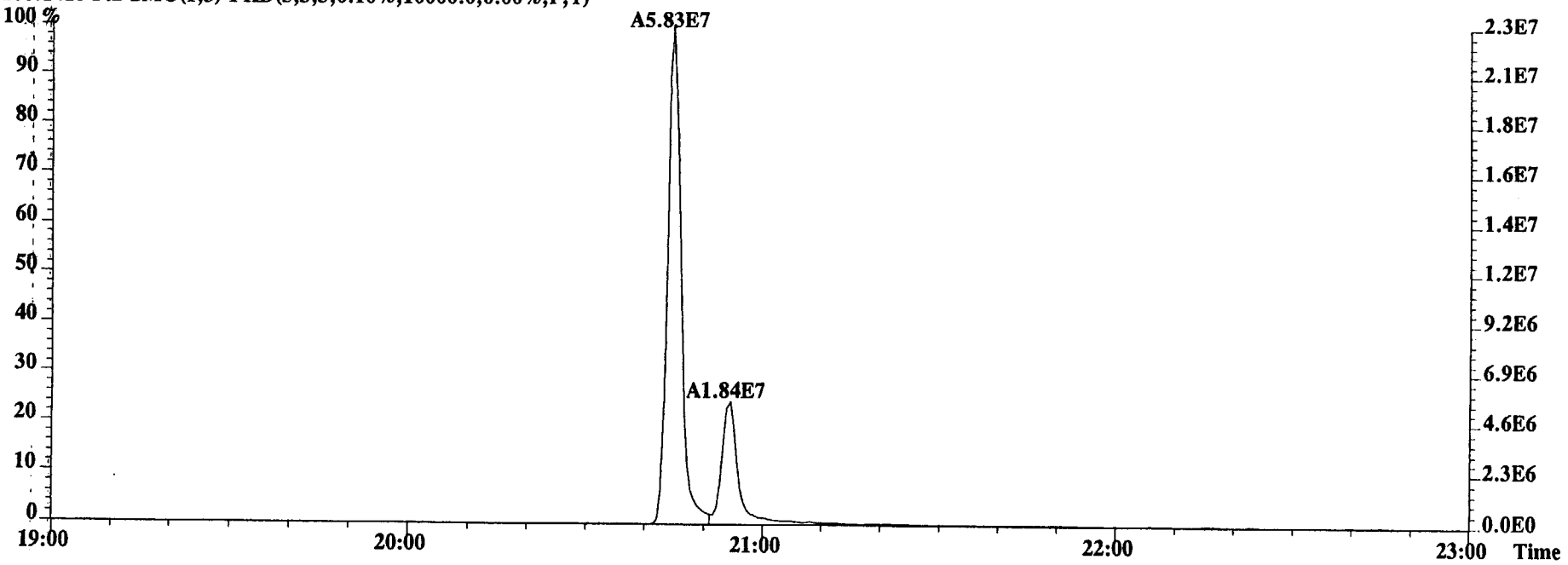
176.1410 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



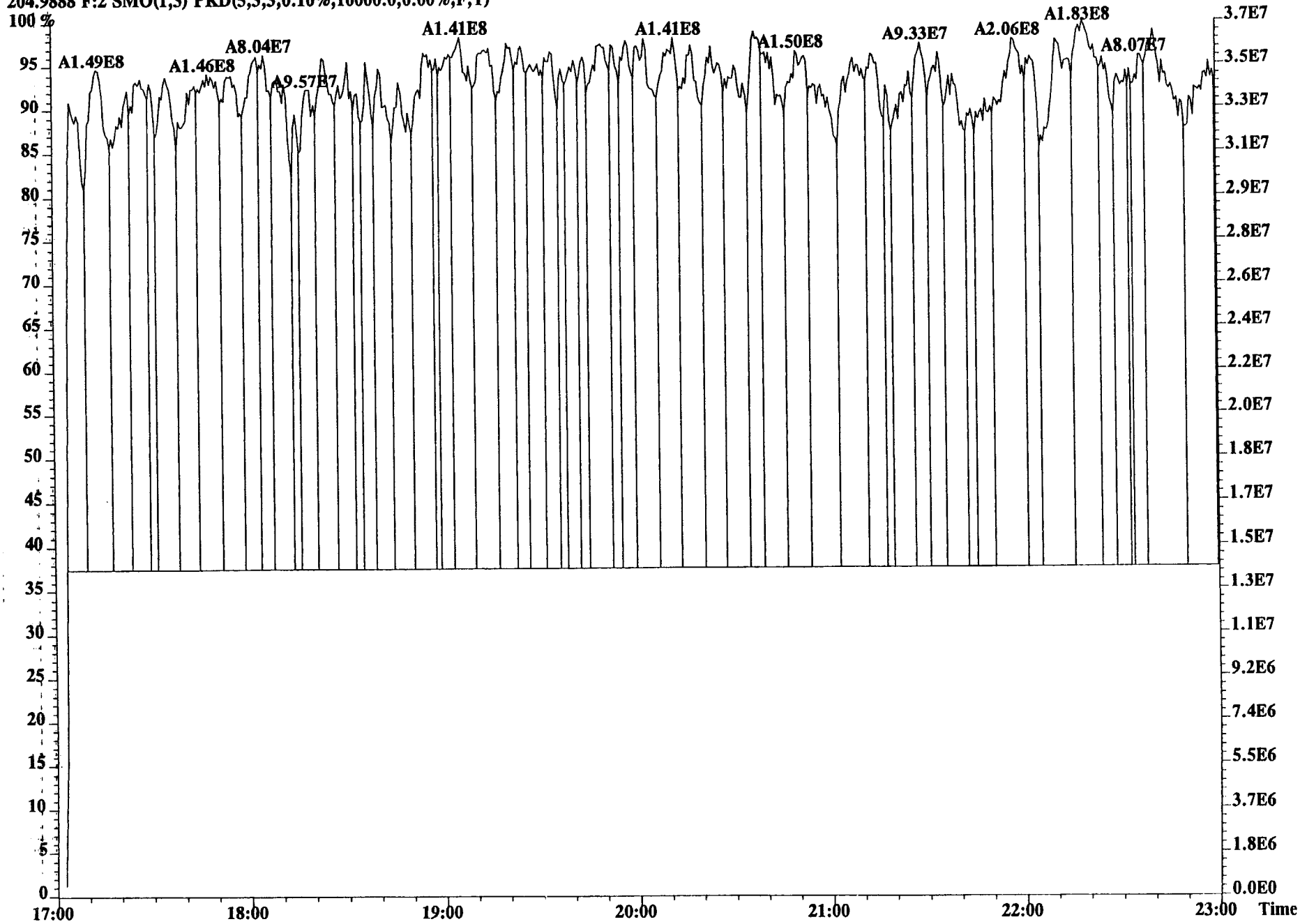
File:03NO98V4 #1-640 Acq: 3-NOV-1998 10:41:10 GC EI+ Voltage SIR 70SE
Sample#1 Text:ST1103 :CS-3 :956-64 : : Exp:PAHAIR
178.0782 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



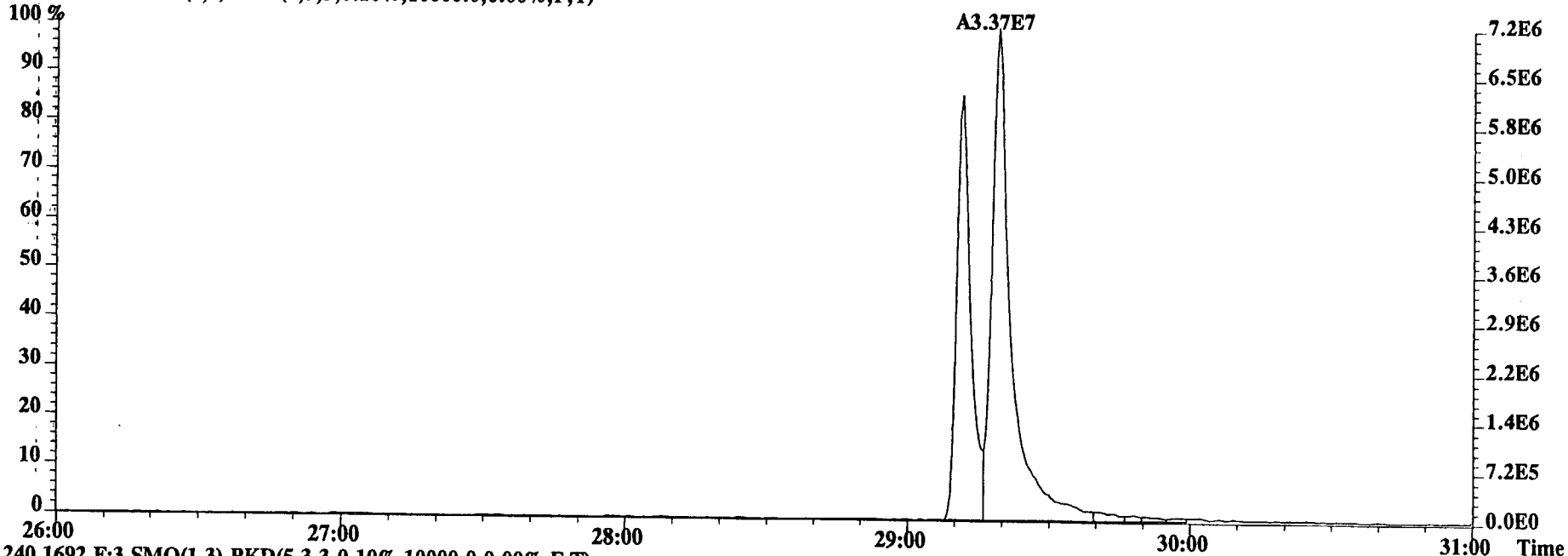
188.1410 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



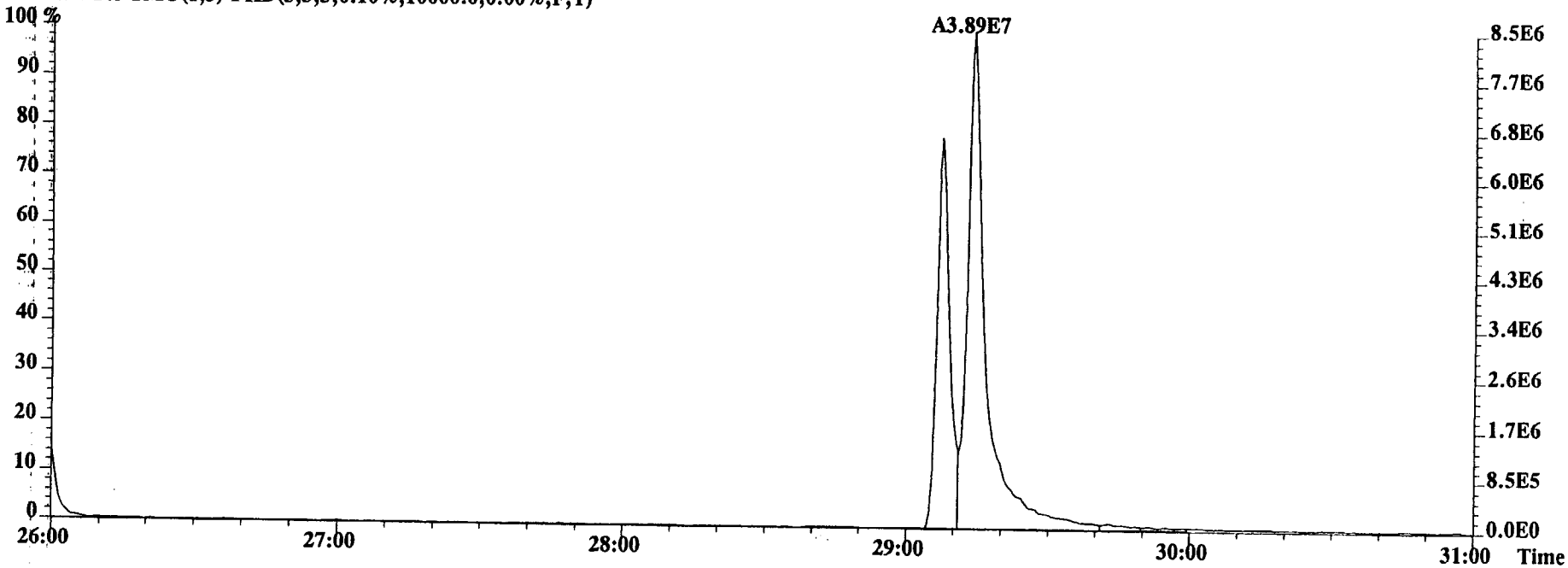
File:03NO98V4 #1-640 Acq: 3-NOV-1998 10:41:10 GC EI+ Voltage SIR 70SE
Sample#1 Text:ST1103 :CS-3 :956-64 : : Exp:PAHAIR
204.9888 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



File:03NO98V4 #1-938 Acq: 3-NOV-1998 10:41:10 GC EI+ Voltage SIR 70SE
Sample#1 Text:ST1103 :CS-3 :956-64 : : Exp:PAHAIR
228.0939 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

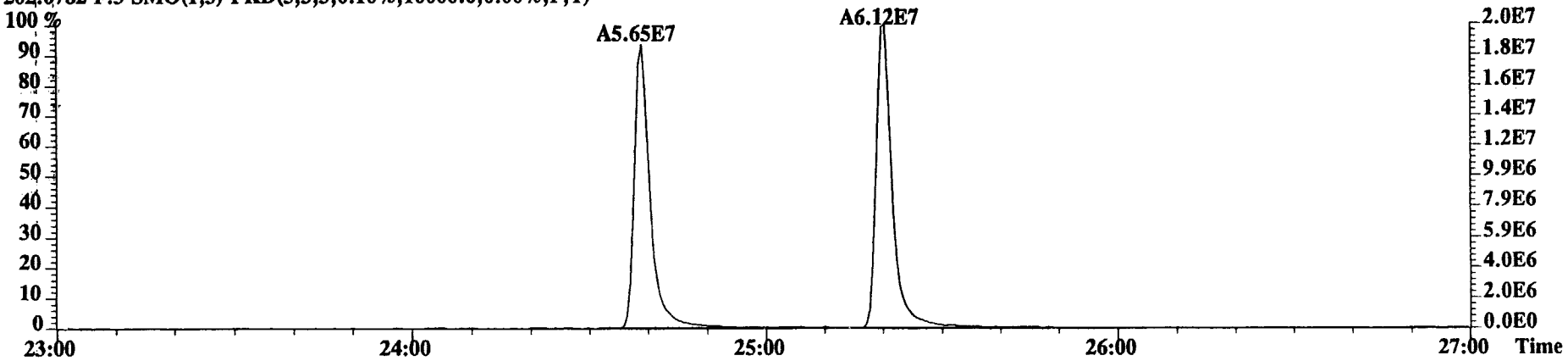


240.1692 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

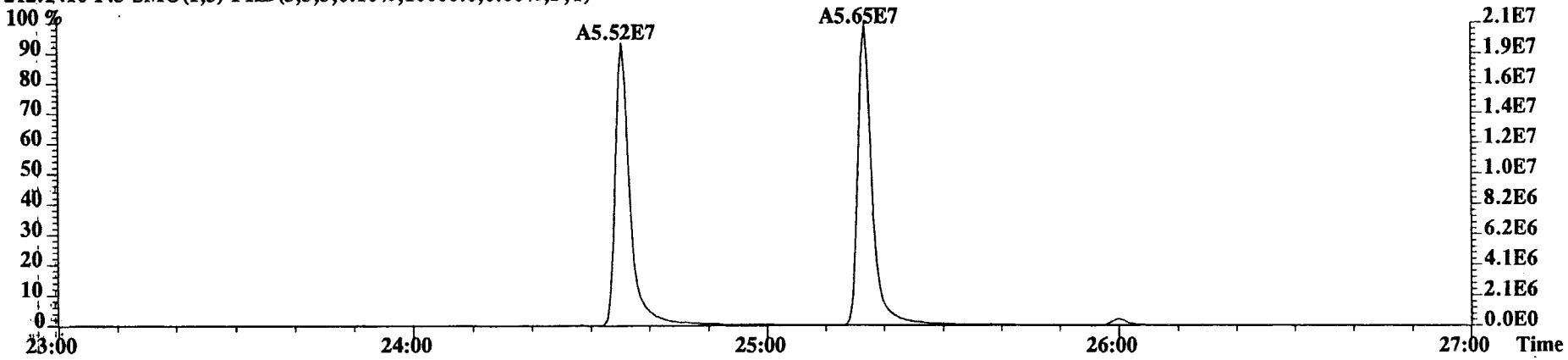


File:03NO98V4 #1-938 Acq: 3-NOV-1998 10:41:10 GC EI+ Voltage SIR 70SE
Sample#1 Text:ST1103 :CS-3 :956-64 : : Exp:PAHAIR

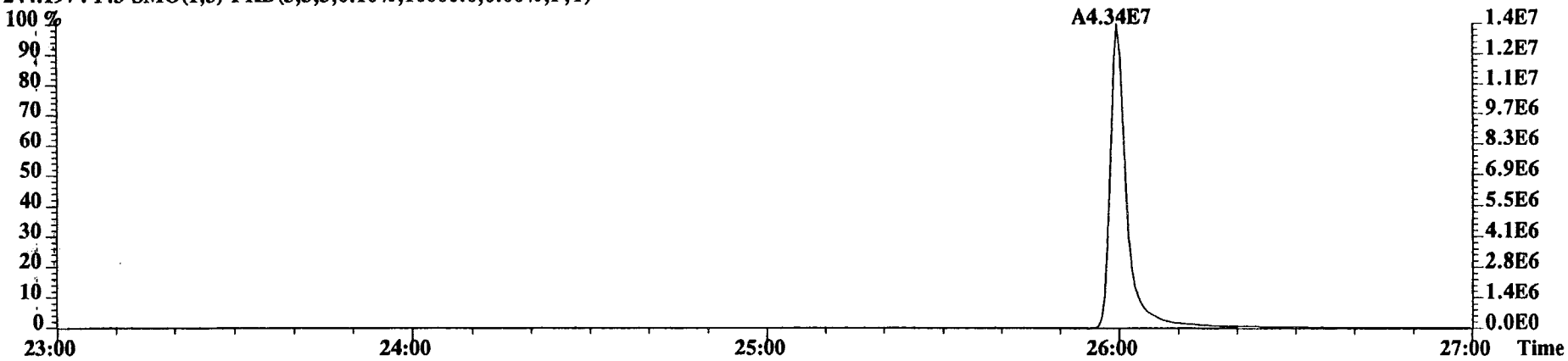
202.0782 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



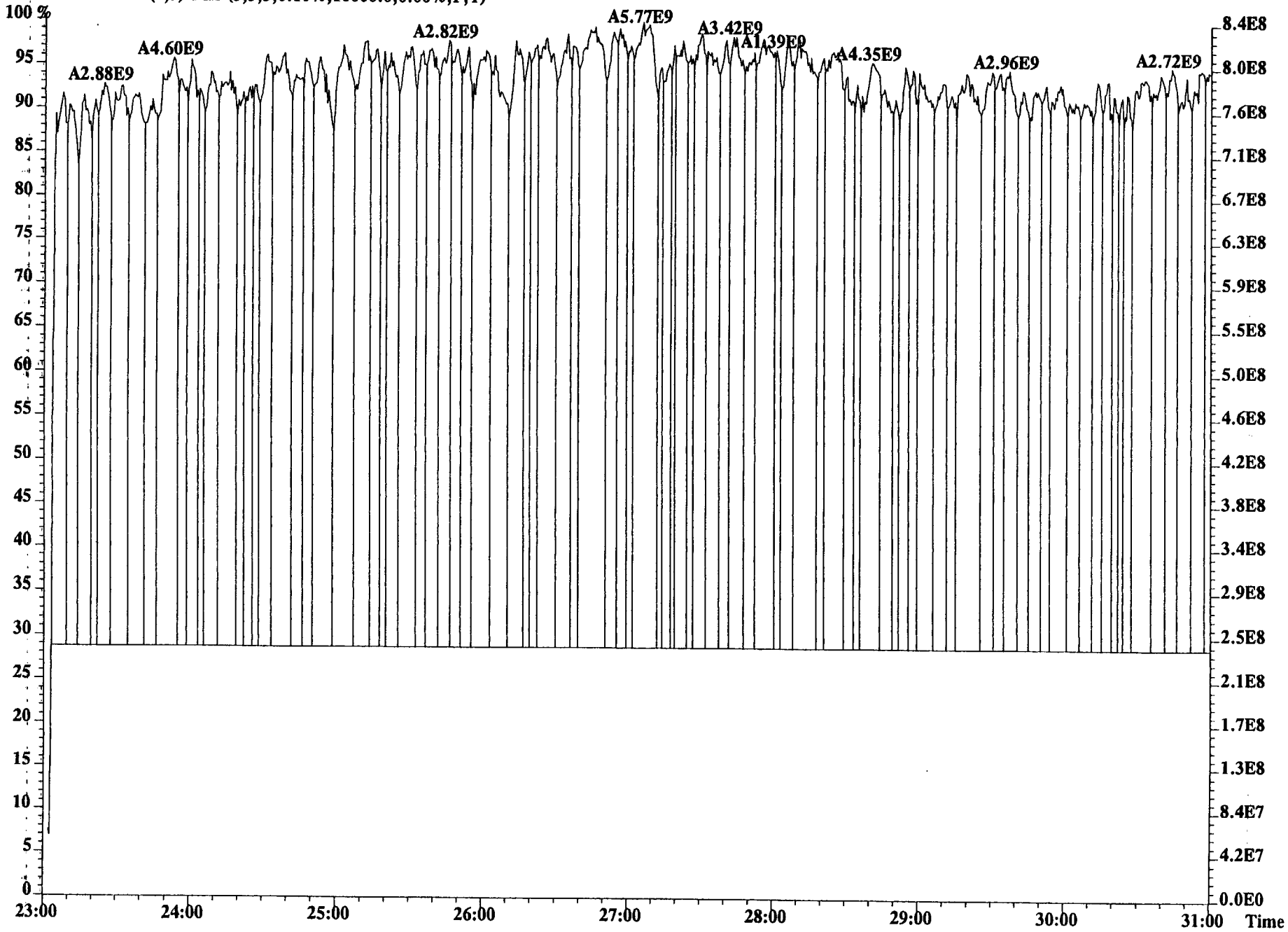
212.1410 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



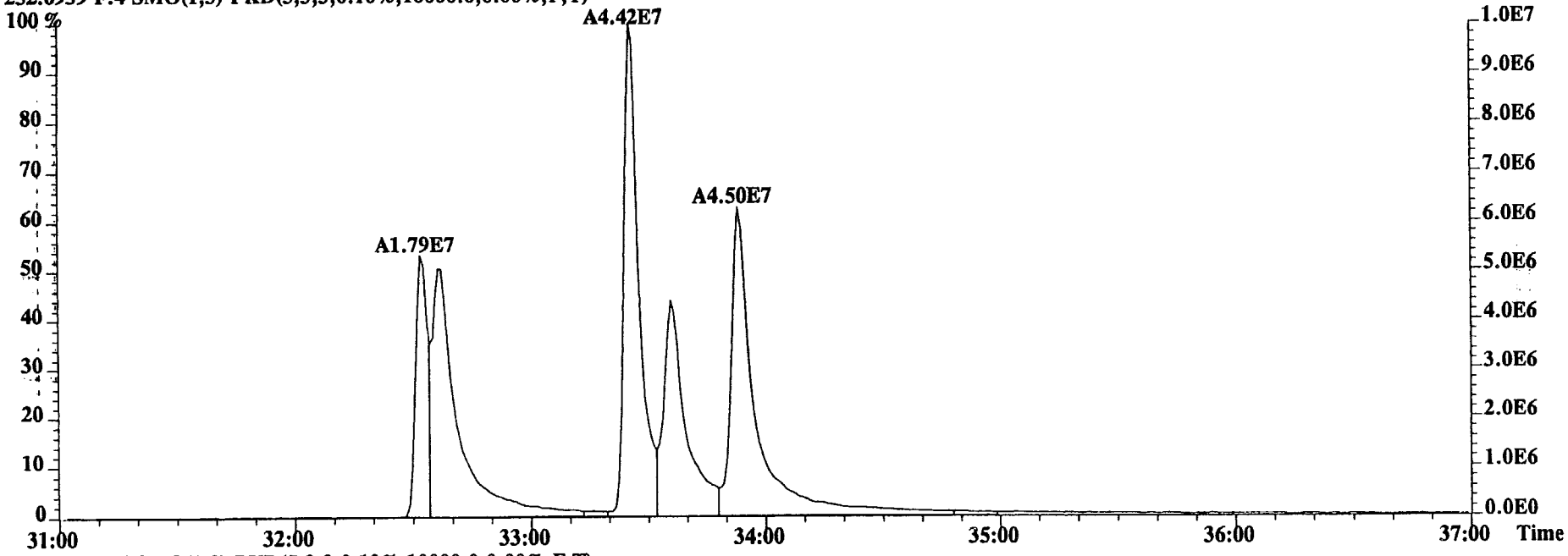
244.1974 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



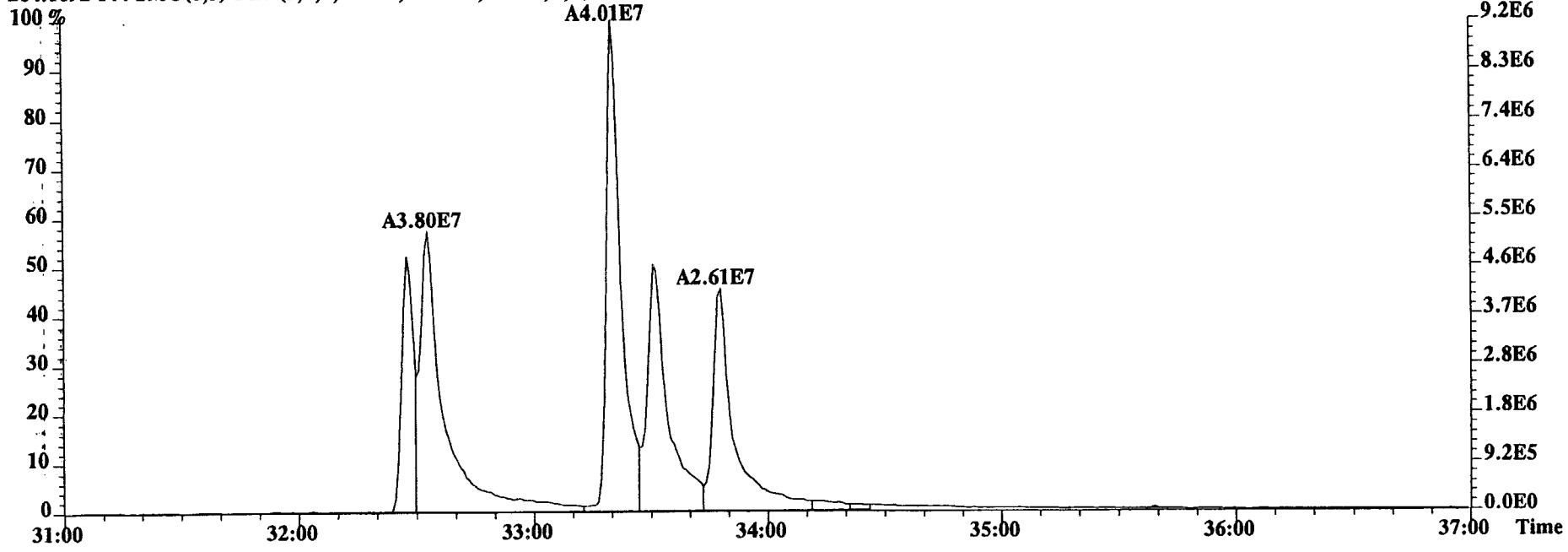
File:03NO98V4 #1-938 Acq: 3-NOV-1998 10:41:10 GC EI+ Voltage SIR 70SE
Sample#1 Text:ST1103 :CS-3 :956-64 : : Exp:PAHAIR
230.9856 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



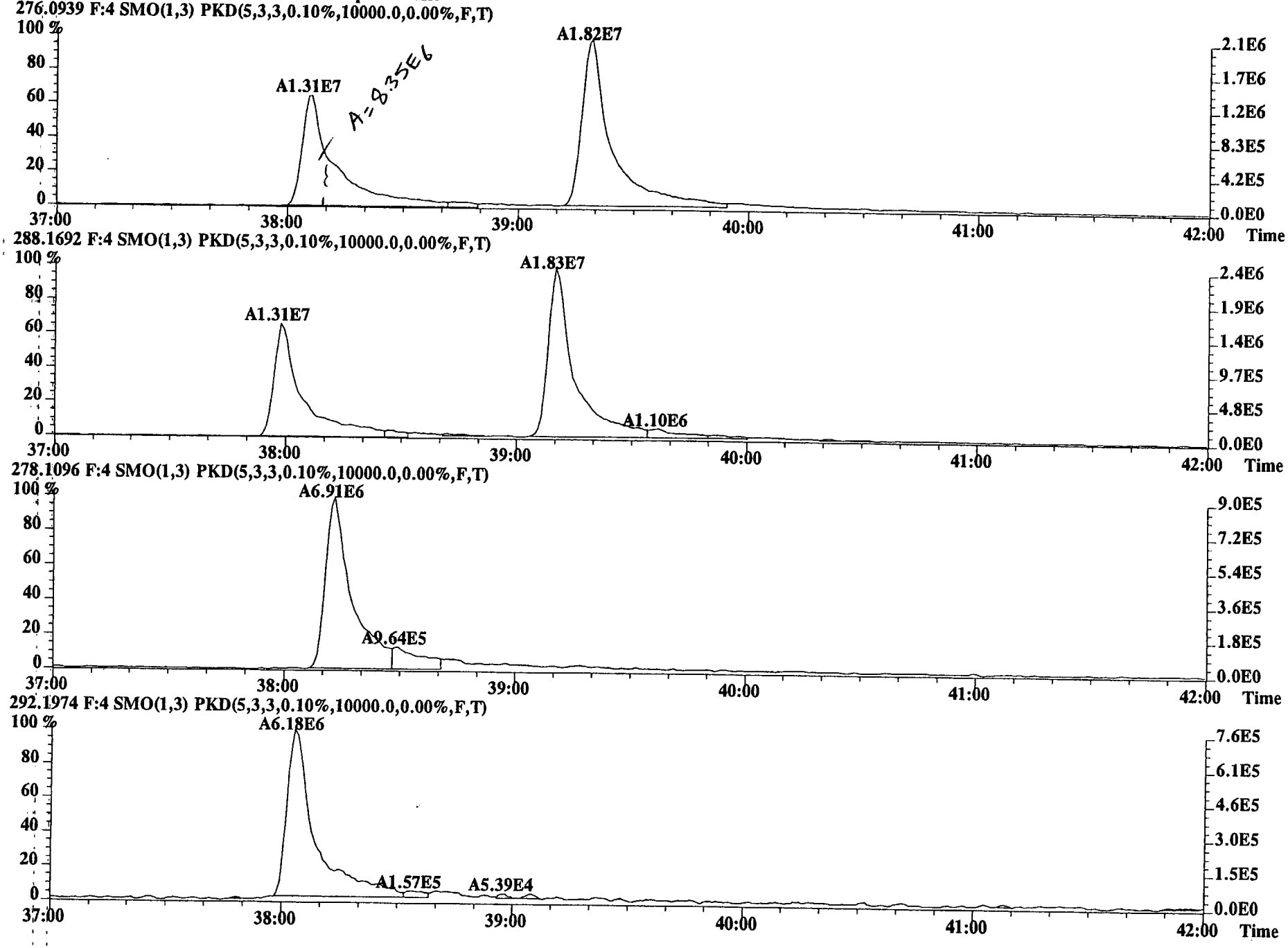
File:03NO98V4 #1-878 Acq: 3-NOV-1998 10:41:10 GC EI+ Voltage SIR 70SE
Sample#1 Text:ST1103 :CS-3 :956-64 : : Exp:PAHAIR
252.0939 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



264.1692 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

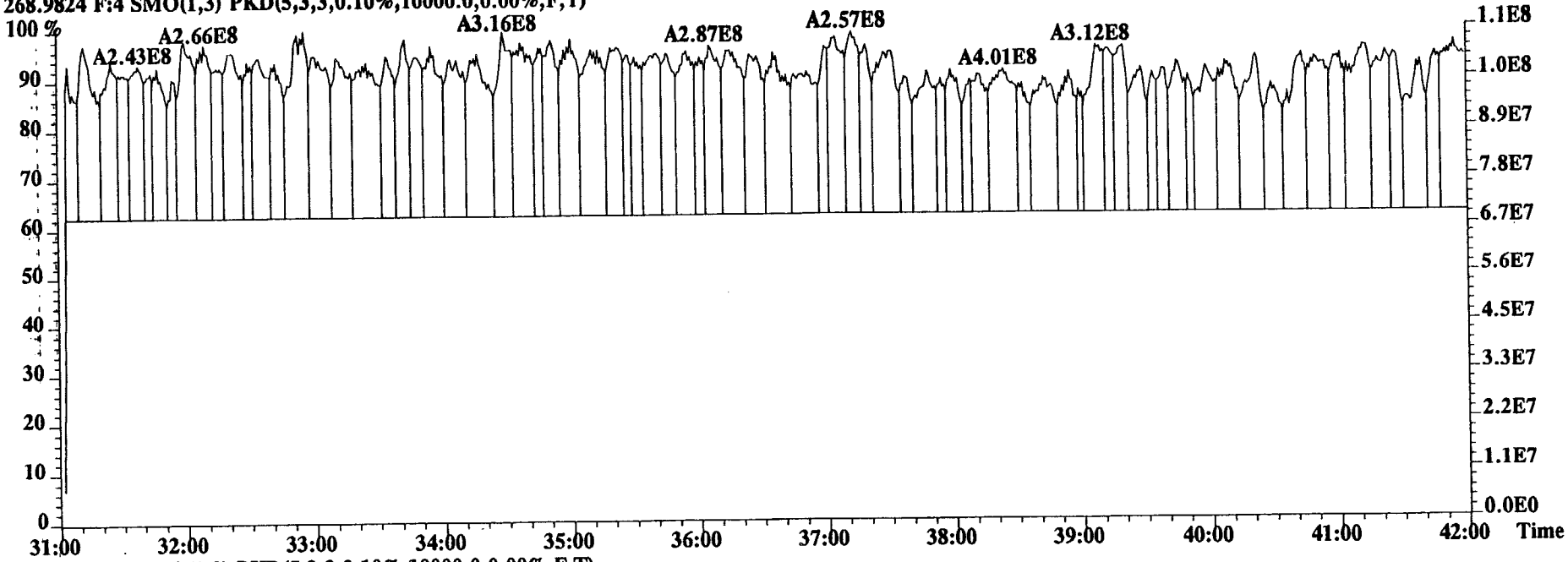


File:03NO98V4 #1-878 Acq: 3-NOV-1998 10:41:10 GC EI+ Voltage SIR 70SE
Sample#1 Text:ST1103 :CS-3 :956-64 : : Exp:PAHAIR

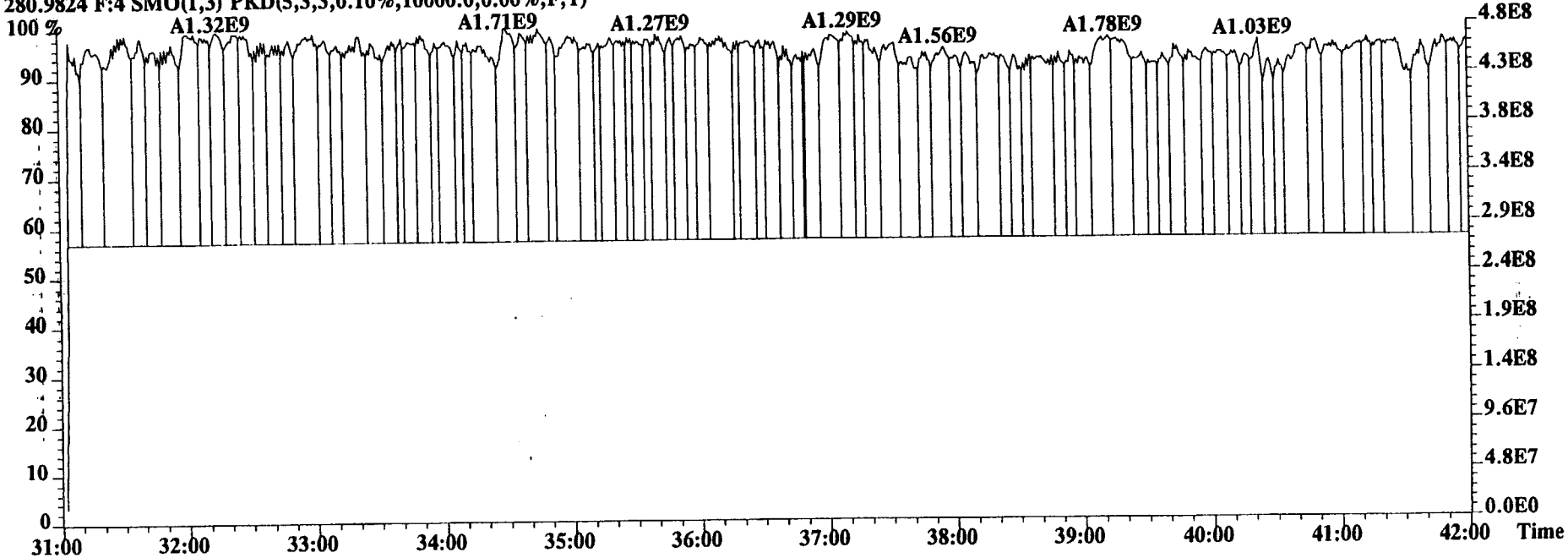


681

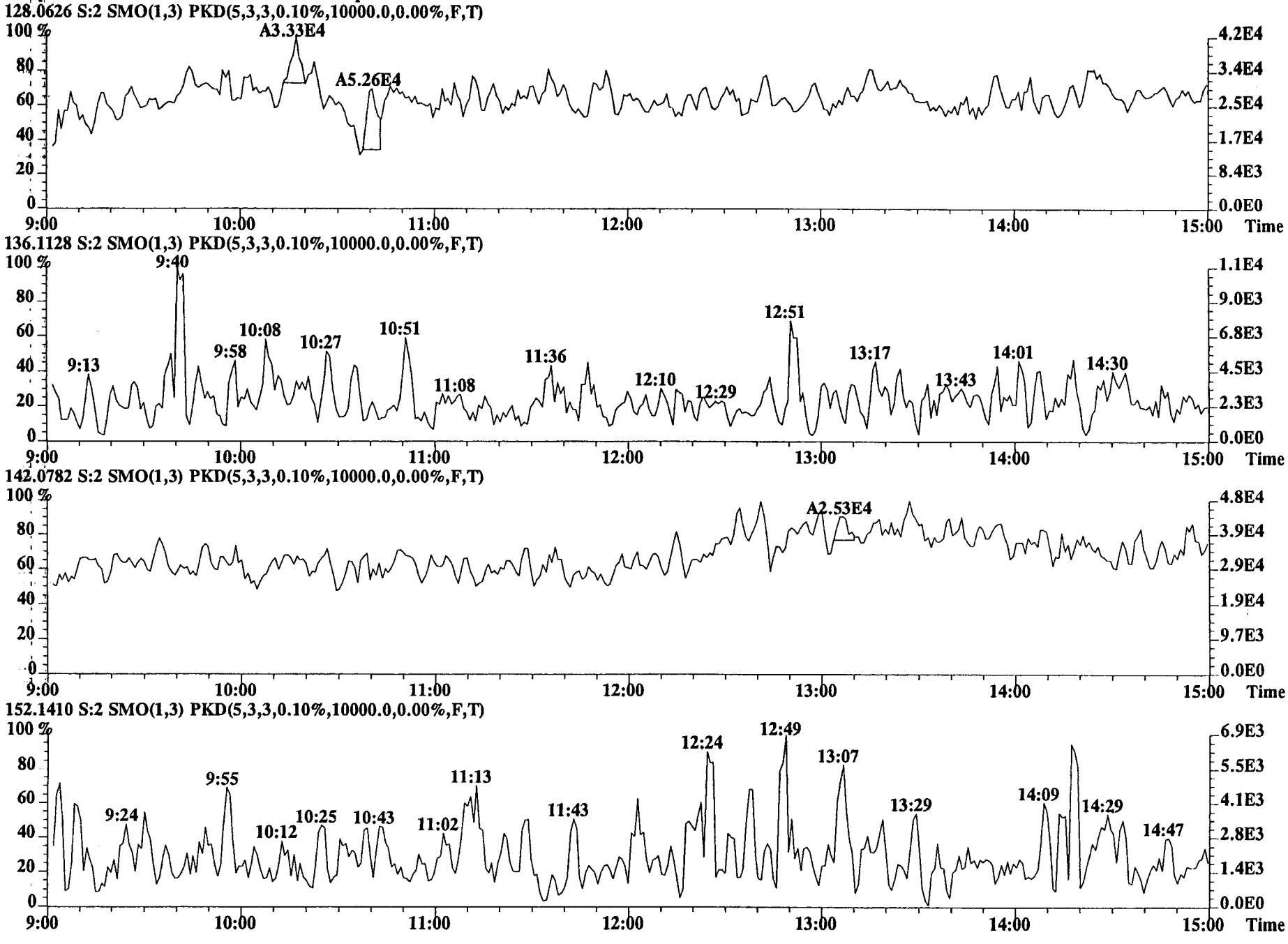
File:03NO98V4 #1-878 Acq: 3-NOV-1998 10:41:10 GC EI+ Voltage SIR 70SE
Sample#1 Text:ST1103 :CS-3 :956-64 : : Exp:PAHAIR
268.9824 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



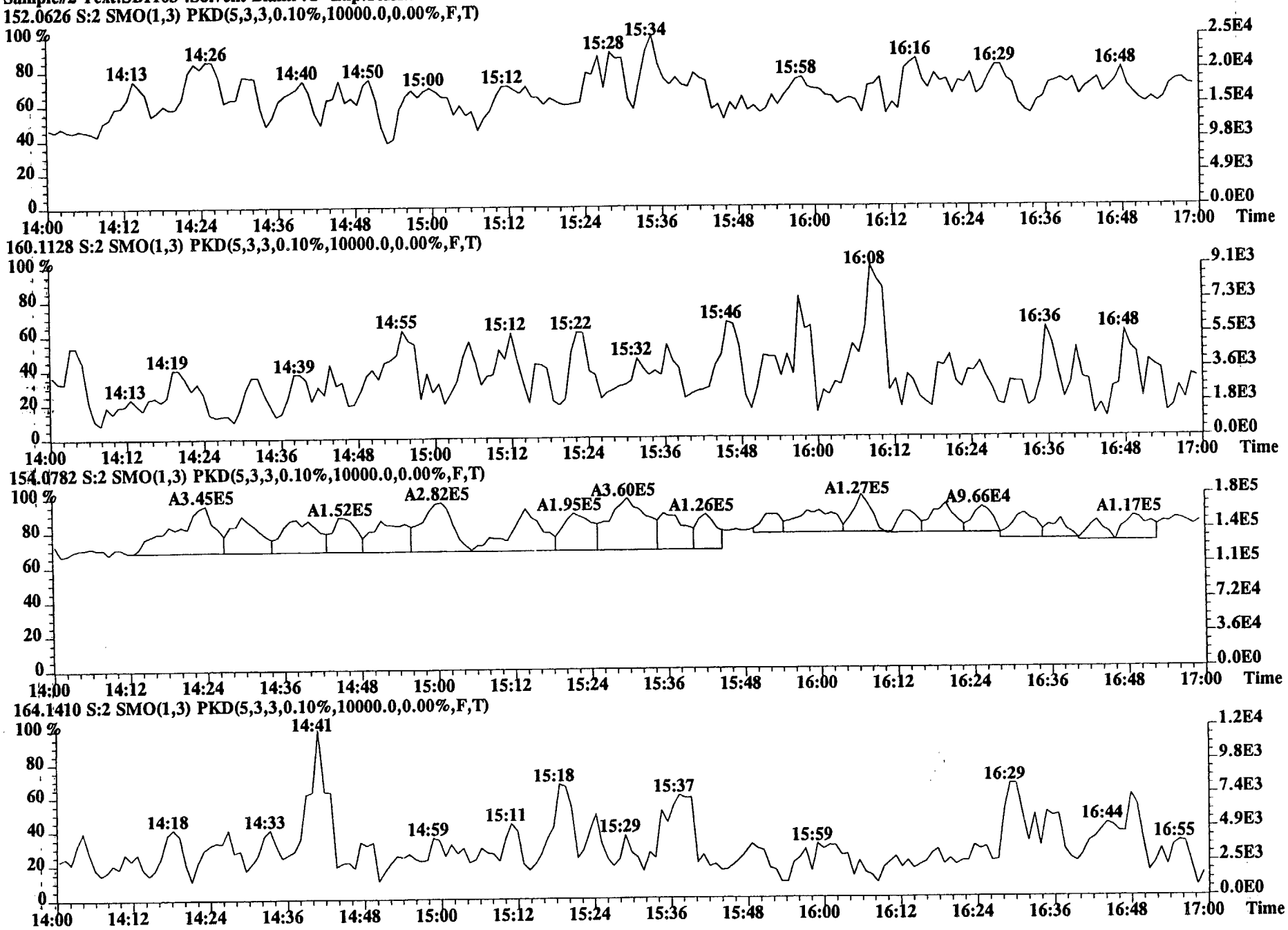
280.9824 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



File:03NO98V4 #1-509 Acq: 3-NOV-1998 11:30:10 GC EI+ Voltage SIR 70SE
Sample#2 Text:SB1103 :Solvent Blank :C- Exp:PAHAIR

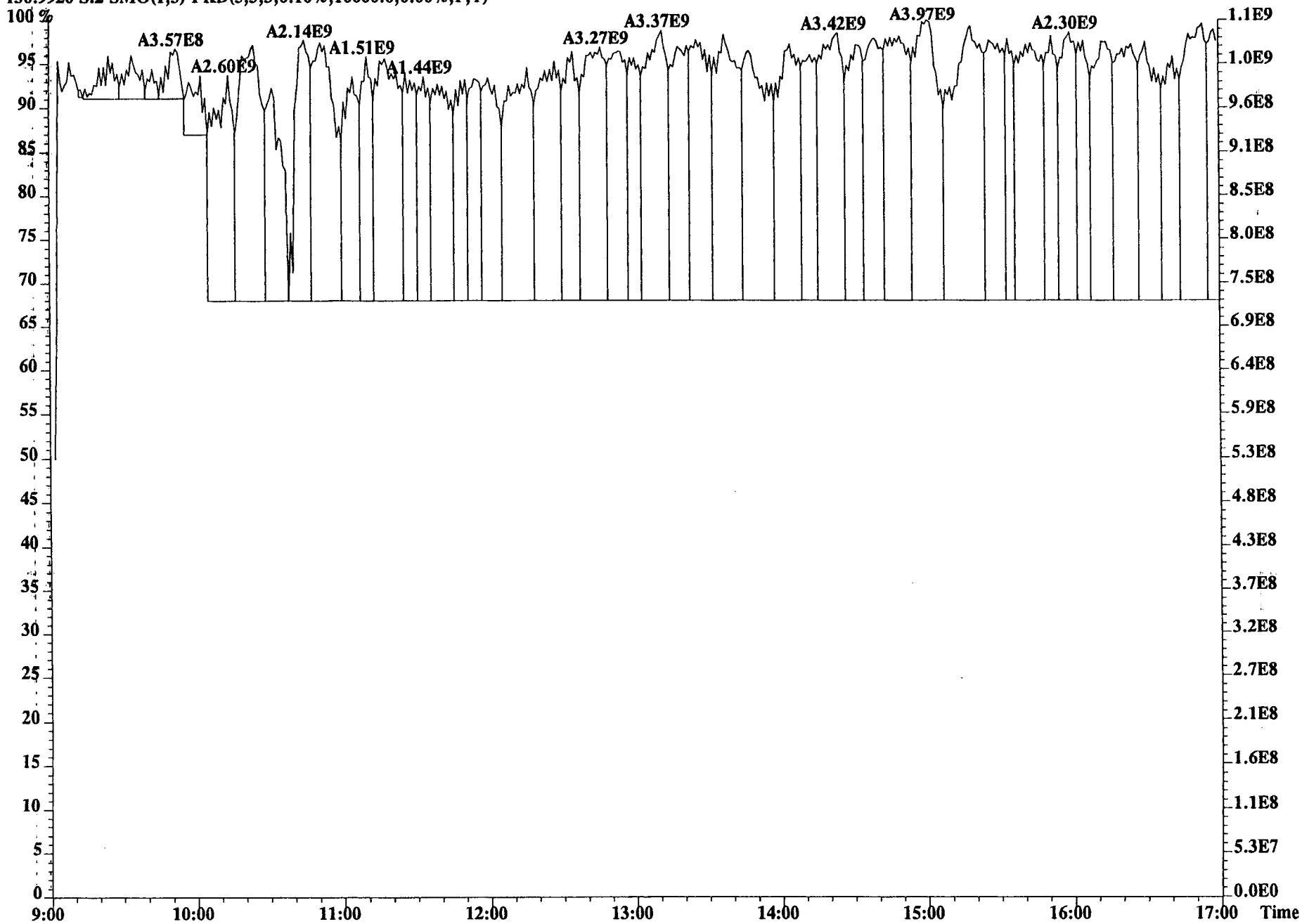


File:03NO98V4 #1-509 Acq: 3-NOV-1998 11:30:10 GC EI+ Voltage SIR 70SE
Sample#2 Text:SB1103 :Solvent Blank :C- Exp:PAHAIR



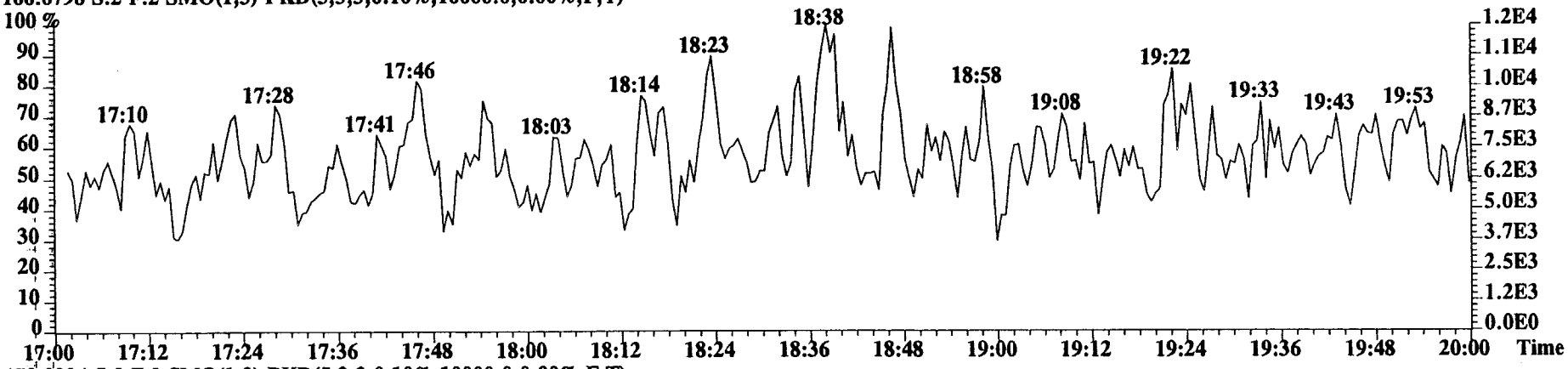
684

File:03NO98V4 #1-509 Acq: 3-NOV-1998 11:30:10 GC EI+ Voltage SIR 70SE
Sample#2 Text:SB1103 :Solvent Blank :C- Exp:PAHAIR
130.9920 S:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

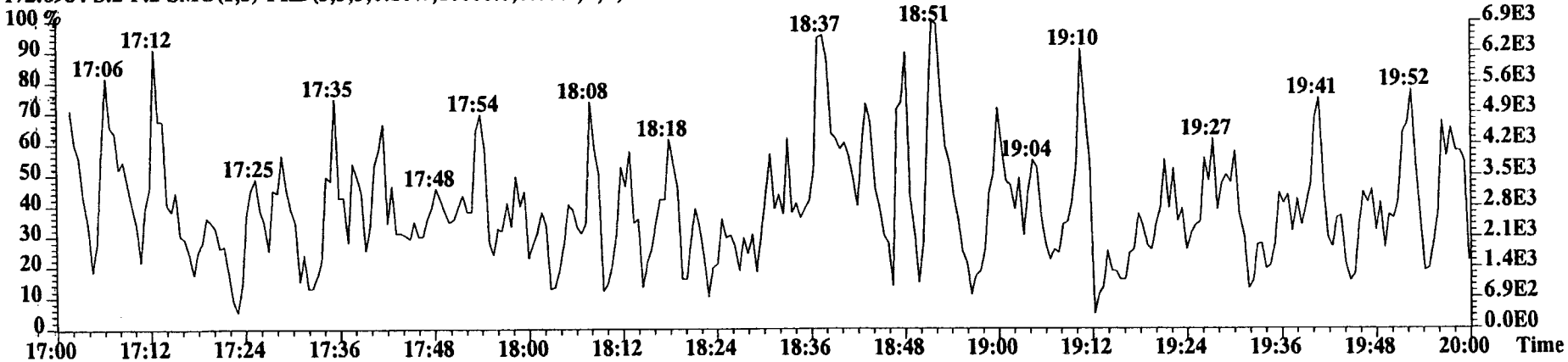


685

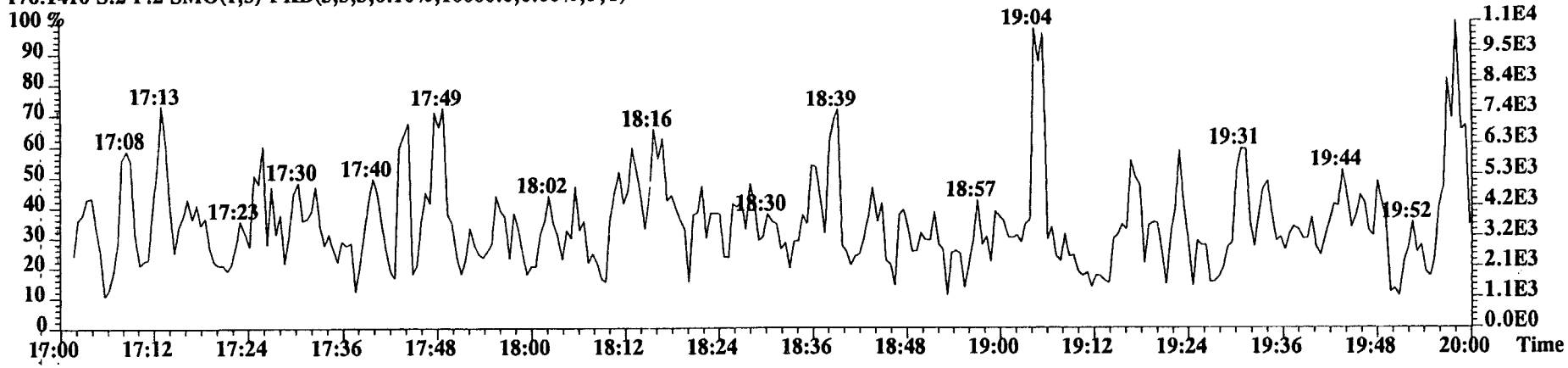
File:03NO98V4 #1-641 Acq: 3-NOV-1998 11:30:10 GC EI+ Voltage SIR 70SE
Sample#2 Text:SB1103 :Solvent Blank :C- Exp:PAHAIR
166.0798 S:2 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



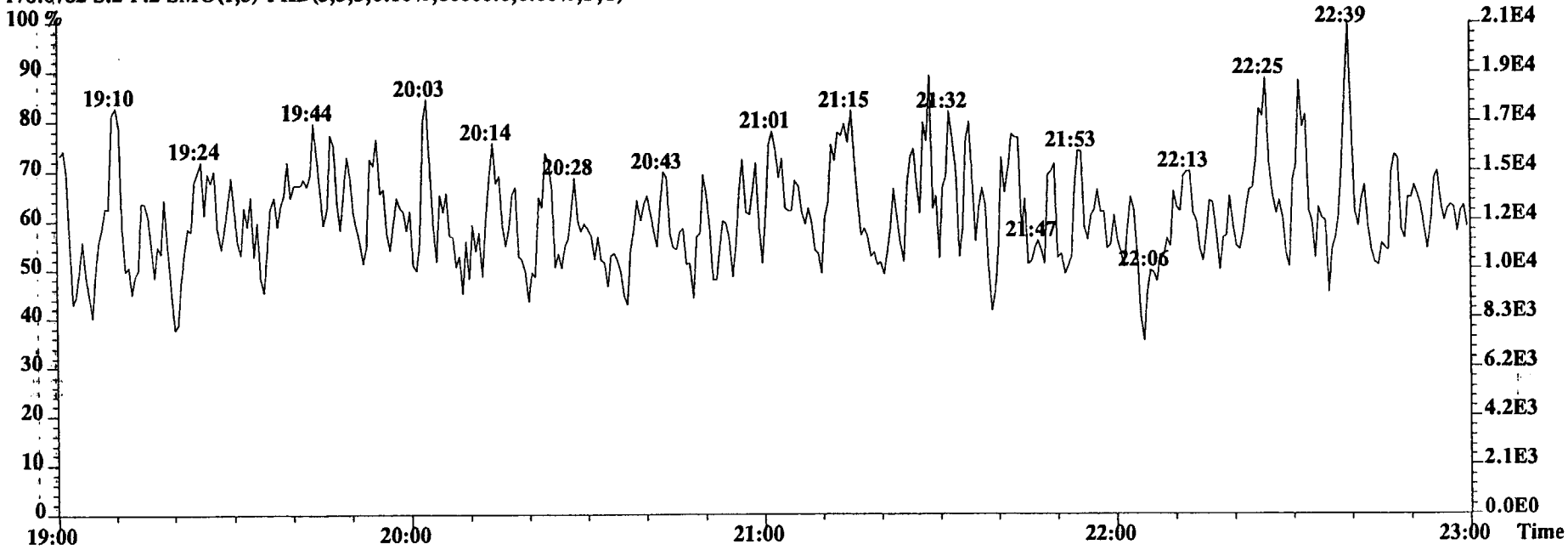
172.0984 S:2 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



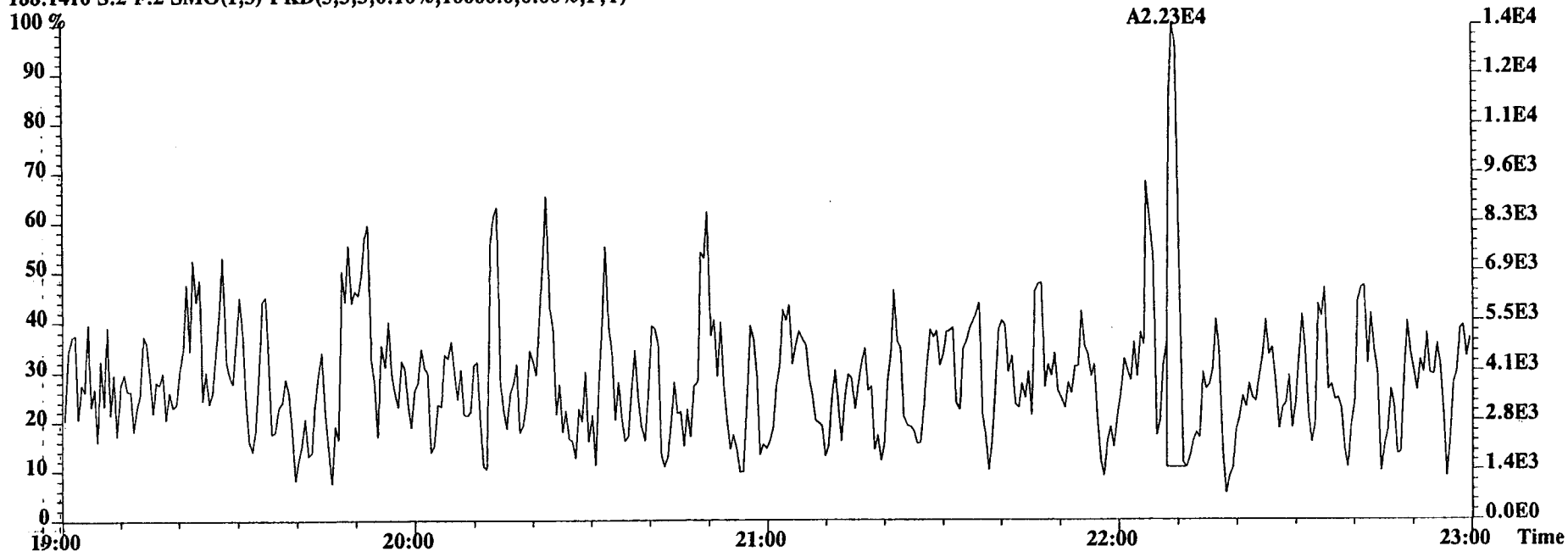
176.1410 S:2 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



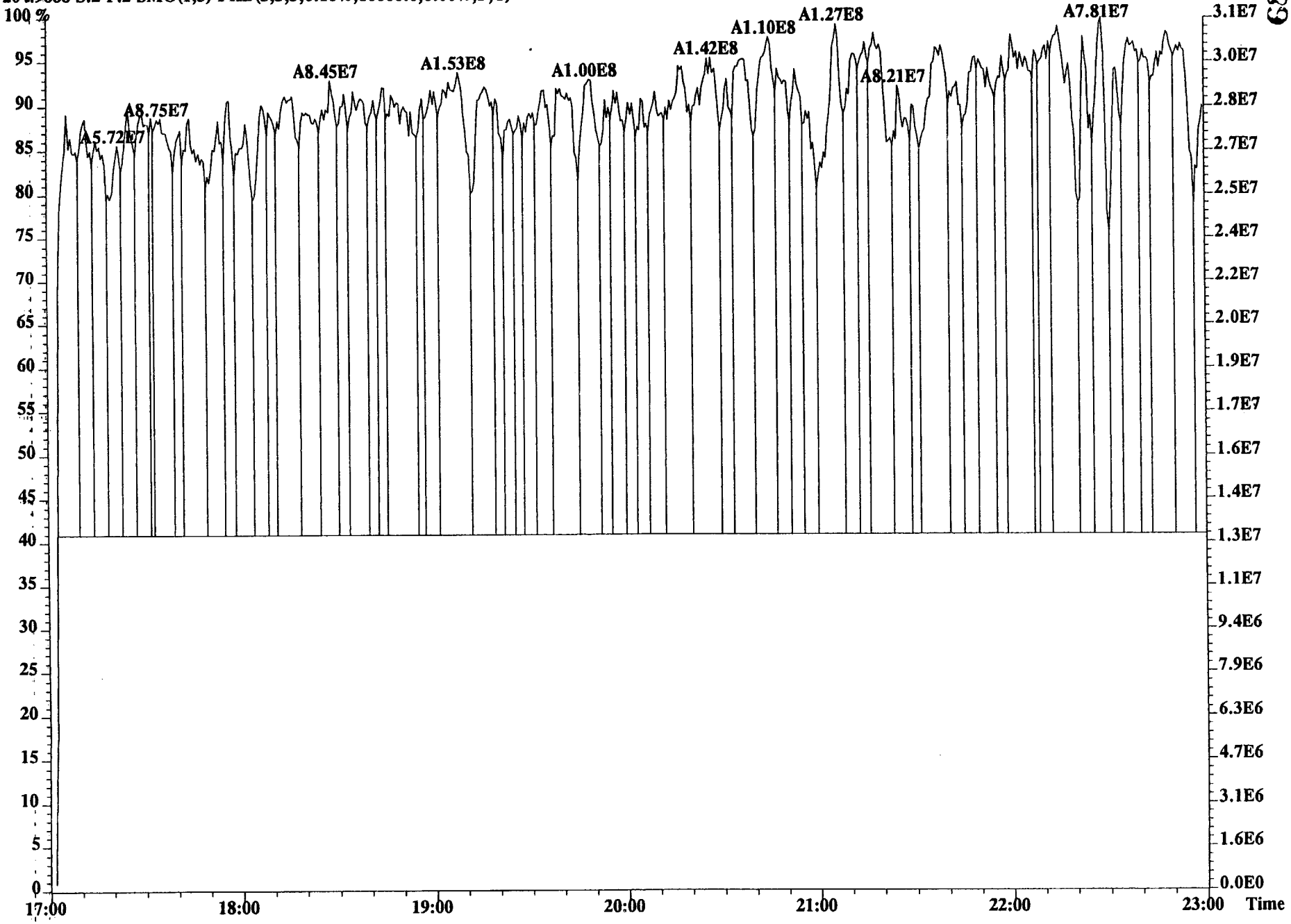
File:03NO98V4 #1-641 Acq: 3-NOV-1998 11:30:10 GC EI+ Voltage SIR 70SE
Sample#2 Text:SB1103 :Solvent Blank :C- Exp:PAHAIR
178.0782 S:2 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



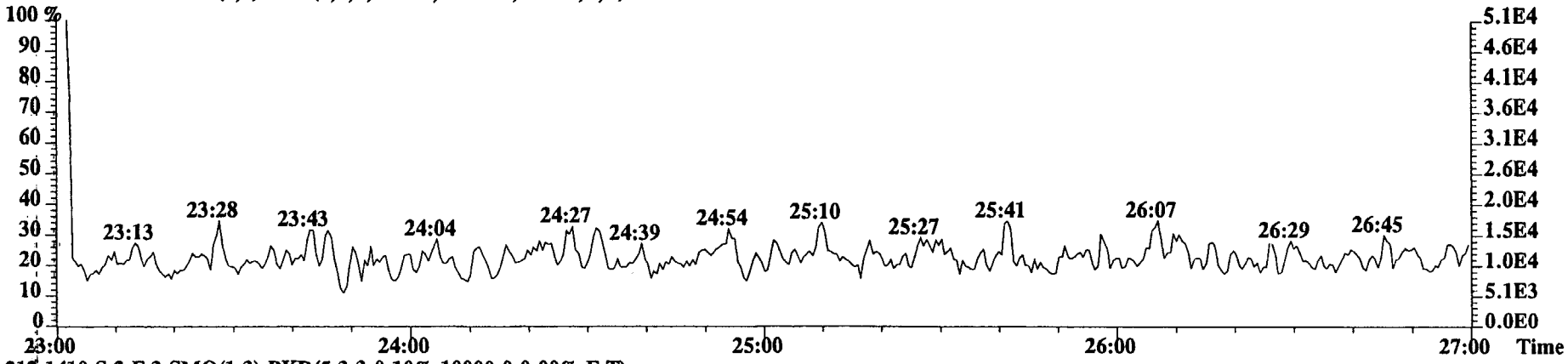
188.1410 S:2 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



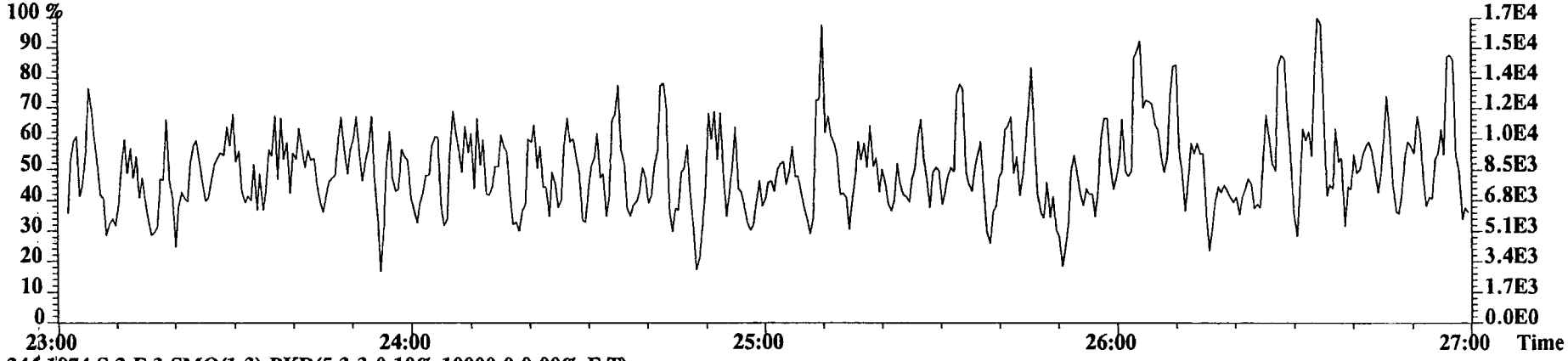
File:03NO98V4 #1-641 Acq: 3-NOV-1998 11:30:10 GC EI+ Voltage SIR 70SE
Sample#2 Text:SB1103 :Solvent Blank :C- Exp:PAHAIR
204.9888 S:2 F:2 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



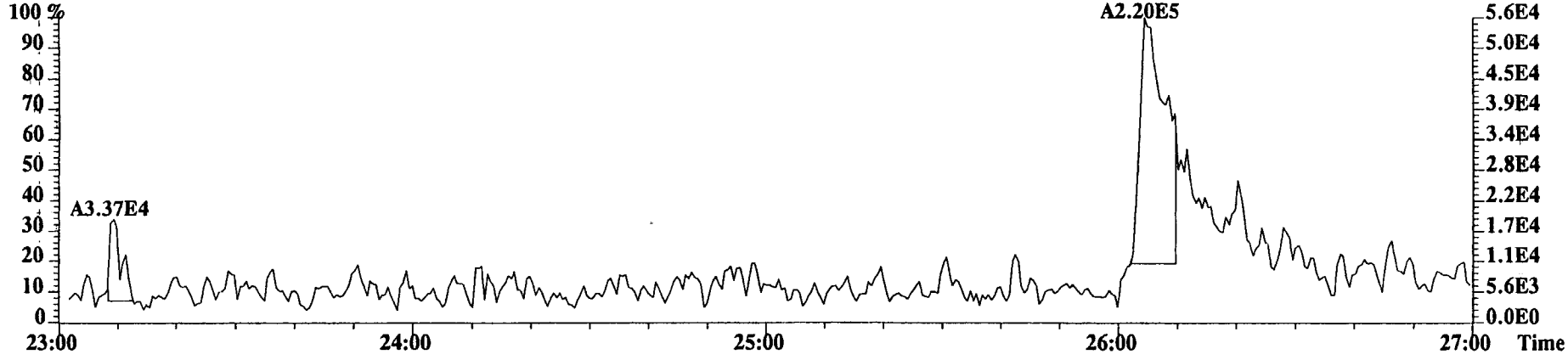
File:03NO98V4 #1-939 Acq: 3-NOV-1998 11:30:10 GC EI+ Voltage SIR 70SE
Sample#2 Text:SB1103 :Solvent Blank :C- Exp:PAHAIR
202.0782 S:2 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



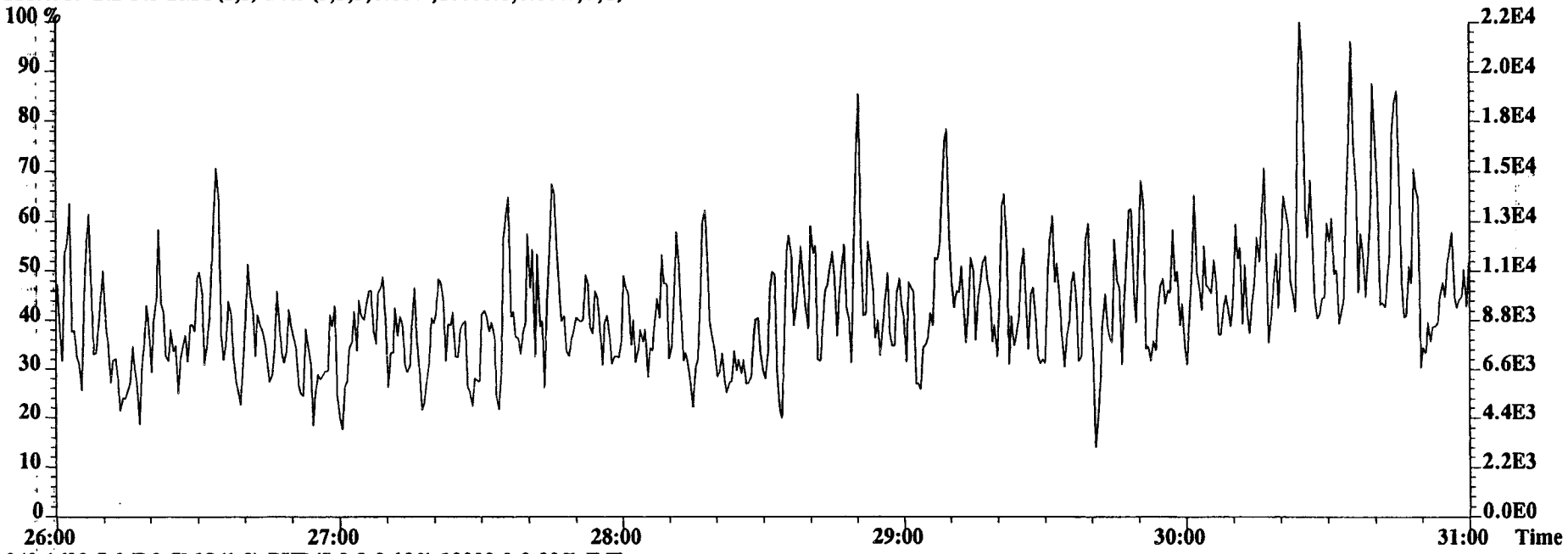
212.1410 S:2 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



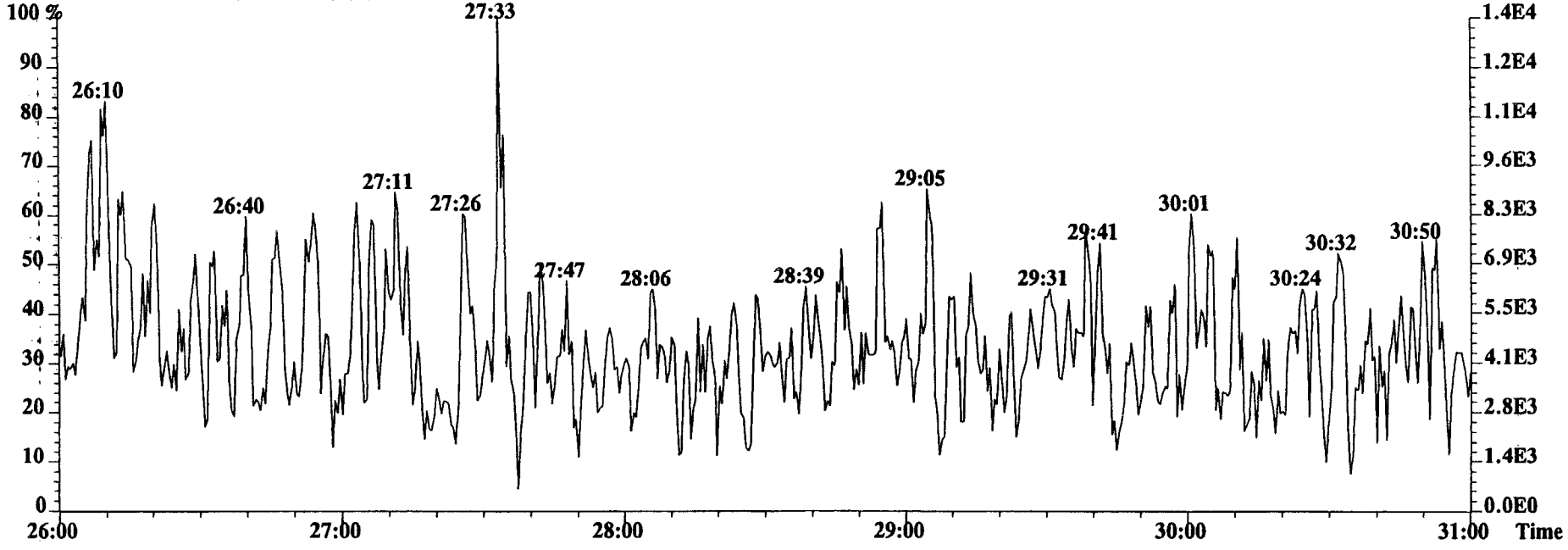
244.1974 S:2 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



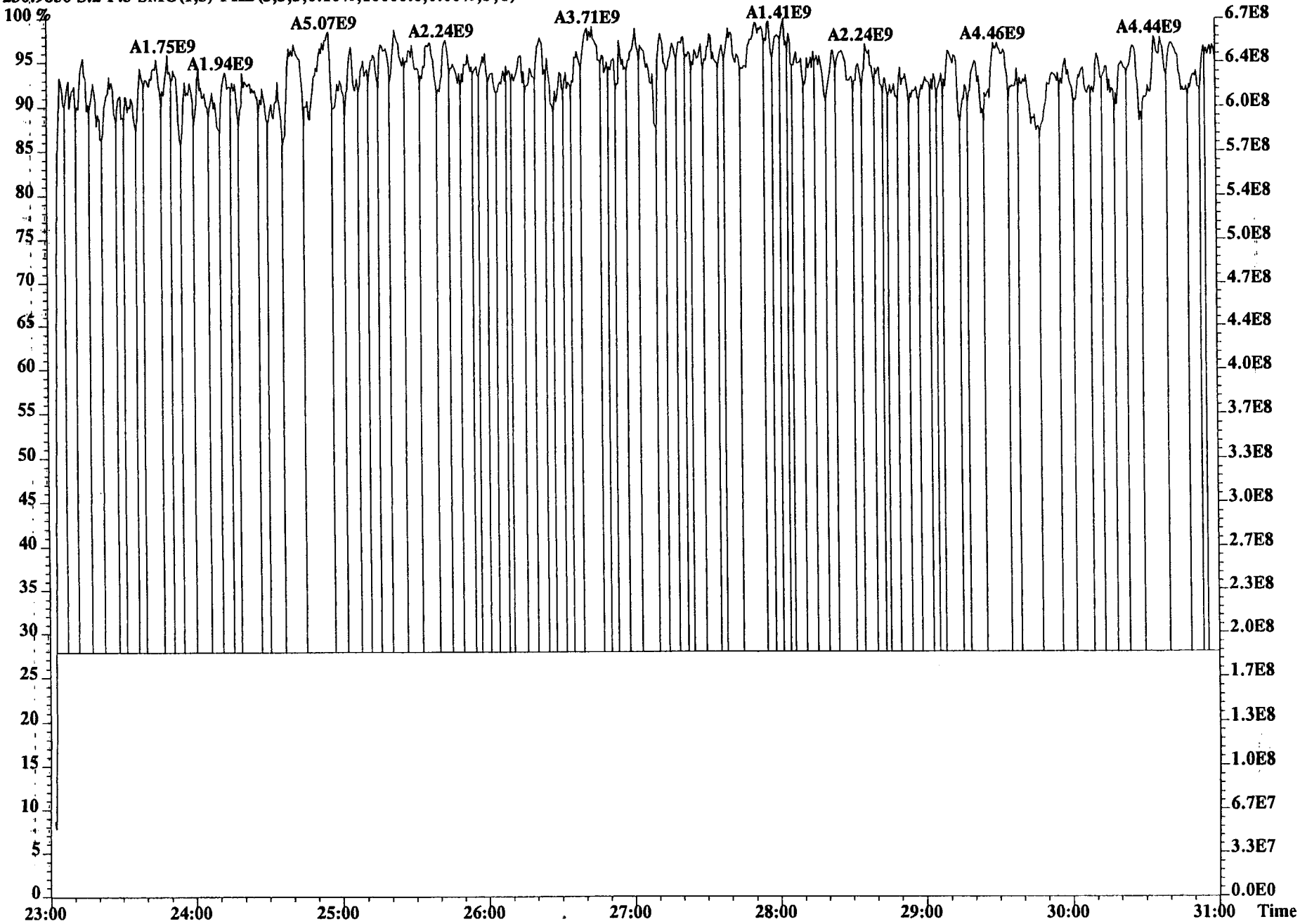
File:03NO98V4 #1-939 Acq: 3-NOV-1998 11:30:10 GC EI+ Voltage SIR 70SE
Sample#2 Text:SB1103 :Solvent Blank :C- Exp:PAHAIR
228.0939 S:2 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



240.1692 S:2 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

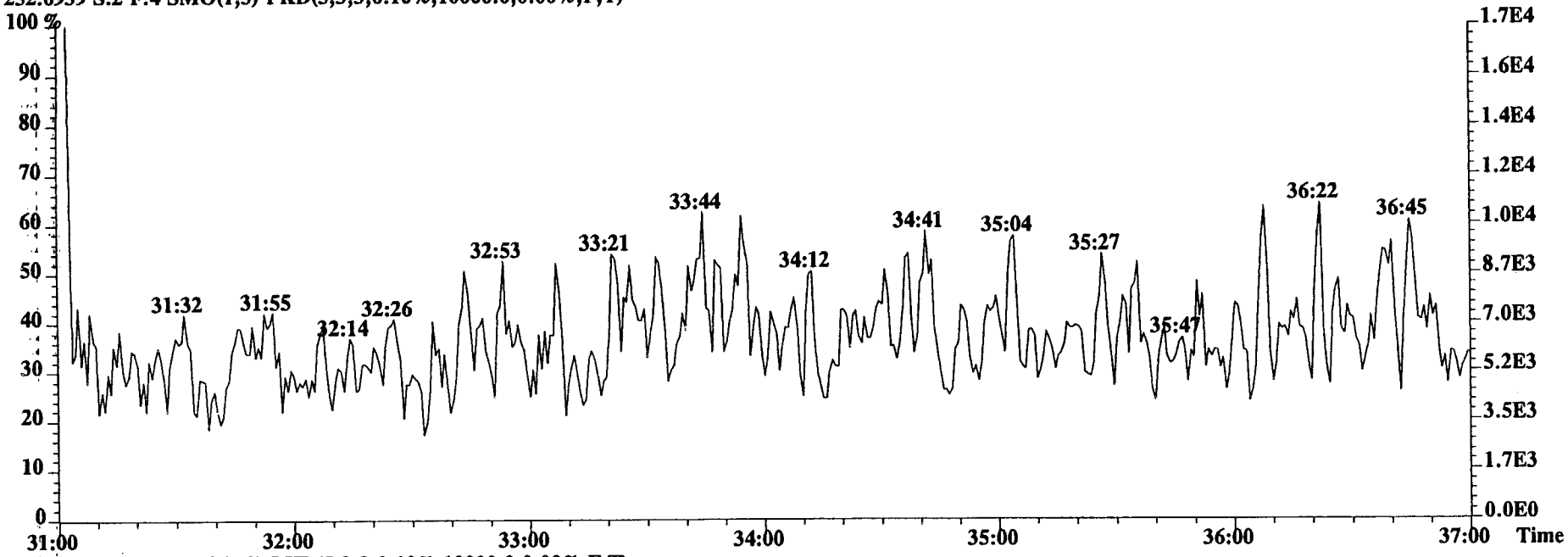


File:03NO98V4 #1-939 Acq: 3-NOV-1998 11:30:10 GC EI+ Voltage SIR 70SE
Sample#2 Text:SB1103 :Solvent Blank :C- Exp:PAHAIR
230.9856 S:2 F:3 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

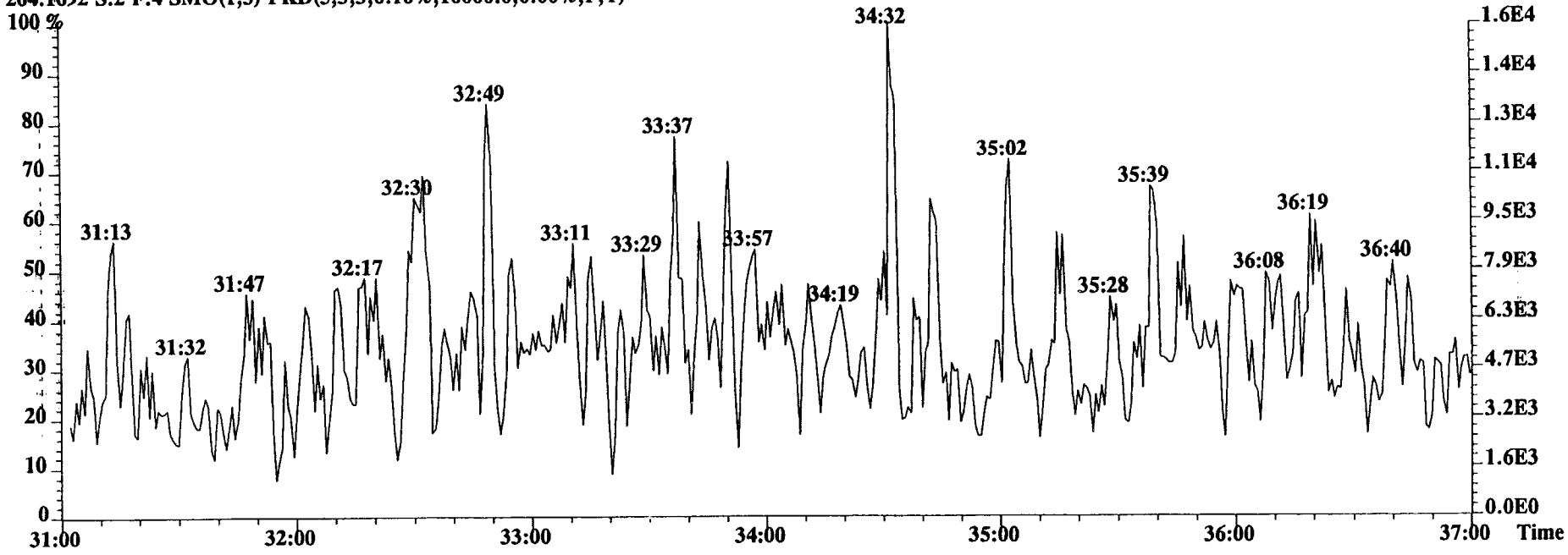


691

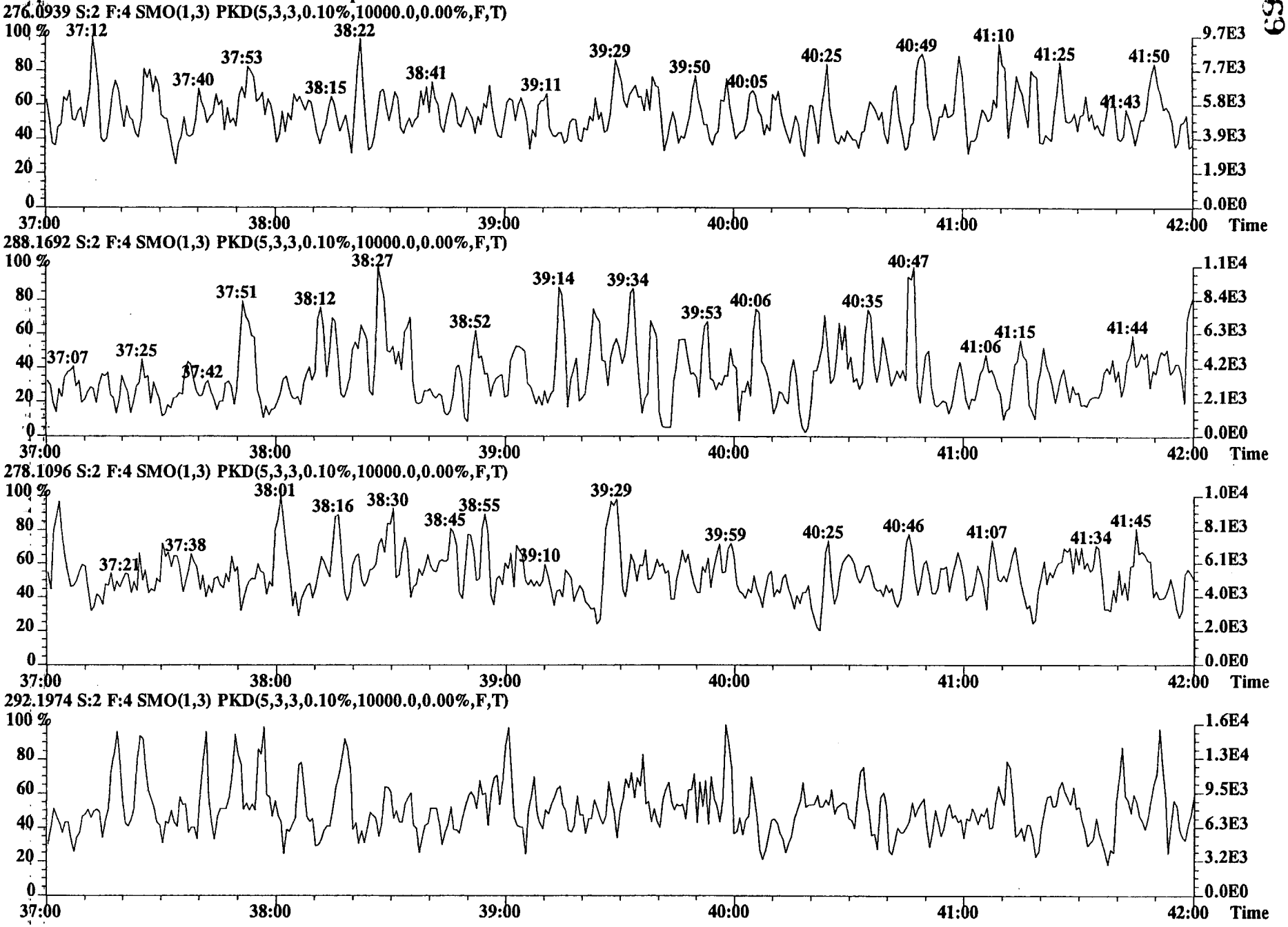
File:03NO98V4 #1-878 Acq: 3-NOV-1998 11:30:10 GC EI+ Voltage SIR 70SE
Sample#2 Text:SB1103 :Solvent Blank :C- Exp:PAHAIR
252.0939 S:2 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



264.1692 S:2 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)

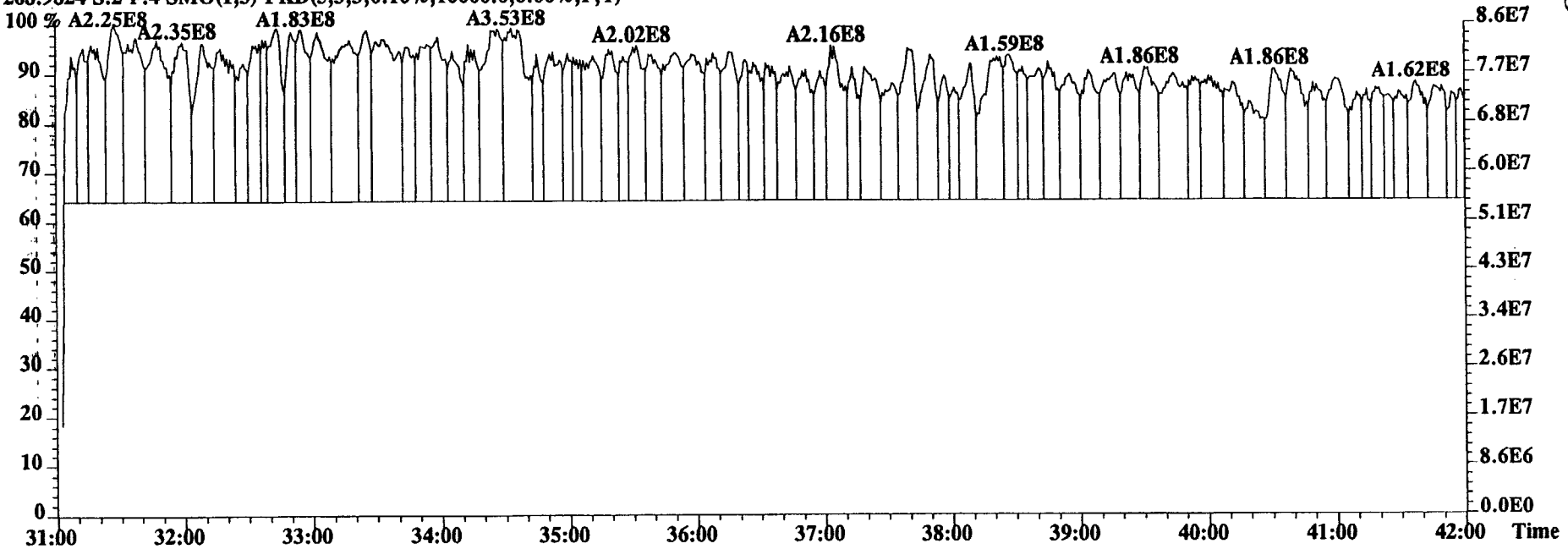


File:03NO98V4 #1-878 Acq: 3-NOV-1998 11:30:10 GC EI+ Voltage SIR 70SE
Sample#2 Text:SB1103 :Solvent Blank :C- Exp:PAHAIR

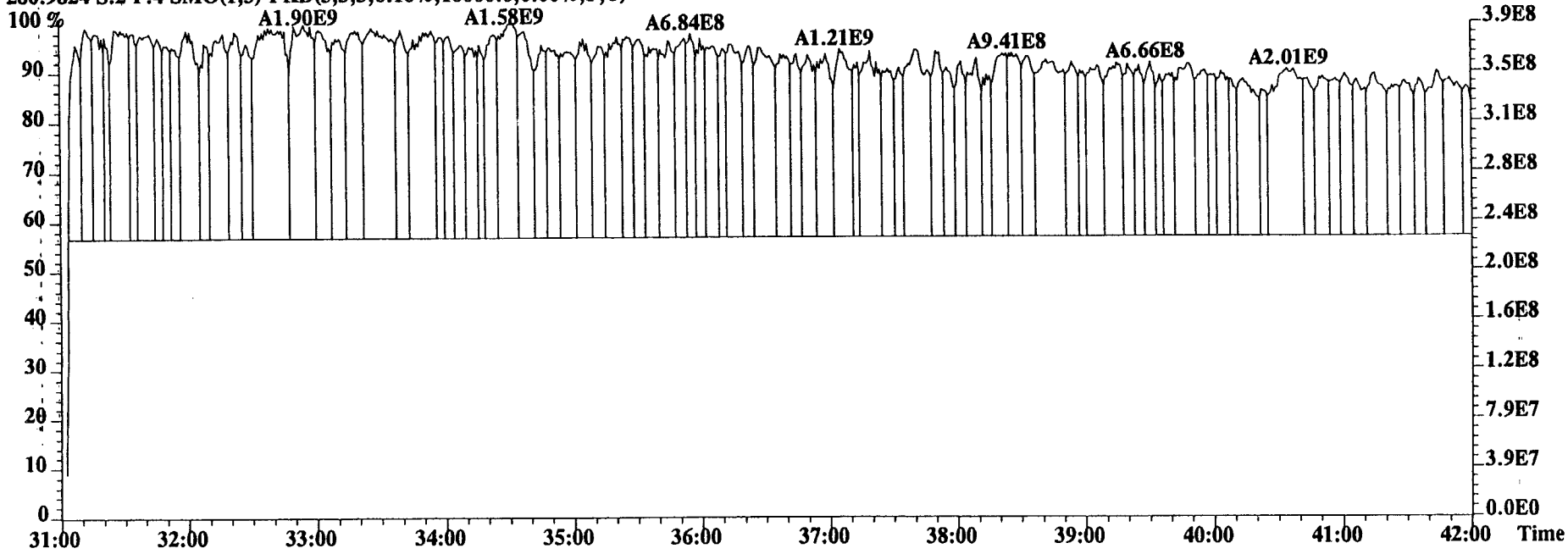


693

File:03NO98V4 #1-878 Acq: 3-NOV-1998 11:30:10 GC EI+ Voltage SIR 70SE
Sample#2 Text:SB1103 :Solvent Blank :C- Exp:PAHAIR
268.9824 S:2 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



280.9824 S:2 F:4 SMO(1,3) PKD(5,3,3,0.10%,10000.0,0.00%,F,T)



Sample Extraction/ Preparation Log Copies

QUANTERRA INCORPORATED

West Sacramento

ADVANCED TECHNOLOGY HIGH RESOLUTION ANALYSIS

CLIENT NAME: Pacific Env Svc.

PROJECT #: 301802 **ANALYSIS:** Method 429

DATE RECEIVED: 10 9.29 DATE TO SUBBING: 10.3 DATE IN PREP: 10.3

LOCATION: W14C, D W17A MATRIX: Air Trains TAT: 28 days

INITIALS: CAW PAGE 1 OF 1

HOLD TIME UP ON: _____ OPS DUE DATE: 10.10 DUE DATE: 10.30

SAMPLE I.D.'S	EXTRACTION	
1-14	SOXHLET	AIR TRAIN
	WW/EE	DILUTION
	SOLVENT QC	613
	SEE BELOW	

QC		^{13}C-INTERNAL STD.		AMT. (ng)	Factor
MB	*		1613 / 8290	2.0 / 4.0	
LCS	*		TCDD/F	2.0	
DCS			MET 23	10.0	
DU		*	MET 429	50.0	2X
MS			MET 428	2.0 / 4.0	
SD			MET 1668	2.0	
			DBD/F	25.0	

%H2O	GRAMS	VOLUME	DILUTION
%LIPIDS			

½ ARCHIVE	SPLIT	½ ALIQUOT

ALIQUOT

CRS	*	NO CRS

OPT C

FULL IFB	UPPER IFB	SILICA GEL

D2	ACID AL^{3+}	BASIC AL^{3+}

MATRIX SPIKE		Factor
CL_4 (tetra)	200 pg	
CL_5 - CL_7 (penta-hepta)	1000 pg	
CL_8 (octa)	2000 pg	
PCB	2.0 ng	
PAH	50.0 ng	2X
DBD/F	25.0 ng	

SAMPLE PRE-PREP	
AS RECEIVED	
DRY	
GRIND	
COMPOSITE	

GC COLUMN	
DB-5	*
DB-225	If needed

		RECOVERY STANDARD		
	1ng		10ng M23	
	2ng		25ng DBD/F	
	2ng PCB	F.V. = 50+450 Plus 1:10 DILUTION:	50ng PAH	X
		C_{14} C_{12} C_{10} C_8		

COMMENTS:
*Combine all fractions for a single analysis

REPORTING LIMIT

GSG

QA-361-MF 01/97

CALLAB-301802

Quanterra Environmental Services, Sacramento -
880 Riverside Parkway

West Sacramento, California 95605
(916) 373-5600

Date Received : 29 SEP 98 15:30

Mr. Ron Kolde
Pacific Environmental Services -
4700 Duke Drive
Suite 150
Mason, Ohio
45040

(513) 398-2556 Fax: (513) 398-3342

Project ID,
EPA Case, RMA Lot : Project 5505.000
AIR-Carb429 092998

P.O. Number : CLC-950302

Delivered By :

Storage Location : W14C,D,W17A

Logged in by : CHYTREK

Airtrain(14) samples received in good condition under Chain-of-Custody
Delivered OTC.

Sample ID	Client's label info	Date/Time Samp.	Containers
301802-0001-MB	Method Blank		Method Blank
301802-0001-SA	A-I-429-1	21 SEP 98	2-AGJ 500AGJ 2-250AGJ PETRI XA
301802-0002-SA	A-I-429-2	22 SEP 98	AGJ 2-500AGJ 2-250AGJ PETRI XA
301802-0003-SA	A-I-429-3	23 SEP 98	3-500AGJ 2-250AGJ PETRI XAD
301802-0004-SA	A-O-429-1	21 SEP 98	AGJ 2-500AGJ 2-250AGJ PETRI XA
301802-0005-SA	A-O-429-2	22 SEP 98	AGJ 2-500AGJ 2-250AGJ PETRI XA
301802-0006-SA	A-O-429-3	23 SEP 98	3-500AGJ 2-250AGJ PETRI XAD
301802-0007-SA	A-U-429-1	24 SEP 98	AGJ 3-500AGJ 250AGJ PETRI XAD
301802-0008-SA	A-U-429-2	24 SEP 98	AGJ 3-500AGJ 250AGJ 2-PETRI XA
301802-0009-SA	A-U-429-3	25 SEP 98	AGJ 2-500AGJ 2-250AGJ PETRI XA
301802-0010-SA	A-U-429-4	25 SEP 98	AGJ 2-500AGJ 2-250AGJ PETRI XA
301802-0011-SA	A-I-429-FB	24 SEP 98	3-500AGJ 2-250AGJ PETRI XAD
301802-0012-SA	A-O-429-FB	24 SEP 98	3-500AGJ 2-250AGJ PETRI XAD
301802-0013-SA	A-U-429-FB	25 SEP 98	500AGJ 4-250AGJ PETRI XAD
301802-0014-SA	A-429-LB	21 SEP 98	4-125AGJ PETRI XAD

Samples not destroyed in testing are retained a maximum
of thirty (30) days unless otherwise requested.

Project Manager: Robert Weidenfeld

Soxhlet portion

** NOT LOG RELEASED! **

QUANTERRA-CALLAB LABORATORY
Chromatography Assignment Sheet

Project #: 301802
Analysis: P-PAH-HR-AIR Ver: 1
Client: Pacific Environmental Services
PA: RWEIDENFELD
Delivery Accepted: MGARCIA 29 SEP 98
Number of Samples: 15
Program: General Airtox

Due Date: 27 OCT 98
Receipt Date: 29 SEP 98
Log Released:
Turnaround: NORMAL
Storage Location: W14C,D,W17A
Earliest Holding Time: 12 OCT 98

Project Description:
14 airtrain samples CARB 429.
All fractions are to be combined for a single analysis per train.

For SA #14, the XAD trap was pulled from the pile of traps that were returned.

Test Modified: N
Sample Instructions: N
Test Instructions: N
Group Instructions: N
QAS #: _____

Date Delivered to PA: _____

Comments:

__ No Problems Occurred with Analysis

✓ See Anomaly Sheet

EXTRACTS are exchanged to Hexane
FC: 1/2SA/5mL.
archive is stored in air tox prep.

All fractions have been combined. SCW 10/9/98

Soxhlet Fraction

QUANTERRA-CALLAB LABORATORY
Analytical Bench Sheet

Project Number: 301802 Date: 03 OCT 98

Test Code: P-PAH-HR-AIR Test Description: Prep - Polynuclear Aromatic Hydrocarbons by HRMS

Turnaround Status: NORMAL Sample Matrix: AIRTRAIN Date Assigned:_____ Prep Completion Due:_____

SOP-Section/Page (Revision):_____

Extractions: [ ] Separatory Funnel [ ] Continuous Liquid/Liquid [ ] Sonication [X] Soxhlet [ ] KD

[ ] Roto Vap [ ] Shaker [ ] Other_____

Samp ID	Holding Time	Sample Size	Extractn Date/ Initials	Adj pH Date/ Initials	Hydrolysis Date/ Initials	Acid Ext Date/ Initials	Conc Date/ Initials	CH2N2 Date/ Initials	N2 Date/ Initials	Final Sample Concentn
0001SA	12 OCT 98	*	10/3/98 SV	NA	NA	NA	10 8 98 SV	NA	10 8 98 SV	1/2 SA/5 mL
0001MB	20 OCT 98									
0002SA	13 OCT 98									
0003SA	14 OCT 98									
0004SA	12 OCT 98									
0005SA	13 OCT 98									
0006SA	14 OCT 98									
0007SA	15 OCT 98									
0008SA	15 OCT 98									
0009SA	16 OCT 98									
0010SA	16 OCT 98									
0011SA	15 OCT 98									
0012SA	15 OCT 98									
0013SA	16 OCT 98									

Project Due: 27 OCT 98 DCS With Project: 301802 DCS Code: 03OCT98-A

LCS With Project:_____ LCS Code:_____

Method Blank With Project:_____ Extraction Includes Project(s):_____

Notes/Comments:
** PLEASE PUT COMMENTS ON ANOMALY SHEET ** MSQC with Project: _____ MSQC Code: _____

Date To Instruments:_____ By:_____ Peer Approval By:_____

* SEE ATTACHED FOR VOLS.

QUANTERRA-CALLAB LABORATORY
Analytical Bench Sheet

Project Number: 301802 Date: 03 OCT 98

Test Code: P-PAH-HR-AIR Test Description: Prep - Polynuclear Aromatic Hydrocarbons by HRMS

Turnaround Status: NORMAL Sample Matrix: AIRTRAIN Date Assigned:_____ Prep Completion Due:_____

SOP-Section/Page (Revision):_____

Extractions: [ ] Separatory Funnel [ ] Continuous Liquid/Liquid [ ] Sonication [X] Soxhlet [ ] KD

[ ] Roto Vap [ ] Shaker [ ] Other_____

Samp ID	Holding Time	Sample Size	Extractn Date/ Initials	Adj pH Date/ Initials	Hydrolysis Date/ Initials	Acid Ext Date/ Initials	Conc Date/ Initials	CH2N2 Date/ Initials	N2 Date/ Initials	Final Sample Concentn
0014SA	12 OCT 98	#	10/3/98 SV	NA	NA	NA	10/8/98 SV	NA	10/8/98 SV	1/ESA/5.0mL
LCS	10/8/98									
~~MB~~	10/8/98									SV 10/8

Project Due: 27 OCT 98 DCS With Project: 301802 DCS Code: 03OCT98-1A

LCS With Project:_____ LCS Code:_____

Method Blank With Project:_____ Extraction Includes Project(s):_____

Notes/Comments:
** PLEASE PUT COMMENTS ON ANOMALY SHEET ** MSQC with Project: _____ MSQC Code: _____

Date To Instruments:_____ By:_____ Peer Approval By:_____

700

QUANTERRA-CALLAB LABORATORY
Quality Assurance Sheet

Project #: 301802 Test: P-PAH-HR-AIR

Quality Assurance/Quality Control:

Sample ID: MB only Spiking Standard Name: PAH Surrogate ^{13}C-fluorene
Spike Code ID: 956-31 Volume: 100µl Conc: 1.0 ng/µl
Spiked By: [illegible] Witness: C Hughes

Sample ID: All Spiking Standard Name: Method 429 PAH IS
Spike Code ID: 265-02 Volume: 100µl Conc:
Spiked By: [illegible] Witness: C Hughes

Sample ID: LCS only Spiking Standard Name: PAH Native Stock II
Spike Code ID: 956-19 Volume: 500µl Conc: 0.2 ng/µl
Spiked By: [illegible] Witness: C Hughes

Sample ID: Spiking Standard Name:
Spike Code ID: Volume: Conc:
Spiked By: Witness:

Solvent: Manufacturer And Lot Number:
Extracting Solvent: $MeCl_2$ M19306
Solvent Keeper:
Transfer Solvent:
Derivatizing Reagent:
Final Solvent: $MeCl_2$ M19306
Other: archive is in $MeCl_2$ EXTRACT was exchange to hexane

Was an aliquot taken? (Y) / N
If yes, how much was aliquoted? 1/2 SA mL 5.0 mL
What was the sample concentration before aliquot? SA / 10 mL

Why was the aliquot taken? archive one half of sample

QUANTERRA-CALLAB LABORATORY
Anomaly Report Form

Project #: 301802 Test: P-PAH-HR-AIR

Anomalies:	Sample(s) Affected:
__ Sample broken during shipping.	_____
__ Limited sample volume.	_____
__ Matrix required a subsample to facilitate extraction.	_____
__ pH of sample required excess acid/base (please circle).	_____
__ Solvent and sample were miscible.	_____
__ Emulsion problems.	_____
__ Emulsion problem required centrifuging.	_____
__ Sample lost during preparation. Re-extraction performed? Yes/No	_____
__ Concentration volume went lower than specified in the SOP.	_____
__ Concentration time longer than normal.	_____
__ Extraction solvent saturated with organic material, therefore sample volume was not concentrated but adjusted based on the screening.	_____
__ Final concentration greater than specified in the SOP due to the screening results.	_____
__ Precipitate observed in the extract.	_____
✓ Other, please comment below.	1-14

Comments: Volumes of all rinses / impinger contents are attached. impinger portion is combined with Soxhlet portion except for MB and ~~LCS~~ 10898 LCS fractions that will analyzed separely

Submitted By: S Valmas Date: 12.8.98

QUANTERRA-CALLAB LABORATORY
Prep (Extraction) Check List

Project #: 301802 Test: P-PAH-HR-AIR

Chemist: Slabmorez Date: 10.8.98

Reviewer: _____ Date: 10/8/98

Number of samples: ~~15~~ Number of extracts: ~~16~~ 18

Benchsheet:	Initiated		Reviewed	
SOP section and page number filled out properly.	Y___	N___	Y___	N___
Each step of extraction procedure initial'ed and dated.	Y___	N___	Y___	N___
Anomalies or deviations from SOP documented.	Y___	N___	Y___	N___
pH adjustments noted.	Y___	N___	Y___	N___
Solvent manufacturer and lot number completed.	Y___	N___	Y___	N___
Volumes and weights of samples to two sig. figs.	Y___	N___	Y___	N___

QA/QC:	Initiated		Reviewed	
DCS/MS forms filled out properly.	Y___	N___	Y___	N___
Spike information correct on bench sheet.	Y___	N___	Y___	N___
Spike witness?	Y___	N___	Y___	N___
If not spiked per SOP, were spike amounts verified?	Y___	N___	Y___	N___

LIMS:	Initiated		Reviewed	
Extraction date (complete date) correct.	Y___	N___	Y___	N___
QC lot number present and correct.	Y___	N___	Y___	N___
QC Run number present and correct.	Y___	N___	Y___	N___
Prep released (date extract goes to Inst.).	Y___	N___	Y___	N___

Extracts:	Initiated		Reviewed	
Number of extracts agree with benchsheet.	Y___	N___	Y___	N___
Concentrations of extract agree with benchsheet.	Y___	N___	Y___	N___
Testtube rack labelled with project id and test.	Y___	N___	Y___	N___

Comments:

Sep funnel Portion

** NOT LOG RELEASED! **

QUANTERRA-CALLAB LABORATORY
Chromatography Assignment Sheet

Project #: 301802
Analysis: P-PAH-HR-AIR Ver: 1
Client: Pacific Environmental Services
PA: RWEIDENFELD
Delivery Accepted: MGARCIA 29 SEP 98
Number of Samples: 15
Program: General Airtox

Due Date: 27 OCT 98
Receipt Date: 29 SEP 98
Log Released:
Turnaround: NORMAL
Storage Location: W14C,D,W17A
Earliest Holding Time: 12 OCT 98

Project Description:
14 airtrain samples CARB 429.
All fractions are to be combined for a single analysis per train.

For SA #14, the XAD trap was pulled from the pile of traps that were returned.

Test Modified: N
Sample Instructions: N
Test Instructions: N
Group Instructions: N
QAS #: _____

Date Delivered to PA: _____

Comments:

__ No Problems Occurred with Analysis

✓ See Anomaly Sheet

QUANTERRA-CALLAB LABORATORY
Analytical Bench Sheet

Project Number: 301802 Date: 04 OCT 98

Test Code: P-PAH-HR-AIR Test Description: Prep - Polynuclear Aromatic Hydrocarbons by HRMS

Turnaround Status: NORMAL Sample Matrix: AIRTRAIN Date Assigned:_____ Prep Completion Due:_____

SOP-Section/Page (Revision):_____

Extractions: [X] Separatory Funnel [ ] Continuous Liquid/Liquid [ ] Sonication [ ] Soxhlet [ ] KD

[ ] Roto Vap [ ] Shaker [ ] Other_____

Samp ID	Holding Time	Sample Size	Extractn Date/ Initials	Adj pH Date/ Initials	Hydrolysis Date/ Initials	Acid Ext Date/ Initials	Conc Date/ Initials	CH2N2 Date/ Initials	N2 Date/ Initials	Final Sample Concentn
0001SA	12 OCT 98	*	10/2/98 SV	NA	NA	NA	10/6/98 SV	NA	10/6/98 SV	Combined with SX.
0001MB	20 OCT 98									
0002SA	13 OCT 98									
0003SA	14 OCT 98									
0004SA	12 OCT 98									
0005SA	13 OCT 98									
0006SA	14 OCT 98									
0007SA	15 OCT 98									
0008SA	15 OCT 98									
0009SA	16 OCT 98									
0010SA	16 OCT 98									
0011SA	15 OCT 98									
0012SA	15 OCT 98									
0013SA	16 OCT 98									

Project Due: 27 OCT 98 DCS With Project: 301802 DCS Code: 04OCT98-16B

LCS With Project:_____ LCS Code:_____

Method Blank With Project:_____ Extraction Includes Project(s):_____

Notes/Comments:
** PLEASE PUT COMMENTS ON ANOMALY SHEET ** MSQC with Project: _____ MSQC Code: _____

* - SEE Volumes attached

Date To Instruments:_____ By:_____ Peer Approval By:_____

QUANTERRA-CALLAB LABORATORY
Analytical Bench Sheet

Project Number: 301802 Date: 04 OCT 98

Test Code: P-PAH-HR-AIR Test Description: Prep - Polynuclear Aromatic Hydrocarbons by HRMS

Turnaround Status: NORMAL Sample Matrix: AIRTRAIN Date Assigned:_____ Prep Completion Due:_____

SOP-Section/Page (Revision):_____

Extractions: (X) Separatory Funnel [ ] Continuous Liquid/Liquid [ ] Sonication [ ] Soxhlet [ ] KD

[ ] Roto Vap [ ] Shaker [ ] Other_____

Samp ID	Holding Time	Sample Size	Extractn Date/ Initials	Adj pH Date/ Initials	Hydrolysis Date/ Initials	Acid Ext Date/ Initials	Conc Date/ Initials	CH2N2 Date/ Initials	N2 Date/ Initials	Final Sample Concentn
0014SA	12 OCT 98	*	100498 SV	NA	NA	NA	100898 SV	NA	10898 SV	Combined with SOX
LCS		↓	↓	↓	↓	↓	↓	↓	↓	↓

Project Due: 27 OCT 98 DCS With Project: 301802 DCS Code: C4OCTG8-16B

LCS With Project:_____ LCS Code:_____

Method Blank With Project:_____ Extraction Includes Project(s):_____

Notes/Comments:
** PLEASE PUT COMMENTS ON ANOMALY SHEET ** MSQC with Project: _____ MSQC Code: _____

* See volumes attached

706

Date To Instruments:_____ By:_____ Peer Approval By:_____

QUANTERRA-CALLAB LABORATORY
Quality Assurance Sheet

Project #: Test:

Quality Assurance/Quality Control:

Sample ID: ALL Spiking Standard Name: ^{13}C-Benzo(ghi) perylene
Spike Code ID: 956-33 Volume: 100µl Conc: 1 ng/µl
Spiked By: SV Witness: K. Shox

Sample ID: LCS only Spiking Standard Name: Method 429 PAH Native Stock II
Spike Code ID: 956-19 Volume: 500µl Conc: 0.2 ng/ml
Spiked By: SV Witness: K. Shox

Sample ID: Spiking Standard Name:
Spike Code ID: Volume: Conc:
Spiked By: Witness:

Sample ID: Spiking Standard Name:
Spike Code ID: Volume: Conc:
Spiked By: Witness:

Solvent: Manufacturer And Lot Number:
Extracting Solvent: $MeCl_2$ M 19306
Solvent Keeper:
Transfer Solvent:
Derivatizing Reagent:
Final Solvent:
Other:

Was an aliquot taken? Y (N) * Extract combined with soxfraction SV 10/8/95
If yes, how much was aliquoted? mL mL
What was the sample concentration before aliquot?

Why was the aliquot taken?

QUANTERRA-CALLAB LABORATORY
Anomaly Report Form

Project #: 301802 Test: P-PAH-HR-AIR

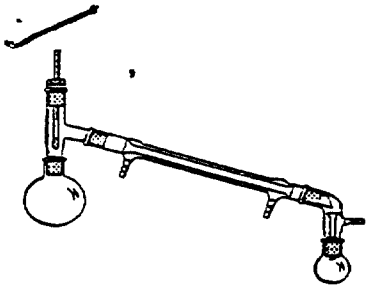
Anomalies:	Sample(s) Affected:
__ Sample broken during shipping.	_____
__ Limited sample volume.	_____
__ Matrix required a subsample to facilitate extraction.	_____
__ pH of sample required excess acid/base (please circle).	_____
__ Solvent and sample were miscible.	_____
__ Emulsion problems.	_____
__ Emulsion problem required centrifuging.	_____
__ Sample lost during preparation. Re-extraction performed? Yes/No	_____
__ Concentration volume went lower than specified in the SOP.	_____
__ Concentration time longer than normal.	_____
__ Extraction solvent saturated with organic material, therefore sample volume was not concentrated but adjusted based on the screening.	_____
__ Final concentration greater than specified in the SOP due to the screening results.	_____
__ Precipitate observed in the extract.	_____
✓ Other, please comment below.	1-14

Comments:
Sep funnel extract is combined with soxhlet portion except MB and LCS which will be analyzed separately.

Submitted By: [signature] Date: 10-8-98

Project 301802 Volumes

Sample #	Front Rinse	Filter/condenser rinse	Knockout	Trap contents	Imp rinse
1	310.7	83.	343	211	95
2	426.7	136	213	200	92
3	330	103	128	194	389
4	205	115	177	213	160
5	234	112	126	245	113
6	218	172	147	192	445
7	317	178	212	215	325
8	172	160	508	183	258
9	309	127	364	264	196
10	408	112	475	233	213
11	152	63	119	156	90
12	334	108	131	465	201
13	372	147	105	213	139
14	64	80	—	98	122
	Hexane	Acetone		$NaHCO_3$ / Na_2CO_3	$MeCl_2$



QUANTERRA INCORPORATED

West Sacramento

ADVANCED TECHNOLOGY HIGH RESOLUTION PREP

Methods 23, 428, 429, 1668, and T-O IX

BENCHSHEET FOR EXTRACTION OF AIR MEDIA

PROJECT #: 301802 **ANALYSIS:** 429

MATRIX: _____ TAT: _____

DATE RECEIVED: _____ DATE IN PREP: _____ DUE DATE: 10/30/98

GCMS LOCATION: _____ DATE TO GCMS: _____

EXTRACTION TYPE: SOXHLET 613 DILUTION OTHER: _____

SOLVENT TYPE: TOLUENE HEXANE DCM OTHER: _____

	SAMPLE ID	Sample Size	613 Date/Int.	Soxhlet Date/Int.	Silica Gel Date/Int.	Upper IFB Date/Int.	Lower IFB Date/Int.	IFB Date/Int.	Special D2 Date/Int.
SOX <	1 MB				10/22/98 MGO				
	1 LCS								
impinger	1 MB								
	1 LCS								
	1								
	2								
	3								
	4								
	5								
	6								
	7								
	8								

(All Samples) I.S. Added: See attached by: _____ Witness: _____ Date: _____

(LCS/MS/SD) PAR/Nat. Added: _____ by: _____ Witness: _____ Date: _____

(MB Only) Surrogate Added: _____ by: _____ Witness: _____ Date: _____

(All Samples) R.S. Added: 50ul/265-03 by: BOH Witness: MGO Date: 10-23-98

Associated QC: None Associated Projects: None

Dilution @ Extraction? No Yes (describe)

Split of Extract? No Yes (describe)

Dilution @ Final Volume? No Yes 1:5 1:10 C_8 C_{10} C_{12} C_{14}

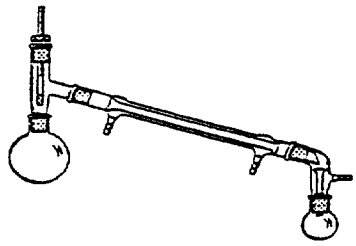
BOH 10-23-98

710

QA-236-MF 11/97

QUANTERRA INCORPORATED

West Sacramento



ADVANCED TECHNOLOGY HIGH RESOLUTION PREP

Methods 23, 428, 429, 1668, and T-O IX

BENCHSHEET FOR EXTRACTION OF AIR MEDIA

PROJECT #: 301802 ANALYSIS: 429

MATRIX: AIRTRAIN TAT: _____

DATE RECEIVED: _____ DATE IN PREP: _____ DUE DATE: 10/30/98

GCMS LOCATION: _____ DATE TO GCMS: _____

EXTRACTION TYPE: ~~SOXHLET~~ 613 DILUTION OTHER: _____

SOLVENT TYPE: ~~TOLUENE~~ ~~HEXANE~~ DCM OTHER: _____

SAMPLE ID	Sample Size	613 Date/Int.	Soxhlet Date/Int.	Silica Gel Date/Int.	Upper IFB Date/Int.	Lower IFB Date/Int.	IFB Date/Int.	Special D2 Date/Int.
9				10/22 Rg INSO				
10								
11								
12								
13								
14								

(All Samples) I.S. Added: See attached by: _____ Witness: _____ Date: _____

(LCS/MS/SD) PAR/Nat. Added: _____ by: _____ Witness: _____ Date: _____

(MB Only) Surrogate Added: _____ by: _____ Witness: _____ Date: _____

(All Samples) R.S. Added: 50ul/265-03 by: BDH Witness: MEO Date: 10-23-98

Associated QC: Above Associated Projects: None

711

Dilution @ Extraction? No Yes (describe)

Split of Extract? No Yes (describe)

Dilution @ Final Volume? No Yes 1:5 1:10 C_8 C_{10} C_{12} C_{14}

10-23-98 BDH

QA-236-MF 11/97

Quanterra Environmental Services

Quanterra - Sacramento
Data Checklist
High Resolution Analyses

CAL ID: 301902-1-14 Method ID: PAH's (MOD 429)

	DB-5	DB-225
Data Analyst:	CP	XA
Date initiated:	11/4/98	
Reviewer:	ES	
Date reviewed:	11/5/98	

QA/QC verification:	Initiated		Reviewed	
-Daily standard package(s) present?	DB-5 ✓ (1)	225	DB-5 (1) ✓	225
-Method Blank present?	DB-5 ✓ (5)	225	DB-5 (5) ✓	225
-LCS copy present?	DB-5 ✓ (2)	225	DB-5 (2) ✓	225
-Internal standard recoveries within limits?*	DB-5 ✓ (3)	225	DB-5 (3)	225
-Ion ratios within ± 15% of theoretical values?	DB-5 ✓	225	DB-5 ✓	225
-Other QC (Dup,MS,SD) within specs?**	DB-5 NA	225	DB-5 NA	225

Sample Analysis:	Initiated		Reviewed?	
-Correct sample aliquot used?	DB-5 ✓	225	DB-5 ✓	225
-All raw data present?	DB-5 ✓	225	DB-5 ✓	225
-Standard ~~target DL~~'s used? (If not, specify below.) RLs x DILUTION 10X 100X	DB-5 100ng/100ng	225	DB-5 10ng (NOT DILUTED)	225
-DL's below ~~target detection~~ limits?	DB-5 ✓	225	DB-5 ✓	225
-All positives reported at levels greater than method blank DL's?	DB-5 (5)	225	DB-5 (5)	225
-Any analytes saturated?	DB-5 (4)	225	DB-5 (4) ✓	225
-Correct RRF's used for method?	DB-5 ✓	225	DB-5 ✓	225
-Internal standard amounts correct for method?	DB-5 ✓	225	DB-5 ✓	225
-Dilution/splitting of extract taken into account?	DB-5 ✓	225	DB-5 ✓	225
-Acquisition date/time correct?	DB-5 ✓	225	DB-5 ✓	225
-Manual integrations checked?	DB-5 ✓	225	DB-5 ✓	225

* SEE ELECTRONIC ANOMALY

Comments: (Use other side if necessary)

(1) see ✓ list comments for std's
(2) LCS RT'd for fluorene
(3) Some low recoveries <50% OK w/ flags. Other low recovery <20% has adverse impact. Flag/annate as matrix effect
(4) Saturated analytes RT'd at 100X dilution
(5) Some MB positives, most samples w/ much higher levels. MB consistent w/ XAD background levels.

* Recovery limits:		** RPD limits:
NCASI 551:	40-120% (20-39% OK if S/N=10:1 for IS)	50%
Method 8290:	40-135%	20%
Method 1613:	25-150%	50%
Method 23:	40-130%(C14-C16), 25-130%(C17-8), 70-130%(surr.)	50%
CARB 428:	40-120% (out of limits OK if S/N=10:1 for IS)	50%
CARB 429	50-150%	50%
PCBs:	25-150%	50%
DBP/DBF:	20-150%	50%

712

TECHNICAL REPORT DATA

Please read instructions on the reverse before completing

1. REPORT NO. EPA-454/R-99-002b	2.	3. RECIPIENT'S ACCESSION NO.
4. TITLE AND SUBTITLE Final Report - Emissions Testing of Combustion Stack and Pushing Operations at Coke Battery No. 5/6 at ABC Coke in Birmingham, Alabama Volume II of III		5. REPORT DATE February 1999 6. PERFORMING ORGANIZATION CODE
7. AUTHOR(S) Franklin Meadows Daniel F. Scheffel		8. PERFORMING ORGANIZATION REPORT NO.
9. PERFORMING ORGANIZATION NAME AND ADDRESS Pacific Environmental Services, Inc. Post Office Box 12077 Research Triangle Park, North Carolina 27709-2077		10. PROGRAM ELEMENT NO. 11. CONTRACT/GRANT NO. 68-D-98-004
12. SPONSORING AGENCY NAME AND ADDRESS U.S. Environmental Protection Agency Office of Air Quality Planning and Standards Emissions, Monitoring and Analysis Division Research Triangle Park, North Carolina 27711		13. TYPE OF REPORT AND PERIOD COVERED Final 14. SPONSORING AGENCY CODE

15. SUPPLEMENTARY NOTES

16. ABSTRACT

The United States Environmental Protection Agency (EPA) is investigating the coke making industry to characterize hazardous air pollutants (HAPs) emitted from coke pushing operations and combustion (underfire) stacks. This test report addresses pushing emissions from a coke oven, and emissions from the combustion (underfire) stack that serves Coke Battery No. 5/6 at ABC Coke in Birmingham, Alabama. The purpose of this test program was to quantify emissions from the inlet and outlet of the baghouse controlling emissions from the coke pushing operation and to quantify emissions from the combustion outlet stack. The data may be used by the EPA in the future to support a residual risk assessment for coke oven facilities.

The testing was performed to quantify uncontrolled and controlled air emissions of filterable particulate matter (PM), methylene chloride extractable matter (MCEM) and 19 polycyclic aromatic hydrocarbons (PAHs) including acenaphthene, acenaphthylene, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(e)pyrene, benzo(k)fluoranthene, benzo(ghi)perylene, chrysene, dibenzo(a,h)anthracene, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, 2-methylnapthalene, napthalene, perylene, phenanthrene, and pyrene. In addition, following the PM and MCEM analyses, the samples were analyzed to screen for the presence of 17 trace metals. Baghouse dust samples were also collected and analyzed for 16 trace metals. Simultaneous testing was performed at the inlet and outlet of the baghouse controlling emissions from the coke pushing operation. Sampling was also performed on the combustion outlet stack. In addition to pollutant testing, oxygen (O_2) and carbon dioxide (CO_2) were measured at each location. During the sampling program, Research Triangle Institute (RTI), another EPA contractor, monitored and recorded process and emission control system operating parameters.

This volume (Volume II) is comprised of 726 pages and consists of Appendix C (Analytical Data -CARB 429).

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTIONS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COASTI Field/Group
Baghouse Coke Ovens Emission Measurements Hazardous Air Pollutants Metals Methylene Chloride Extractable Matter Particulate Matter Polycyclic Aromatic Hydrocarbons		

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Agency

Office of Air Quality
Planning and Standards
Research Triangle Park, NC 27711

EPA-454/R-99-002c
February 1999

AIR

EPA

Final Report - Volume III of III

Emissions Testing of Combustion Stack and Pushing Operations at Coke Battery No. 5/6 at ABC Coke in Birmingham, Alabama

Office of Air Quality
Clean Air
OAQPS
Planning and Standards

FINAL REPORT
EMISSIONS TESTING OF COMBUSTION STACK AND COKE PUSHING OPERATIONS AT COKE BATTERY NO. 5/6 AT ABC COKE IN BIRMINGHAM, ALABAMA

Volume III
Appendices E through H

EPA Contract No. 68-D-98-004
Work Assignment No. 2-02

Prepared for:

John C. Bosch, Jr. (MD-19)
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SCGA, EMC, EMAD, OAQPS
U.S. Environmental Protection Agency
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February 1999
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APPENDIX E

CALCULATIONS

Nomenclature and Dimensions

An	=	Cross-sectional area of sampling nozzle, ft^2
As	=	Cross-sectional area of stack, ft^2
Bws	=	Proportion by volume of water vapor in the gas stream, dimensionless
Cp	=	Pitot tube coefficient, dimensionless
Cs	=	Concentration of pollutant matter in stack gas-dry basis, grains per dry standard cubic foot (gr/dscf)
%CO	=	Percent of carbon monoxide by volume, dry basis
$\%CO_2$	=	Percent of carbon dioxide by volume, dry basis
ΔH	=	Average pressure drop across the sampling meter flow orifice, inches of water (in. H_2O)
GCV	=	Gross calorific value, Btu/lb
I	=	Percent of isokinetic sampling
La	=	Maximum acceptable leakage rate for either a pretest leak check or for a leak check following a component change/ equal to 0.020 cubic foot per minute or 4% of the average sampling rate, whichever is less
Md	=	Dry molecular weight, lb/lb-mole
Mn	=	Total amount of pollutant matter collected, milligrams (mg)
Ms	=	Molecular weight of stack gas (wet basis), lb/lb-mole
$\%N_2$	=	Percent of nitrogen by volume, dry basis
$\%O_2$	=	Percent of oxygen by volume, dry basis
ΔP	=	Velocity head of stack gas, inches of water (in. H_2O)
Pbar	=	Barometric pressure, inches of mercury (in. Hg)
Ps	=	Absolute stack gas pressure, inches of mercury (in. Hg)
Pstd	=	Gas pressure at standard conditions, inches of mercury (29.92 in. Hg)

pmr	=	Pollutant matter emission rate, pounds per hour (lb/hr)
Qs	=	Volumetric flow rate - wet basis at stack conditions, actual cubic feet per minute (acfm)
Qsstd	=	Volumetric flow rate - dry basis at stack conditions, actual cubic feet per minute (dscfm)
Tm	=	Average temperature of dry gas meter, °R
Ts	=	Average temperature of stack gas, °R
Tstd	=	Temperature at standard conditions, 528°R
Vlc	=	Total volume of liquid collected in impingers, ml
Vsg	=	Volume of moisture collected in silica gel, grams
Vm	=	Volume of dry gas sampled at meter conditions, ft^3
Vmstd	=	Volume of dry gas sampled at standard conditions, ft^3
Vs	=	Average stack gas velocity at stack conditions, ft/s
Vwstd	=	Volume of water vapor at standard conditions, scf
γ	=	Dry gas meter calibration factor, dimensionless
Θ	=	Total sampling time, minutes

NOTE: Standard conditions = 68°F and 29.92 in. Hg

Example Calculations for Pollutant Emissions

1. **Volume of dry gas sampled corrected to standard conditions, ft3.**
   Note: Vm must be corrected for leakage if any leakage rates exceed La.

$$Vmstd = 17.647 * Vm * \gamma * \frac{Pbar + \frac{\Delta H}{13.6}}{Tm,\ °R}$$

2. **Volume of water vapor at standard conditions, ft^3.**

$$Vmstd = 0.04707 * Vlc + 0.04715 * Vsg$$

3. **Moisture content in stack gas, dimension less.**

$$Bws = \frac{Vwstd}{Vwstd + Vmstd}$$

4. **Dry molecular weight of stack gas, lb/lb -mole.**

$$Md = 0.44 * \%CO_2 + 0.32 * \%O_2 + 0.28 * (\%N_2 + \%CO)$$

5. **Molecular weight of stack gas, lb/lb-mole.**

$$Ms = Md\ (1\text{-}Bws) + 18 * BWS$$

6. **Stack velocity at stack conditions, f/s.**

$$Vs = 85.49 * Cp * ave\sqrt{\Delta P} * \sqrt{\frac{Ts,\ °R}{Ps * Ms}}$$

7. **Stack gas volumetric flow rate at stack conditions, cfm.**

$$Qs = 60 * Vs * As$$

8. **Dry stack gas volumetric flow rate at standard conditions, cfm.**

$$Qsstd = 17.647 * Qs * \frac{Ps}{Ts,\ °R} * (1 - Bws)$$

9. Concentration in gr/dscf.

$$Cs = 0.01543 * \frac{Mn}{Vmstd}$$

10. Concentration in lb/dscf.

$$Cs,\ lb/dscf = \frac{gr/dscf}{7000}$$

11. Pollutant mass emission rate, lb/hr.

$$Pmr,\ lb/hr = lb/dscf * Qsstd * 60$$

12. Pollutant mass emission rate, lb/MMBtu.

$$pmr,\ lb/MMBtu = \frac{pmr,\ lb/hr}{MMBtu/hr}$$

13. F-factor, Fd.

$$Fd = \frac{10^6 * (3.64 * \%H) + (1.53 * \%C) + (0.57 * \%S) + (0.14 * \%N) - (0.46 * \%O_2)}{GCV\ (Btu/lb)}$$

14. F-factor, pollutant mass emission rate, lb/MMBtu.

$$= \frac{lb/dscf * F * 20.9}{(20.9 - \%O_2)}$$

15. Heat imput, MMBtu/hr fuel.

$$= \frac{GVC\ (Btu/lb) * Feed\ Rate\ (lb/hr)}{10^6}$$

16. Heat input, MMBtu/hr, F-factor.

$$= \frac{Qsstd}{Fd} * ((20.9 - \%O_2) + 20.9) * 60$$

Summary of Stack Gas Parameters and Test Results
S512.000
ABC Coke - Birmingham, Alabama
US EPA Test Method 315 - EOM/Particulate Matter/Metals
Baghouse Inlet

	RUN NUMBER	***A-I-315-1***	***A-I-315-2***	***A-I-315-3***	
	RUN DATE	***9/21/98***	***9/22/98***	***9/23/98***	***Average***
	RUN TIME	***1128-1911***	***1018-1816***	***1016-1800***	
	MEASURED DATA				
P_{static}	Stack Static Pressure, inches H_2O	-5.90	-4.50	-5.50	-5.30
y	Meter Box Correction Factor	1.004	1.004	1.004	1.004
P_{bar}	Barometric Pressure, inches Hg	29.70	29.74	29.80	29.75
V_m	Sample Volume, ft^3	192.272	103.570	152.489	149.444
$Dp^{1/2}$	Average Square Root Dp, (in. $H_2O)^{1/2}$	0.6287	0.3760	0.5372	0.5140
DH	Avg Meter Orifice Pressure, in. H_2O	0.7221	0.3016	0.7612	0.5950
T_m	Average Meter Temperature, °F	111	113	109	111
T_s	Average Stack Temperature, °F	138	154	137	143
V_{lc}	Condensate Collected, ml	115.5	44.9	57.7	72.7
CO_2	Carbon Dioxide content, % by volume	0.2	0.2	0.2	0.2
O_2	Oxygen content, % by volume	20.2	20.3	20.3	20.3
N_2	Nitrogen content, % by volume	79.6	79.5	79.5	79.5
C_p	Pitot Tube Coefficient	0.84	0.84	0.84	0.84
	Circular Stack? 1=Y,0=N:	0	0	0	
As	Diameter or Dimensions, inches:	4680	4680	4680	4680
Q	Sample Run Duration, minutes	458	421.4	435	438
D_n	Nozzle Diameter, inches	0.192	0.192	0.192	0.192
Push	Tons of Coke pushed	257.46	281.98	269.72	269.72
	Total Test Time, hours	7.72	7.97	7.73	7.81
	Tons of Coke per Hour	33.3	35.4	34.9	34.5
	CALCULATED DATA	**All Calculations are on Time Weighted Average Basis**			
A_n	Nozzle Area, ft^2	0.000201	0.000201	0.000201	0.000201
$V_{m(std)}$	Standard Meter Volume, ft^3	177.437	95.274	141.706	138.139
$V_{m(std)}$	Standard Meter Volume, m^3	5.024	2.698	4.013	3.912
Q_m	Average Sampling Rate, dscfm	0.387	0.226	0.326	0.313
P_s	Stack Pressure, inches Hg	29.27	29.41	29.40	29.36
B_{ws}	Moisture, % by volume	3.0	2.2	1.9	2.3
$B_{ws(sat)}$	Moisture (at saturation), % by volume	19.0	28.3	18.5	21.9
V_{wstd}	Standard Water Vapor Volume, ft^3	5.437	2.113	2.716	3.422
$1-B_{ws}$	Dry Mole Fraction	0.970	0.978	0.981	0.977
M_d	Molecular Weight (d.b.), lb/lb•mole	28.84	28.84	28.84	28.84
M_s	Molecular Weight (w.b.), lb/lb•mole	28.52	28.61	28.64	28.59
V_s	Stack Gas Velocity, ft/s	38.2	23.1	32.5	31.3
A	Stack Area, ft^2	32.5	32.5	32.5	32.50
Q_a	Stack Gas Volumetric flow, acfm	74,526	44,982	63,350	60,952
Q_s	Stack Gas Volumetric flow, dscfm	62,426	37,181	53,989	51,199
Q_s	Stack Gas Volumetric flow, dscmm	1,768	1,053	1,529	1,450
I	Isokinetic Sampling Ratio, %	100.3	98.3	97.6	98.7

Method 315 Analytical Results (g) and Blank Corrections
ABC Coke - Birmingham, Alabama
Baghouse Inlet

All Weights are listed in grams

Run No.	Filters		Acetone-FHR	MeCl2 -FHR	Acetone-BHR	MeCl2 -BHR	H2O Imp. Rinse		Corrected Total
	PM	MCEM	PM	MCEM	MCEM	MCEM	MCEM	PM	MCEM
A-I-315-1	0.8754	0.0009	0.0794	0.0008	0.0005	0.0084	0.0008	**0.9545**	**0.0112**
A-I-315-2	0.8613	0.0003	0.1277	0.0003	0.0001	0.0059	0.0003	**0.9887**	**0.0067**
A-I-315-3	1.0267	0.0002	0.0925	0.0002	0.0007	0.0029	0.0002	**1.1189**	**0.0040**
Blank Values	0.0001	0.0000	0.0002	0.0000	0.0000	0.0001	0.0001	**0.0003**	**0.0002**

Summary of Stack Gas Parameters and Test Results
S512.000
ABC Coke - Birmingham, Alabama
US EPA Test Method 315 - EOM/Particulate Matter
Baghouse Inlet

	RUN NUMBER	*A-I-315-1*	*A-I-315-2*	*A-I-315-3*	
	RUN DATE	*9/21/98*	*9/22/98*	*9/23/98*	*Average*
	RUN TIME	*1128-1911*	*1018-1816*	*1016-1800*	
	EMISSIONS DATA				
	EMISSIONS DATA				
	Particulate Matter				
PM	Total Catch, g	0.9545	0.9887	1.1189	1.0207
C_{PM} @ 7% O_2	Concentration, gr/dscf @ 7% O2	1.6484	3.7100	2.8229	2.7271
C_{PM} @ 7% O_2	Concentration, g/dscm @ 7% O2	3.77E+06	8.49E+06	6.46E+06	6.24E+06
C_{PM}	Concentration, µg/dscm	1.90E+05	3.66E+05	2.79E+05	2.78E+05
E_{PM}	Emission Rate, µg/hr	2.01E+10	2.32E+10	2.56E+10	2.30E+10
C_{PM}	Concentration, gr/dscf	0.083	0.160	0.122	0.122
C_{PM}	Concentration, lb/dscf	1.19E-05	2.29E-05	1.74E-05	1.74E-05
E_{PM}	Emission Rate, lb/hr	44.4	51.0	56.4	50.6
Push	Pounds per Ton of Coke Pushed	1.33E+00	1.44E+00	1.62E+00	1.46E+00
	Extractable Organic Matter				
EOM	Total Catch, g	0.0112	0.0067	0.0040	0.0073
C_{EOM} @ 7% O_2	Concentration, gr/dscf @ 7% O2	0.0193	0.0251	0.0101	0.0182
C_{EOM} @ 7% O_2	Concentration, g/dscm @ 7% O2	4.43E+04	5.75E+04	2.31E+04	4.16E+04
C_{EOM}	Concentration, µg/dscm	2.23E+03	2.48E+03	9.97E+02	1.90E+03
E_{EOM}	Emission Rate, µg/hr	2.36E+08	1.57E+08	9.14E+07	1.62E+08
C_{EOM}	Concentration, gr/dscf	9.74E-04	1.09E-03	4.36E-04	8.32E-04
C_{EOM}	Concentration, lb/dscf	1.39E-07	1.55E-07	6.22E-08	1.19E-07
E_{EOM}	Emission Rate, lb/hr	0.521	0.346	0.202	0.356
Push	Pounds per Ton of Coke Pushed	1.56E-02	9.78E-03	5.78E-03	1.04E-02

Method 315 Analytical Results (ug) and Blank Corrections
ABC Coke - Birmingham, Alabama
Baghouse Inlet

Target Catch, ug/sample							
Metal	A-I-315-1	A-I-315-1 Corrected	A-I-315-2	A-I-315-2 Corrected	A-I-315-3	A-I-315-3 Corrected	Filter Blank
Antimony	0.5	0.5	0.0	0.0	0.0	0.0	0.0
Arsenic	16.8	16.8	11.5	11.5	9.7	9.7	0.0
Barium	36.2	36.2	41.8	41.8	35.6	35.6	0.0
Beryllium	0.35	0.35	0.47	0.47	0.48	0.48	0.0
Cadmium	0.38	0.38	0.36	0.36	10.2	10.2	0.0
Chromium	12.9	12.9	11.8	11.8	9.8	9.8	0.0
Colbalt	2.5	2.5	2.0	2.0	1.6	1.6	0.0
Copper	16.1	16.1	11.4	11.4	25.7	25.7	0.0
Lead	20.6	20.6	17.6	17.6	17.1	17.1	0.0
Manganese	36.3	33.6	18.7	16.0	20.9	18.2	2.7
Mercury	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Nickel	19.6	19.6	14.0	14.0	24.3	24.3	0.0
Phosphorus	59.0	59.0	56.0	56.0	70.0	70.0	0.0
Selenium	4.4	4.4	3.6	3.6	4.3	4.3	0.0
Silver	0.3	0.3	0.1	0.1	0.0	0.0	0.0
Thallium	1.1	1.1	1.1	1.1	1.2	1.2	0.0
Zinc	70.0	65.0	47.0	42.0	54.0	49.0	5.0

Summary of Stack Gas Parameters and Test Results
S512.000
ABC Coke - Birmingham, Alabama
US EPA Test Method 315 -Metals
Baghouse Inlet

	RUN NUMBER	***A-I-315-1***	***A-I-315-2***	***A-I-315-3***	***Average***
	RUN DATE	***9/21/98***	***9/22/98***	***9/23/98***	
	RUN TIME	***1128-1911***	***1018-1816***	***1016-1800***	
	Antimony				
Sb	Target Catch, µg	0.5	0.0	0.0	0.2
C_{Sb}	Concentration, µg/dscm	0.10	0.00	0.00	0.03
C_{Sb} @ 7% O_2	Concentration, µg/dscm @ 7% O2	2.0	0.0	0.0	0.7
V_m	Emission Rate, µg/hr	10,555	0	0	3,518
E_{Sb}	Emission Rate, lb/hr	2.32E-05	0.00E+00	0.00E+00	7.74E-06
Push	Pounds per Ton of Coke Pushed	6.96E-07	0.00E+00	0.00E+00	2.32E-07
	Arsenic				
As	Target Catch, µg	16.8	11.5	9.7	12.67
C_{As}	Concentration, µg/dscm	3.3	4.3	2.4	3.3
C_{Sb} @ 7% O_2	Concentration, µg/dscm @ 7% O2	66	99	56	74
E_{As}	Emission Rate, µg/hr	354,633	269,272	221,739	281,881
E_{As}	Emission Rate, lb/hr	7.80E-04	5.92E-04	4.88E-04	6.20E-04
Push	Pounds per Ton of Coke Pushed	2.34E-05	1.67E-05	1.40E-05	1.80E-05
	Barium				
Ba	Target Catch, µg	36.2	41.8	35.6	37.87
C_{Ba}	Concentration, µg/dscm	7.20	15.49	8.87	10.52
C_{Ba} @ 7% O_2	Concentration, µg/dscm @ 7% O2	143	359	206	236
E_{Ba}	Emission Rate, µg/hr	764,149	978,745	813,805	852,233
E_{Ba}	Emission Rate, lb/hr	1.68E-03	2.15E-03	1.79E-03	1.87E-03
Push	Pounds per Ton of Coke Pushed	5.04E-05	6.09E-05	5.13E-05	5.42E-05

Summary of Stack Gas Parameters and Test Results
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Baghouse Inlet

	RUN NUMBER	***A-I-315-1***	***A-I-315-2***	***A-I-315-3***	***Average***
	RUN DATE	***36059***	***36060***	***36061***	
	RUN TIME	***1128-1911***	***1018-1816***	***1016-1800***	
	EMISSIONS DATA - Continued				
	Beryllium				
Be	Target Catch, µg	0.4	0.5	0.5	0.43
C_{Be}	Concentration, µg/dscm	0.070	0.174	0.120	0.121
C_{Be} @ 7% O_2	Concentration, µg/dscm @ 7% O2	1.38E+00	4.04E+00	2.77E+00	2.73E+00
E_{Be}	Emission Rate, µg/hr	7,388	11,005	10,973	9,789
E_{Be}	Emission Rate, lb/hr	1.63E-05	2.42E-05	2.41E-05	2.15E-05
Push	Pounds per Ton of Coke Pushed	4.87E-07	6.84E-07	6.92E-07	6.21E-07
	Cadmium				
Cd	Target Catch, µg	0.4	0.4	10.2	3.6
C_{Cd}	Concentration, µg/dscm	0.076	0.133	2.542	0.917
C_{Cd} @ 7% O_2	Concentration, µg/dscm @ 7% O2	1.50E+00	3.09E+00	5.89E+01	2.12E+01
E_{Cd}	Emission Rate, µg/hr	8,021	8,429	233,169	83,207
E_{Cd}	Emission Rate, lb/hr	1.76E-05	1.85E-05	5.13E-04	1.83E-04
Push	Pounds per Ton of Coke Pushed	5.29E-07	5.24E-07	1.47E-05	5.25E-06
	Chromium				
Cr	Target Catch, µg	12.9	11.8	9.8	11.50
C_{Cr}	Concentration, µg/dscm	2.57	4.37	2.44	3.13
C_{Cr} @ 7% O_2	Concentration, µg/dscm @ 7% O2	5.10E+01	1.01E+02	5.66E+01	6.96E+01
E_{Cr}	Emission Rate, µg/hr	272,307	276,296	224,025	257,543
E_{Cr}	Emission Rate, lb/hr	5.99E-04	6.08E-04	4.93E-04	5.67E-04
Push	Pounds per Ton of Coke Pushed	1.80E-05	1.72E-05	1.41E-05	1.64E-05

Summary of Stack Gas Parameters and Test Results

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ABC Coke - Birmingham, Alabama

US EPA Test Method 315 -Metals

Baghouse Inlet

	RUN NUMBER	***A-I-315-1***	***A-I-315-2***	***A-I-315-3***	***Average***
	RUN DATE	***36059***	***36060***	***36061***	
	RUN TIME	***1128-1911***	***1018-1816***	***1016-1800***	
	EMISSIONS DATA - Continued				
	Colbalt				
Co	Target Catch, µg	2.5	2.0	1.6	2.03
C_{Co}	Concentration, µg/dscm	0.498	0.741	0.399	0.546
C_{Co} @ 7% O_2	Concentration, µg/dscm @ 7% O2	9.88E+00	1.72E+01	9.24E+00	1.21E+01
E_{Co}	Emission Rate, µg/hr	52,773	46,830	36,576	45,393
E_{Co}	Emission Rate, lb/hr	1.16E-04	1.03E-04	8.05E-05	9.99E-05
Push	Pounds per Ton of Coke Pushed	3.48E-06	2.91E-06	2.31E-06	2.90E-06
	Copper				
Cu	Target Catch, µg	16.1	11.4	25.7	17.73
C_{Cu}	Concentration, µg/dscm	3.20	4.23	6.40	4.61
C_{Cu} @ 7% O_2	Concentration, µg/dscm @ 7% O2	6.36E+01	9.79E+01	1.48E+02	1.03E+02
E_{Cu}	Emission Rate, µg/hr	339,856	266,930	587,494	398,094
E_{Cu}	Emission Rate, lb/hr	7.48E-04	5.87E-04	1.29E-03	8.76E-04
Push	Pounds per Ton of Coke Pushed	2.24E-05	1.66E-05	3.70E-05	2.54E-05
	Lead				
Pb	Target Catch, µg	20.6	17.6	17.1	18.4
C_{Pb}	Concentration, µg/dscm	4.1	6.5	4.3	5.0
C_{Pb} @ 7% O_2	Concentration, µg/dscm @ 7% O2	8.14E+01	1.51E+02	9.87E+01	1.10E+02
E_{Pb}	Emission Rate, µg/hr	434,847	412,103	390,901	412,617
E_{Pb}	Emission Rate, lb/hr	9.57E-04	9.07E-04	8.60E-04	9.08E-04
Push	Pounds per Ton of Coke Pushed	2.87E-05	2.56E-05	2.46E-05	2.63E-05

Summary of Stack Gas Parameters and Test Results
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ABC Coke - Birmingham, Alabama
US EPA Test Method 315 -Metals
Baghouse Inlet

	RUN NUMBER	***A-I-315-1***	***A-I-315-2***	***A-I-315-3***	***Average***
	RUN DATE	***36059***	***36060***	***36061***	
	RUN TIME	***1128-1911***	***1018-1816***	***1016-1800***	
	EMISSIONS DATA - Continued				
	Manganese				
Mn	Target Catch, µg	33.6	16.0	18.2	22.60
C_{Mn}	Concentration, µg/dscm	6.7	5.9	4.5	5.7
C_{Mn} @ 7% O_2	Concentration, µg/dscm @ 7% O2	1.33E+02	1.37E+02	1.05E+02	1.25E+02
E_{Mn}	Emission Rate, µg/hr	709,265	374,639	416,046	499,984
E_{Mn}	Emission Rate, lb/hr	1.56E-03	8.24E-04	9.15E-04	1.10E-03
Push	Pounds per Ton of Coke Pushed	4.68E-05	2.33E-05	2.62E-05	3.21E-05
	Mercury				
Hg	Target Catch, µg	0.0	0.0	0.0	0.00
C_{Hg}	Concentration, µg/dscm	0.00	0.00	0.00	0.00
C_{Hg} @ 7% O_2	Concentration, µg/dscm @ 7% O2	0.00E+00	0.00E+00	0.00E+00	0.00E+00
E_{Hg}	Emission Rate, µg/hr	0	0	0	0
E_{Hg}	Emission Rate, lb/hr	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Push	Pounds per Ton of Coke Pushed	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Nickel				
Ni	Target Catch, µg	19.6	14.0	24.3	19.30
C_{Ni}	Concentration, µg/dscm	3.9	5.2	6.1	5.0
C_{Ni} @ 7% O_2	Concentration, µg/dscm @ 7% O2	7.75E+01	1.20E+02	1.40E+02	1.13E+02
E_{Ni}	Emission Rate, µg/hr	413,738	327,809	555,491	432,346
E_{Ni}	Emission Rate, lb/hr	9.10E-04	7.21E-04	1.22E-03	9.51E-04
Push	Pounds per Ton of Coke Pushed	2.73E-05	2.04E-05	3.50E-05	2.76E-05

Summary of Stack Gas Parameters and Test Results
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ABC Coke - Birmingham, Alabama
US EPA Test Method 315 -Metals
Baghouse Inlet

	RUN NUMBER	***A-I-315-1***	***A-I-315-2***	***A-I-315-3***	***Average***
	RUN DATE	***36059***	***36060***	***36061***	
	RUN TIME	***1128-1911***	***1018-1816***	***1016-1800***	
	EMISSIONS DATA - Continued				
	Phosphorus				
P	Target Catch, µg	59.0	56.0	70.0	61.67
C_P	Concentration, µg/dscm	11.7	20.8	17.4	16.6
C_P @ 7% O_2	Concentration, µg/dscm @ 7% O2	2.33E+02	4.81E+02	4.04E+02	3.73E+02
E_P	Emission Rate, µg/hr	1,245,436	1,311,237	1,600,179	1,385,617
E_P	Emission Rate, lb/hr	2.74E-03	2.88E-03	3.52E-03	3.05E-03
Push	Pounds per Ton of Coke Pushed	8.22E-05	8.15E-05	1.01E-04	8.82E-05
	Selenium				
Se	Target Catch, µg	4.4	3.6	4.3	4.10
C_{Se}	Concentration, µg/dscm	0.88	1.33	1.07	1.09
C_{Se} @ 7% O_2	Concentration, µg/dscm @ 7% O2	1.74E+01	3.09E+01	2.48E+01	2.44E+01
E_{Se}	Emission Rate, µg/hr	92,880	84,294	98,297	91,823
E_{Se}	Emission Rate, lb/hr	2.04E-04	1.85E-04	2.16E-04	2.02E-04
Push	Pounds per Ton of Coke Pushed	6.13E-06	5.24E-06	6.20E-06	5.86E-06
	Silver				
Ag	Target Catch, µg	0.3	0.1	0.0	0.13
C_{ag}	Concentration, µg/dscm	0.0597	0.0371	0.0000	0.0323
C_{Ag} @ 7% O_2	Concentration, µg/dscm @ 7% O2	1.19E+00	8.59E-01	0.00E+00	6.81E-01
E_{Ag}	Emission Rate, µg/hr	6,333	2,341	0	2,891
E_{Ag}	Emission Rate, lb/hr	1.39E-05	5.15E-06	0.00E+00	6.36E-06
Push	Pounds per Ton of Coke Pushed	4.18E-07	1.46E-07	0.00E+00	1.88E-07

Summary of Stack Gas Parameters and Test Results
S512.000
ABC Coke - Birmingham, Alabama
US EPA Test Method 315 -Metals
Baghouse Inlet

	RUN NUMBER	***A-I-315-1***	***A-I-315-2***	***A-I-315-3***	***Average***
	RUN DATE	***36059***	***36060***	***36061***	
	RUN TIME	***1128-1911***	***1018-1816***	***1016-1800***	
	EMISSIONS DATA - Continued				
	Thallium				
Tl	Target Catch, µg	1.1	1.1	1.2	1.13
C_{Tl}	Concentration, µg/dscm	0.22	0.41	0.30	0.31
C_{Tl} @ 7% O_2	Concentration, µg/dscm @ 7% O2	4.35E+00	9.45E+00	6.93E+00	6.91E+00
E_{Tl}	Emission Rate, µg/hr	23,220	25,756	27,432	25,469
E_{Tl}	Emission Rate, lb/hr	5.11E-05	5.67E-05	6.03E-05	5.60E-05
Push	Pounds per Ton of Coke Pushed	1.53E-06	1.60E-06	1.73E-06	1.62E-06
	Zinc				
Zn	Target Catch, µg	65.0	42.0	49.0	52.00
C_{Zn}	Concentration, µg/dscm	12.9	15.6	12.2	13.6
C_{Zn} @ 7% O_2	Concentration, µg/dscm @ 7% O2	2.57E+02	3.61E+02	2.83E+02	3.00E+02
E_{Zn}	Emission Rate, µg/hr	1,372,090	983,428	1,120,125	1,158,548
E_{Zn}	Emission Rate, lb/hr	3.02E-03	2.16E-03	2.46E-03	2.55E-03
Push	Pounds per Ton of Coke Pushed	9.05E-05	6.12E-05	7.06E-05	7.41E-05

Summary of Stack Gas Parameters and Test Results
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ABC Coke - Birmingham, Alabama
US EPA Test Method 315 - EOM/Particulate Matter/Metals
Baghouse Outlet

	RUN NUMBER	***A-O-315-1***	***A-O-315-2***	***A-O-315-3***	
	RUN DATE	***9/21/98***	***9/22/98***	***9/23/98***	***Average***
	RUN TIME	***1126-1911***	***1028-1819***	***1020-1806***	
	MEASURED DATA				
P_{static}	Stack Static Pressure, inches H_2O	0.15	0.15	0.15	0.15
y	Meter Box Correction Factor	1.005	1.005	1.005	1.005
P_{bar}	Barometric Pressure, inches Hg	29.70	29.74	29.80	29.75
V_m	Sample Volume, ft^3	176.377	109.102	140.811	142.097
$Dp^{1/2}$	Average Square Root Dp, (in. H_2O)$^{1/}$	0.5154	0.3265	0.4731	0.4383
DH	Avg Meter Orifice Pressure, in. H_2O	0.9621	0.4801	0.8511	0.76
T_m	Average Meter Temperature, °F	92	94	88	91
T_s	Average Stack Temperature, °F	118	133	120	124
V_{lc}	Condensate Collected, ml	103.9	62.0	55.6	73.8
CO_2	Carbon Dioxide content, % by volum	0.20	0.2	0.1	0.2
O_2	Oxygen content, % by volume	20.40	20.4	20.4	20.4
N_2	Nitrogen content, % by volume	79.4	79.4	79.5	79.4
C_p	Pitot Tube Coefficient	0.84	0.84	0.84	0.84
	Circular Stack? 1=Y,0=N:	1	1	1	
As	Diameter or Dimensions, inches:	85.75	85.75	85.75	85.75
Q	Sample Run Duration, minutes	412	404	420	412
D_n	Nozzle Diameter, inches	0.216	0.216	0.216	0.216
Push	Tons of Coke Pushed	257.46	281.98	269.72	269.72
	Total Test Time, hours	7.75	7.85	7.77	7.79
	Tons of Coke per Hour	33.2	35.9	34.7	34.6
	CALCULATED DATA	**All Calculations are on Time Weighted Average Basis**			
A_n	Nozzle Area, ft^2	0.000254	0.000254	0.000254	0.000254
$V_{m(std)}$	Standard Meter Volume, ft^3	168.639	103.955	136.034	136.209
$V_{m(std)}$	Standard Meter Volume, m^3	4.775	2.944	3.852	3.857
Q_m	Average Sampling Rate, dscfm	0.409	0.257	0.324	0.330
P_s	Stack Pressure, inches Hg	29.71	29.75	29.81	29.76
B_{ws}	Moisture, % by volume	2.8	2.7	1.9	2.5
$B_{ws(sat)}$	Moisture (at saturation), % by volum	11.0	16.4	11.5	13.0
V_{wstd}	Standard Water Vapor Volume, ft^3	4.891	2.918	2.617	3.475
$1-B_{ws}$	Dry Mole Fraction	0.972	0.973	0.981	0.975
M_d	Molecular Weight (d.b.), lb/lb•mole	28.85	28.85	28.83	28.84
M_s	Molecular Weight (w.b.), lb/lb•mole	28.54	28.55	28.63	28.57
V_s	Stack Gas Velocity, ft/s	30.6	19.6	28.0	26.1
A	Stack Area, ft^2	40.1	40.1	40.1	40.10
Q_a	Stack Gas Volumetric flow, acfm	73,527	47,139	67,395	62,687
Q_s	Stack Gas Volumetric flow, dscfm	64,792	40,579	59,951	55,108
Q_s	Stack Gas Volumetric flow, dscmm	1,835	1,149	1,698	1,560
I	Isokinetic Sampling Ratio, %	99.6	100.0	85.2	94.9

Method 315 Analytical Results (g) and Blank Corrections
ABC Coke - Birmingham, Alabama
Baghouse Outlet

All Weights are listed in grams

Run No.	Filters		Acetone-FHR	MeCl2 -FHR	Acetone-BHR	MeCl2 -BHR	H2O Imp. Rinse		Corrected Total
	PM	MCEM	PM	MCEM	MCEM	MCEM*	MCEM	PM	MCEM
A-O-315-1	0.0020	0.0000	0.0043	0.0011	0.0009	0.0146	0.0005	**0.0062**	**0.0156**
A-O-315-2	0.0039	0.0000	0.0048	0.0005	0.0003	0.0038	0.0003	**0.0086**	**0.0034**
A-O-315-3	0.0111	0.0000	0.0044	0.0005	0.0000	0.0021	0.0003	**0.0154**	**0.0014**
Blank Values	0.0000	0.0000	0.0001	0.0000	0.0012	**0.0002**	0.0001	**0.0001**	**0.0015**

* Blank Value for the $MeCl_2$ - BHR were erroneous, so the lab blank value was used.

Summary of Stack Gas Parameters and Test Results
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ABC Coke - Birmingham, Alabama
US EPA Test Method 315 - EOM/Particulate Matter
Baghouse Outlet

	RUN NUMBER	*A-O-315-1*	*A-O-315-2*	*A-O-315-3*	
	RUN DATE	*9/21/98*	*9/22/98*	*9/23/98*	*Average*
	RUN TIME	*1126-1911*	*1028-1819*	*1020-1806*	
	EMISSIONS DATA				
	EMISSIONS DATA				
	Particulate Matter				
PM	Total Catch, g	0.0062	0.0086	0.0154	0.0101
C_{PM} @ 7% O	Concentration, gr/dscf @ 7% O2	0.0158	0.0355	0.0486	0.0333
C_{PM} @ 7% O	Concentration, g/dscm @ 7% O2	3.61E+04	8.12E+04	1.11E+05	7.62E+04
C_{PM}	Concentration, µg/dscm	1.30E+03	2.92E+03	4.00E+03	2.74E+03
E_{PM}	Emission Rate, µg/hr	1.43E+08	2.01E+08	4.07E+08	2.51E+08
C_{PM}	Concentration, gr/dscf	5.67E-04	1.28E-03	1.75E-03	1.20E-03
C_{PM}	Concentration, lb/dscf	8.11E-08	1.82E-07	2.50E-07	1.71E-07
E_{PM}	Emission Rate, lb/hr	0.315	0.444	0.898	0.552
Push	Pounds per Ton of Coke Pushed	9.48E-03	1.24E-02	2.59E-02	1.59E-02
	Extractable Organic Matter				
EOM	Total Catch, g	0.0156	0.0034	0.0014	0.0068
EOM @ 7% O	Concentration, gr/dscf @ 7% O2	0.0397	0.0140	0.0044	0.0194
EOM @ 7% O	Concentration, g/dscm @ 7% O2	9.08E+04	3.21E+04	1.01E+04	4.43E+04
C_{EOM}	Concentration, µg/dscm	3.27E+03	1.16E+03	3.63E+02	1.60E+03
E_{EOM}	Emission Rate, µg/hr	3.60E+08	7.96E+07	3.70E+07	1.59E+08
C_{EOM}	Concentration, gr/dscf	1.43E-03	5.05E-04	1.59E-04	6.97E-04
C_{EOM}	Concentration, lb/dscf	2.04E-07	7.21E-08	2.27E-08	9.96E-08
E_{EOM}	Emission Rate, lb/hr	0.793	0.176	0.082	0.350
Push	Pounds per Ton of Coke Pushed	2.39E-02	4.89E-03	2.35E-03	1.04E-02

Method 315 Analytical Results (ug) and Blank Corrections
ABC Coke - Birmingham, Alabama
Baghouse Outlet

Target Catch, ug/sample							
Metal	A-O-315-1	A-O-315-1 Corrected	A-O-315-2	A-O-315-2 Corrected	A-O-315-3	A-O-315-3 Corrected	Filter Blank
Antimony	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Arsenic	0.3	0.3	0.4	0.4	0.5	0.5	0.0
Barium	4.9	4.9	6.9	6.9	7.8	7.8	0.0
Beryllium	0.0	0.0	0.03	0.03	0.04	0.04	0.0
Cadmium	0.09	0.09	0.12	0.12	0.07	0.07	0.0
Chromium	1.9	1.9	3.0	3.0	3.5	3.5	0.0
Colbalt	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Copper	2.8	2.8	3.6	3.6	4.4	4.4	0.0
Lead	1.2	1.2	2.5	2.5	1.6	1.6	0.0
Manganese	5.2	2.5	7.2	4.5	8.1	5.4	2.7
Mercury	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Nickel	0.0	0.0	1.8	1.8	1.2	1.2	0.0
Phosphorus	16.0	16.0	15.0	15.0	20.0	20.0	0.0
Selenium	0.0	0.0	0.6	0.6	0.0	0.0	0.0
Silver	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Thallium	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Zinc	16.0	11.0	18.0	13.0	20.0	15.0	5.0

Summary of Stack Gas Parameters and Test Results
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ABC Coke - Birmingham, Alabama
US EPA Test Method 315 - Metals
Baghouse Outlet

	RUN NUMBER	***A-O-315-1***	***A-O-315-2***	***A-O-315-3***	
	RUN DATE	***9/21/98***	***9/22/98***	***9/23/98***	***Average***
	RUN TIME	***1126-1911***	***1028-1819***	***1020-1806***	
	Antimony				
Sb	Target Catch, µg	0.0	0.0	0.0	0.0
C_{Sb}	Concentration, µg/dscm @ 7% O2	0.0000	0.0000	0.0000	0.0000
C_{Sb} @ 7% O_2	Concentration, µg/dscm	0.00E+00	0.00E+00	0.00E+00	0.00E+00
E_{Sb}	Emission Rate, µg/hr	0.000	0.000	0.000	0.000
E_{Sb}	Emission Rate, lb/hr	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Push	Pounds per Ton of Coke Pushed	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Arsenic				
As	Target Catch, µg	0.3	0.4	0.5	0.4
C_{As}	Concentration, µg/dscm @ 7% O2	1.75	3.78	3.61	3.04
C_{Sb} @ 7% O_2	Concentration, µg/dscm	0.0628	0.1359	0.1298	0.1095
E_{As}	Emission Rate, µg/hr	6,916	9,369	13,221	9,835
E_{As}	Emission Rate, lb/hr	1.52E-05	2.06E-05	2.91E-05	2.16E-05
Push	Pounds per Ton of Coke Pushed	4.58E-07	5.74E-07	8.38E-07	6.23E-07
	Barium				
Ba	Target Catch, µg	4.9	6.9	7.8	6.53
C_{Ba}	Concentration, µg/dscm @ 7% O2	28.5	65.2	56.3	50.0
C_{Ba} @ 7% O_2	Concentration, µg/dscm	1.03	2.34	2.02	1.80
E_{Ba}	Emission Rate, µg/hr	112,956	161,608	206,252	160,272
E_{Ba}	Emission Rate, lb/hr	2.49E-04	3.56E-04	4.54E-04	3.53E-04
Push	Pounds per Ton of Coke Pushed	7.48E-06	9.90E-06	1.31E-05	1.01E-05

Summary of Stack Gas Parameters and Test Results

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ABC Coke - Birmingham, Alabama

US EPA Test Method 315 - Metals

Baghouse Outlet

	RUN NUMBER	***A-O-315-1***	***A-O-315-2***	***A-O-315-3***	***Average***
	RUN DATE	***09/21/98***	***09/22/98***	***09/23/98***	
	RUN TIME	***1126-1911***	***1028-1819***	***1020-1806***	
	EMISSIONS DATA - Continued				
	Beryllium				
Be	Target Catch, µg	0.0	0.0	0.0	0.02
C_{Be}	Concentration, µg/dscm @ 7% O2	0.00E+00	2.83E-01	2.89E-01	1.91E-01
C_{Be} @ 7% O_2	Concentration, µg/dscm	0.00E+00	1.02E-02	1.04E-02	6.86E-03
E_{Be}	Emission Rate, µg/hr	0	703	1,058	587
E_{Be}	Emission Rate, lb/hr	0.00E+00	1.55E-06	2.33E-06	1.29E-06
Push	Pounds per Ton of Coke Pushed	0.00E+00	4.30E-08	6.70E-08	3.67E-08
	Cadmium				
Cd	Target Catch, µg	0.1	0.1	0.1	0.1
C_{Cd}	Concentration, µg/dscm @ 7% O2	5.24E-01	1.13E+00	5.05E-01	7.21E-01
C_{Cd} @ 7% O_2	Concentration, µg/dscm	1.88E-02	4.08E-02	1.82E-02	2.59E-02
E_{Cd}	Emission Rate, µg/hr	2,075	2,811	1,851	2,245
E_{Cd}	Emission Rate, lb/hr	4.56E-06	6.18E-06	4.07E-06	4.94E-06
Push	Pounds per Ton of Coke Pushed	1.37E-07	1.72E-07	1.17E-07	1.42E-07
	Chromium				
Cr	Target Catch, µg	1.9	3.0	3.5	2.80
C_{Cr}	Concentration, µg/dscm @ 7% O2	11.1	28.3	25.3	21.6
C_{Cr} @ 7% O_2	Concentration, µg/dscm	0.398	1.019	0.909	0.775
E_{Cr}	Emission Rate, µg/hr	43,799	70,264	92,549	68,871
E_{Cr}	Emission Rate, lb/hr	9.64E-05	1.55E-04	2.04E-04	1.52E-04
Push	Pounds per Ton of Coke Pushed	2.90E-06	4.30E-06	5.87E-06	4.36E-06

Summary of Stack Gas Parameters and Test Results
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ABC Coke - Birmingham, Alabama
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Baghouse Outlet

	RUN NUMBER	***A-O-315-1***	***A-O-315-2***	***A-O-315-3***	***Average***
	RUN DATE	***09/21/98***	***09/22/98***	***09/23/98***	
	RUN TIME	***1126-1911***	***1028-1819***	***1020-1806***	
	EMISSIONS DATA - Continued				
	Colbalt				
Co	Target Catch, µg	0.0	0.0	0.0	0.00
C_{Co}	Concentration, µg/dscm @ 7% O2	0.00E+00	0.00E+00	0.00E+00	0.00E+00
C_{Co} @ 7% O_2	Concentration, µg/dscm	0.00E+00	0.00E+00	0.00E+00	0.00E+00
E_{Co}	Emission Rate, µg/hr	0	0	0	0
E_{Co}	Emission Rate, lb/hr	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Push	Pounds per Ton of Coke Pushed	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Copper				
Cu	Target Catch, µg	2.8	3.6	4.4	3.60
C_{Cu}	Concentration, µg/dscm @ 7% O2	16.300	33.998	31.754	27.351
C_{Cu} @ 7% O_2	Concentration, µg/dscm	0.586	1.223	1.142	0.984
E_{Cu}	Emission Rate, µg/hr	64,546	84,317	116,347	88,404
E_{Cu}	Emission Rate, lb/hr	1.42E-04	1.85E-04	2.56E-04	1.94E-04
Push	Pounds per Ton of Coke Pushed	4.27E-06	5.16E-06	7.37E-06	5.60E-06
	Lead				
Pb	Target Catch, µg	1.2	2.5	1.6	1.8
C_{Pb}	Concentration, µg/dscm @ 7% O2	6.99E+00	2.36E+01	1.15E+01	1.40E+01
C_{Pb} @ 7% O_2	Concentration, µg/dscm	0.251	0.849	0.415	0.505
E_{Pb}	Emission Rate, µg/hr	27,663	58,554	42,308	42,841
E_{Pb}	Emission Rate, lb/hr	6.09E-05	1.29E-04	9.31E-05	9.43E-05
Push	Pounds per Ton of Coke Pushed	1.83E-06	3.59E-06	2.68E-06	2.70E-06

Summary of Stack Gas Parameters and Test Results
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ABC Coke - Birmingham, Alabama
US EPA Test Method 315 - Metals
Baghouse Outlet

	RUN NUMBER	***A-O-315-1***	***A-O-315-2***	***A-O-315-3***	***Average***
	RUN DATE	***09/21/98***	***09/22/98***	***09/23/98***	
	RUN TIME	***1126-1911***	***1028-1819***	***1020-1806***	
	EMISSIONS DATA - Continued				
	Manganese				
Mn	Target Catch, µg	2.5	4.5	5.4	4.13
C_{Mn}	Concentration, µg/dscm @ 7% O2	1.46E+01	4.25E+01	3.90E+01	3.20E+01
C_{Mn} @ 7% O_2	Concentration, µg/dscm	0.524	1.529	1.402	1.151
E_{Mn}	Emission Rate, µg/hr	57,631	105,397	142,790	101,939
E_{Mn}	Emission Rate, lb/hr	1.27E-04	2.32E-04	3.14E-04	2.24E-04
Push	Pounds per Ton of Coke Pushed	3.82E-06	6.46E-06	9.05E-06	6.44E-06
	Mercury				
Hg	Target Catch, µg	0.0	0.0	0.0	0.00
C_{Hg}	Concentration, µg/dscm @ 7% O2	0.00E+00	0.00E+00	0.00E+00	0.00E+00
C_{Hg} @ 7% O_2	Concentration, µg/dscm	0.00E+00	0.00E+00	0.00E+00	0.00E+00
E_{Hg}	Emission Rate, µg/hr	0	0	0	0
E_{Hg}	Emission Rate, lb/hr	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Push	Pounds per Ton of Coke Pushed	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Nickel				
Ni	Target Catch, µg	0.0	1.8	1.2	1.00
C_{Ni}	Concentration, µg/dscm @ 7% O2	0.00	17.00	8.66	8.55
C_{Ni} @ 7% O_2	Concentration, µg/dscm	0.000	0.611	0.312	0.308
E_{Ni}	Emission Rate, µg/hr	0	42,159	31,731	24,630
E_{Ni}	Emission Rate, lb/hr	0.00E+00	9.27E-05	6.98E-05	5.42E-05
Push	Pounds per Ton of Coke Pushed	0.00E+00	2.58E-06	2.01E-06	1.53E-06

Summary of Stack Gas Parameters and Test Results
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ABC Coke - Birmingham, Alabama
US EPA Test Method 315 - Metals
Baghouse Outlet

	RUN NUMBER	***A-O-315-1***	***A-O-315-2***	***A-O-315-3***	***Average***
	RUN DATE	***09/21/98***	***09/22/98***	***09/23/98***	
	RUN TIME	***1126-1911***	***1028-1819***	***1020-1806***	
	EMISSIONS DATA - Continued				
	Phosphorus				
P	Target Catch, µg	16.0	15.0	20.0	17.00
C_P	Concentration, µg/dscm @ 7% O2	93.1	141.7	144.3	126.4
C_P @ 7% O_2	Concentration, µg/dscm	3.35	5.10	5.19	4.55
E_P	Emission Rate, µg/hr	368,836	351,322	528,850	416,336
E_P	Emission Rate, lb/hr	8.11E-04	7.73E-04	1.16E-03	9.16E-04
Push	Pounds per Ton of Coke Pushed	2.44E-05	2.15E-05	3.35E-05	2.65E-05
	Selenium				
Se	Target Catch, µg	0.0	0.6	0.0	0.20
C_{Se}	Concentration, µg/dscm @ 7% O2	0.0000	5.67	0.00	1.89
C_{Se} @ 7% O_2	Concentration, µg/dscm	0.0000	0.2038	0.0000	0.0679
E_{Se}	Emission Rate, µg/hr	0	14,053	0	4,684
E_{Se}	Emission Rate, lb/hr	0.00E+00	3.09E-05	0.00E+00	1.03E-05
Push	Pounds per Ton of Coke Pushed	0.00E+00	8.61E-07	0.00E+00	2.87E-07
	Silver				
Ag	Target Catch, µg	0.0	0.0	0.0	0.00
C_{ag}	Concentration, µg/dscm @ 7% O2	0.00E+00	0.00E+00	0.00E+00	0.00E+00
C_{Ag} @ 7% O_2	Concentration, µg/dscm	0.00E+00	0.00E+00	0.00E+00	0.00E+00
E_{Ag}	Emission Rate, µg/hr	0	0	0	0
E_{Ag}	Emission Rate, lb/hr	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Push	Pounds per Ton of Coke Pushed	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Summary of Stack Gas Parameters and Test Results

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ABC Coke - Birmingham, Alabama

US EPA Test Method 315 - Metals

Baghouse Outlet

	RUN NUMBER	***A-O-315-1***	***A-O-315-2***	***A-O-315-3***	***Average***
	RUN DATE	***09/21/98***	***09/22/98***	***09/23/98***	
	RUN TIME	***1126-1911***	***1028-1819***	***1020-1806***	
	EMISSIONS DATA - Continued				
	Thallium				
Tl	Target Catch, µg	0.0	0.0	0.0	0.00
C_{Tl}	Concentration, µg/dscm @ 7% O2	0.00E+00	0.00E+00	0.00E+00	0.00E+00
C_{Tl} @ 7% O_2	Concentration, µg/dscm	0.00E+00	0.00E+00	0.00E+00	0.00E+00
E_{Tl}	Emission Rate, µg/hr	0	0	0	0
E_{Tl}	Emission Rate, lb/hr	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Push	Pounds per Ton of Coke Pushed	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Zinc				
Zn	Target Catch, µg	11.0	13.0	15.0	13.00
C_{Zn}	Concentration, µg/dscm @ 7% O2	64.0	122.8	108.3	98.4
C_{Zn} @ 7% O_2	Concentration, µg/dscm	2.30	4.42	3.89	3.54
E_{Zn}	Emission Rate, µg/hr	253,575	304,479	396,638	318,231
E_{Zn}	Emission Rate, lb/hr	5.58E-04	6.70E-04	8.73E-04	7.00E-04
Push	Pounds per Ton of Coke Pushed	1.68E-05	1.86E-05	2.51E-05	2.02E-05

Summary of Stack Gas Parameters and Test Results
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ABC Coke - Birmingham, Alabama
US EPA Test Method 315 - EOM/Particulate Matter
Underfire Stack

	RUN NUMBER	*A-U-315-1*	*A-U-315-2*	*A-U-315-3*	*A-U-315-4*	
	RUN DATE	*9/24/98*	*9/24/98*	*9/25/98*	*9/25/98*	*Average**
	RUN TIME	*1025-1344*	*1443-1806*	*0738-1029*	*1110-1428*	
	MEASURED DATA					
P_{static}	Stack Static Pressure, inches H_2O	-1.00	-1.00	-1.00	-1.00	-1.00
y	Meter Box Correction Factor	0.981	0.981	0.981	0.981	0.981
P_{bar}	Barometric Pressure, inches Hg	29.85	29.85	29.85	29.85	29.85
V_m	Sample Volume, ft^3	123.816	123.200	116.290	119.763	122.260
$Dp^{1/2}$	Average Square Root Dp, (in. $H_2O)^{1/2}$	0.0898	0.0954	0.0996	0.0951	0.0934
DH	Avg Meter Orifice Pressure, in. H_2O	1.42	1.44	1.46	1.36	1.41
T_m	Average Meter Temperature, °F	99	102	88	101	101
T_s	Average Stack Temperature, °F	449	437	480	476	454
V_{lc}	Condensate Collected, ml	394.6	426.4	393.0	360.5	393.8
CO_2	Carbon Dioxide content, % by volume	2.70	3.0	2.7	2.8	2.8
O_2	Oxygen content, % by volume	14.70	15.00	13.20	13.50	14.4
N_2	Nitrogen content, % by volume	82.6	82.0	84.1	83.7	82.8
C_p	Pitot Tube Coefficient	0.84	0.84	0.84	0.84	0.84
	Circular Stack? 1=Y,0=N:	1	1	1	1	1.0000
As	Diameter or Dimensions, inches:	187	187	187	187	187.00
Q	Sample Run Duration, minutes	180	180	171.4	180	180
D_n	Nozzle Diameter, inches	0.740	0.740	0.740	0.740	0.740
Charge	Tons of Coal Charged	168.63	183.96	0.00	122.64	158.41
	Total Test Time, hours	3.32	3.38	2.85	3.30	3.33
	Tons of Coal per Hour	50.8	54.4	0.0	37.2	47.5
	CALCULATED DATA					
A_n	Nozzle Area, ft^2	0.002987	0.002987	0.002987	0.002987	0.002987
$V_{m(std)}$	Standard Meter Volume, ft^3	114.814	113.638	110.010	110.643	113.032
$V_{m(std)}$	Standard Meter Volume, m^3	3.251	3.218	3.115	3.133	3.201
Q_m	Average Sampling Rate, dscfm	0.638	0.631	0.642	0.615	0.628
P_s	Stack Pressure, inches Hg	29.78	29.78	29.78	29.78	29.78
B_{ws}	Moisture, % by volume	13.9	15.0	14.4	13.3	14.1
$B_{ws(sat)}$	Moisture (at saturation), % by volume	2976.1	2626.5	4044.8	3892.6	3165.1
V_{wstd}	Standard Water Vapor Volume, ft^3	18.574	20.071	18.499	16.969	18.538
$1-B_{ws}$	Dry Mole Fraction	0.861	0.850	0.856	0.867	0.859
M_d	Molecular Weight (d.b.), lb/lb•mole	29.02	29.08	28.96	28.99	29.03
M_s	Molecular Weight (w.b.), lb/lb•mole	27.49	27.42	27.38	27.53	27.48
V_s	Stack Gas Velocity, ft/s	6.8	7.2	7.7	7.3	7.1
A	Stack Area, ft^2	190.7	190.7	190.7	190.7	190.73
Q_a	Stack Gas Volumetric flow, acfm	77,773	82,178	87,884	83,514	81,155
Q_s	Stack Gas Volumetric flow, dscfm	38,682	40,898	42,039	40,634	40,071
Q_s	Stack Gas Volumetric flow, dscmm	1,095	1,158	1,190	1,151	1,135
I	Isokinetic Sampling Ratio, %	105.3	98.6	97.5	96.6	100.2

*Run A-U-315-3 is not included in averages. This Test was conducted under non-push conditions.

Method 315 Analytical Results (g) and Blank Corrections
ABC Coke - Birmingham, Alabama
Underfire Stack

All Weights are listed in grams

Run No.	Filters		Acetone-FHR	MeCl2 -FHR	Acetone-BHR	MeCl2 -BHR	H2O Imp. Rinse		Corrected Total
	PM	MCEM	PM	MCEM	MCEM	MCEM	MCEM	PM	MCEM
A-U-315-1	0.0674	0.0000	0.0481	0.0033	0.0003	0.0018	0.0003	**0.1153**	**0.0051**
A-U-315-2	0.0837	0.0000	0.0574	0.0005	0.0002	0.0039	0.0002	**0.1409**	**0.0042**
A-U-315-3	0.0751	0.0001	0.0680	0.0028	0.0001	0.0044	0.0004	**0.1429**	**0.0072**
A-U-315-4	0.1207	0.0000	0.0489	0.0007	0.0003	0.0012	0.0002	**0.1694**	**0.0018**
Blank Values	0.0000	0.0000	0.0002	0.0000	0.0001	0.0003	0.0002	**0.0002**	**0.0006**

Summary of Stack Gas Parameters and Test Results
S512.000
ABC Coke - Birmingham, Alabama
US EPA Test Method 315 - EOM/Particulate Matter
Underfire Stack
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	RUN NUMBER	***A-U-315-1***	***A-U-315-2***	***A-U-315-3***	***A-U-315-4***	
	RUN DATE	***9/24/98***	***9/24/98***	***9/25/98***	***9/25/98***	***Average***
	RUN TIME	***1025-1344***	***1443-1806***	***0738-1029***	***1110-1428***	
	EMISSIONS DATA					
	EMISSIONS DATA					
	Particulate Matter					
PM	Total Catch, g	0.1153	0.1409	0.1429	0.1694	0.1419
C_{PM} @ 7% O_2	Concentration, gr/dscf @ 7% O2	0.0347	0.0451	0.0362	0.0444	0.0414
C_{PM} @ 7% O_2	Concentration, g/dscm @ 7% O2	7.95E+04	1.03E+05	8.28E+04	1.02E+05	9.47E+04
C_{PM}	Concentration, µg/dscm	3.55E+04	4.38E+04	4.59E+04	5.41E+04	4.44E+04
E_{PM}	Emission Rate, µg/hr	2.33E+09	3.04E+09	3.28E+09	3.73E+09	3.04E+09
C_{PM}	Concentration, gr/dscf	1.55E-02	1.91E-02	2.00E-02	2.36E-02	1.94E-02
C_{PM}	Concentration, lb/dscf	2.21E-06	2.73E-06	2.86E-06	3.38E-06	2.77E-06
E_{PM}	Emission Rate, lb/hr	5.14E+00	6.71E+00	7.22E+00	8.23E+00	6.69E+00
Charge	Pounds per Ton of Coal Charged	1.01E-01	1.23E-01	0.00E+00	2.21E-01	1.49E-01
	Extractable Organic Matter					
EOM	Total Catch, g	0.0051	0.0042	0.0072	0.0018	0.0037
C_{EOM} @ 7% O_2	Concentration, gr/dscf @ 7% O2	0.0015	0.0013	0.0018	0.0005	0.0011
C_{EOM} @ 7% O_2	Concentration, g/dscm @ 7% O2	3.52E+03	3.07E+03	4.17E+03	1.08E+03	2.56E+03
C_{EOM}	Concentration, µg/dscm	1.57E+03	1.31E+03	2.31E+03	5.75E+02	1.15E+03
E_{EOM}	Emission Rate, µg/hr	1.03E+08	9.07E+07	1.65E+08	3.97E+07	7.78E+07
C_{EOM}	Concentration, gr/dscf	6.85E-04	5.70E-04	1.01E-03	2.51E-04	5.02E-04
C_{EOM}	Concentration, lb/dscf	9.79E-08	8.15E-08	1.44E-07	3.59E-08	7.18E-08
E_{EOM}	Emission Rate, lb/hr	2.27E-01	2.00E-01	3.64E-01	8.74E-02	1.72E-01
Charge	Pounds per Ton of Coal Charged	4.47E-03	3.67E-03	0.00E+00	2.35E-03	3.50E-03

*Run A-U-315-3 is not included in averages. This Test was conducted under non-push conditions.

Method 315 Analytical Results (ug) and Blank Corrections
ABC Coke - Birmingham, Alabama
Underfire Stack

Target Catch, ug/sample									
Metal	A-U-315-1	A-U-315-1 Corrected	A-U-315-2	A-U-315-2 Corrected	A-U-315-3	A-U-315-3 Corrected	A-U-315-4	A-U-315-4 Corrected	Filter Blank
Antimony	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Arsenic	2.8	2.8	5.1	5.1	4.1	4.1	4.7	4.7	0.0
Barium	5.4	5.4	12.1	12.1	7.8	7.8	8.3	8.3	0.0
Beryllium	0.02	0.02	0.07	0.07	0.03	0.03	0.03	0.03	0.0
Cadmium	0.31	0.31	0.35	0.35	0.45	0.45	0.47	0.5	0.0
Chromium	5.2	5.2	10.7	10.7	6.7	6.7	5.8	5.8	0.0
Colbalt	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Copper	4.9	4.9	5.1	5.1	4.6	4.6	5.7	5.7	0.0
Lead	8.1	8.1	8.4	8.4	4.3	4.3	5.3	5.3	0.0
Manganese	5.1	2.4	8.3	5.6	5.5	2.8	8.9	6.2	2.7
Mercury	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Nickel	1.1	1.1	2.9	2.9	1.9	1.9	1.6	1.6	0.0
Phosphorus	15.0	15.0	36.0	36.0	18.0	18.0	30.0	30.0	0.0
Selenium	2.0	2.0	4.3	4.3	4.5	4.5	5.2	5.2	0.0
Silver	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Thallium	0.9	0.9	1.0	1.0	0.6	0.6	0.8	0.8	0.0
Zinc	31.0	26.0	37.0	32.0	34.0	29.0	35.0	30.0	5.0

Summary of Stack Gas Parameters and Test Results
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ABC Coke - Birmingham, Alabama
US EPA Test Method 315 - Metals
Underfire Stack

	RUN NUMBER	*A-U-315-1*	*A-U-315-2*	*A-U-315-3*	*A-U-315-4*	
	RUN DATE	*9/24/98*	*9/24/98*	*9/25/98*	*9/25/98*	*Average*
	RUN TIME	*1025-1344*	*1443-1806*	*0738-1029*	*1110-1428*	
	Antimony					
Sb	Target Catch, µg	0.0	0.0	0.0	0.0	0.0
C_{Sb}	Concentration, µg/dscm	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
C_{Sb} @ 7% O_2	Concentration, µg/dscm @ 7% O2	0.0000	0.0000	0.0000	0.0000	0.0000
E_{Sb}	Emission Rate, µg/hr	0.000	0.000	0.000	0.000	0.000
E_{Sb}	Emission Rate, lb/hr	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Charge	Pounds per Ton of Coal Charged	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Arsenic					
As	Target Catch, µg	2.8	5.1	4.1	4.7	4.20
C_{As}	Concentration, µg/dscm	2.56E-03	4.40E-03	3.44E-03	4.08E-03	3.68E-03
C_{Sb} @ 7% O_2	Concentration, µg/dscm @ 7% O2	5.73E-03	1.04E-02	6.22E-03	7.67E-03	7.93E-03
E_{As}	Emission Rate, µg/hr	184,021	354,377	292,841	324,476	287,625
E_{As}	Emission Rate, lb/hr	3.70E-07	6.73E-07	5.41E-07	6.20E-07	5.54E-07
Charge	Pounds per Ton of Coal Charged	7.28E-09	1.24E-08	0.00E+00	1.67E-08	1.21E-08
	Barium					
Ba	Target Catch, µg	5.4	12.1	7.8	8.3	8.60
C_{Ba}	Concentration, µg/dscm	4.93E-03	1.04E-02	6.55E-03	7.21E-03	7.53E-03
C_{Ba} @ 7% O_2	Concentration, µg/dscm @ 7% O2	1.11E-02	2.46E-02	1.18E-02	1.35E-02	1.64E-02
E_{Ba}	Emission Rate, µg/hr	354,897	840,777	557,113	573,011	589,562
E_{Ba}	Emission Rate, lb/hr	7.13E-07	1.60E-06	1.03E-06	1.10E-06	1.14E-06
Charge	Pounds per Ton of Coal Charged	1.40E-08	2.93E-08	0.00E+00	2.95E-08	2.43E-08

*Run A-U-315-3 is not included in averages. This Test was conducted under non-push conditions

Summary of Stack Gas Parameters and Test Results
S512.000
ABC Coke - Birmingham, Alabama
US EPA Test Method 315 - Metals
Underfire Stack

	RUN NUMBER	***A-U-315-1***	***A-U-315-2***	***A-U-315-3***	***A-U-315-4***	
	RUN DATE	***09/24/98***	***09/24/98***	***09/25/98***	***09/25/98***	***Average***
	RUN TIME	***1025-1344***	***1443-1806***	***0738-1029***	***1110-1428***	
	EMISSIONS DATA - Continued					
	Beryllium					
Be	Target Catch, µg	0.0	0.1	0.0	0.0	0.04
C_{Be}	Concentration, µg/dscm	1.83E-05	6.04E-05	2.52E-05	2.61E-05	3.49E-05
C_{Be} @ 7% O_2	Concentration, µg/dscm @ 7% O2	4.09E-05	1.42E-04	4.55E-05	4.90E-05	7.74E-05
E_{Be}	Emission Rate, µg/hr	1,314	4,864	2,143	2,071	2,750
E_{Be}	Emission Rate, lb/hr	2.64E-09	9.24E-09	3.96E-09	3.96E-09	5.28E-09
Charge	Pounds per Ton of Coal Charged	5.20E-11	1.70E-10	0.00E+00	1.07E-10	1.09E-10
	Cadmium					
Cd	Target Catch, µg	0.3	0.4	0.5	0.5	0.4
C_{Cd}	Concentration, µg/dscm	2.83E-04	3.02E-04	3.78E-04	4.08E-04	3.31E-04
C_{Cd} @ 7% O_2	Concentration, µg/dscm @ 7% O2	6.34E-04	7.12E-04	6.82E-04	7.67E-04	7.05E-04
E_{Cd}	Emission Rate, µg/hr	20,374	24,320	32,141	32,448	25,714
E_{Cd}	Emission Rate, lb/hr	4.09E-08	4.62E-08	5.94E-08	6.20E-08	4.97E-08
Charge	Pounds per Ton of Coal Charged	8.06E-10	8.49E-10	0.00E+00	1.67E-09	1.11E-09
	Chromium					
Cr	Target Catch, µg	5.2	10.7	6.7	5.8	7.23
C_{Cr}	Concentration, µg/dscm	4.75E-03	9.24E-03	5.63E-03	5.04E-03	6.34E-03
C_{Cr} @ 7% O_2	Concentration, µg/dscm @ 7% O2	1.06E-02	2.18E-02	1.02E-02	9.47E-03	1.40E-02
E_{Cr}	Emission Rate, µg/hr	341,753	743,497	478,545	400,417	495,223
E_{Cr}	Emission Rate, lb/hr	6.86E-07	1.41E-06	8.84E-07	7.66E-07	9.55E-07
Charge	Pounds per Ton of Coal Charged	1.35E-08	2.60E-08	0.00E+00	2.06E-08	2.00E-08

*Run A-U-315-3 is not included in averages. This Test was conducted under non-push conditions

Summary of Stack Gas Parameters and Test Results
S512.000
ABC Coke - Birmingham, Alabama
US EPA Test Method 315 - Metals
Underfire Stack

	RUN NUMBER	***A-U-315-1***	***A-U-315-2***	***A-U-315-3***	***A-U-315-4***	
	RUN DATE	***09/24/98***	***09/24/98***	***09/25/98***	***09/25/98***	***Average***
	RUN TIME	***1025-1344***	***1443-1806***	***0738-1029***	***1110-1428***	
	EMISSIONS DATA - Continued					
	Colbalt					
Co	Target Catch, µg	0.0	0.0	0.0	0.0	0.00
C_{Co}	Concentration, µg/dscm	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
C_{Co} @ 7% O_2	Concentration, µg/dscm @ 7% O2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
E_{Co}	Emission Rate, µg/hr	0	0	0	0	0
E_{Co}	Emission Rate, lb/hr	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Charge	Pounds per Ton of Coal Charged	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Copper					
Cu	Target Catch, µg	4.9	5.1	4.6	5.7	5.23
C_{Cu}	Concentration, µg/dscm	4.47E-03	4.40E-03	3.86E-03	4.95E-03	4.61E-03
C_{Cu} @ 7% O_2	Concentration, µg/dscm @ 7% O2	1.00E-02	1.04E-02	6.98E-03	9.31E-03	9.90E-03
E_{Cu}	Emission Rate, µg/hr	322,036	354,377	328,554	393,514	356,642
E_{Cu}	Emission Rate, lb/hr	6.47E-07	6.73E-07	6.07E-07	7.52E-07	6.91E-07
Charge	Pounds per Ton of Coal Charged	1.27E-08	1.24E-08	0.00E+00	2.02E-08	1.51E-08
	Lead					
Pb	Target Catch, µg	8.1	8.4	4.3	5.3	7.3
C_{Pb}	Concentration, µg/dscm	7.39E-03	7.25E-03	3.61E-03	4.61E-03	6.42E-03
C_{Pb} @ 7% O_2	Concentration, µg/dscm @ 7% O2	1.66E-02	1.71E-02	6.52E-03	8.65E-03	1.41E-02
E_{Pb}	Emission Rate, µg/hr	532,346	583,680	307,126	365,899	493,975
E_{Pb}	Emission Rate, lb/hr	1.07E-06	1.11E-06	5.68E-07	7.00E-07	9.59E-07
Charge	Pounds per Ton of Coal Charged	2.11E-08	2.04E-08	0.00E+00	1.88E-08	2.01E-08

*Run A-U-315-3 is not included in averages. This Test was conducted under non-push conditions

Summary of Stack Gas Parameters and Test Results
S512.000
ABC Coke - Birmingham, Alabama
US EPA Test Method 315 - Metals
Underfire Stack

	RUN NUMBER	***A-U-315-1***	***A-U-315-2***	***A-U-315-3***	***A-U-315-4***	
	RUN DATE	***09/24/98***	***09/24/98***	***09/25/98***	***09/25/98***	***Average***
	RUN TIME	***1025-1344***	***1443-1806***	***0738-1029***	***1110-1428***	
	EMISSIONS DATA - Continued					
	Manganese					
Mn	Target Catch, µg	2.4	5.6	2.8	6.2	4.73
C_{Mn}	Concentration, µg/dscm	2.19E-03	4.84E-03	2.35E-03	5.39E-03	4.14E-03
C_{Mn} @ 7% O_2	Concentration, µg/dscm @ 7% O2	4.91E-03	1.14E-02	4.25E-03	1.01E-02	8.81E-03
E_{Mn}	Emission Rate, µg/hr	157,732	389,120	199,989	428,032	324,962
E_{Mn}	Emission Rate, lb/hr	3.17E-07	7.39E-07	3.70E-07	8.18E-07	6.25E-07
Charge	Pounds per Ton of Coal Charged	6.24E-09	1.36E-08	0.00E+00	2.20E-08	1.39E-08
	Mercury					
Hg	Target Catch, µg	0.0	0.0	0.0	0.0	0.00
C_{Hg}	Concentration, µg/dscm	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
C_{Hg} @ 7% O_2	Concentration, µg/dscm @ 7% O2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
E_{Hg}	Emission Rate, µg/hr	0	0	0	0	0
E_{Hg}	Emission Rate, lb/hr	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Charge	Pounds per Ton of Coal Charged	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Nickel					
Ni	Target Catch, µg	1.1	2.9	1.9	1.6	1.87
C_{Ni}	Concentration, µg/dscm	1.00E-03	2.50E-03	1.60E-03	1.39E-03	1.63E-03
C_{Ni} @ 7% O_2	Concentration, µg/dscm @ 7% O2	2.25E-03	5.90E-03	2.88E-03	2.61E-03	3.59E-03
E_{Ni}	Emission Rate, µg/hr	72,294	201,509	135,707	110,460	128,087
E_{Ni}	Emission Rate, lb/hr	1.45E-07	3.83E-07	2.51E-07	2.11E-07	2.46E-07
Charge	Pounds per Ton of Coal Charged	2.86E-09	7.03E-09	0.00E+00	5.68E-09	5.19E-09

*Run A-U-315-3 is not included in averages. This Test was conducted under non-push conditions

Summary of Stack Gas Parameters and Test Results
S512.000
ABC Coke - Birmingham, Alabama
US EPA Test Method 315 - Metals
Underfire Stack

	RUN NUMBER	***A-U-315-1***	***A-U-315-2***	***A-U-315-3***	***A-U-315-4***	
	RUN DATE	***09/24/98***	***09/24/98***	***09/25/98***	***09/25/98***	***Average***
	RUN TIME	***1025-1344***	***1443-1806***	***0738-1029***	***1110-1428***	
	EMISSIONS DATA - Continued					
	Phosphorus					
P	Target Catch, µg	15.0	36.0	18.0	30.0	27.00
C_P	Concentration, µg/dscm	1.37E-02	3.11E-02	1.51E-02	2.61E-02	2.36E-02
C_P @ 7% O_2	Concentration, µg/dscm @ 7% O2	3.07E-02	7.32E-02	2.73E-02	4.90E-02	5.10E-02
E_P	Emission Rate, µg/hr	985,826	2,501,486	1,285,644	2,071,125	1,852,812
E_P	Emission Rate, lb/hr	1.98E-06	4.75E-06	2.38E-06	3.96E-06	3.56E-06
Charge	Pounds per Ton of Coal Charged	3.90E-08	8.73E-08	0.00E+00	1.07E-07	7.76E-08
	Selenium					
Se	Target Catch, µg	2.0	4.3	4.5	5.2	3.83
C_{Se}	Concentration, µg/dscm	1.83E-03	3.71E-03	3.78E-03	4.52E-03	3.35E-03
C_{Se} @ 7% O_2	Concentration, µg/dscm @ 7% O2	4.09E-03	8.75E-03	6.82E-03	8.49E-03	7.11E-03
E_{Se}	Emission Rate, µg/hr	131,443	298,789	321,411	358,995	263,076
E_{Se}	Emission Rate, lb/hr	2.64E-07	5.68E-07	5.94E-07	6.86E-07	5.06E-07
Charge	Pounds per Ton of Coal Charged	5.20E-09	1.04E-08	0.00E+00	1.85E-08	1.14E-08
	Silver					
Ag	Target Catch, µg	0.0	0.0	0.0	0.0	0.00
C_{ag}	Concentration, µg/dscm	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
C_{Ag} @ 7% O_2	Concentration, µg/dscm @ 7% O2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
E_{Ag}	Emission Rate, µg/hr	0	0	0	0	0
E_{Ag}	Emission Rate, lb/hr	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Charge	Pounds per Ton of Coal Charged	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

*Run A-U-315-3 is not included in averages. This Test was conducted under non-push conditions

Summary of Stack Gas Parameters and Test Results
S512.000
ABC Coke - Birmingham, Alabama
US EPA Test Method 315 - Metals
Underfire Stack

	RUN NUMBER	***A-U-315-1***	***A-U-315-2***	***A-U-315-3***	***A-U-315-4***	
	RUN DATE	***09/24/98***	***09/24/98***	***09/25/98***	***09/25/98***	***Average***
	RUN TIME	***1025-1344***	***1443-1806***	***0738-1029***	***1110-1428***	
	EMISSIONS DATA - Continued					
	Thallium					
Tl	Target Catch, µg	0.9	1.0	0.6	0.8	0.90
C_{Tl}	Concentration, µg/dscm	8.22E-04	8.63E-04	5.04E-04	6.95E-04	7.93E-04
C_{Tl} @ 7% O_2	Concentration, µg/dscm @ 7% O2	1.84E-03	2.03E-03	9.10E-04	1.31E-03	1.73E-03
E_{Tl}	Emission Rate, µg/hr	59,150	69,486	42,855	55,230	61,288
E_{Tl}	Emission Rate, lb/hr	1.19E-07	1.32E-07	7.92E-08	1.06E-07	1.19E-07
Charge	Pounds per Ton of Coal Charged	2.34E-09	2.43E-09	0.00E+00	2.84E-09	2.54E-09
	Zinc					
Zn	Target Catch, µg	26.0	32.0	29.0	30.0	29.33
C_{Zn}	Concentration, µg/dscm	2.37E-02	2.76E-02	2.44E-02	2.61E-02	2.58E-02
C_{Zn} @ 7% O_2	Concentration, µg/dscm @ 7% O2	5.32E-02	6.51E-02	4.40E-02	4.90E-02	5.58E-02
E_{Zn}	Emission Rate, µg/hr	1,708,764	2,223,543	2,071,316	2,071,125	2,001,144
E_{Zn}	Emission Rate, lb/hr	3.43E-06	4.22E-06	3.83E-06	3.96E-06	3.87E-06
Charge	Pounds per Ton of Coal Charged	6.76E-08	7.76E-08	0.00E+00	1.07E-07	8.39E-08

*Run A-U-315-3 is not included in averages. This Test was conducted under non-push conditions.

Summary of Stack Gas Parameters and Test Results
ABC Coke - Birmingham, Alabama
CARB Method 429 - PAH's
Baghouse Inlet

	RUN NUMBER	A-I-429-1	A-I-429-2	A-I-429-3	
	RUN DATE	9/21/98	9/22/98	9/23/98	*Average*
	RUN TIME	1128-1912	1018-1816	1019-1810	
	MEASURED DATA				
γ	Meter Box Correction Factor	1.002	1.002	1.002	1.002
ΔH	Avg. Meter Orifice Pressure, in. H_2O	0.8588	0.4392	0.5672	0.6217
P_{bar}	Barometric Pressure, inches Hg	29.70	29.74	29.80	29.75
V_m	Sample Volume, ft^3	176.494	99.075	155.926	143.832
T_m	Average Meter Temperature, °F	99	103	107	103
P_{static}	Stack Static Pressure, inches H_2O	-5.90	-4.50	-5.80	-5.40
T_s	Average Stack Temperature, °F	120	136	135	130
V_{lc}	Condensate Collected, ml	121.3	63.0	92.3	92.200
CO_2	Carbon Dioxide content, % by volume	0.2	0.2	0.2	0.20
O_2	Oxygen content, % by volume	20.30	20.30	20.30	20.30
N_2	Nitrogen content, % by volume	79.50	79.50	79.50	79.50
C_p	Pitot Tube Coefficient	0.84	0.84	0.84	0.84
$\Delta p^{1/2}$	Average Square Root Dp, (in. $H_2O)^{1/2}$	0.6439	0.4436	0.5096	0.5324
	Circular Stack? 1=Y,0=N:	0	0	0	
As	Diameter or Dimensions, inches:	4680	4680	4680	4680
Θ	Sample Run Duration, minutes	458	422	435	438
D_n	Nozzle Diameter, inches	0.183	0.183	0.183	0.183
	Tons of Coke pushed	257.46	281.98	269.72	269.72
	Total Test Time, hours	7.73	7.97	7.85	7.85
	Tons of Coke per Hour	33.3	35.4	34.4	34.3
	CALCULATED DATA				
A_n	Nozzle Area, ft^2	0.000183	0.000183	0.000183	0.000183
$V_{m(std)}$	Standard Meter Volume, dscf	166.098	92.605	145.053	134.585
$V_{m(std)}$	Standard Meter Volume, dscm	4.703	2.622	4.107	3.811
Q_m	Average Sampling Rate, dscfm	3.63E-01	2.19E-01	3.33E-01	3.05E-01
B_{ws}	Moisture, % by volume	3.3	3.1	2.9	3.1
$B_{ws(sat)}$	Moisture (at saturation), % by volume	11.8	18.0	17.5	15.766
V_{wstd}	Standard Water Vapor Volume, ft^3	5.710	2.965	4.345	4.340
$1-B_{ws}$	Dry Mole Fraction	0.967	0.969	0.971	0.969
M_d	Molecular Weight (d.b.), lb/lb•mole	28.84	28.84	28.84	28.84
M_s	Molecular Weight (w.b.), lb/lb•mole	28.48	28.51	28.53	28.51
V_s	Stack Gas Velocity, ft/s	38.6	26.9	30.8	32.1
A	Stack Area, ft^2	32.5	32.5	32.5	32.50
Q_a	Stack Gas Volumetric flow, acfm	75,215	52,375	60,131	62,574
Q_s	Stack Gas Volumetric flow, dscfm	64,724	44,174	50,842	53,246
$Q_{s(cmm)}$	Stack Gas Volumetric flow, dscmm	1,833	1,251	1,440	1,508
I	Isokinetic Sampling Ratio, %	99.7	88.4	116.7	101.6

quantdata

Baghouse Inlet

Trunc'd	CMPD	Quanterra Compound Name		Mol. Wt.	Method Blank	A-I-429-1	Blank Adjusted	A-I-429-2	Blank Adjusted	A-I-429-3	Blank Adjusted
Naphthal	cmpd1	Naphthalene	1	128.16	340	360,000	359,660	120,000	119,660	160,000	159,660
2-Methyl	cmpd2	2-Methylnaphthalene	2	142.2	25	76,000	75,975	24,000	23,975	41,000	40,975
Acenaph	cmpd3	Acenaphthylene	3	154.21	0	88,000	88,000	36,000	36,000	33,000	33,000
Acenaph	cmpd4	Acenaphthene	4	154.21	0	15,000	15,000	4,300	4,300	6,300	6,300
Fluorene	cmpd5	Fluorene	5	166.21	0	3,400	3,400	16,000	16,000	18,000	18,000
Phenant	cmpd6	Phenanthrene	6	178.22	24	160,000	159,976	53,000	52,976	66,000	65,976
Anthranc	cmpd7	Anthrancene	7	178.22	0	16,000	16,000	4,300	4,300	9,100	9,100
Fluorant	cmpd8	Fluoranthene	8	202.26	0	50,000	50,000	18,000	18,000	25,000	25,000
Pyrene	cmpd9	Pyrene	9	202.24	0	33,000	33,000	13,000	13,000	18,000	18,000
Benzo (a	cmpd10	Benzo (a) anthrancene	10	228.29	0	15,000	15,000	7,000	7,000	11,000	11,000
Chrysen	cmpd11	Chrysene	11	228.28	0	26,000	26,000	12,000	12,000	18,000	18,000
Benzo (b	cmpd12	Benzo (b) fluoranthene	12	252.32	0	17,000	17,000	5,200	5,200	6,100	6,100
Benzo (k	cmpd13	Benzo (k) fluoranthene	13	252.32	0	9,200	9,200	3,700	3,700	3,600	3,600
Benzo (e	cmpd14	Benzo (e) pyrene	14	252.3	0	6,500	6,500	2,600	2,600	3,300	3,300
Benzo (a	cmpd15	Benzo (a) pyrene	15	252.3	0	6,300	6,300	1,900	1,900	1,800	1,800
Perylene	cmpd16	Perylene	16	202.24	0	1,100	1,100	330	330	280	280
Indeno (	cmp17	Indeno (1,2,3-cd) pyrene	17	290.34	0	11,000	11,000	4,300	4,300	3,900	3,900
Dibenz (	cmpd18	Dibenz (a,h) anthracene	18	278.33	0	2,500	2,500	1,100	1,100	980	980
Benzo (g	cmpd19	Benzo (g,h,i) perylene	19	276.34	0	11,000	11,000	3,800	3,800	4,000	4,000

Baghouse Inlet

	A-I-429-1	A-I-429-2	A-I-429-3	Average
Naphthalene				
Molecular Weight, g/g-mole	128.16	128.16	128.16	
Target Catch, ng	359,660	119,660	159,660	212,993
ng to µg	359.66	119.66	159.66	212.99
Concentration, µg/dscm [a]	76.5	45.6	38.9	53.7
Emission Rate, µg/hr [b]	8,408,972	3,424,793	3,357,695	5,063,820
Emission Rate, lb/hr [c]	1.85E-02	7.55E-03	7.40E-03	1.12E-02
Pounds per Ton of Coke Pushed	5.57E-04	2.13E-04	2.15E-04	3.28E-04
2-Methylnaphthalene				
Molecular Weight, g/g-mole	142.20	142.20	142.20	
Target Catch, ng	75,975	23,975	40,975	46,975
ng to µg	75.98	23.98	40.98	46.98
Concentration, µg/dscm [a]	16.15	9.14	9.98	11.76
Emission Rate, µg/hr [b]	1,776,321	686,189	861,716	1,108,075
Emission Rate, lb/hr [c]	3.92E-03	1.51E-03	1.90E-03	2.44E-03
Pounds per Ton of Coke Pushed	1.18E-04	4.28E-05	5.53E-05	7.19E-05
Acenaphthylene				
Molecular Weight, g/g-mole	154.21	154.21	154.21	
Target Catch, ng	88,000	36,000	33,000	52,333
ng to µg	88.00	36.00	33.00	52.33
Concentration, µg/dscm [a]	18.71	13.73	8.03	13.49
Emission Rate, µg/hr [b]	2,057,470	1,030,357	693,999	1,260,609
Emission Rate, lb/hr [c]	4.54E-03	2.27E-03	1.53E-03	2.78E-03
Pounds per Ton of Coke Pushed	1.36E-04	6.42E-05	4.45E-05	8.16E-05
Acenaphthene				
Molecular Weight, g/g-mole	154.21	154.21	154.21	
Target Catch, ng	15000.00	4300.00	6300.00	8533.33
ng to µg	15.00	4.30	6.30	8.53
Concentration, µg/dscm [a]	3.189	1.640	1.534	2.121
Emission Rate, µg/hr [b]	350,705	123,070	132,491	202,089
Emission Rate, lb/hr [c]	7.73E-04	2.71E-04	2.92E-04	4.46E-04
Pounds per Ton of Coke Pushed	2.32E-05	7.67E-06	8.50E-06	1.31E-05
Fluorene				
Molecular Weight, g/g-mole	166.21	166.21	166.21	
Target Catch, ng	3,400	16,000	18,000	12,467
ng to µg	3.40	16.00	18.00	12.47
Concentration, µg/dscm [a]	0.723	6.102	4.382	3.736
Emission Rate, µg/hr [b]	79,493	457,937	378,545	305,325
Emission Rate, lb/hr [c]	1.75E-04	1.01E-03	8.35E-04	6.73E-04
Pounds per Ton of Coke Pushed	5.26E-06	2.85E-05	2.43E-05	1.94E-05

	A-I-429-1	A-I-429-2	A-I-429-3	Average
Phenanthrene				
Molecular Weight, g/g-mole	178.22	178.22	178.22	
Target Catch, ng	159,976	52,976	65,976	92,976
ng to µg	160.0	53.0	66.0	93.0
Concentration, µg/dscm [a]	34.01	20.20	16.06	23.43
Emission Rate, µg/hr [b]	3,740,293	1,516,228	1,387,494	2,214,672
Emission Rate, lb/hr [c]	8.25E-03	3.34E-03	3.06E-03	4.88E-03
Pounds per Ton of Coke Pushed	2.48E-04	9.45E-05	8.90E-05	1.44E-04
Anthrancene				
Molecular Weight, g/g-mole	178.22	178.22	178.22	
Target Catch, ng	16000	4300	9100	9800
ng to µg	16.00	4.30	9.10	9.80
Concentration, µg/dscm [a]	3.402	1.640	2.215	2.419
Emission Rate, µg/hr [b]	374,085	123,070	191,376	229,510
Emission Rate, lb/hr [c]	8.25E-04	2.71E-04	4.22E-04	5.06E-04
Pounds per Ton of Coke Pushed	2.48E-05	7.67E-06	1.23E-05	1.49E-05
Fluoranthene				
Molecular Weight, g/g-mole	202.26	202.26	202.26	
Target Catch, ng	50,000	18,000	25,000	31,000
ng to µg	50.00	18.00	25.00	31.00
Concentration, µg/dscm [a]	10.63	6.86	6.09	7.86
Emission Rate, µg/hr [b]	1,169,017	515,179	525,757	736,651
Emission Rate, lb/hr [c]	2.58E-03	1.14E-03	1.16E-03	1.62E-03
Pounds per Ton of Coke Pushed	7.74E-05	3.21E-05	3.37E-05	4.77E-05
Pyrene				
Molecular Weight, g/g-mole	202.24	202.24	202.24	
Target Catch, ng	33,000	13,000	18,000	21,333
ng to µg	33.00	13.00	18.00	21.33
Concentration, µg/dscm [a]	7.016	4.958	4.382	5.452
Emission Rate, µg/hr [b]	771,551	372,073	378,545	507,390
Emission Rate, lb/hr [c]	1.70E-03	8.20E-04	8.35E-04	1.12E-03
Pounds per Ton of Coke Pushed	5.11E-05	2.32E-05	2.43E-05	3.28E-05
Benzo (a) anthrancene				
Molecular Weight, g/g-mole	228.29	228.29	228.29	
Target Catch, ng	15000	7000	11000	11000
ng to µg	15.00	7.00	11.00	11.00
Concentration, µg/dscm [a]	3.1892	2.6694	2.6781	2.8456
Emission Rate, µg/hr [b]	350,705	200,347	231,333	260,795
Emission Rate, lb/hr [c]	7.73E-04	4.42E-04	5.10E-04	5.75E-04
Pounds per Ton of Coke Pushed	2.32E-05	1.25E-05	1.48E-05	1.68E-05

	A-I-429-1	A-I-429-2	A-I-429-3	Average
Chrysene				
Molecular Weight, g/g-mole	228.28	228.28	228.28	
Target Catch, ng	26,000	12,000	18,000	18,667
ng to µg	26.00	12.00	18.00	18.67
Concentration, µg/dscm [a]	5.53	4.58	4.38	4.83
Emission Rate, µg/hr [b]	607,889	343,452	378,545	443,295
Emission Rate, lb/hr [c]	1.34E-03	7.57E-04	8.35E-04	9.77E-04
Pounds per Ton of Coke Pushed	4.02E-05	2.14E-05	2.43E-05	2.86E-05
Benzo (b) fluoranthene				
Molecular Weight, g/g-mole	252.32	252.32	252.32	
Target Catch, ng	17,000	5,200	6,100	9,433
ng to µg	17.00	5.20	6.10	9.43
Concentration, µg/dscm [a]	3.61	1.98	1.49	2.36
Emission Rate, µg/hr [b]	397,466	148,829	128,285	224,860
Emission Rate, lb/hr [c]	8.76E-04	3.28E-04	2.83E-04	4.96E-04
Pounds per Ton of Coke Pushed	2.63E-05	9.27E-06	8.23E-06	1.46E-05
Benzo (k) fluoranthene				
Molecular Weight, g/g-mole	252.32	252.32	252.32	
Target Catch, ng	9,200	3,700	3,600	5,500
ng to µg	9.20	3.70	3.60	5.50
Concentration, µg/dscm [a]	1.96	1.41	0.876	1.414
Emission Rate, µg/hr [b]	215,099	105,898	75,709	132,235
Emission Rate, lb/hr [c]	4.74E-04	2.33E-04	1.67E-04	2.92E-04
Pounds per Ton of Coke Pushed	1.42E-05	6.60E-06	4.86E-06	8.56E-06
Benzo (e) pyrene				
Molecular Weight, g/g-mole	252.30	252.30	252.30	
Target Catch, ng	6,500	2,600	3,300	4,133
ng to µg	6.50	2.60	3.30	4.13
Concentration, µg/dscm [a]	1.382	0.992	0.803	1.059
Emission Rate, µg/hr [b]	151,972	74,415	69,400	98,596
Emission Rate, lb/hr [c]	3.35E-04	1.64E-04	1.53E-04	2.17E-04
Pounds per Ton of Coke Pushed	1.01E-05	4.64E-06	4.45E-06	6.38E-06
Benzo (a) pyrene				
Molecular Weight, g/g-mole	252.30	252.30	252.30	
Target Catch, ng	6300	1900	1800	3333
ng to µg	6.30	1.90	1.80	3.33
Concentration, µg/dscm [a]	1.339	0.725	0.438	0.834
Emission Rate, µg/hr [b]	147,296	54,380	37,855	79,844
Emission Rate, lb/hr [c]	3.25E-04	1.20E-04	8.35E-05	1.76E-04
Pounds per Ton of Coke Pushed	9.75E-06	3.39E-06	2.43E-06	5.19E-06

	A-I-429-1	A-I-429-2	A-I-429-3	Average
Perylene				
Molecular Weight, g/g-mole	202.24	202.24	202.24	
Target Catch, ng	1100.00	330.00	280.00	570.00
ng to µg	1.10	0.28	0.28	0.55
Concentration, µg/dscm [a]	0.2339	0.11	0.07	0.1363
Emission Rate, µg/hr [b]	25,718	8013.89	5888.48	13206.9
Emission Rate, lb/hr [c]	5.67E-05	1.77E-05	1.30E-05	2.91E-05
Pounds per Ton of Coke Pushed	1.70E-06	4.99E-07	3.78E-07	8.60E-07
Indeno (1,2,3-cd) pyrene				
Molecular Weight, g/g-mole	290.34	290.34	290.34	
Target Catch, ng	11,000	4,300	3,900	6,400
ng to µg	11.00	4.30	3.90	6.40
Concentration, µg/dscm [a]	2.34	1.64	0.949	1.643
Emission Rate, µg/hr [b]	257,184	123,070	82,018	154,091
Emission Rate, lb/hr [c]	5.67E-04	2.71E-04	1.81E-04	3.40E-04
Pounds per Ton of Coke Pushed	1.70E-05	7.67E-06	5.26E-06	9.98E-06
Dibenz (a,h) anthracene				
Molecular Weight, g/g-mole	278.33	278.33	278.33	
Target Catch, ng	2,500	1,100	980	1527
ng to µg	2.50	1.10	0.980	1.527
Concentration, µg/dscm [a]	0.532	0.419	0.239	0.397
Emission Rate, µg/hr [b]	58,451	31,483	20,610	36,848
Emission Rate, lb/hr [c]	1.29E-04	6.94E-05	4.54E-05	8.12E-05
Pounds per Ton of Coke Pushed	3.87E-06	1.96E-06	1.32E-06	2.38E-06
Benzo (g,h,i) perylene				
Molecular Weight, g/g-mole	276.34	276.34	276.34	
Target Catch, ng	11,000	3,800	4,000	6,267
ng to µg	11.00	3.80	4.00	6.27
Concentration, µg/dscm [a]	2.339	1.449	0.974	1.587
Emission Rate, µg/hr [b]	257,184	108,760	84,121	150,022
Emission Rate, lb/hr [c]	5.67E-04	2.40E-04	1.85E-04	3.31E-04
Pounds per Ton of Coke Pushed	1.70E-05	6.78E-06	5.40E-06	9.73E-06

[a] Milligrams per dry standard cubic meter at 68° F (20° C) and 1 atm.

[b] Micrograms per hour.

[c] Pounds per hour.

ND Not Detectable - Results are below target analyte detection limit. Values are counted as zero (0) in averages.

{ } Estimate - Analyte results are below the quantitation limit and above the detection limit.

Summary of Stack Gas Parameters and Test Results
ABC Coke - Birmingham, Alabama
CARB Method 429 - PAH's
Baghouse Outlet

	RUN NUMBER	**A-O-429-1**	**A-O-429-2**	**A-O-429-3**	
	RUN DATE	**9/21/98**	**9/22/98**	**9/23/98**	***Average***
	RUN TIME	**1126-1911**	**1028-1819**	**1020-1806**	
	MEASURED DATA				
γ	Meter Box Correction Factor	1.012	1.012	1.012	1.012
ΔH	Avg. Meter Orifice Pressure, in. H_2O	0.9748	0.5466	0.9421	0.8212
P_{bar}	Barometric Pressure, inches Hg	29.70	29.74	29.80	29.75
V_m	Sample Volume, ft^3	161.653	100.253	151.043	137.650
T_m	Average Meter Temperature, °F	87	92	92	90
P_{static}	Stack Static Pressure, inches H_2O	0.15	0.15	0.15	0.15
T_s	Average Stack Temperature, °F	117	128	125	123
V_{lc}	Condensate Collected, ml	110.2	57.2	52.9	73.433
CO_2	Carbon Dioxide content, % by volume	0.20	0.2	0.1	0.17
O_2	Oxygen content, % by volume	20.40	20.40	20.40	20.40
N_2	Nitrogen content, % by volume	79.40	79.40	79.50	79.43
C_p	Pitot Tube Coefficient	0.84	0.84	0.84	0.84
$\Delta p^{1/2}$	Average Square Root Dp, (in. $H_2O)^{1/2}$	0.5115	0.3204	0.4724	0.4348
	Circular Stack? 1=Y,0=N:	1	1	1	
As	Diameter or Dimensions, inches:	85.75	85.75	85.75	85.75
Θ	Sample Run Duration, minutes	412	400	420	411
D_n	Nozzle Diameter, inches	0.213	0.213	0.215	0.214
	Tons of Coke pushed	257.48	281.98	269.72	269.72
	Total Test Time, hours	7.75	7.85	7.77	7.79
	Tons of Coke per Hour	33.2	35.9	34.7	34.6
	CALCULATED DATA				
A_n	Nozzle Area, ft^2	0.000247	0.000247	0.000252	0.000249
$V_{m(std)}$	Standard Meter Volume, dscf	157.065	96.553	145.903	133.174
$V_{m(std)}$	Standard Meter Volume, dscm	4.448	2.734	4.132	3.771
Q_m	Average Sampling Rate, dscfm	3.81E-01	2.41E-01	3.47E-01	3.23E-01
B_{ws}	Moisture, % by volume	3.2	2.7	1.7	2.5
$B_{ws(sat)}$	Moisture (at saturation), % by volume	10.7	14.4	13.2	12.761
V_{wstd}	Standard Water Vapor Volume, ft^3	5.187	2.692	2.490	3.457
$1-B_{ws}$	Dry Mole Fraction	0.968	0.973	0.983	0.975
M_d	Molecular Weight (d.b.), lb/lb•mole	28.85	28.85	28.83	28.84
M_s	Molecular Weight (w.b.), lb/lb•mole	28.50	28.55	28.65	28.57
V_s	Stack Gas Velocity, ft/s	30.3	19.1	28.1	25.8
A	Stack Area, ft^2	40.1	40.1	40.1	40.10
Q_a	Stack Gas Volumetric flow, acfm	72,960	46,062	67,558	62,193
Q_s	Stack Gas Volumetric flow, dscfm	64,153	39,996	59,710	54,620
$Q_{s(cmm)}$	Stack Gas Volumetric flow, dscmm	1,817	1,133	1,691	1,547
I	Isokinetic Sampling Ratio, %	96.3	97.8	92.6	95.6

quantdata

Baghouse Outlet

Trunc'd Name	CMPD	Quanterra Compound Name		Mol. Wt.	Method Blank	A-O-429-1	Blank Adjusted	A-O-429-2	Blank Adjusted	A-O-429-3	Blank Adjusted
Naphthalene	cmpd1	Naphthalene	1	128.16	340	290,000	289,660	95,000	94,660	110,000	109,660
2-Methylnaphthalene	cmpd2	2-Methylnaphthalene	2	142.2	25	55,000	54,975	24,000	23,975	36,000	35,975
Acenaphthylene	cmpd3	Acenaphthylene	3	154.21	0	50,000	50,000	22,000	22,000	17,000	17,000
Acenaphthene	cmpd4	Acenaphthene	4	154.21	0	7,000	7,000	2,500	2,500	3,500	3,500
Fluorene	cmpd5	Fluorene	5	166.21	0	21,000	21,000	7,500	7,500	8,800	8,800
Phenanthrene	cmpd6	Phenanthrene	6	178.22	24	66,000	65,976	45,000	44,976	27,000	26,976
Anthrancene	cmpd7	Anthrancene	7	178.22	0	20,000	20,000	3,300	3,300	5,100	5,100
Fluoranthene	cmpd8	Fluoranthene	8	202.26	0	32,000	32,000	14,000	14,000	12,000	12,000
Pyrene	cmpd9	Pyrene	9	202.24	0	16,000	16,000	8,100	8,100	6,400	6,400
Benzo (a) anthrancene	cmpd10	Benzo (a) anthrancene	10	228.29	0	290	290	240	240	240	240
Chrysene	cmpd11	Chrysene	11	228.28	0	740	740	640	640	690	690
Benzo (b) fluoranthene	cmpd12	Benzo (b) fluoranthene	12	252.32	0	200	200	180	180	210	210
Benzo (k) fluoranthene	cmpd13	Benzo (k) fluoranthene	13	252.32	0	200	200	160	160	140	140
Benzo (e) pyrene	cmpd14	Benzo (e) pyrene	14	252.3	0	130	130	0	ND	110	110
Benzo (a) pyrene	cmpd15	Benzo (a) pyrene	15	252.3	0	0	ND	0	ND	0	ND
Perylene	cmpd16	Perylene	16	202.24	0	0	ND	0	ND	0	ND
Indeno (1,2,3-cd) pyren	cmp17	Indeno (1,2,3-cd) pyrene	17	290.34	0	0	ND	0	ND	0	ND
Dibenz (a,h) anthracen	cmpd18	Dibenz (a,h) anthracene	18	278.33	0	0	ND	0	ND	0	ND
Benzo (g,h,i) perylene	cmpd19	Benzo (g,h,i) perylene	19	276.34	0	0	ND	0	ND	0	ND

Baghouse Outlet

	A-O-429-1	A-O-429-2	A-O-429-3	Average
Naphthalene				
Molecular Weight, g/g-mole	128.16	128.16	128.16	
Target Catch, ng	289,660	94,660	109,660	164,660
ng to µg	289.7	94.7	109.7	164.7
Concentration, µg/dscm [a]	65.1	34.6	26.5	42.1
Emission Rate, µg/hr [b]	7,098,639	2,352,729	2,692,659	4,048,009
Emission Rate, lb/hr [c]	1.56E-02	5.19E-03	5.94E-03	8.92E-03
Pounds per Ton of Coke Pushed	4.71E-04	1.44E-04	1.71E-04	2.62E-04
2-Methylnaphthalene				
Molecular Weight, g/g-mole	142.20	142.20	142.20	
Target Catch, ng	54,975	23,975	35,975	38,308
ng to µg	55.0	24.0	36.0	38.3
Concentration, µg/dscm [a]	12.36	8.77	8.71	9.95
Emission Rate, µg/hr [b]	1,347,261	595,887	883,352	942,167
Emission Rate, lb/hr [c]	2.97E-03	1.31E-03	1.95E-03	2.08E-03
Pounds per Ton of Coke Pushed	8.94E-05	3.66E-05	5.61E-05	6.07E-05
Acenaphthylene				
Molecular Weight, g/g-mole	154.21	154.21	154.21	
Target Catch, ng	50,000	22,000	17,000	29,667
ng to µg	50.0	22.0	17.0	29.7
Concentration, µg/dscm [a]	11.24	8.05	4.11	7.80
Emission Rate, µg/hr [b]	1,225,340	546,799	417,429	729,856
Emission Rate, lb/hr [c]	2.70E-03	1.21E-03	9.20E-04	1.61E-03
Pounds per Ton of Coke Pushed	8.13E-05	3.36E-05	2.65E-05	4.71E-05
Acenaphthene				
Molecular Weight, g/g-mole	154.21	154.21	154.21	
Target Catch, ng	7,000	2,500	3,500	4,333
ng to µg	7.00	2.50	3.50	4.33
Concentration, µg/dscm [a]	1.574	0.914	0.847	1.112
Emission Rate, µg/hr [b]	171,548	62,136	85,941	106,542
Emission Rate, lb/hr [c]	3.78E-04	1.37E-04	1.89E-04	2.35E-04
Pounds per Ton of Coke Pushed	1.14E-05	3.81E-06	5.46E-06	6.89E-06
Fluorene				
Molecular Weight, g/g-mole	166.21	166.21	166.21	
Target Catch, ng	21,000	7,500	8,800	12,433
ng to µg	21.00	7.50	8.80	12.43
Concentration, µg/dscm [a]	4.72	2.74	2.13	3.20
Emission Rate, µg/hr [b]	514,643	186,409	216,081	305,711
Emission Rate, lb/hr [c]	1.13E-03	4.11E-04	4.76E-04	6.74E-04
Pounds per Ton of Coke Pushed	3.42E-05	1.14E-05	1.37E-05	1.98E-05

	A-O-429-1	A-O-429-2	A-O-429-3	Average
Phenanthrene				
Molecular Weight, g/g-mole	178.22	178.22	178.22	
Target Catch, ng	65,976	44,976	26,976	45,976
ng to µg	66.0	45.0	27.0	46.0
Concentration, µg/dscm [a]	14.8	16.5	6.5	12.6
Emission Rate, µg/hr [b]	1,616,861	1,117,857	662,385	1,132,368
Emission Rate, lb/hr [c]	3.56E-03	2.46E-03	1.46E-03	2.50E-03
Pounds per Ton of Coke Pushed	1.07E-04	6.86E-05	4.21E-05	7.27E-05
Anthrancene				
Molecular Weight, g/g-mole	178.22	178.22	178.22	
Target Catch, ng	20,000	3,300	5,100	9,467
ng to µg	20.00	3.30	5.10	9.47
Concentration, µg/dscm [a]	4.50	1.21	1.23	2.31
Emission Rate, µg/hr [b]	490,136	82,020	125,229	232,461
Emission Rate, lb/hr [c]	1.08E-03	1.81E-04	2.76E-04	5.12E-04
Pounds per Ton of Coke Pushed	3.25E-05	5.03E-06	7.95E-06	1.52E-05
Fluoranthene				
Molecular Weight, g/g-mole	178.22	178.22	178.22	
Target Catch, ng	20,000	3,300	5,100	9,467
ng to µg	20.00	3.30	5.10	9.47
Concentration, µg/dscm [a]	4.50	1.21	1.23	2.31
Emission Rate, µg/hr [b]	490,136	82,020	125,229	232,461
Emission Rate, lb/hr [c]	1.08E-03	1.81E-04	2.76E-04	5.12E-04
Pounds per Ton of Coke Pushed	3.25E-05	5.03E-06	7.95E-06	1.52E-05
Pyrene				
Molecular Weight, g/g-mole	202.24	202.24	202.24	
Target Catch, ng	16,000	8,100	6,400	10,167
ng to µg	16.00	8.10	6.40	10.17
Concentration, µg/dscm [a]	3.60	2.96	1.55	2.70
Emission Rate, µg/hr [b]	392,109	201,322	157,150	250,193
Emission Rate, lb/hr [c]	8.64E-04	4.44E-04	3.46E-04	5.52E-04
Pounds per Ton of Coke Pushed	2.60E-05	1.24E-05	9.98E-06	1.61E-05
Benzo (a) anthrancene				
Molecular Weight, g/g-mole	228.29	228.29	228.29	
Target Catch, ng	290	240	240	257
ng to µg	0.290	0.240	0.240	0.257
Concentration, µg/dscm [a]	0.0652	0.0878	0.0581	0.0704
Emission Rate, µg/hr [b]	7,107	5,965	5,893	6,322
Emission Rate, lb/hr [c]	1.57E-05	1.32E-05	1.30E-05	1.39E-05
Pounds per Ton of Coke Pushed	4.72E-07	3.66E-07	3.74E-07	4.04E-07

	A-O-429-1	A-O-429-2	A-O-429-3	Average
Chrysene				
Molecular Weight, g/g-mole	228.28	228.28	228.28	
Target Catch, ng	740	640	690	690
ng to µg	0.740	0.640	0.690	0.690
Concentration, µg/dscm [a]	0.166	0.234	0.167	0.189
Emission Rate, µg/hr [b]	18,135	15,907	16,943	16,995
Emission Rate, lb/hr [c]	4.00E-05	3.51E-05	3.74E-05	3.75E-05
Pounds per Ton of Coke Pushed	1.20E-06	9.76E-07	1.08E-06	1.09E-06
Benzo (b) fluoranthene				
Molecular Weight, g/g-mole	252.32	252.32	252.32	
Target Catch, ng	200	180	210	197
ng to µg	0.200	0.180	0.210	0.197
Concentration, µg/dscm [a]	0.0450	0.0658	0.0508	0.0539
Emission Rate, µg/hr [b]	4,901	4,474	5,156	4,844
Emission Rate, lb/hr [c]	1.08E-05	9.86E-06	1.14E-05	1.07E-05
Pounds per Ton of Coke Pushed	3.25E-07	2.75E-07	3.27E-07	3.09E-07
Benzo (k) fluoranthene				
Molecular Weight, g/g-mole	252.32	252.32	252.32	
Target Catch, ng	200	160	140	167
ng to µg	0.200	0.160	0.140	0.167
Concentration, µg/dscm [a]	0.0450	0.0585	0.0339	0.0458
Emission Rate, µg/hr [b]	4,901	3,977	3,438	4,105
Emission Rate, lb/hr [c]	1.08E-05	8.77E-06	7.58E-06	9.05E-06
Pounds per Ton of Coke Pushed	3.25E-07	2.44E-07	2.18E-07	2.63E-07
Benzo (e) pyrene				
Molecular Weight, g/g-mole	252.30	252.30	252.30	
Target Catch, ng	130.0	ND	110.0	80.0
ng to µg	0.1300	0.0000	0.1100	0.0800
Concentration, µg/dscm [a]	0.0292	0.0000	0.0266	0.0186
Emission Rate, µg/hr [b]	3,186	0	2,701	1,962
Emission Rate, lb/hr [c]	7.02E-06	0.00E+00	5.95E-06	4.33E-06
Pounds per Ton of Coke Pushed	2.11E-07	0.00E+00	1.72E-07	1.28E-07
Benzo (a) pyrene				
Molecular Weight, g/g-mole	252.30	252.30	252.30	
Target Catch, ng	ND	ND	ND	0.00
ng to µg	0.00	0.00	0.00	0.00
Concentration, µg/dscm [a]	0.00000	0.00000	0.00000	0.00000
Emission Rate, µg/hr [b]	0	0	0	0
Emission Rate, lb/hr [c]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Pounds per Ton of Coke Pushed	0.00E+00	0.00E+00	0.00E+00	0.00E+00

	A-O-429-1	A-O-429-2	A-O-429-3	Average
Perylene				
Molecular Weight, g/g-mole	202.24	202.24	202.24	
Target Catch, ng	ND	ND	ND	0.00
ng to µg	0.00	0.00	0.00	0.00
Concentration, µg/dscm [a]	0.00000	0.00000	0.00000	0.00000
Emission Rate, µg/hr [b]	0	0	0.00	0
Emission Rate, lb/hr [c]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Pounds per Ton of Coke Pushed	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Indeno (1,2,3-cd) pyrene				
Molecular Weight, g/g-mole	290.34	290.34	290.34	
Target Catch, ng	ND	ND	ND	0.00
ng to µg	0.00	0.00	0.00	0.00
Concentration, µg/dscm [a]	0.00000	0.00000	0.00000	0.00000
Emission Rate, µg/hr [b]	0	0	0	0
Emission Rate, lb/hr [c]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Pounds per Ton of Coke Pushed	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Dibenz (a,h) anthracene				
Molecular Weight, g/g-mole	278.33	278.33	278.33	
Target Catch, ng	ND	ND	ND	0.00
ng to µg	0.00	0.00	0.00	0.00
Concentration, µg/dscm [a]	0.00000	0.00000	0.00000	0.00000
Emission Rate, µg/hr [b]	0.0	0.00	0.00	0.00
Emission Rate, lb/hr [c]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Pounds per Ton of Coke Pushed	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Benzo (g,h,i) perylene				
Molecular Weight, g/g-mole	276.34	276.34	276.34	
Target Catch, ng	ND	ND	ND	0.00
ng to µg	0.00	0.00	0.00	0.00
Concentration, µg/dscm [a]	0.00000	0.00000	0.00000	0.00000
Emission Rate, µg/hr [b]	0	0	0	0
Emission Rate, lb/hr [c]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Pounds per Ton of Coke Pushed	0.00E+00	0.00E+00	0.00E+00	0.00E+00

[a] Milligrams per dry standard cubic meter at 68° F (20° C) and 1 atm.

[b] Micrograms per hour.

[c] Pounds per hour.

ND Not Detectable - Results are below target analyte detection limit. Values are counted as zero (0) in averages.

{ } Estimate - Analyte results are below the quantitation limit and above the detection limit.

Summary of Stack Gas Parameters and Test Results
ABC Coke - Birmingham, Alabama
CARB Method 429 - PAH's
Underfire Stack

	RUN NUMBER	A-U-429-1	A-U-429-2	A-U-429-3	A-U-429-4	
	RUN DATE	9/24/98	9/24/98	9/25/98	9/25/98	Average*
	RUN TIME	1025-1345	1443-1812	0738-1029	1110-1427	
	MEASURED DATA					
γ	Meter Box Correction Factor	1.002	1.002	1.002	1.002	1.002
ΔH	Avg. Meter Orifice Pressure, in. H_2O	1.396	1.344	1.034	1.340	1.360
P_{bar}	Barometric Pressure, inches Hg	29.85	29.85	29.85	29.85	29.85
V_m	Sample Volume, ft^3	109.964	117.850	97.169	118.132	115.315
T_m	Average Meter Temperature, °F	99	103	87	102	101
P_{static}	Stack Static Pressure, inches H_2O	-1.00	-1.00	-1.00	-1.00	-1.00
T_s	Average Stack Temperature, °F	435	454	465	460	450
V_{lc}	Condensate Collected, ml	429.8	408.8	325.8	370.2	402.9
CO_2	Carbon Dioxide content, % by volume	2.7	2.95	2.65	2.8	2.82
O_2	Oxygen content, % by volume	14.70	15.00	13.20	13.50	14.40
N_2	Nitrogen content, % by volume	82.60	82.05	84.15	83.70	82.78
C_p	Pitot Tube Coefficient	0.84	0.84	0.84	0.84	0.84
$\Delta p^{1/2}$	Average Square Root Dp, $(in.\ H_2O)^{1/2}$	0.0994	0.0924	0.0830	0.0941	0.0953
	Circular Stack? 1=Y,0=N:	1	1	1	1	1.0000
As	Diameter or Dimensions, inches:	187	187	187	187	187
Θ	Sample Run Duration, minutes	180	180	172.5	180	180
D_n	Nozzle Diameter, inches	0.740	0.740	0.740	0.740	0.740
Charge	Tons of Coal Charged	168.63	183.96	0.00	122.64	158.41
	Total Test Time, hours	3.33	3.48	2.85	3.28	3.36
	Tons of Coal per Hour	50.6	52.9	0.0	37.4	47.0
	CALCULATED DATA					
A_n	Nozzle Area, ft^2	0.002987	0.002987	0.002987	0.002987	0.002987
$V_{m(std)}$	Standard Meter Volume, dscf	104.145	110.807	93.963	111.269	108.740
$V_{m(std)}$	Standard Meter Volume, dscm	2.949	3.138	2.661	3.151	3.079
Q_m	Average Sampling Rate, dscfm	5.79E-01	6.16E-01	5.45E-01	6.18E-01	6.04E-01
B_{ws}	Moisture, % by volume	16.3	14.8	14.0	13.5	14.9
$B_{ws(sat)}$	Moisture (at saturation), % by volume	2571.5	3131.8	3496.5	3326.9	3010.1
V_{wstd}	Standard Water Vapor Volume, ft^3	20.231	19.242	15.335	17.425	18.966
$1-B_{ws}$	Dry Mole Fraction	0.837	0.852	0.860	0.865	0.851
M_d	Molecular Weight (d.b.), lb/lb•mole	29.02	29.07	28.95	28.99	29.03
M_s	Molecular Weight (w.b.), lb/lb•mole	27.23	27.43	27.42	27.50	27.39
V_s	Stack Gas Velocity, ft/s	7.5	7.0	6.3	7.2	7.2
A	Stack Area, ft^2	190.7	190.7	190.7	190.7	190.73
Q_s	Stack Gas Volumetric flow, acfm	85,825	80,320	72,571	81,966	82,704
Q_s	Stack Gas Volumetric flow, dscfm	42,176	39,328	35,427	40,461	40,655
$Q_{s(cmm)}$	Stack Gas Volumetric flow, dscmm	1,194	1,114	1,003	1,146	1,151
I	Isokinetic Sampling Ratio, %	87.6	100.0	98.2	97.6	95.1

***Averages do not include A-U-429-3. This was a non-pushing baseline test run.**

quantdata

Underfire Stack

Trunc'd	CMPD	Quanterra Compound Name		Mol. Wt.	Method Blank	A-U-429-1	Blank Adjusted	A-U-429-2	Blank Adjusted	A-U-429-3	Blank Adjusted	A-U-429-4	Blank Adjusted
Naphthal	cmpd1	Naphthalene	1	128.16	340	100,000	99,660	130,000	129,660	76,000	75,660	99,000	98,660
2-Methyl	cmpd2	2-Methylnaphthalene	2	142.2	25	2,900	2,875	2,300	2,275	1,600	1,575	4,400	4,375
Acenaph	cmpd3	Acenaphthylene	3	154.21	0	16,000	16,000	68,000	68,000	13,000	13,000	NC	NC
Acenaph	cmpd4	Acenaphthene	4	154.21	0	280	280	240	240	120	120	240	240
Fluorene	cmpd5	Fluorene	5	166.21	0	930	930	690	690	360	360	1,300	1,300
Phenant	cmpd6	Phenanthrene	6	178.22	24	11,000	10,976	20,000	19,976	9,900	9,876	1,800	1,776
Anthranc	cmpd7	Anthrancene	7	178.22	0	310	310	460	460	220	220	280	280
Fluorant	cmpd8	Fluoranthene	8	202.26	0	5,400	5,400	12,000	12,000	4,800	4,800	7,100	7,100
Pyrene	cmpd9	Pyrene	9	202.24	0	2,700	2,700	21,000	21,000	3,300	3,300	4,600	4,600
Benzo (a	cmpd10	Benzo (a) anthrancene	10	228.29	0	160	160	100	100	0	ND	150	150
Chrysen	cmpd11	Chrysene	11	228.28	0	380	380	460	460	290	290	520	520
Benzo (b	cmpd12	Benzo (b) fluoranthene	12	252.32	0	270	270	420	420	210	210	260	260
Benzo (k	cmpd13	Benzo (k) fluoranthene	13	252.32	0	0	ND	130	130	0	ND	110	110
Benzo (e	cmpd14	Benzo (e) pyrene	14	252.3	0	290	290	1,400	1,400	350	350	300	300
Benzo (a	cmpd15	Benzo (a) pyrene	15	252.3	0	230	230	210	210	0	ND	160	160
Perylene	cmpd16	Perylene	16	202.24	0	0	ND	0	ND	0	ND	0	ND
Indeno (	cmp17	Indeno (1,2,3-cd) pyrene	17	290.34	0	0	ND	0	ND	0	ND	0	ND
Dibenz (	cmpd18	Dibenz (a,h) anthracene	18	278.33	0	0	ND	0	ND	0	ND	0	ND
Benzo (g	cmpd19	Benzo (g,h,i) perylene	19	276.34	0	0	ND	0	ND	0	ND	0	ND

Underfire Stack

	A-U-429-1	A-U-429-2	A-U-429-3	A-U-429-4	Average[d]
Naphthalene					
Molecular Weight, g/g-mole	128.16	128.16	128.16	128.16	
Target Catch, ng	99,660	129,660	75,660	98,660	109,327
ng to µg	99.66	129.66	75.66	98.66	109.33
Concentration, µg/dscm [a]	33.79	41.32	28.44	31.31	35.48
Emission Rate, µg/hr [b]	2,421,573	2,761,196	1,711,580	2,152,550	2,445,106
Emission Rate, lb/hr [c]	5.34E-03	6.09E-03	3.77E-03	4.75E-03	5.39E-03
Pounds per Ton of Coal Charged	1.05E-04	1.15E-04	0.00E+00	1.27E-04	1.16E-04
2-Methylnaphthalene					
Molecular Weight, g/g-mole	142.20	142.20	142.20	142.20	
Target Catch, ng	2,875	2,275	1,575	4,375	3,175
ng to µg	2.88	2.28	1.58	4.38	3.18
Concentration, µg/dscm [a]	0.97	0.725	0.59	1.39	1.03
Emission Rate, µg/hr [b]	69,858	48,448	35,630	95,453	71,253
Emission Rate, lb/hr [c]	1.54E-04	1.07E-04	7.85E-05	2.10E-04	1.57E-04
Pounds per Ton of Coal Charged	3.04E-06	2.02E-06	0.00E+00	5.63E-06	3.56E-06
Acenaphthylene					
Molecular Weight, g/g-mole	154.21	154.21	154.21	154.21	
Target Catch, ng	16,000	68,000	13,000	NC	42,000
ng to µg	16.00	68.00	13.00	NC	42.00
Concentration, µg/dscm [a]	5.425	21.672	4.886	NC	13.549
Emission Rate, µg/hr [b]	388,774	1,448,105	294,086	NC	918,439
Emission Rate, lb/hr [c]	8.57E-04	3.19E-03	6.48E-04	NC	2.02E-03
Pounds per Ton of Coal Charged	1.69E-05	6.04E-05	0.00E+00	0.00E+00	2.58E-05
Acenaphthene					
Molecular Weight, g/g-mole	154.21	154.21	154.21	154.21	
Target Catch, ng	280.00	240.00	120.00	240.00	253.33
ng to µg	0.28	0.24	0.12	0.24	0.25
Concentration, µg/dscm [a]	0.0949	0.0765	0.0451	0.0762	0.0825
Emission Rate, µg/hr [b]	6,804	5,111	2,715	5,236	5,717
Emission Rate, lb/hr [c]	1.50E-05	1.13E-05	5.98E-06	1.15E-05	1.26E-05
Pounds per Ton of Coal Charged	2.96E-07	2.13E-07	0.00E+00	3.09E-07	2.73E-07
Fluorene					
Molecular Weight, g/g-mole	166.21	166.21	166.21	166.21	
Target Catch, ng	930	690	360	1,300	973
ng to µg	0.93	0.69	0.36	1.30	0.97
Concentration, µg/dscm [a]	0.3154	0.2199	0.1353	0.4126	0.3160
Emission Rate, µg/hr [b]	22,597	14,694	8,144	28,363	21,885
Emission Rate, lb/hr [c]	4.98E-05	3.24E-05	1.80E-05	6.25E-05	4.82E-05
Pounds per Ton of Coal Charged	9.84E-07	6.13E-07	0.00E+00	1.67E-06	1.09E-06

	A-U-429-1	A-U-429-2	A-U-429-3	A-U-429-4	Average[d]
Phenanthrene					
Molecular Weight, g/g-mole	178.22	178.22	178.22	178.22	
Target Catch, ng	10,976	19,976	9,876	1,776	10,909
ng to µg	10.98	19.98	9.88	1.78	10.91
Concentration, µg/dscm [a]	3.722	6.366	3.712	0.564	3.551
Emission Rate, µg/hr [b]	266,699	425,402	223,415	38,749	243,616
Emission Rate, lb/hr [c]	5.88E-04	9.38E-04	4.93E-04	8.54E-05	5.37E-04
Pounds per Ton of Coal Charged	1.16E-05	1.77E-05	0.00E+00	2.28E-06	1.05E-05
Anthrancene					
Molecular Weight, g/g-mole	178.22	178.22	178.22	178.22	
Target Catch, ng	310.00	460.00	220.00	280.00	350.00
ng to µg	0.31	0.46	0.22	0.28	0.35
Concentration, µg/dscm [a]	0.10512	0.14660	0.08268	0.08887	0.11353
Emission Rate, µg/hr [b]	7,532	9,796	4,977	6,109	7,812
Emission Rate, lb/hr [c]	1.66E-05	2.16E-05	1.10E-05	1.35E-05	1.72E-05
Pounds per Ton of Coal Charged	3.28E-07	4.09E-07	0.00E+00	3.60E-07	3.66E-07
Fluoranthene					
Molecular Weight, g/g-mole	202.26	202.26	202.26	202.26	
Target Catch, ng	5400.00	12000.00	4800.00	7100.00	8166.67
ng to µg	5.40	12.00	4.80	7.10	8.17
Concentration, µg/dscm [a]	1.8311	3.8245	1.8040	2.2534	2.6363
Emission Rate, µg/hr [b]	131,211	255,548	108,586	154,907	180,555
Emission Rate, lb/hr [c]	2.89E-04	5.63E-04	2.39E-04	3.42E-04	3.98E-04
Pounds per Ton of Coal Charged	5.71E-06	1.07E-05	0.00E+00	9.13E-06	8.50E-06
Pyrene					
Molecular Weight, g/g-mole	202.24	202.24	202.24	202.24	
Target Catch, ng	2700.00	21000.00	3300.00	4600.00	9433.33
ng to µg	2.70	21.00	3.30	4.60	9.43
Concentration, µg/dscm [a]	0.9155	6.6928	1.2403	1.4600	3.0228
Emission Rate, µg/hr [b]	65,606	447,209	74,653	100,362	204,392
Emission Rate, lb/hr [c]	1.45E-04	9.86E-04	1.65E-04	2.21E-04	4.51E-04
Pounds per Ton of Coal Charged	2.86E-06	1.87E-05	0.00E+00	5.92E-06	9.14E-06
Benzo (a) anthrancene					
Molecular Weight, g/g-mole	228.29	228.29	228.29	228.29	
Target Catch, ng	160.00	100.00	ND	150.00	136.67
ng to µg	0.16	0.10	0.00	0.15	0.14
Concentration, µg/dscm [a]	0.05425	0.03187	0.00000	0.04761	0.04458
Emission Rate, µg/hr [b]	3,888	2,130	0	3,273	3,097
Emission Rate, lb/hr [c]	8.57E-06	4.69E-06	0.00E+00	7.22E-06	6.83E-06
Pounds per Ton of Coal Charged	1.69E-07	8.88E-08	0.00E+00	1.93E-07	1.50E-07

	A-U-429-1	A-U-429-2	A-U-429-3	A-U-429-4	Average[d]
Chrysene					
Molecular Weight, g/g-mole	228.28	228.28	228.28	228.28	
Target Catch, ng	380.00	460.00	290.00	520.00	453.33
ng to µg	0.38	0.46	0.29	0.52	0.45
Concentration, µg/dscm [a]	0.1289	0.1466	0.1090	0.1650	0.1468
Emission Rate, µg/hr [b]	9,233	9,796	6,560	11,345	10,125
Emission Rate, lb/hr [c]	2.04E-05	2.16E-05	1.45E-05	2.50E-05	2.23E-05
Pounds per Ton of Coal Charged	4.02E-07	4.09E-07	0.00E+00	6.69E-07	4.93E-07
Benzo (b) fluoranthene					
Molecular Weight, g/g-mole	252.32	252.32	252.32	252.32	
Target Catch, ng	270.00	420.00	210.00	260.00	316.67
ng to µg	0.27	0.42	0.21	0.26	0.32
Concentration, µg/dscm [a]	0.0916	0.1339	0.0789	0.0825	0.1026
Emission Rate, µg/hr [b]	6,561	8,944	4,751	5,673	7,059
Emission Rate, lb/hr [c]	1.45E-05	1.97E-05	1.05E-05	1.25E-05	1.56E-05
Pounds per Ton of Coal Charged	2.86E-07	3.73E-07	0.00E+00	3.34E-07	3.31E-07
Benzo (k) fluoranthene					
Molecular Weight, g/g-mole	252.32	252.32	252.32	252.32	
Target Catch, ng	ND	130.00	ND	110.00	80.00
ng to µg	0.00	0.13	0.00	0.11	0.08
Concentration, µg/dscm [a]	0.0000	0.0414	0.0000	0.0349	0.0254
Emission Rate, µg/hr [b]	0	2,768	0	2,400	1,723
Emission Rate, lb/hr [c]	0.00E+00	6.10E-06	0.00E+00	5.29E-06	3.80E-06
Pounds per Ton of Coal Charged	0.00E+00	1.15E-07	0.00E+00	1.42E-07	8.57E-08
Benzo (e) pyrene					
Molecular Weight, g/g-mole	252.30	252.30	252.30	252.30	
Target Catch, ng	290.00	1400.00	350.00	300.00	663.33
ng to µg	0.29	1.40	0.35	0.30	0.66
Concentration, µg/dscm [a]	0.0983	0.4462	0.1315	0.0952	0.2132
Emission Rate, µg/hr [b]	7,047	29,814	7,918	6,545	14,469
Emission Rate, lb/hr [c]	1.55E-05	6.57E-05	1.75E-05	1.44E-05	3.19E-05
Pounds per Ton of Coal Charged	3.07E-07	1.24E-06	0.00E+00	3.86E-07	6.45E-07
Benzo (a) pyrene					
Molecular Weight, g/g-mole	252.30	252.30	252.30	252.30	
Target Catch, ng	230.00	210.00	ND	160.00	200.00
ng to µg	0.23	0.21	0.00	0.16	0.20
Concentration, µg/dscm [a]	0.0780	0.0669	0.0000	0.0508	0.0652
Emission Rate, µg/hr [b]	5,589	4,472	0	3,491	4,517
Emission Rate, lb/hr [c]	1.23E-05	9.86E-06	0.00E+00	7.70E-06	9.96E-06
Pounds per Ton of Coal Charged	2.43E-07	1.87E-07	0.00E+00	2.06E-07	2.12E-07

	A-U-429-1	A-U-429-2	A-U-429-3	A-U-429-4	Average[d]
Perylene					
Molecular Weight, g/g-mole	202.24	202.24	202.24	202.24	
Target Catch, ng	ND	ND	ND	ND	0.00
ng to µg	0.00	0.00	0.00	0.00	0.00
Concentration, µg/dscm [a]	0.00	0.00	0.00	0.00	0.00
Emission Rate, µg/hr [b]	0	0.00	0.00	0.00	0
Emission Rate, lb/hr [c]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Pounds per Ton of Coal Charged	0.00E+00	0.00E+00	0	0.00E+00	0.00E+00
Indeno (1,2,3-cd) pyrene					
Molecular Weight, g/g-mole	290.34	290.34	290.34	290.34	
Target Catch, ng	ND	ND	ND	ND	0.00
ng to µg	0.00	0.00	0.00	0.00	0.00
Concentration, µg/dscm [a]	0	0	0	0	0
Emission Rate, µg/hr [b]	0	0	0	0	0
Emission Rate, lb/hr [c]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Pounds per Ton of Coal Charged	0.00E+00	0.00E+00	0	0.00E+00	0.00E+00
Dibenz (a,h) anthracene					
Molecular Weight, g/g-mole	278.33	278.33	278.33	278.33	
Target Catch, ng	ND	ND	ND	ND	0.00
ng to µg	0.00	0.00	0.00	0.00	0.00
Concentration, µg/dscm [a]	0.00000	0.00000	0.00000	0.00000	0.00000
Emission Rate, µg/hr [b]	0	0	0	0	0
Emission Rate, lb/hr [c]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Pounds per Ton of Coal Charged	0.00E+00	0.00E+00	0	0.00E+00	0.00E+00
Benzo (g,h,i) perylene					
Molecular Weight, g/g-mole	276.34	276.34	276.34	276.34	
Target Catch, ng	ND	ND	ND	ND	0.00
ng to µg	0.00	0.00	0.00	0.00	0.00
Concentration, µg/dscm [a]	0.0000	0.0000	0.0000	0.0000	0.0000
Emission Rate, µg/hr [b]	0	0	0	0	0
Emission Rate, lb/hr [c]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Pounds per Ton of Coal Charged	0.00E+00	0.00E+00	0	0.00E+00	0.00E+00

[a] Milligrams per dry standard cubic meter at 68° F (20° C) and 1 atm.

[b] Micrograms per hour.

[c] Pounds per hour.

[d] Averages do not include A-U-429-3. This was a non-pushing baseline test run.

ND Not Detectable - Results are below target analyte detection limit. Values are counted as zero (0) in averages.

{ } Estimate - Analyte results are below the quantitation limit and above the detection limit.

APPENDIX F

QA/QC DATA

PROCEDURES AUDIT FOR METHOD 315
ERG LABORATORIES

The following is a record of a visit to ERG Labs to evaluate their procedures and handling of Method 315 samples of emission tests from coke ovens. The work was performed by ERG chemist Mr. Linh Nguyen under the direction of Dr. Joan T. Bursey, Laboratory Director.

The first objective was to observe the procedure for weighing the samples. After the samples were logged in, they were transferred to the weighing room, which is temperature and humidity controlled. The samples were then put in desiccators to desiccate for twenty-four hours before being weighed. The samples were then weighed on a laboratory balance. The balance was located on a weighing table, which is especially designed to add stability and provide more accurate weight measurements.

Because the analysis of Method 315 samples for Methylene Chloride Extractable Matter (MCEM) is done over a period of about seven to eight working days, it was not possible to observe the analysis in its entirety. It was decided to observe two segments of the analysis on separate visits. During the first visit the procedures handling of the filters for MCEM analysis, were observed to verify that the analyses were done according to section 11.2.1.2 of the method. The chemist was very meticulate in his work and explained the procedures as they were occurring and answered questions as they were raised. The second visit was about four days later or midway into the analysis. This segment included the MCEM analysis of the impinger solutions. This was done following the procedures in section 11.2.4.1 of the method. This involved the adding of a known quantity of methylene chloride to the impinger water in a separatory funnel and extracting off the phase that had separated. This was done a total of three times. The extracts were then heated to near dryness, transferred to an aluminum dish where the extract was allowed to dry and reach equilibration in the balance room. The sample was then weighed to the nearest 0.1 mg. After analysis was completed and data computed, the data was reviewed by the laboratory director for accuracy and completeness.

This observer did not notice any sample handling or analytical procedures outside the procedures of Method 315 that would result in the invalidation of data for the above referenced project.

Pacific Environmental Services, Inc.

Memo

To: PES Project File S511.000

From: Franklin Meadows, Project Manager

CC:

Date: 12/15/98

Re: First Analytical Laboratory Visit

The PM and MCEM sample residues were hand delivered by the PES Project Manager to First Analytical Laboratory (FAL) for subsequent analysis for 17 trace metals. The samples were received in a dedicated sample receiving area where they were unpacked and arranged by Run Number and sample fraction. The samples were inspected for integrity, damage, and chain-of-custody documentation. All of the samples were received in good condition and all were accounted for.

Once the samples were accounted for, Dr. William A. Wadlin, FAL Laboratory Manager, assigned a project number to the PES project and logged the samples into FAL's sample tracking system. Each sample and sample fraction was assigned a unique identification number and the samples were again compared to the sample chain-of-custody document.

During the sample preparation stage, each sample digestate was labelled with the original sample identification code. These numbers were used to track the sample through the sample preparation and digestion process. All raw data printouts and calibration curves are labelled with the identification number. These numbers were used throughout the preparation and analysis to the final report of the results, so that a paper trail could be generated for each analytical result that tracks the result back to the original sample.

A walk-through of the laboratory indicated that the laboratory was well organized, clean, and well maintained. The samples were prepared and analyzed by Dr. Wadlin. Standard FAL procedure is to analyze the samples progressively first using the procedure having the least analytical sensitivity followed by the procedure having the next best analytical sensitivity. The laboratory continuously monitors instrument performance and makes necessary instrument repairs in advance of instrument failure so that samples do not need to be re-analyzed due to instrument performance outside the method QC requirements.

FAL has been participating in the EPA's quarterly audit for metals analysis (lead) for the past three years. FAL is also approved by EPA Region I for EPA Method 29 analyses.

PERFORMANCE AUDIT

Laboratory: Quanterra Environmental Services, Inc.
Address: 880 Riverside Parkway
West Sacramento, California

Telephone: 916-374-4333

INTRODUCTION

On December 16, 1998, Mr. Dennis Becvar of Pacific Environmental Services, Inc. (PES), Baldwin Park, California, conducted a performance audit of laboratory work just completed by Quanterra Laboratories (Project No. 301802) for PES. The audit was conducted at the request of the PES office in Research Triangle Park, North Carolina, for samples collected by PES under contract to US EPA at ABC Coke, Birmingham, Alabama (PES Project No. S512.000). The source testing and sample analysis for polyaromatic hydrocarbons was conducted following the procedures of California Air Resources Board Method 429 as published on August 9, 1996.

The audit included a review of quality assurance and quality control procedures, sample handling, sample analysis, and data reporting. During this audit the laboratory was represented by Mr. Eric Redman, Manager of Advanced Technology. All of the analytical data and other documentation for this project were available for review by the auditor at the time of this audit. Also, Quanterra Project Manager, Mr. Robert Weidenfeld, was available during this audit.

OVERVIEW OF LABORATORY MANAGEMENT AND QUALITY ASSURANCE PROGRAM

Sample receiving and log-in

The samples for this project were delivered at 1530 hours on September 29, 1998, directly from the field to the laboratory by PES. A review of the sample log-in sheet indicated sample temperatures had exceeded the temperature range specified by the

method. Sample temperatures ranged from 8°C to 23°C. The method specifies that the temperatures of the samples upon receipt are to be 4°C ± 2°C. No other anomolies were recorded by the laboratory upon sample receipt. The sample log-in or "project receipt checklist" (copy attached) used by Quanterra allows for the early "flagging" of problems with samples when received by the laboratory. After the samples were logged into the laboratory information management system (LIMs) they were immediately transferred and stored in a refrigerator until sample recovery. The temperature of the refrigerator housing the samples was maintained within the allowable range.

It should be noted that the PES project manager was not notified by the laboratory that the sample temperatures of the samples received were outside the allowable range. The laboratory indicated that they did inform the PES technician of the sample temperatures.

Sample extraction and concentration

The samples were extracted on October 3, 1998, within the 21 day period after sample collection as specified by CARB Method 429. The various fractions from the Modified Method 5 sampling train were combined into one composite sample per test run. In order to determine matrix effects each sample was spiked with a PAH surrogate ^{13}c-fluorene. After extraction each sample was concentrated on a rotary evaporator to a volume of 10 mls. Each sample was then equally split: a total of 5 mls were set aside as a sample retain, and the remaining 5 mls were further concentrated in preparation for analysis. The final concentration step was conducted with a turbo extractor using nitrogen. The extraction laboratory technician did not encounter any special problems nor did he note any anomolies with the samples. The standard laboratory practice is to maintain a sample split of each sample received for a period of thirty days.

Analysis

The analysis for this project work was conducted on GC/MS identified as "VA-4" equipped with column "DB-5". The Method Detection Level (MDL) for this analytical procedure was established approximately one year ago. According to Mr. Redman the MDL was established by following the procedures of CARB Method 429. The practical quantification level (PQL) is based on 5X the MDL as stated by the method. Prior to analysis the instrument was standardized with known standards of 10, 50, 100, 200 and 500 ug to establish a five point calibration for each of the polyaromatic hydrocarbons included in Method 429. Each standard was injected at least five times, and from this data the average response factor, relative response factor, standard deviation and relative standard deviation were calculated for each PAH. For each analyte, a deutorated surrogate in the same concentration was used. Also, each sample contained an internal standard to which each analysis was normalized. During instrument standardization a response factor was established for each analyte based on the five point calibration just described. A relative response factor was also determined based on the internal standard of d_{14}-Terphenyl.

The standards for calibrating the instrument were prepared by diluting a stock standard prepared and certified by the National Institute of Standards and Technology (NIST). When a new standard is prepared, it is standard laboratory practice to compare it to the previous standard to assure the correct dilution was achieved. Since the laboratory has a sufficiently high volume of analytical work, the standards are generally expended within a month.

The concentration of PAH's in the inlet samples were sufficiently high that several dilutions with iso-octane were required to dilute the sample concentrations within the standardized range of the instrument. The internal standard was used to determine the accuracy of any dilutions.

Data Reporting

All of the calibration and sample information are retained by the LIMs. Also, printouts are made of the instrument standardizations and the various sample chromatograms. Each PAH analyte has an accompanying deutorated surrogate. All of the final results are normalized to the internal standard and the deutorated surrogates. The reported data of several samples were evaluated during the audit. The following equation is used to calculate the final concentration of a detected analyte:

$C_{TA} = (A_T / A_{IS}) \times (M_{IS}\ ng/(Response\ Factor \times AF))]$

Where: C_{TA} = concentration of analyte to be reported

A_T = area of analyte peak

A_{IS} = area of internal standard

M_{IS} = mass of the internal standard in ng

RF = response factor of analyte compared to the internal standard

AF = aliquot factor (the analysis is based on a 50:50 split of the sample)

If two compounds co-elute, both compounds are reported and the analyst makes an assessment regarding the identity and concentration of each compound and flags the data for the final reviewer.

The quality control range for back-to-back injections of samples is ± 30%, and the internal standards is ± 40%

STAFF EXPERIENCE

The analyst for this project was Saleh Argunrhtin who has more than twenty years of experience in gc/ms work, and more than five years of experience with PAH's.

The analytical assist was Adriana Mesman who has eight years of analytical experience with more than five years in PAH work.

The data reviewer for this project was Teri Stone who has eight years of experience working in an analytical laboratory with five years of experience directly with PAHs.

The report was assembled by Clark Pickell and approved by Eric Redman. Both scientists have more than twenty years of experience in analytical laboratory work.

OBSERVATIONS

The samples from this project had a significant amount of naphthalene, however, according to the laboratory the naphthalene concentrations did not interfere with the analysis for the other PAH's. The inlet samples did require a significant amount of dilution, however, it appears the laboratory made every effort to minimize any additional error introduced through dilutions. The samples upon receipt at the laboratory were outside the acceptable temperature range, however, since the samples were not exposed to elevated temperatures the samples should be representative for this source. The highest temperature recorded by the laboratory was 23°C with most of the samples averaging 11°C.

The laboratory did follow the quality control requirements specified by the method as well as the quality control criteria developed by the laboratory.

The laboratory does employ qualified staff to conduct PAH analysis. The results reported by Quanterra should be considered representative of the samples collected in the field.

FINDINGS

The PES project manager was not notified regarding the deviation in sample temperatures upon arrival of the samples at Quanterra. It is recommended the laboratory incorporate into its LIMs the name and telephone of the PES project manager in order to quickly notify PES of any concerns regarding the quality of the samples or problems with the analysis.

PACIFIC ENVIRONMENTAL SERVICES,INC.

4700 Duke Drive,
Suite 150
Mason, Ohio
Phone: (513) 398-2556
Fax: (513) 3983342
www.pes.com

TEMPERATURE SENSOR CALIBRATION DATA FOR STACK THERMOCOUPLES

THERMOCOUPLE NUMBER: T4A

DATE: 12/22/97

BAROMETRIC PRES.(In.Hg): 29.52

REFERENCE:
Mercury-in-glass: ASTM-3F

Other:

AMBIENT TEMP. °F: 72

CALIBRATOR: J.C.

Reference point number	Source[a] (Specify)	Reference Thermometer Temperature,°F	Thermocouple Potentiometer Temperature,°F	Temperature Difference,[b] %
1	Ambient Air	72	72	0.00
2	Cold Bath	52	51	0.20
3	Hot Bath	195	194	0.15
4	Hot Oil	284	283	0.13

[a]Type of calibration used.

[b]$\frac{(\text{ref. temp.}^{\circ}\text{F}+460)-(\text{test thermometer temp.}^{\circ}\text{F}+460)}{\text{ref temp.}^{\circ}\text{F}+460} \times 100$ $100 \leq 1.5\%$

Comments:

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TEMPERATURE SENSOR CALIBRATION DATA FOR STACK THERMOCOUPLES

THERMOCOUPLE NUMBER: 4B

DATE: 12/23/97

BAROMETRIC PRES.(In.Hg): 29.52

REFERENCE:
Mercury-in-glass: ASTM-3F

Other:

AMBIENT TEMP. °F: 74

CALIBRATOR: J.C.

Reference point number	Source[a] (Specify)	Reference Thermometer Temperature,°F	Thermocouple Potentiometer Temperature,°F	Temperature Difference,[b] %
1	Ambient Air	74	74	0.00
2	Cold Bath	36	42	1.21
3	Hot Bath	208	204	0.60
4	Hot Oil	307	309	0.26

[a]Type of calibration used.

[b]$\frac{(\text{ref. temp.}^{\circ}\text{F}+460)-(\text{test thermometer temp.}^{\circ}\text{F}+460)}{\text{ref temp,}^{\circ}\text{F}+460}$ X100 $100 \leq 1.5\%$

Comments:

PACIFIC ENVIRONMENTAL SERVICES,INC.

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Suite 150
Mason, Ohio
Phone: (513) 398-2556
Fax: (513) 3983342
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TEMPERATURE SENSOR CALIBRATION DATA FOR STACK THERMOCOUPLES

THERMOCOUPLE NUMBER: 4E

DATE: 12/23/97

BAROMETRIC PRES.(In.Hg): 29.52

REFERENCE:
Mercury-in-glass: ASTM-3F

Other:

AMBIENT TEMP. °F: 74

CALIBRATOR: G.Gay

Reference point number	Source[a] (Specify)	Reference Thermometer Temperature,°F	Thermocouple Potentiometer Temperature,°F	Temperature Difference,[b] %
1	Ambient Air	74	74	0.00
2	Cold Bath	38	38	0.00
3	Hot Bath	203	202	0.15
4	Hot Oil	339	340	0.13

[a]Type of calibration used.

[b]$\frac{(\text{ref. temp.}^{\circ}\text{F}+460)-(\text{test thermometer temp.}^{\circ}\text{F}+460)}{\text{ref temp,}^{\circ}\text{F}+460} \times 100$ $100 \leq 1.5\%$

Comments:

PACIFIC ENVIRONMENTAL SERVICES,INC.

4700 Duke Drive,
Suite 150
Mason, Ohio
Phone: (513) 398-2556
Fax: (513) 3983342
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TEMPERATURE SENSOR CALIBRATION DATA FOR STACK THERMOCOUPLES

THERMOCOUPLE NUMBER: 5E

DATE: 12/23/97

BAROMETRIC PRES.(In.Hg): 29.52

REFERENCE:
Mercury-in-glass: ASTM-3F

Other:

AMBIENT TEMP. °F: 74

CALIBRATOR: J.C.

Reference point number	Source[a] (Specify)	Reference Thermometer Temperature,°F	Thermocouple Potentiometer Temperature,°F	Temperature Difference,[b] %
1	Ambient Air	74	74	0.00
2	Cold Bath	46	46	0.00
3	Hot Bath	200	200	0.00
4	Hot Oil	318	318	0.00

[a]Type of calibration used.

[b]$\frac{(\text{ref. temp.}°F+460)-(\text{test thermometer temp.}°F+460)}{\text{ref temp,}°F+460}$ X100 $100 \leq 1.5\%$

Comments:

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TEMPERATURE SENSOR CALIBRATION DATA FOR STACK THERMOCOUPLES

THERMOCOUPLE NUMBER: 12A

DATE: 12/24/97

BAROMETRIC PRES.(In.Hg): 29.44

REFERENCE:
Mercury-in-glass: ASTM-3F

Other:

AMBIENT TEMP. °F: 72

CALIBRATOR: S.Simon

Reference point number	Source[a] (Specify)	Reference Thermometer Temperature,°F	Thermocouple Potentiometer Temperature,°F	Temperature Difference,[b] %
1	Ambient Air	72	72	0.00
2	Cold Bath	31	32	0.20
3	Hot Bath	205	206	0.15
4	Hot Oil	352	352	0.00

[a]Type of calibration used.

[b]$\frac{(\text{ref. temp.}^{\circ}\text{F}+460)-(\text{test thermometer temp.}^{\circ}\text{F}+460)}{\text{ref temp.}^{\circ}\text{F}+460}$ X100 $100 \leq 1.5\%$

Comments:

TEMPERATURE SENSOR CALIBRATION FORM

Temperature Sensor No. RP-20 (PROBE) **Sensor Type** K-TC **Length** _____
Ambient Temp. °F 72 **Barometric Pressure, "Hg** 30.21
Reference Temp. Sensor: Fixed

Date	Ref. Point No.	Temp. Source	Temp. °F		Temp. Diff. %	Within Limits Y/N	Calibrated By
			Ref. Sensor	Test Sensor			
1-22-98	1	ICE H2O	32	32	0	Y	LWB
"	2	AMB. AIR	72	69	-.65	Y	LWB
"	3	BOIL. H2O	210	208	-.298	Y	LWB
	1						
	2						
	3						
	1						
	2						
	3						
	1						
	2						
	3						
	1						
	2						
	3						
	1						
	2						
	3						

$$\% \text{ Temp. Diff} = \frac{(\text{Ref. Temp} + 460) - (\text{Test Temp.} + 460)}{(\text{Ref. Temp.} + 460)} \times 100 \leq 1.5\ \%$$

PACIFIC ENVIRONMENTAL SERVICES, INC.

TEMPERATURE SENSOR CALIBRATION DATA FORM FOR METER BOX

DATE: 10-16-97

AMBIENT TEMPERATURE: 75 °F

CALIBRATOR: G. Gay

THERMOCOUPLE NUMBER: MB-1

BAROMETRIC PRES.(In.Hg): 29.59

REFERENCE:

Mercury-in-glass: ASTM 3F

Other:

Reference point number	Source[a] (Specify)	Reference Thermometer Temperature, °F	Thermocouple Potentiometer Temperature, °F	Temperature Difference,[b] °F
INLET				
1	Ambient Air	75	75	0
2	Cold Bath	38	38	0
3	Hot Bath	190	190	0
OUTLET				
1	Ambient Air	75	74	-1
2	Cold Bath	37	37	0
3	Hot Bath	190	190	0

[a]Type of calibration used.

[b]Allowable tolerance ±5°F

Comments:

PACIFIC ENVIRONMENTAL SERVICES, INC.

TEMPERATURE SENSOR CALIBRATION DATA FORM FOR METER BOX

DATE: 10-17-97

AMBIENT TEMPERATURE: 71 °F

CALIBRATOR: R.Kolde

THERMOCOUPLE NUMBER: MB-02

BAROMETRIC PRES.(In.Hg): 29.5

REFERENCE:
Mercury-in-glass: ASTM 3F

Other:

Reference point number	Source[a] (Specify)	Reference Thermometer Temperature, °F	Thermocouple Potentiometer Temperature, °F	Temperature Difference,[b] °F
INLET				
1	Ambient Air	70	69	-1
2	Cold Bath	34	34	0
3	Hot Bath	160	159	-1
OUTLET				
1	Ambient Air	70	70	0
2	Cold Bath	34	33	-1
3	Hot Bath	160	160	0

[a]Type of calibration used.

[b]Allowable tolerance ±5°F

Comments:

PACIFIC ENVIRONMENTAL SERVICES, INC.

TEMPERATURE SENSOR CALIBRATION DATA FORM FOR METER BOX

DATE: 10-16-97

AMBIENT TEMPERATURE: 74 °F

CALIBRATOR: G. Gay

THERMOCOUPLE NUMBER: MB-13 in/out

BAROMETRIC PRES.(In.Hg): 29.59

REFERENCE:

Mercury-in-glass: ASTM 3F

Other:

Reference point number	Source[a] (Specify)	Reference Thermometer Temperature, °F	Thermocouple Potentiometer Temperature, °F	Temperature Difference,[b] °F
INLET				
1	Ambient Air	74	74	0
2	Cold Bath	30	31	1
3	Hot Bath	190	190	0
OUTLET				
1	Ambient Air	73	72	-1
2	Cold Bath	32	31	-1
3	Hot Bath	190	190	0

[a]Type of calibration used.

[b]Allowable tolerance ±5°F

Comments:

PACIFIC ENVIRONMENTAL SERVICES, INC.

TEMPERATURE SENSOR CALIBRATION DATA FORM FOR METER BOX

DATE: 10-16-97

AMBIENT TEMPERATURE: 74 °F

CALIBRATOR: G. Gay

THERMOCOUPLE NUMBER: MB-14 in/out

BAROMETRIC PRES.(In.Hg): 29.59

REFERENCE:
Mercury-in-glass: ASTM 3F

Other:

Reference point number	Source[a] (Specify)	Reference Thermometer Temperature, °F	Thermocouple Potentiometer Temperature, °F	Temperature Difference,[b] °F
INLET				
1	Ambient Air	74	74	0
2	Cold Bath	30	30	0
3	Hot Bath	190	191	1
OUTLET				
1	Ambient Air	73	72	-1
2	Cold Bath	32	30	-2
3	Hot Bath	190	191	1

[a]Type of calibration used.

[b]Allowable tolerance ±5°F

Comments:

PACIFIC ENVIRONMENTAL SERVICES, INC.

TEMPERATURE SENSOR CALIBRATION DATA FORM FOR METER BOX

DATE: 12-29-97

AMBIENT TEMPERATURE: 71 °F

CALIBRATOR: R.Kolde

THERMOCOUPLE NUMBER: MB-15

BAROMETRIC PRES.(In.Hg): 29.5

REFERENCE:

Mercury-in-glass: ASTM 3F

Other:

Reference point number	Source[a] (Specify)	Reference Thermometer Temperature, °F	Thermocouple Potentiometer Temperature, °F	Temperature Difference,[b] °F
INLET				
1	Ambient Air	70	69	-1
2	Cold Bath	34	34	0
3	Hot Bath	160	159	-1
OUTLET				
1	Ambient Air	70	71	1
2	Cold Bath	34	33	-1
3	Hot Bath	160	161	1

[a]Type of calibration used.

[b]Allowable tolerance ±5°F

Comments:

PACIFIC ENVIRONMENTAL SERVICES, INC.

TEMPERATURE SENSOR CALIBRATION DATA FORM FOR METER BOX

DATE: 17-Oct-97

THERMOCOUPLE NUMBER: RMB-13

AMBIENT TEMPERATURE: 68 °F

BAROMETRIC PRES.(In.Hg): 29.5

CALIBRATOR: R. Kolde

REFERENCE:
Mercury-in-glass: ASTM-3F

Other:

Reference point number	Source[a] (Specify)	Reference Thermometer Temperature, °F	Thermocouple Potentiometer Temperature, °F	Temperature Difference,[b] °F
INLET				
1	Ambient Air	68	67	-1
2	Cold Bath	33	34	1
3	Hot Bath	155	155	0
OUTLET				
1	Ambient Air	68	68	0
2	Cold Bath	33	34	1
3	Hot Bath	155	156	1

[a]Type of calibration used.

[b]Allowable tolerance ±5°F

Comments:

PACIFIC ENVIRONMENTAL SERVICES, INC.

THERMOCOUPLE DIGITAL INDICATOR
CALIBRATION DATA SHEET

DATE: 10-16-97 INDICATOR NO.: MB-1

OPERATOR: R. Kolde SERIAL NO.: 207

CALIBRATION DEVICE Digital simulator MANUFACTURER: Omega

TEST POINT NO.	MILLIVOLT SIGINAL	EQUIVALENT TEMP °F	DIGITAL INDICATOR TEMP READING °F	DIFFERENCE %
1	-0.692	0	-1	0.217391304
2	1.520	100	99	0.18
3	3.819	200	200	0.00
4	6.092	300	300	0.00
5	8.314	400	398	0.23
6	10.560	500	500	0.00
7	22.251	1000	1001	-0.07
8	29.315	1300	1300	0.00
9	36.166	1600	1601	-0.05
10	42.732	1900	1900	0.00

Percent difference must be less than or equal to 0.5 %

Percent difference: $\frac{(\text{Equivalent temp,.}^{\circ}\text{R - Digital indicator tem, }^{\circ}\text{R}) * (100\%)}{(\text{Equivalent temp, }^{\circ}\text{R})}$

Where $^{\circ}R = {}^{\circ}F + 460$

DIGITAL INDICATOR

PACIFIC ENVIRONMENTAL SERVICES, INC.

THERMOCOUPLE DIGITAL INDICATOR
CALIBRATION DATA SHEET

DATE: 10-17-97 INDICATOR NO.: MB-02

OPERATOR: R. Kolde SERIAL NO.: 207

CALIBRATION DEVICE Digital simulator MANUFACTURER: Omega

TEST POINT NO.	MILLIVOLT SIGINAL	EQUIVALENT TEMP °F	DIGITAL INDICATOR TEMP READING °F	DIFFERENCE %
1	-0.692	0	1	-0.217391304
2	1.520	100	102	-0.36
3	3.819	200	203	-0.45
4	6.092	300	302	-0.26
5	8.314	400	400	0.00
6	10.560	500	503	-0.31
7	22.251	1000	1004	-0.27
8	29.315	1300	1304	-0.23
9	36.166	1600	1604	-0.19
10	42.732	1900	1905	-0.21

Percent difference must be less than or equal to 0.5 %

Percent difference: $\frac{(\text{Equivalent temp,.}^{\circ}\text{R - Digital indicator tem, }^{\circ}\text{R}) * (100\%)}{(\text{Equivalent temp, }^{\circ}\text{R})}$

Where °R = °F + 460

DIGITAL INDICATOR

PACIFIC ENVIRONMENTAL SERVICES, INC.

THERMOCOUPLE DIGITAL INDICATOR
CALIBRATION DATA SHEET

DATE: 10-16-97 INDICATOR NO.: MB-13

OPERATOR: R. Kolde SERIAL NO.: 207

CALIBRATION DEVICE Digital simulator MANUFACTURER: Omega

TEST POINT NO.	MILLIVOLT SIGINAL	EQUIVALENT TEMP °F	DIGITAL INDICATOR TEMP READING °F	DIFFERENCE %
1	-0.692	0	0	0
2	1.520	100	99	0.18
3	3.819	200	201	-0.15
4	6.092	300	301	-0.13
5	8.314	400	398	0.23
6	10.560	500	499	0.10
7	22.251	1000	999	0.07
8	29.315	1300	1298	0.11
9	36.166	1600	1598	0.10
10	42.732	1900	1900	0.00

Percent difference must be less than or equal to 0.5 %

Percent difference:

$$\frac{(\text{Equivalent temp,.}^{\circ}\text{R - Digital indicator tem, }^{\circ}\text{R}) * (100\%)}{(\text{Equivalent temp, }^{\circ}\text{R})}$$

Where $^{\circ}R = {}^{\circ}F + 460$

DIGITAL INDICATOR

PACIFIC ENVIRONMENTAL SERVICES, INC.

THERMOCOUPLE DIGITAL INDICATOR
CALIBRATION DATA SHEET

DATE: 10-17-97 INDICATOR NO.: MB-14

OPERATOR: R. Kolde SERIAL NO.: 207

CALIBRATION DEVICE Digital simulator MANUFACTURER: Omega

TEST POINT NO.	MILLIVOLT SIGINAL	EQUIVALENT TEMP °F	DIGITAL INDICATOR TEMP READING °F	DIFFERENCE %
1	-0.692	0	0	0
2	1.520	100	99	0.18
3	3.819	200	199	0.15
4	6.092	300	301	-0.13
5	8.314	400	399	0.12
6	10.560	500	499	0.10
7	22.251	1000	999	0.07
8	29.315	1300	1298	0.11
9	36.166	1600	1599	0.05
10	42.732	1900	1901	-0.04

Percent difference must be less than or equal to 0.5 %

Percent difference: $\frac{\text{(Equivalent temp,.°R - Digital indicator tem, °R) * (100\%)}}{\text{(Equivalent temp, °R)}}$

Where °R = °F + 460

DIGITAL INDICATOR

PACIFIC ENVIRONMENTAL SERVICES, INC.

THERMOCOUPLE DIGITAL INDICATOR
CALIBRATION DATA SHEET

DATE: 12-29-97 INDICATOR NO.: MB-15

OPERATOR: R. Kolde SERIAL NO.: 207

CALIBRATION DEVICE Digital simulator MANUFACTURER: Omega

TEST POINT NO.	MILLIVOLT SIGINAL	EQUIVALENT TEMP °F	DIGITAL INDICATOR TEMP READING °F	DIFFERENCE %
1	-0.692	0	1	-0.22
2	1.520	100	101	-0.18
3	3.819	200	203	-0.45
4	6.092	300	300	0.00
5	8.314	400	400	0.00
6	10.560	500	502	-0.21
7	22.251	1000	1004	-0.27
8	29.315	1300	1303	-0.17
9	36.166	1600	1604	-0.19
10	42.732	1900	1903	-0.13

Percent difference must be less than or equal to 0.5 %

Percent difference:

$$\frac{(\text{Equivalent temp,.}^{\circ}\text{R - Digital indicator tem, }^{\circ}\text{R}) * (100\%)}{(\text{Equivalent temp, }^{\circ}\text{R})}$$

Where $^{\circ}R = {}^{\circ}F + 460$

DIGITAL INDICATOR

PACIFIC ENVIRONMENTAL SERVICES, INC.

4700 Duke Drive,
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Phone: (513) 398-2556
Fax (513) 398-3342
www.pes.com

Pitot Tube Number: 4A

Date: 12/23/97

Effective Length: 49"

Calibrated By: S. Simon

Pitot Tube Openings Damaged? YES **NO**

Pitot Tube Assembly Level? **YES** NO

α_1 = 1.1 °(< 10°)

α_2 = 0.8 °(< 10°)

β_1 = 0.5 °(< 5°)

β_2 = 0.3 °(< 5°)

Y = 0.8 θ = 0.7 A = 0.967

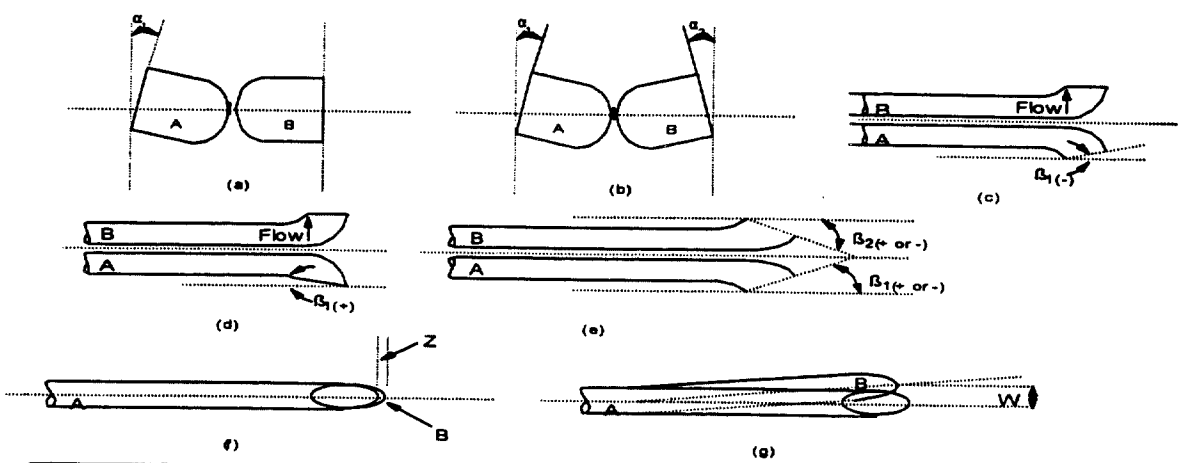
$z = A \sin \gamma$ = 0.014 cm (in.) 0.32 cm (< 1/8 in.)

$w = A \sin \theta$ = 0.012 cm (in.) 0.08 cm (< 1/32 in.)

P_A = 0.484 cm (in.)

P_β = 0.483 cm (in.)

D_t = 0.375 cm (in.)



The types of face-opening misalignment shown above will not affect the baseline value of Cp(s) so long as α_1 and α_2 is less than or equal to 10°, β_1 and β_2 is less than or equal to 5°, z is less than or equal to 0.32 cm (1/8 in.), and w is less than or equal to 0.08 cm (1/32 in.) (reference 11.0 in Section 16.0).

4B

PACIFIC ENVIRONMENTAL SERVICES, INC.

4700 Duke Drive,
Suite 150
Mason, Ohio 45040
Phone: (513) 398-2556
Fax (513) 398-3342
www.pes.com

Pitot Tube Number: 4B

Date: 12/23/97

Effective Length: 48"

Calibrated By: S. Simon

Pitot Tube Openings Damaged? YES **NO**

Pitot Tube Assembly Level? **YES** NO

α_1 = 3 °(< 10°)

α_2 = 2 °(< 10°)

β_1 = 0 °(< 5°)

β_2 = 1 °(< 5°)

Y = 1 θ = 1 A = 0.949

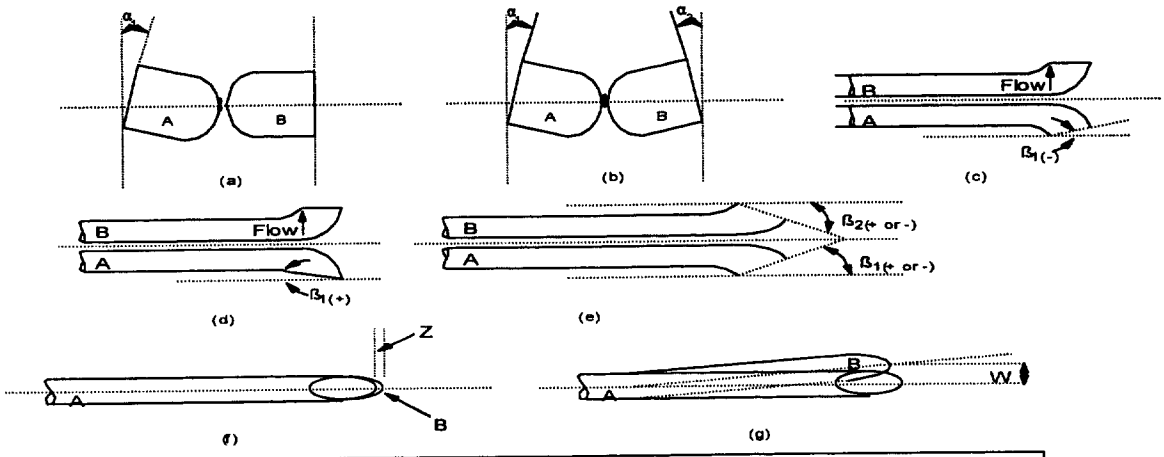
z = A sin γ = 0.017 cm (in.) 0.32 cm (< 1/8 in.)

w = A sin θ = 0.017 cm (in.) 0.08 cm (< 1/32 in.)

P_A = 0.475 cm (in.)

P_β = 0.474 cm (in.)

D_t = 0.375 cm (in.)



The types of face-opening misalignment shown above will not affect the baseline value of Cp(s) so long as α_1 and α_2 is less than or equal to 10°, β_1 and β_2 is less than or equal to 5°, z is less than or equal to 0.32 cm (1/8 in.), and w is less than or equal to 0.08 cm (1/32 in.) (reference 11.0 in Section 16.0).

4E

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www.pes.com

Pitot Tube Number: 4E

Date: 12/23/97

Effective Length: 49"

Calibrated By: S. Simon

Pitot Tube Openings Damaged? YES **NO**

Pitot Tube Assembly Level? **YES** NO

α_1 = 0 °(< 10°)

α_2 = 1 °(< 10°)

β_1 = 1 °(< 5°)

β_2 = 3 °(< 5°)

Y = 0 θ = 1 A = 0.973

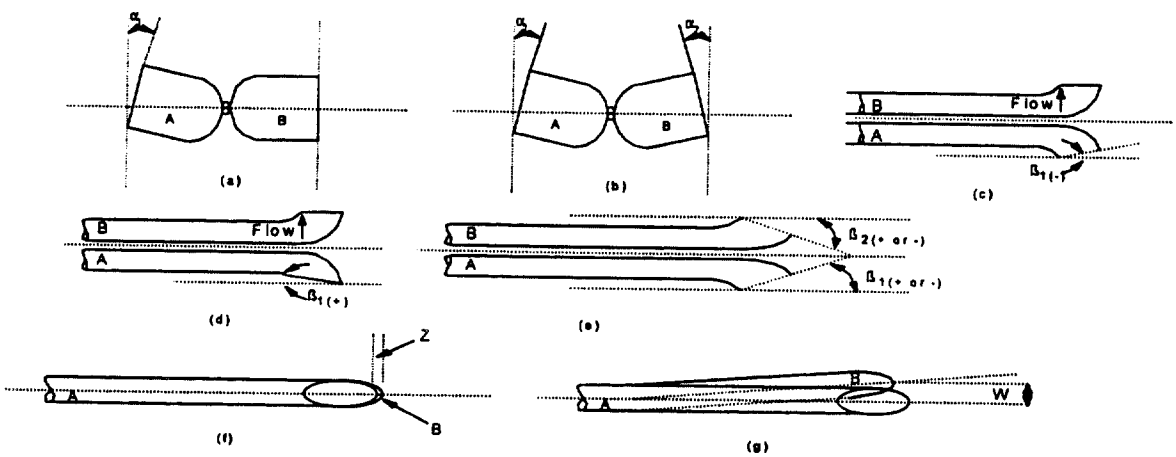
z = A sin γ = 0 cm (in.) 0.32 cm (< 1/8 in.)

w = A sin θ = 0.017 cm (in.) 0.08 cm (< 1/32 in.)

P_A = 0.487 cm (in.)

P_β = 0.486 cm (in.)

D_t = 0.375 cm (in.)



The types of face-opening misalignment shown above will not affect the baseline value of Cp(s) so long as α_1 and α_2 is less than or equal to 10°, β_1 and β_2 is less than or equal to 5°, z is less than or equal to 0.32 cm (1/8 in.), and w is less than or equal to 0.08 cm (1/32 in.) (reference 11.0 in Section 16.0).

5C

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Phone: (513) 398-2556
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www.pes.com

Pitot Tube Number: 5C

Date: 12/23/97

Effective Length: 61"

Calibrated By: S. Simon

Pitot Tube Openings Damaged? YES **NO**

Pitot Tube Assembly Level? **YES** NO

α_1 = 0 °(< 10°)

α_2 = 1 °(< 10°)

β_1 = 1 °(< 5°)

β_2 = 1 °(< 5°)

Y = 1 θ = 1 A = 0.948

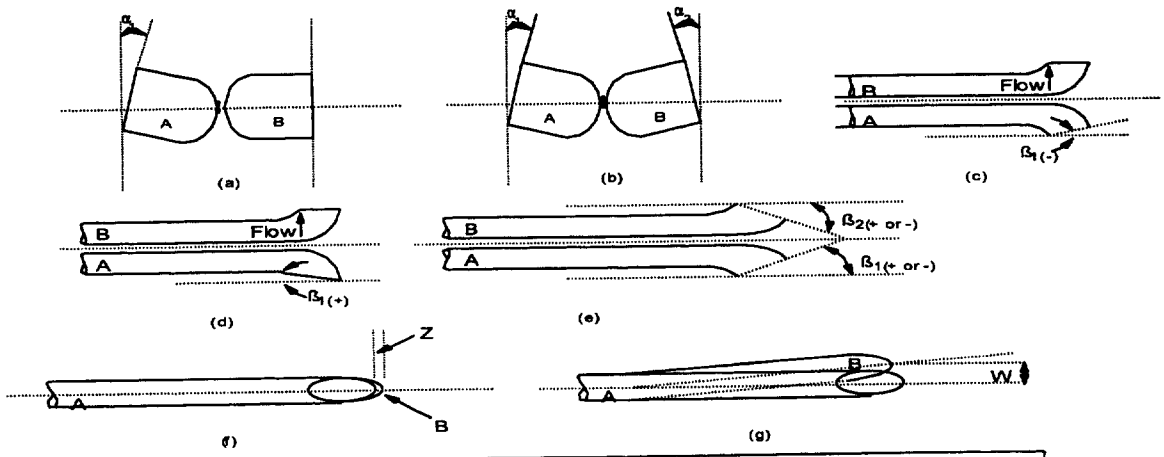
$z = A \sin \gamma$ = 0.017 cm (in.) 0.32 cm (< 1/8 in.)

$w = A \sin \theta$ = 0.017 cm (in.) 0.08 cm (< 1/32 in.)

P_A = 0.474 cm (in.)

P_β = 0.474 cm (in.)

D_t = 0.375 cm (in.)



The types of face-opening misalignment shown above will not affect the baseline value of Cp(s) so long as α_1 and α_2 is less than or equal to 10°, β_1 and β_2 is less than or equal to 5°, z is less than or equal to 0.32 cm (1/8 in.), and w is less than or equal to 0.08 cm (1/32 in.) (reference 11.0 in Section 16.0).

5E

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Suite 150
Mason, Ohio 45040
Phone: (513) 398-2556
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www.pes.com

Pitot Tube Number: 5E

Date: 12/22/97

Effective Length: 64"

Calibrated By: S. Simon

Pitot Tube Openings Damaged? YES **NO**

Pitot Tube Assembly Level? **YES** NO

α_1 = 1 °(< 10°)

α_2 = 1 °(< 10°)

β_1 = 1 °(< 5°)

β_2 = 3 °(< 5°)

Y = 0 θ = 1 A = 1.122

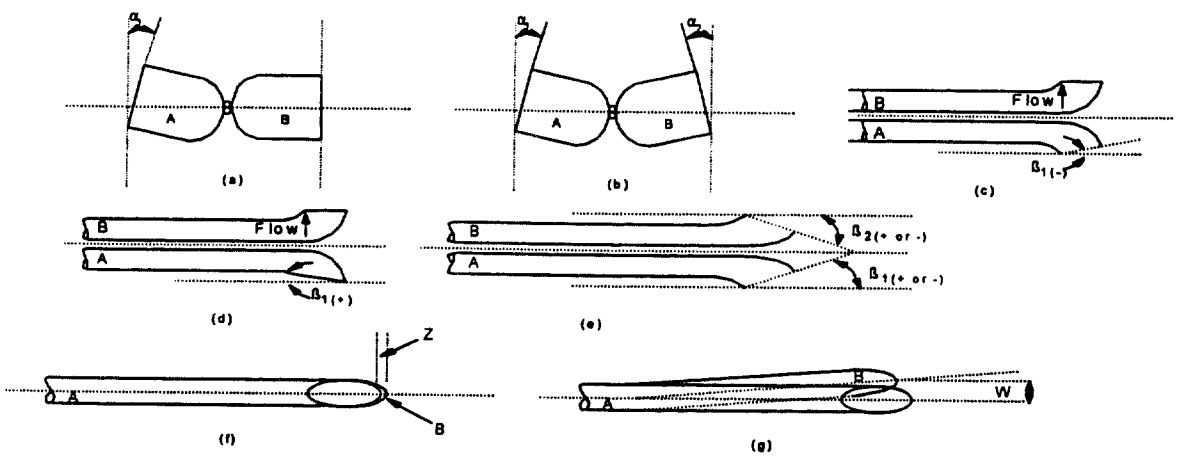
z = A sin γ = 0 cm (in.) 0.32 cm (< 1/8 in.)

w = A sin θ = 0.02 cm (in.) 0.08 cm (< 1/32 in.)

P_A = 0.561 cm (in.)

P_β = 0.561 cm (in.)

D_t = 0.375 cm (in.)



The types of face-opening misalignment shown above will not affect the baseline value of Cp(s) so long as α_1 and α_2 is less than or equal to 10°, β_1 and β_2 is less than or equal to 5°, z is less than or equal to 0.32 cm (1/8 in.), and w is less than or equal to 0.08 cm (1/32 in.) (reference 11.0 in Section 16.0).

12A

PACIFIC ENVIRONMENTAL SERVICES, INC.

4700 Duke Drive,
Suite 150
Mason, Ohio 45040
Phone: (513) 398-2556
Fax (513) 398-3342
www.pes.com

Pitot Tube Number: 12A

Date: 12/23/97

Effective Length: 145"

Calibrated By: S. Simon

Pitot Tube Openings Damaged? YES **NO**

Pitot Tube Assembly Level? **YES** NO

α_1 = 4 °(< 10°)

α_2 = 5 °(< 10°)

β_1 = 3 °(< 5°)

β_2 = 0 °(< 5°)

Y= 2 θ = 1 A = 0.936

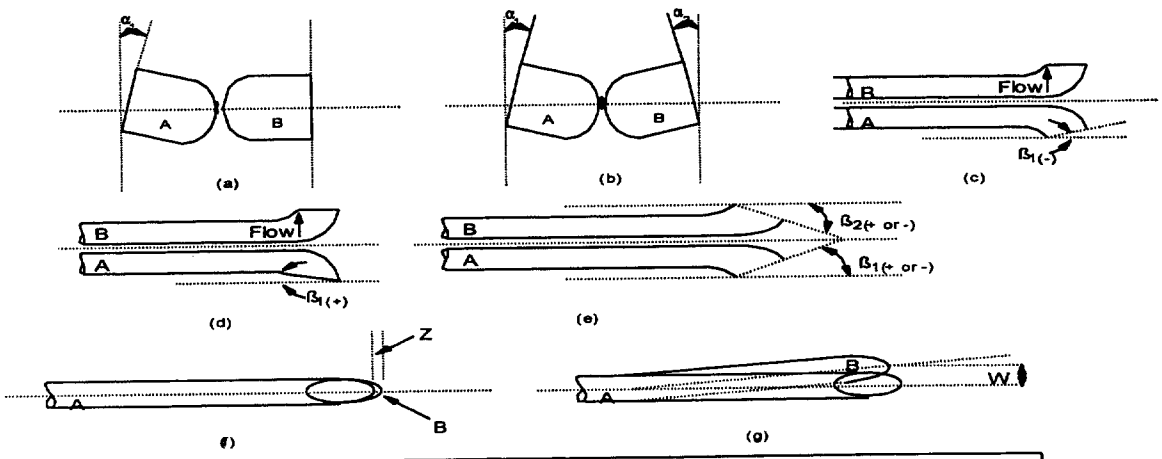
z = A sin γ = 0.033 cm (in.) 0.32 cm (< 1/8 in.)

w = A sin θ = 0.016 cm (in.) 0.08 cm (< 1/32 in.)

P_A = 0.468 cm (in.)

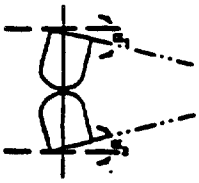
P_β = 0.468 cm (in.)

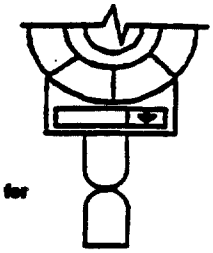
D_t = 0.375 cm (in.)



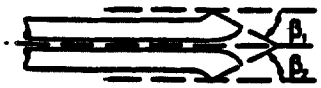
The types of face-opening misalignment shown above will not affect the baseline value of Cp(s) so long as α_1 and α_2 is less than or equal to 10°, β_1 and β_2 is less than or equal to 5°, z is less than or equal to 0.32 cm (1/8 in.), and w is less than or equal to 0.08 cm (1/32 in.) (reference 11.0 in Section 16.0).

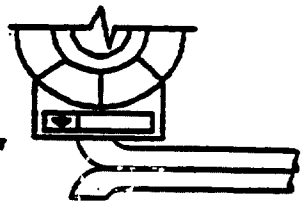
CALIBRATION DATA SHEET 2
Type S Pitot Tube Inspection



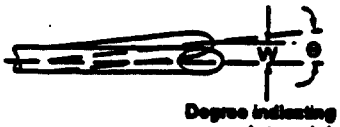


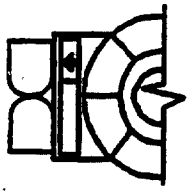
Degree indicating level position for determining α_1 and α_2.



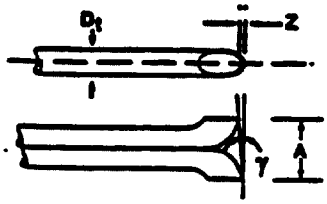


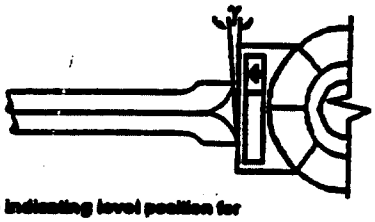
Degree indicating level position for determining β_1 and β_2.





Degree indicating level position for determining θ.





Degree indicating level position for determining γ then calculate Z.

Level and Perpendicular?	✓
Obstruction?	N/A
Damaged?	N/A
α_1 ($-10° \le \alpha_1 \le +10°$)	0
α_2 ($-10° \le \alpha_2 \le +10°$)	1
β_1 ($-5° \le \beta_1 \le +5°$)	1
β_2 ($-5° \le \beta_2 \le +5°$)	0
γ	1
θ	0
$z = A \tan \gamma$ ($\le 0.125"$)	.0179
$w = A \tan \theta$ ($\le 0.03125"$)	0
D_t ($3/16" \le D_t \le 3/8"$)	3/8
A	1.023
$A/2D_t$ ($1.05 \le P_A/D_t \le 1.5$)	1.36

QA/QC Check

Completeness ____ Legibility ____ Accuracy ____ Specifications ____ Reasonableness ____

Certification

I certify that the Type S pitot tube/probe ID# 1RP-20 meets or exceeds all specifications, criteria and/or applicable design features and is hereby assigned a pitot tube calibration factor C_p of 0.84.

Certified by: DDH 11-2-98

Personnel (Signature/Date)

Team Leader (Signature/Date)

PACIFIC ENVIRONMENTAL SERVICES, INC.

4700 Duke Drive,
Suite 150
Mason, Ohio 45040
Phone:(513)398-2556
Fax: (513)398-3342
www.pes.com

Box No.:	1	Bar. Press.(Ps):	29.80	in. Hg
Date:	9-29-98	Pretest Gamma:	1.012	
Calibrated By :	am	Pretest dH@:	1.954	
Plant:	EPA Coke			

		RUN 1	RUN 2	RUN 3
DH	Delta H	2.30	2.30	2.30
in Hg	Vacuum	10.00	10.00	10.00
Vw_1	Initial RTM	543.645	555.028	567.630
Vw_2	Final RTM	555.028	567.630	579.845
Vd_1	Initial DGM	318.370	329.663	342.205
Vd_2	Final DGM	329.663	342.205	354.466
Tw	Ave. Temp RTM °F	71.0	70.0	70.0
Td	Ave. Temp DGM °F	72.0	72.0	76.0
t	Time (min.)	14.0	15.0	15.0
$Vw_2 - Vw_1$	Net Volume RTM	11.383	12.602	12.215
$Vd_2 - Vd_1$	Net Volume DGM	11.293	12.542	12.261
	Y	1.004	1.003	1.002
	dH@	1.962	1.830	1.934

AVERAGE Y = **1.003**

% Difference from Yearly Y = **-0.893** **ACCEPT**

AVERAGE dH@ = **1.908**

Calculations

Y = (Vw * Pb * (Td + 460)) / (Vd * (Pb + (dHd / 13.6)) * (Tw +460))

dH@ = 0.0317 * dHd / (Pb (Td + 460)) * (((Tw +460) * time) / Vw)^2

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Box No.: MB-1 Bar. Press.(Pb): 29.13 in. Hg

Date: 10-27-97 Calibrated By : TAA

		RUN 1	RUN 2	RUN 3	RUN 4	RUN 5	RUN 6
DH	Delta H	0.50	0.75	1.00	1.50	2.00	4.00
in Hg	Vaccum	10	10	10	10	10	10
Vw_1	Initial RTM	934.200	952.122	963.339	975.415	987.492	999.025
Vw_2	Final RTM	951.896	962.945	975.195	987.207	998.114	1009.583
Vd_1	Initial DGM	448.724	466.737	478.016	490.201	502.365	513.990
Vd_2	Final DGM	466.501	477.617	489.970	502.081	513.078	524.620
Tw	Ave. Temp RTM "F	70	72	71	72	70	71
Td	Ave. Temp DGM "F	79	82	83	84	85	87
t	Time (min.)	46.000	23.000	22.0	18.0	14.0	10.0
$Vw_2 - Vw_1$	Net Volume RTM	17.696	10.823	11.856	11.792	10.622	10.558
$Vd_2 - Vd_1$	Net Volume DGM	17.777	10.880	11.954	11.880	10.713	10.630
	Y	1.011	1.012	1.012	1.011	1.014	1.013
	dH@	1.916	1.925	1.946	1.979	1.949	2.013

AVERAGE Y = 1.012

Average Y Range = 0.992 TO 1.032 **ACCEPT**

AVERAGE dH 1.954

Average dH@ Range = 1.754 TO 2.154 **ACCEPT**

Calculations

Y = (Vw * Pb * (Td + 460)) / (Vd * (Pb + (dHd / 13.6)) * (Tw +460))

dH@ = 0.0317 * dHd / (Pb (Td + 460)) * (((Tw +460) * t) / Vw)^2

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Box No.:	MB 02	Bar. Press.(Pb):	29.80	in. Hg
Date:	9-29-98	Pretest Gamma:	1.002	
Calibrated By :	am	Pretest dH@:	1.797	
Plant:	EPA Coke			

		RUN 1	RUN 2	RUN 3
DH	Delta H	2.00	2.00	2.00
in Hg	Vacuum	12.00	12.00	12.00
Vw_1	Initial RTM	581.580	592.959	604.663
Vw_2	Final RTM	592.959	604.663	618.175
Vd_1	Initial DGM	313.545	325.154	337.005
Vd_2	Final DGM	325.154	337.005	350.664
Tw	Ave. Temp RTM °F	70.0	71.0	72.0
Td	Ave. Temp DGM °F	70.0	76.0	75.0
t	Time (min.)	15.0	15.0	17.0
$Vw_2 - Vw_1$	Net Volume RTM	11.379	11.704	13.512
$Vd_2 - Vd_1$	Net Volume DGM	11.609	11.851	13.659
	Y	0.975	0.992	0.990
	dH@	1.959	1.838	1.782

AVERAGE Y = **0.986**

% Difference from Yearly Y = **-1.620** **ACCEPT**

AVERAGE dH@ = **1.860**

Calculations

Y = (Vw * Pb * (Td + 460)) / (Vd * (Pb + (dHd / 13.6)) * (Tw +460))

dH@ = 0.0317 * dHd / (Pb (Td + 460)) * (((Tw +460) * time) / Vw)^2

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Box No.: 2 ar. Press.(Pb): 29.50 in. Hg

Date: 10-17-97 Calibrated By : RJK

		RUN 1	RUN 2	RUN 3	RUN 4	RUN 5	RUN 6
DH	Delta H	0.50	0.75	1.00	1.50	2.00	4.00
in Hg	Vacuum	10	10	10	10	10	10
Vw_1	Initial RTM	558.612	574.095	586.200	598.965	612.242	630.900
Vw_2	Final RTM	569.029	585.906	598.741	612.032	630.414	646.492
Vd_1	Initial DGM	108.182	123.684	135.800	148.548	161.792	180.404
Vd_2	Final DGM	118.634	135.517	148.334	161.596	179.920	195.932
Tw	Ave. Temp RTM "F	75	76	78	78	79	80
Td	Ave. Temp DGM "F	75	78	80	82	83	85
t	Time (min.)	25.5	24.0	22.0	19.0	23.0	14.0
$Vw_2 - Vw_1$	Net Volume RTM	10.417	11.811	12.541	13.067	18.172	15.592
$Vd_2 - Vd_1$	Net Volume DGM	10.452	11.833	12.534	13.048	18.128	15.528
	Y	0.996	0.999	1.003	1.004	1.006	1.003
	dH@	1.719	1.779	1.769	1.822	1.839	1.852

AVERAGE Y = **1.002**

Average Y Range = 0.982 TO 1.022 **ACCEPT**

AVERAGE dH@ **1.797**

Average dH@ Range = 1.597 TO 1.997 **ACCEPT**

Calculations

Y = (Vw * Pb * (Td + 460)) / (Vd * (Pb + (dHd / 13.6)) * (Tw +460))

dH@ = 0.0317 * dHd / (Pb (Td + 460)) * (((Tw +460) * t) / Vw)^2

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Box No.:	3(13)	Bar. Press.(Ps):	29.80	in. Hg
Date:	9-29-98	Pretest Gamma:	1.004	
Calibrated By :	am	Pretest dH@:	1.784	
Plant:	EPA Coke			

		RUN 1	RUN 2	RUN 3
DH	Delta H	1.90	1.90	1.90
in Hg	Vacuum	6.00	6.00	6.00
Vw_1	Initial RTM	506.810	518.900	530.308
Vw_2	Final RTM	518.900	530.308	543.644
Vd_1	Initial DGM	954.527	966.713	978.289
Vd_2	Final DGM	966.713	978.289	991.885
Tw	Ave. Temp RTM °F	91.0	90.0	90.0
Td	Ave. Temp DGM °F	97.0	100.0	100.0
t	Time (min.)	15.0	15.0	15.0
$Vw_2 - Vw_1$	Net Volume RTM	12.090	11.408	13.336
$Vd_2 - Vd_1$	Net Volume DGM	12.186	11.576	13.596
	Y	0.998	0.999	0.994
	dH@	1.696	1.888	1.381

AVERAGE Y = **0.997**

% Difference from Yearly Y = **-0.697** **ACCEPT**

AVERAGE dH@ = **1.655**

Calculations

Y = (Vw * Pb * (Td + 460)) / (Vd * (Pb + (dHd / 13.6)) * (Tw +460))

dH@ = 0.0317 * dHd / (Pb (Td + 460)) * (((Tw +460) * time) / Vw)^2

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Box No.:	13	Bar. Press.(Pb):	29.59	in. Hg	
Date:	10-16-97	Calibrated By :	R. Kolde		

		RUN 1	RUN 2	RUN 3	RUN 4	RUN 5	RUN 6
DH	Delta H	0.50	0.75	1.00	1.50	2.00	4.00
in Hg	Vacuum	10	10	10	10	10	10
Vw_1	Initial RTM	474.707	484.860	493.733	506.082	517.525	528.376
Vw_2	Final RTM	484.514	493.318	505.845	517.191	527.985	539.639
Vd_1	Initial DGM	70.442	80.600	89.500	101.900	113.405	124.306
Vd_2	Final DGM	80.267	89.087	101.668	113.061	123.902	135.615
Tw	Ave. Temp RTM "F	90	89	89	89	90	91
Td	Ave. Temp DGM "F	95	95	94	95	98	99
t	Time (min.)	24.0	17.0	21.0	16.0	13.0	10.0
$Vw_2 - Vw_1$	Net Volume RTM	9.807	8.458	12.112	11.109	10.460	11.263
$Vd_2 - Vd_1$	Net Volume DGM	9.825	8.487	12.168	11.161	10.497	11.309
	Y	1.006	1.006	1.002	1.002	1.006	1.000
	dH@	1.749	1.763	1.752	1.810	1.794	1.835

AVERAGE Y =	**1.004**				
Average Y Range =		0.984	TO	1.024	**ACCEPT**
AVERAGE dH@	**1.784**				
Average dH@ Range =		1.584	TO	1.984	**ACCEPT**

Calculations

Y = (Vw * Pb * (Td + 460)) / (Vd * (Pb + (dHd / 13.6)) * (Tw +460))

dH@ = 0.0317 * dHd / (Pb (Td + 460)) * (((Tw +460) * t) / Vw)^2

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Box No.:	15(5)	Bar. Press.(Ps):	30.00	in. Hg
Date:	9-29-98	Pretest Gamma:	0.981	
Calibrated By :	gg	Pretest dH@:	1.710	
Plant:	EPA Coke			

		RUN 1	RUN 2	RUN 3
DH	Delta H	1.80	1.80	1.80
in Hg	Vacuum	5.00	5.00	5.00
Vw_1	Initial RTM	214.453	230.230	245.365
Vw_2	Final RTM	230.230	245.365	260.368
Vd_1	Initial DGM	608.315	624.400	639.854
Vd_2	Final DGM	624.400	639.854	655.294
Tw	Ave. Temp RTM °F	72.0	72.0	73.0
Td	Ave. Temp DGM °F	81.0	84.0	86.0
t	Time (min.)	20.6	20.0	20.0
$Vw_2 - Vw_1$	Net Volume RTM	15.777	15.135	15.003
$Vd_2 - Vd_1$	Net Volume DGM	16.085	15.454	15.440
	Y	0.993	0.997	0.991
	dH@	1.696	1.728	1.759

AVERAGE Y = **0.994**

% Difference from Yearly Y = **1.296** **ACCEPT**

AVERAGE dH@ = **1.728**

Calculations

Y = (Vw * Pb * (Td + 460)) / (Vd * (Pb + (dHd / 13.6)) * (Tw +460))

dH@ = 0.0317 * dHd / (Pb (Td + 460)) * (((Tw +460) * time) / Vw)^2

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Box No.:	MB 15	ar. Press.(Pb):	29.15	in. Hg	
Date:	12-29-97	alibrated By :	G GAY		

		RUN 1	RUN 2	RUN 3	RUN 4	RUN 5	RUN 6
DH	Delta H	0.50	0.75	1.00	1.50	2.00	4.00
in Hg	Vaccum	10	10	10	10	10	10
Vw_1	Initial RTM	150.884	157.349	165.074	173.960	184.521	197.212
Vw_2	Final RTM	157.026	164.869	173.741	184.259	196.465	214.019
Vd_1	Initial DGM	564.125	570.758	578.795	587.860	598.779	611.999
Vd_2	Final DGM	570.432	578.496	587.643	598.511	611.127	629.263
Tw	Ave. Temp RTM "F	73	75	75	76	76	78
Td	Ave. Temp DGM "F	76	80	82	84	86	88
t	Time (min.)	15.000	15.000	15.0	15.0	15.0	15.0
$Vw_2 - Vw_1$	Net Volume RTM	6.142	7.520	8.667	10.299	11.944	16.807
$Vd_2 - Vd_1$	Net Volume DGM	6.307	7.738	8.848	10.651	12.348	17.264
	Y	0.978	0.979	0.990	0.978	0.980	0.982
	dH@	1.719	1.720	1.720	1.827	1.805	1.830

AVERAGE Y =	0.981				
Average Y Range =		0.961	TO	1.001	ACCEPT
AVERAGE dH	1.770				
Average dH@ Range =		1.570	TO	1.970	ACCEPT

Calculations

Y = (Vw * Pb * (Td + 460)) / (Vd * (Pb + (dHd / 13.6)) * (Tw +460))

dH@ = 0.0317 * dHd / (Pb (Td + 460)) * (((Tw +460) * t) / Vw)^2

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Box No.:	6(Rmb 13)	Bar. Press.(Ps):	29.80	in. Hg
Date:	9-29-98	Pretest Gamma:	1.005	
Calibrated By :	am	Pretest dH@:	1.778	
Plant:	EPA Coke			

		RUN 1	RUN 2	RUN 3
DH	Delta H	2.30	2.30	2.30
in Hg	Vacuum	4.00	4.00	4.00
Vw_1	Initial RTM	455.655	473.310	490.345
Vw_2	Final RTM	473.310	490.345	506.805
Vd_1	Initial DGM	223.936	241.899	259.085
Vd_2	Final DGM	241.899	259.085	275.869
Tw	Ave. Temp RTM °F	70.0	74.0	74.0
Td	Ave. Temp DGM °F	71.0	82.0	85.0
t	Time (min.)	20.0	20.0	20.0
$Vw_2 - Vw_1$	Net Volume RTM	17.655	17.035	16.460
$Vd_2 - Vd_1$	Net Volume DGM	17.963	17.186	16.784
	Y	0.979	1.000	0.995
	dH@	1.661	1.774	1.890

AVERAGE Y = **0.992**

% Difference from Yearly Y = **-1.334** **ACCEPT**

AVERAGE dH@ = **1.775**

Calculations

Y = (Vw * Pb * (Td + 460)) / (Vd * (Pb + (dHd / 13.6)) * (Tw +460))

dH@ = 0.0317 * dHd / (Pb (Td + 460)) * (((Tw +460) * time) / Vw)^2

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Box No.: RMB-13 (MB-6) Bar. Press.(Pb): 29.50 in. Hg

Date: 10-17-97 Calibrated By : R.Kolde

		RUN 1	RUN 2	RUN 3	RUN 4	RUN 5	RUN 6
DH	Delta H	0.50	0.75	1.00	1.50	2.00	4.00
in Hg	Vacuum	10	10	10	10	10	10
Vw_1	Initial RTM	669.271	680.835	691.078	701.618	713.486	724.113
Vw_2	Final RTM	680.326	690.745	701.245	713.109	723.578	735.099
Vd_1	Initial DGM	23.196	34.797	45.097	55.700	67.635	78.300
Vd_2	Final DGM	34.289	44.775	55.330	67.254	77.774	89.309
Tw	Ave. Temp RTM °F	68.500	67.500	67.000	67.000	67.500	68.500
Td	Ave. Temp DGM °F	73.000	73.500	75.000	75.500	76.500	78.000
t	Time (min.)	27.000	20.000	18.0	17.0	13.0	10.0
$Vw_2 - Vw_1$	Net Volume RTM	11.055	9.910	10.167	11.491	10.092	10.986
$Vd_2 - Vd_1$	Net Volume DGM	11.093	9.978	10.233	11.554	10.139	11.009
	Y	1.004	1.003	1.006	1.007	1.007	1.006
	dH@	1.680	1.712	1.748	1.830	1.850	1.849

AVERAGE Y = **1.005**

Average Y Range = 0.985 TO 1.025 **ACCEPT**

AVERAGE dH@ = **1.778**

Average dH@ Range = 1.578 TO 1.978 **ACCEPT**

Calculations

$$Y = (Vw * Pb * (Td + 460)) / (Vd * (Pb + (dHd / 13.6)) * (Tw + 460))$$

$$dH@ = 0.0317 * dHd / (Pb (Td + 460)) * (((Tw + 460) * t) / Vw)^2$$

Pacific Environmental Services VOST Box Calibration

Date:	7/19-98	Flow Rate:	**1.0 l/min**
Vost Box Number:	V-2	Rotameter Setting:	0.95
		Bubble Meter Temp. :	91

Run 1

Bubble Meter				Meter Box
1005		1007	Initial Volume	8883.5
1007		1009	Final Volume	8903.5
1007		1012	Initial Temp.	105
		1008	Final Temp.	104
			Average Temp.	104.5
	Average:	**1007.86**	Time:	18.49
			QDGM=	1055.798
			Y=	**0.9546**

Run 2

Bubble Meter				Meter Box
1007		1008	Initial Volume	8903.5
1006		1009	Final Volume	8923.5
1006		1010	Initial Temp.	105
		1012	Final Temp.	105
			Average Temp.	105
	Average:	**1008.29**	Time:	18.5
			QDGM=	1054.293
			Y=	**0.9564**

Run 3

1005		1003	Initial Volume	8924
1004		1002	Final Volume	8944
1003		1004	Initial Temp.	105
		1005	Final Temp.	105
			Average Temp.	105
	Average:	**1003.71**	Time:	18.6
			QDGM=	1048.624988
			Y=	**0.9572**

Average Y= 0.9560

Pacific Environmental Services VOST Box Calibration

Date:	7-19-98	Flow Rate:	**0.5 l/min**
Vost Box Number:	V-2	Rotameter Setting:	0.4
		Bubble Meter Temp. :	91

Run 1

Bubble Meter			Meter Box	
499.9		498.7	Initial Volume	8837
500.9		501.3	Final Volume	8852
498.9		499.8	Initial Temp.	104
		500.2	Final Temp.	104
			Average Temp.	104
	Average:	**499.96**	Time:	27.6
			QDGM=	530.951
			Y=	**0.9416**

Run 2

Bubble Meter			Meter Box	
500.2		500.0	Initial Volume	8852.25
501.0		499.8	Final Volume	8867.25
500.8		499.6	Initial Temp.	104
		499.8	Final Temp.	104
			Average Temp.	104
	Average:	**500.17**	Time:	27.5
			QDGM=	532.882
			Y=	**0.9386**

Run 3

500.0		500.9	Initial Volume	8867.5
500.6		500.7	Final Volume	8882.75
501.0		500.1	Initial Temp.	105
		499.5	Final Temp.	104
			Average Temp.	104.5
	Average:	**500.40**	Time:	27.6
			QDGM=	539.322345
			Y=	**0.9278**

Average Y= 0.9360

Pacific Environmental Services VOST Box Calibration

Date:	7-19-98	Flow Rate:	**0.25 l/min**
Vost Box Number:	V-2	Rotameter Setting:	0.2
		Bubble Meter Temp. :	91

Run 1

Bubble Meter			Meter Box	
238.5		240.9	Initial Volume	**8815.5**
239.4		241.0	Final Volume	**8822**
240.1		240.5	Initial Temp.	103
		240.8	Final Temp.	102
			Average Temp.	102.5
	Average:	**240.17**	Time:	27.3
			QDGM=	233.228
			Y=	**1.0298**

Run 2

Bubble Meter			Meter Box	
238.0		240.1	Initial Volume	**8822.5**
239.5		240.4	Final Volume	**8829**
239.6		240.4	Initial Temp.	103
		240.0	Final Temp.	103
			Average Temp.	103
	Average:	**239.71**	Time:	27.35
			QDGM=	232.594
			Y=	**1.0306**

Run 3

240.6		240.8	Initial Volume	**8829.5**
240.8		240.0	Final Volume	**8836**
240.2		239.6	Initial Temp.	104
		239.0	Final Temp.	104
			Average Temp.	104
	Average:	**240.14**	Time:	27.3
			QDGM=	232.6072273
			Y=	**1.0324**

Average Y= 1.0309

Pacific Environmental Services VOST Box Calibration

Date:	7/19-98	Flow Rate:	**1.0 l/min**
Vost Box Number:	V-1	Rotameter Setting:	**1.08**
		Bubble Meter Temp. :	**91**

Run 1

Bubble Meter				Meter Box
1012		1007	Initial Volume	9829
1010		1007	Final Volume	9855
1010		1008	Initial Temp.	104
		1009	Final Temp.	104
			Average Temp.	101
	Average:	**1009.00**	Time:	26.25
			QDGM=	972.821
			Y=	**1.0372**

Run 2

Bubble Meter				Meter Box
1008		1010	Initial Volume	9855.5
1010		1009	Final Volume	9881.5
1011		1007	Initial Temp.	104
		1003	Final Temp.	103
			Average Temp.	103.5
	Average:	**1008.29**	Time:	26.25
			QDGM=	968.505
			Y=	**1.0411**

Run 3

1009		1005	Initial Volume	9882
1008		1003	Final Volume	9908
1006		1005	Initial Temp.	104
		1008	Final Temp.	103
			Average Temp.	103.5
	Average:	**1006.29**	Time:	26.26
			QDGM=	968.1358553
			Y=	**1.0394**

Average Y= 1.0392

Pacific Environmental Services VOST Box Calibration

Date: 7-19-98
Vost Box Number: V-1

Flow Rate: **0.5 l/min**
Rotameter Setting: 0.6
Bubble Meter Temp. : 91

Run 1

Bubble Meter			Meter Box	
500.5		501.9	Initial Volume	9783
501.9		502.0	Final Volume	9797.5
500.9		501.7	Initial Temp.	101
		501.3	Final Temp.	100
			Average Temp.	100.5
	Average:	**501.46**	Time:	28.3
			QDGM=	503.683
			Y=	**0.9956**

Run 2

Bubble Meter			Meter Box	
501.5		500.2	Initial Volume	9798
501.6		500.2	Final Volume	9812.5
501.9		500.3	Initial Temp.	102
		500.5	Final Temp.	100
			Average Temp.	101
	Average:	**500.89**	Time:	28.4
			QDGM=	501.462
			Y=	**0.9988**

Run 3

501.8		501.9	Initial Volume	9813
502.0		501.5	Final Volume	9827.5
502.2		501.3	Initial Temp.	103
		500.8	Final Temp.	103
			Average Temp.	103
	Average:	**501.64**	Time:	28.4
			QDGM=	499.6810347
			Y=	**1.0039**

Average Y= 0.9995

Pacific Environmental Services VOST Box Calibration

Date:	7-19-98	Flow Rate:	**0.25 l/min**
Vost Box Number:	V-1	Rotameter Setting:	0.32
		Bubble Meter Temp. :	90

Run 1

Bubble Meter			Meter Box	
232.9		232.8	Initial Volume	9761.5
233.0		232.9	Final Volume	9768
233.1		232.9	Initial Temp.	99
		232.9	Final Temp.	99
			Average Temp.	99
	Average:	**232.93**	Time:	28.2
			QDGM=	226.785
			Y=	**1.0271**

Run 2

Bubble Meter			Meter Box	
233.0		232.8	Initial Volume	9768.25
233.0		232.8	Final Volume	9774.75
233.2		232.4	Initial Temp.	100
		232.2	Final Temp.	100
			Average Temp.	100
	Average:	**232.77**	Time:	28.18
			QDGM=	226.541
			Y=	**1.0275**

Run 3

232.8		233.0	Initial Volume	9775
232.7		233.2	Final Volume	9781.5
232.5		233.6	Initial Temp.	100
		234.0	Final Temp.	100
			Average Temp.	100
	Average:	**233.11**	Time:	28.2
			QDGM=	226.3804458
			Y=	**1.0297**

Average Y= 1.0281

ABC COKE
COKE OVEN EMISSION TEST
BIRMINGHAM, ALABAMA

Inlet Location
Trains Method 4-29 Method 315 Method NIOSH 5506 Date Monday Sept 21, 1998
MB. Operator - Gary Gay MB Operator Troy Abernathy Page 1 of 2

Quality Control Check	Observation
Prior to Start of Tests	
Keep all cleaned glassware sealed until train assembly	done
Assemble trains in dust free environment	done
Visually inspect each train for proper assembly	done
Level and zero manometer	done
Calculate proper sampling nozzle size	done
Visually inspect sampling nozzle for chips	done
Visually inspect Type S Pitot tube	done
Leak check each leg of Type S Pitot tube	done
Leak check entire sampling train	done
During Testing	
Read temperatures and differential pressures at each traverse point	yes
Sample data and calculations recorded on preformatted data sheets	yes
Unusual occurrences noted in test log	yes
Properly maintain the roll and pitch of axis of Type S Pitots and sampling nozzle	N/A
Leak check train before and after any component changes during test	yes
Maintain the probe and filter temperature	yes
Maintain ice in ice water bath and maintain impinger exit temperature	yes
Calibration forms reviewed for completeness and accuracy	yes
Data sheets reviewed by PM daily during testing	yes

Method 429 - MB # 2
y = 1.002
ΔH = 1.797
K Factor = 1.2

Method 315 - MB # 3
y = 1.004
ΔH 1.784
K. Factor 1.36

Monday

Date 9-21-98

Page 2 of 2

ABC Coke

Quality Control Check	Observation
After Testing	
Visually inspect sampling nozzle	yes
Visually inspect Type S Pitot tube	yes
Leak check each leg of the Type S Pitot tube	yes
Leak check the entire sampling train	yes
Record observations if any	yes
Field Log	
Project name/ID and location	ABC COKE Birmingham, Ala.
Sampling personnel (names/position)	Gary Gay, Troy Abernathy, Steve Blaine
Geological observations including map	Flat to rolling hills east of Bag house 30 ft
Sample run times and dates	11:28AM – 7:11PM 9-21-98
Sample descriptions	4/29 315 Particulate Organics
Description of QC samples	N/A
Deviations from QAPP	NO
Difficulties in sampling or unusual conditions	Works like a batch operation. Flow varies w/ Coke Pushes
Sample Labels	yes
Sample ID	yes
Date and time of collection	9-21-98 11:28AM – 7:11PM
Lab technician initials	RK & RD
Analytical parameter	Particulates, Organics, PAH's
Preservative required	After recovery – sample need to be kept

ABC COKE
COKE OVEN EMISSION TEST
BIRMINGHAM, ALABAMA

Sept 21, 1998
Monday

Inlet Location

I. Test Run Observations		Date	9-21-98	9-21-98		
R = Recommended M = Mandatory			Test Run 1 M-429	Test Run 2 M-315	Test Run 3	Test Run 4
1. Train set up	filter ID		N/A	080798-20		
	filter weight		N/A	N/A *		
	filter checked for holes		yes	yes		
	filter centered		yes	yes		
	nozzle clean		yes	yes		
	nozzle undamaged		yes	yes		
	nozzle diameter (in.)	*	.186	.192		
	probe liner clean		yes	yes		
	probe markings correct		yes	yes		
	probe heated along entire length		yes	yes		
	impingers charged		yes	yes		
	impingers iced		yes	yes		
	meter box leveled		yes	yes		
	pitot manometer zeroed		yes	yes		
	orifice manometer zeroed		yes	yes		
	filter box or holder at temp.		yes	yes		
	all ball joints lightly greased		N/A	N/A		
	all openings capped		yes	yes		
2. Train leak check at nozzle: (≤0.02 cfm @ 15 in. Hg initial. Intermediate and final at highest Vacuum during test run.)	initial (R)	LC	.003	.005		
		VAC	15"	15"		
	* intermediate (R)	LC	.002	—		
		VAC	10"	—		
	intermediate (R)	LC	—	—		
		VAC	—	—		
	intermediate (R)	LC	—	—		
		VAC	—	—		
	final (M)	LC	.002	.002		
		VAC	10" Hg	10" Hg		
3. Pitot lines leak check: (hold 3 in. H_2O) on manometer for (15 sec.)	initial positive line (R)		>5 ok	>3" ok		
	negative line (R)		>5 ok	>3" ok		
	final positive line (M)		>3" ok	>3" ok		
	negative line (R)		>3" ok	>3" ok		
	pitot tube undamaged		yes	yes		
M-3 bag initial leak check (M) Tedlar bag:	Should hold 2 to 4 in. H_2O pressure for 10 minutes or		yes	yes		
	zero flow meter reading on continuous evacuation or		yes	yes		
	Completely fill bag and let stand overnight—no deflation.		yes	yes		

* Nozzle tip broke off coming out of First Port change. New nozzle installed & train leak checked. Nozzle Size .183

* Filter wt. will and was weighed by ERG. all we have is ID Number.

Inlet

Date	9-21-98	9-21-98		
R = Recommended M = Mandatory	Test Run 1 M-429	Test Run 2 M-315	Test Run 3	Test Run 4
4. M-3 sampling train check: initial (M) *	N/A	N/A		
(should hold 10 in. vacuum for 1/2 min.) final (M)	N/A	N/A		
	N/A	N/A		
Purge sample train with stack gas	yes	yes		
Constant rate sampling 1 pm	yes	yes		
5. Time test started	7:28	7:28		
Time test ended	7:12PM	7:11PM		
6. Dry gas meter volume: ( ) port initial	434.281	499.100		
final	—	—		
( ) port initial	—	—		
final	—	—		
( ) port initial	—	—		
final	—	—		
( ) port initial	—	—		
final	672.368	697.588		
7. Train operation during run: Nozzle changed during run — NOT ALLOWED	* yes	NO		
pitch and yaw of probe o.k.	yes	yes		
nozzle not scraped on nipple *	no	yes		
effective seal around probe	yes	yes		
probe moved at proper time	yes	yes		
probe heated	yes	yes		
calculator constants or nomograph changed when TS and/or TM changes significantly	N/A	N/A		
average time to set isokenetics after probe moved to next point	Appro. 10 Sec	Appro 10 Sec		
Average values: impinger temperature should be ≤ 70°F	yes.	yes		
Post filter gas streamer or Filter box temperature 250°F ± 25, ≤320°F, °F circle one	yes	yes		
stack temperature	130°F	137°F		
barometric P taken and value	29.7	29.7		
was probe ever disconnected from filter holder while in stack?	no	no		
was filter changed during run?	no	no		

* See notes on first Page.

* Dealing with M-3 - These bags were run as intergrated samples taken along with the M-429 or M-315 Meter box.

Inlet

R = Recommended M = Mandatory	Date	9-21-98	9-21-98		
		Test Run 1 M-429	Test Run 2 M-315	Test Run 3	Test Run 4
Check on filter holder loosening of clamping device holder		done	done		
was silica gel changed during run?		no	no		
was any particulate lost?		no	no		
Accurate reading of:	ΔP Average (Time Weighted)	.0542	.5833		
	ΔH Average (Time Weighted)	.8592	.9855		
meter temperature		99°F	111°F		
stack temperature		120°F	138°F		
1* meter vacuum		10"	5"		
2* time per point		✓	✓		
impinger temperature		<70°F	<70°F		
filter box temperature		250±25	250±25°F		
2* Minimum sample time of 360 min met Minimum sample volume of ____ dscf collected		OK	OK		
8. Post test: - All openings sealed		yes	yes		
- recovery area clean sheltered		yes	yes		
- filter handled with gloves, forceps		yes	yes		
- petri dish sealed, labeled		yes	yes		
- any sample lost		no	no		
	grad cyl. weighed				
water measured ✓mL gms		121.3	115.5		
- silica gel weighed, net gms		37.0	31.3		
- condition - color		clear	clear		
% spent		30%	40%		
- probe cooled sufficiently		yes	yes		
- nozzle removed and brushed		yes	yes		
- probe brushed 6 times		yes	yes		
- nozzle brushes clean		yes	yes		
- wash bottles clean		yes	yes		
- acetone clean		yes	yes		
hexane & Methylene Chloride - M-8 15 minute purge		N/A	N/A		
- water/solution clean		yes	yes		
- blank taken: acetone, water, other		yes	yes		
Probe brush and extension clean.		yes	yes		
Sample container: Clean		yes	yes		
Capped		yes	yes		
Labeled		yes	yes		
Sealed		yes	yes		
Liquid level marked		yes	yes		

1* This represents the highest meter vacuum recorded

2* Because of the process, sample time and volume is based upon the number of pushes there are and how long the pushes last. This was a pre-agreement with EPA & host facil

		Test Run 1	Test Run 2	Test Run 3	Test Run 4
	Date	9-21-98	9-21-98		
R = Recommended M = Mandatory		M-429	M-311		
9. Post test Orsat Analysis of integrated bag sample Orsat analyzer - Analyzer leak check (levels should not fall below cap. tubing and not more than 0.2 mL in burrette for 2 min.)	Initial (M)	yes	yes		
	Final (M)	yes	yes		
		—	—		
Orsat samples: Each bag analyzed 3 times		yes	yes		
% CO_2 agrees within 0.2%		yes	yes		
% O_2 agrees within 0.2%		yes	yes		
% CO agrees within 0.2%		N/A	N/A		
Analysis at end of test. Orsat analyzer checked against air (20.9 ± 0.3)		yes	yes		
Orsat Analysis:					
CO_2%		0.2 to 0.3	0.2 to 0.3		
O_2%		20.4-20.6	20.4-20.6		
CO%		N/A	N/A		
Fo = $\frac{20.9 - \% O_2}{\% CO_2}$		N/A	N/A		
Fuel		N/A	N/A		
F_o range for fuel		N/A	N/A		
Orsat analysis valid		yes	yes		
Orsat solutions changed when calculated F_o exceeds fuel type range		N/A	N/A		
10. All samples locked up		yes	yes		
All sampling components clean and sealed		yes	yes		
* All data sheets submitted to observer *		yes	yes		
- Orsat		yes	yes		
- Run isokenetic Team/Observer		9/25/98	9/26/98		
- Particulate recovery		yes	yes		
* - Process data		N/A	N/A		
- Charts		yes	yes		
- Calibration sheets					

* Sample custodian

* Process data handled by another contractor and will be submitted at later date for insertion into Final Rep.

J. NOTES: Care should be taken, when sampling for organic compounds, to follow stringent quality control guidelines to avoid contamination of the sample and sampling train. Take note of any occurences which could bias the sample in any manner.

Include: (1) General comments; (2) Changes to pretest agreement with justification; (3) Identify (manufacturer) and describe condition of sampling equipment; (4) any abnormal occurrences during test program. (Additional page(s) attached: Yes ____, No ✓.)

Dennis P Hobzek
Signature of Observer

P E S
Affiliation of Observer

9-21-98
Date

ABC COKE
COKE OVEN EMISSION TEST
BIRMINGHAM, ALABAMA

Inlet Location

Trains M-429 Method 315 N105 h5306 **Date** Tuesday Sept. 22, 1998

MB- operator Steve Blaine MB-Operator Troy Abernathy **Page** 1 of 2

Quality Control Check	Observation
Prior to Start of Tests	
Keep all cleaned glassware sealed until train assembly	done
Assemble trains in dust free environment	done
Visually inspect each train for proper assembly	done
Level and zero manometer	done
Calculate proper sampling nozzle size	done
Visually inspect sampling nozzle for chips	done
Visually inspect Type S Pitot tube	done
Leak check each leg of Type S Pitot tube	done
Leak check entire sampling train	done
During Testing	
Read temperatures and differential pressures at each traverse point	yes
Sample data and calculations recorded on preformatted data sheets	yes
Unusual occurrences noted in test log	yes
Properly maintain the roll and pitch of axis of Type S Pitots and sampling nozzle	yes
Leak check train before and after any component changes during test	yes
Maintain the probe and filter temperature	yes
Maintain ice in ice water bath and maintain impinger exit temperature	yes
Calibration forms reviewed for completeness and accuracy	yes
Data sheets reviewed by PM daily during testing	yes

Method 429 - MB #2
y = 1.002
ΔH = 1.797
K Factor = 1.2

Method 315 - MB #3
y = 1.004
ΔH = 1.784

Inlet Location

Quality Control Check	Observation
After Testing	
Visually inspect sampling nozzle	yes
Visually inspect Type S Pitot tube	yes
Leak check each leg of the Type S Pitot tube	yes
Leak check the entire sampling train	yes
Record observations if any	yes
Field Log	
Project name/ID and location	ABC Coke Birmingham, Alabama
Sampling personnel (names/position)	Gary Gay, Troy Abernathy, Steve Blaine
Geological observations including map	Flat to rolling hill NW & N, and NE of Pl
Sample run times and dates	10:18 to 6:16 PM 9-22-98
Sample descriptions	M-429 Organics & Particulate M-315 NIOSH 53
Description of QC samples	N/A
Deviations from QAPP	NO
Difficulties in sampling or unusual conditions	Batch type sampling - Variation of Pl
Sample Labels	yes
Sample ID	yes
Date and time of collection	9-22-98 10:18AM to 6:16 PM
Lab technician initials	R D & R.K
Analytical parameter	Particulates, Organics, PAH's
Preservative required	after recovery sample are to maintain Cool until Analysis.

ABC COKE
COKE OVEN EMISSION TEST
BIRMINGHAM, ALABAMA

chlet Location

I. Test Run Observations	Date	9-22-98	9-22-98		
R = Recommended M = Mandatory		Test Run 1 M-429	Test Run 2 M-315	Test Run 3	Test Run 4
1. Train set up	filter ID	N/A	080998-07		
	filter weight	N/A	N/A *		
	filter checked for holes	yes	yes		
	filter centered	yes	yes		
	nozzle clean	yes	yes		
	nozzle undamaged	yes	yes		
	nozzle diameter (in.)	.183	.192		
	probe liner clean	yes	yes		
	probe markings correct	yes	yes		
	probe heated along entire length	yes	yes		
	impingers charged	yes	yes		
	impingers iced	yes	yes		
	meter box leveled	yes	yes		
	pitot manometer zeroed	yes	yes		
	orifice manometer zeroed	yes	yes		
	filter box or holder at temp.	yes	yes		
	all ball joints lightly greased	N/A	N/A		
	all openings capped	yes	yes		
2. Train leak check at nozzle: (<0.02 cfm @ 15 in. Hg initial. Intermediate and final at highest Vacuum during test run.)	initial (R) LC	.006	.004		
	initial (R) VAC	14" Hg	15" Hg		
	intermediate (R) LC	—	—		
	intermediate (R) VAC	—	—		
	intermediate (R) LC	—	—		
	intermediate (R) VAC	—	—		
	intermediate (R) LC	—	—		
	intermediate (R) VAC	—	N/A —		
	final (M) LC	.006	.001		
	final (M) VAC	8" Hg	10" Hg		
3. Pitot lines leak check: (hold 3 in. H_2O) on manometer for (15 sec.)	initial positive line (R)	>3" ok	>3" ok		
	initial negative line (R)	>3" ok	>3" ok		
	final positive line (M)	>3" ok	>3" ok		
	final negative line (R)	>3" ok	>3" ok		
	pitot tube undamaged	yes	yes		
M-3 bag initial leak check (M) Tedlar bag:	Should hold 2 to 4 in. H_2O pressure for 10 minutes or	yes	yes		
	zero flow meter reading on continuous evacuation or	yes	yes		
	Completely fill bag and let stand overnight—no deflation.	yes	yes		

* Filter wt. will and was weighed by ERG. all we have is the I D number.

Inlet Location

Date	9-22-98	9-22-98		
R = Recommended M = Mandatory	Test Run 2 M-429	Test Run 2 M-315	Test Run 3	Test Run 4
4. M-3 sampling train check: initial (M) *	N/A	N/A		
(should hold 10 in. vacuum for 1/2 min.) final (M)	N/A	N/A		
	N/A	N/A		
Purge sample train with stack gas	yes	yes		
Constant rate sampling 1 pm	yes	yes		
5. Time test started	10:18 AM	10:18 AM		
Time test ended	6:16 PM	6:16 PM		
6. Dry gas meter volume: ( ) port initial	672.830	673.721		
final	—	—		
( ) port initial	—	—		
final	—	—		
( ) port initial	—	—		
final	—	—		
( ) port initial	—	—		
final	776.335	778.343		
7. Train operation during run: Nozzle changed during run – NOT ALLOWED	N.O.	NO		
pitch and yaw of probe o.k.	yes	yes		
nozzle not scraped on nipple	no	no		
effective seal around probe	yes	yes		
probe moved at proper time	yes	yes		
probe heated	yes	yes		
calculator constants or nomograph changed when TS and/or TM changes significantly	N/A	N/A		
average time to set isokenetics after probe moved to next point	<.10 sec	<10 sec		
Average values: impinger temperature should be ≤ 70°F	yes	yes		
Post filter gas streamer or Filter box temperature 250°F ± 25, ≤320°F, °F circle one	yes	yes		
stack temperature				
barometric P taken and value	29.74	29.74		
was probe ever disconnected from filter holder while in stack?	no	no		
was filter changed during run?	no	no		

* Concerning M-3. All the bags were run as intergrated samples taken simultaneously with M-429 or M 315 Meter Box

Row 2 Inlet Location

Date	9-22-98	9-22-98		
R = Recommended M = Mandatory	Test Run 1 M-429	Test Run 2 M-315	Test Run 3	Test Run 4
Check on filter holder loosening of clamping device holder	Done	Done		
was silica gel changed during run?	no	no		
was any particulate lost?	no	no		
Accurate reading of: ΔP Average (time weighted)	.4305	.2611		
ΔH Average (time weighted)	.42	1.19		
meter temperature	103°F	114°F		
stack temperature	145°F	137°F		
Highest * meter vacuum Accurate	7" Hg	4" Hg		
time per point	OK	OK		
impinger temperature	<70°F	<70°F		
filter box temperature	250±25	250±25		
* Minimum sample time of _____ min met Minimum sample volume of _____ dscf collected	OK	OK		
8. Post test: - All openings sealed	yes	yes		
- recovery area clean sheltered	yes	yes		
- filter handled with gloves, forceps	yes	yes		
- petri dish sealed, labeled	yes	yes		
- any sample lost	no	no		
grad cyl. weighed		44.9	DPH	
water measured ~~mL~~ gms	630	~~21.3~~		DPH
- silica gel weighed, net gms	18.0	~~5.10~~	16.4	
- condition - color	clear	clear		
% spent	15%	30%		
- probe cooled sufficiently	yes	yes		
- nozzle removed and brushed	yes	yes		
- probe brushed 6 times	yes	yes		
- nozzle brushes clean	yes	yes		
- wash bottles clean	yes	yes		
Hexane Methylene Chloride - acetone clean	yes	yes		
- M-8 15 minute purge	N/A	N/A		
- water/solution clean	yes	yes		
- blank taken: acetone, water, other	yes	yes		
Probe brush and extension clean.	yes	yes		
Sample container: Clean	yes	yes		
Capped	yes	yes		
Labeled	yes	yes		
Sealed	yes	yes		
Liquid level marked	yes	yes		

Inlet Location

R = Recommended M = Mandatory		Test Run 1	Test Run 2	Test Run 3	Test Run 4
	Date	9-22-98	9-22-98		
		M-429	M-315		
9. Post test Orsat Analysis of integrated bag sample Orsat analyzer - Analyzer leak check (levels should not fall below cap. tubing and not more than 0.2 mL in burrette for 2 min.)	Initial (M)	yes	yes		
	Final (M)	yes	yes		
		yes	yes		
Orsat samples: Each bag analyzed 3 times		yes	yes		
% CO_2 agrees within 0.2%		yes	yes		
% O_2 agrees within 0.2%		yes	yes		
% CO agrees within 0.2%		N/A	N/A		
Analysis at end of test. Orsat analyzer checked against air (20.9 ± 0.3)		yes	yes		
Orsat Analysis:					
CO_2%		0.2	0.2		
O_2%		20.25	20.25		
CO%		N/A	N/A		
$F_o = \frac{20.9 - \% O_2}{\% CO_2}$		N/A	N/A		
Fuel		N/A	N/A		
F_o range for fuel		N/A	N/A		
Orsat analysis valid		yes	yes		
Orsat solutions changed when calculated F_o exceeds fuel type range		N/A	N/A		
10. All samples locked up		yes	yes		
All sampling components clean and sealed		yes	yes		
1 * All data sheets submitted to observer		yes	yes		
- Orsat		yes	yes		
- Run isokenetic Team/Observer		108% ✓	94% ✓		
- Particulate recovery		yes	yes		
- Process data		✓	✓		
2 * - Charts		N/A	N/A		
- Calibration sheets		yes	yes		

1 * Sample custodian

2 * Process data handled by another contractor and will be submitted at later date for inclusion into Final Rep

J. NOTES: Care should be taken, when sampling for organic compounds, to follow stringent quality control guidelines to avoid contamination of the sample and sampling train. Take note of any occurences which could bias the sample in any manner.

Include: (1) General comments; (2) Changes to pretest agreement with justification; (3) Identify (manufacturer) and describe condition of sampling equipment; (4) any abnormal occurrences during test program. (Additional page(s) attached: Yes ____, No ✓.)

Dennis P Hobgschuh
Signature of Observer

P.E.S.
Affiliation of Observer

9-22-98
Date

ABC COKE
COKE OVEN EMISSION TEST
BIRMINGHAM, ALABAMA

Inlet Location
Trains - 4/29 & Method 315
Steve Blaine Gary Gay Troy Abernathy

NIOSH 5506

Wednesday
Date Sept 23, 1998
Page 1 of 2

Run 3

Quality Control Check	Observation
Prior to Start of Tests	
Keep all cleaned glassware sealed until train assembly	done
Assemble trains in dust free environment	done
Visually inspect each train for proper assembly	done
Level and zero manometer	done
Calculate proper sampling nozzle size	done
Visually inspect sampling nozzle for chips	done
Visually inspect Type S Pitot tube	done
Leak check each leg of Type S Pitot tube	done
Leak check entire sampling train	done
During Testing	
Read temperatures and differential pressures at each traverse point	yes
Sample data and calculations recorded on preformated data sheets	yes
Unusual occurrences noted in test log	yes
Properly maintain the roll and pitch of axis of Type S Pitots and sampling nozzle	yes
Leak check train before and after any component changes during test	yes
Maintain the probe and filter temperature	yes
Maintain ice in ice water bath and maintain impinger exit temperature	yes
Calibration forms reviewed for completeness and accuracy	yes
Data sheets reviewed by PM daily during testing	yes

Quality Control Check	Observation
After Testing	
Visually inspect sampling nozzle	yes
Visually inspect Type S Pitot tube	yes
Leak check each leg of the Type S Pitot tube	yes
Leak check the entire sampling train	yes
Record observations if any	yes
Field Log	
Project name/ID and location	ABC Coke Birmingham, Alabama
Sampling personnel (names/position)	Gary Gray, Steve Blum, Troy Abernathy
Geological observations including map	Flat to rolling hills, east of Bay house - 30' off
Sample run times and dates	10:20 AM to 6:19 PM 9-23-98
Sample descriptions	M-Cor 6429, M 315, N105h 5506
Description of QC samples	N/A
Deviations from QAPP	NO
Difficulties in sampling or unusual conditions	Variable Flow changes
Sample Labels	yes
Sample ID	yes
Date and time of collection	9-23-98 10:20 AM to 6:19 PM
Lab technician initials	PK & RD
Analytical parameter	Particulate, Organics PAHS
Preservative required	Handled with Care, Samples sealed Lined marked & Kept cool until Analysis

ABC COKE
COKE OVEN EMISSION TEST
BIRMINGHAM, ALABAMA

Sept 23, 1998
Wednesday

Inlet Location

I. Test Run Observations		Date	9-23-98	9-23-98		
R = Recommended M = Mandatory			Test Run 3 M-5/29	Test Run 3 M-3/15	Test Run 3	Test Run 4
1. Train set up	filter ID		N/A	080898-16		
	filter weight		N/A	N/A		
	filter checked for holes		yes	yes		
	filter centered		yes	yes		
	nozzle clean		yes	yes		
	nozzle undamaged		yes	yes		
	nozzle diameter (in.)		.183	.192		
	probe liner clean		yes	yes		
	probe markings correct		yes	yes		
	probe heated along entire length		yes	yes		
	impingers charged		yes	yes		
	impingers iced		yes	yes		
	meter box leveled		yes	yes		
	pitot manometer zeroed		yes	yes		
	orifice manometer zeroed		yes	yes		
	filter box or holder at temp.		yes	yes		
	all ball joints lightly greased		N/A	N/A		
	all openings capped		yes	yes		
2. Train leak check at nozzle: (≤0.02 cfm @ 15 in. Hg initial. Intermediate and final at highest Vacuum during test run.)	initial (R)	LC	.003	.002 @15"		
		VAC	15" Hg	15"		
	intermediate (R)	LC	.001	.002		
		VAC	10" Hg	6" Hg		
	intermediate (R)	LC	—	—		
		VAC	—	—		
	intermediate (R)	LC	—	—		
		VAC	—	—		
	final (M)	LC	.001	.001		
		VAC	8" Hg	6" Hg		
3. Pitot lines leak check: (hold 3 in. H_2O) on manometer for (15 sec.)	initial positive line (R)		>5 ok	>5 ok		
	negative line (R)		>5 ok	>5 ok		
	final positive line (M)		>3" ok	>3" ok		
	negative line (R)		>3" ok	>3" ok		
	pitot tube undamaged		yes	yes		
M-3 bag initial leak check (M) Tedlar bag:	Should hold 2 to 4 in. H_2O pressure for 10 minutes or		yes	yes		
	zero flow meter reading on continuous evacuation or		yes	yes		
	completely fill bag and let stand overnight—no deflation.		yes	yes		

Wednesday

R = Recommended M = Mandatory	Date 9-23-98	9-23-98		
	Test Run 3 M-429	Test Run 3 M-315	Test Run 3	Test Run 4
4. M-3 sampling train check: initial (M)	N/A	N/A		
(should hold 10 in. vacuum for 1/2 min.) final (M)	N/A	N/A		
	N/A	N/A		
Purge sample train with stack gas	yes	yes		
Constant rate sampling 1 pm	yes	yes		
5. Time test started	10:19AM	10:19AM		
Time test ended	6:19PM	6:19PM		
6. Dry gas meter volume: ( ) port initial	712.746	798.340		
final	—	—		
( ) port initial	—	—		
final	—	—		
( ) port initial	—	—		
final	—	—		
( ) port initial	—	—		
final	868.980	952.125		
7. Train operation during run: Nozzle changed during run – NOT ALLOWED	NO	NO		
pitch and yaw of probe o.k.	yes	yes		
nozzle not scraped on nipple				
effective seal around probe	yes	yes		
probe moved at proper time	yes	yes		
probe heated	yes	yes		
calculator constants or nomograph changed when TS and/or TM changes significantly	N/A	N/A		
average time to set isokenetics after probe moved to next point	<10 Sec	<10 Sec		
Average values: impinger temperature should be ≤ 70°F	yes	yes		
Post filter gas streamer or Filter box temperature 250°F ± 25, ≤320°F, °F circle one	yes	yes		
stack temperature	188°F	112°F		
barometric P taken and value	29.8	29.8		
was probe ever disconnected from filter holder while in stack?	NO	NO		
was filter changed during run?	NO	NO		

Inlet

R = Recommended M = Mandatory	Date	9-23-98	9-23-98		
		Test Run 3 M-429	Test Run 3 M-315	Test Run 3	Test Run 4
Check on filter holder loosening of clamping device holder		done	done		
	was silica gel changed during run?	no	no		
	was any particulate lost?	no	no		
Accurate reading of:	ΔP Average (Time Weighted)	.2922	.3102		
	ΔH Average (Time Weighted)	.2744	.2245		
	meter temperature	108°F	117°F		
	stack temperature	135°F	137°F		
	meter vacuum Recorded	6" Hg	8" Hg		
Higher *	time per point	ok	ok		
	impinger temperature	<70°F	<70°F		
	filter box temperature	250±25	250±25		
* Minimum sample time of _____ min met Minimum sample volume of _____ dscf collected		ok	ok		
8. Post test:	- All openings sealed	yes	yes		
	- recovery area clean sheltered	yes	yes		
	- filter handled with gloves, forceps	yes	yes		
	- petri dish sealed, labeled	yes	yes		
	- any sample lost	no	no		
		grad cyl. weighed			
	water measured mL gms	92.3	57.7		
	- silica gel weighed, net gms	100.1	25.8		
	- condition - color	White Pink Blue			
	% spent	20%	20%		
	- probe cooled sufficiently	yes	yes		
	- nozzle removed and brushed	yes	yes		
	- probe brushed 6 times	yes	yes		
	- nozzle brushes clean	yes	yes		
	- wash bottles clean	yes	yes		
Hexane & Methylene Chloride	- acetone clean	yes	yes		
	- M-8 15 minute purge	N/A	N/A		
	- water/solution clean	yes	yes		
	- blank taken: acetone, water, other	yes	yes		
	Probe brush and extension clean	yes	yes		
	Sample container: Clean	yes	yes		
	Capped	yes	yes		
	Labeled	yes	yes		
	Sealed	yes	yes		
	Liquid level marked	yes	yes		

Water: H_2O impinger "Clean"

* Because of the process, Sample time and Volume is based upon the number of pushes there are and how long the pushes last. A pre-agreement with EPA & Host Facility.

Sept 23 199

R = Recommended M = Mandatory	Date	9-23-98	9-23-98		
		Test Run 3 M-429	Test Run 3 M-315	Test Run 3	Test Run 4
9. Post test Orsat Analysis of integrated bag sample Orsat analyzer – Analyzer leak check (levels should not fall below cap. tubing and not more than 0.2 mL in burrette for 2 min.)	Initial (M)	yes	yes		
	Final (M)	yes	yes		
		—	—		
Orsat samples: Each bag analyzed 3 times		yes	yes		
% CO_2 agrees within 0.2%		yes	yes		
% O_2 agrees within 0.2%		yes	yes		
% CO agrees within 0.2%		N/A	N/A		
Analysis at end of test. Orsat analyzer checked against air (20.9 ± 0.3)		yes	yes		
Orsat Analysis:					
CO_2%		0.2	0.2		
O_2%		20.25	20.25		
CO%		N/A	N/A		
$Fo = \frac{20.9 - \% O_2}{\% CO_2}$		N/A	N/A		
Fuel		N/A	N/A		
F_o range for fuel		N/A	N/A		
Orsat analysis valid		yes	yes		
Orsat solutions changed when calculated F_o exceeds fuel type range		N/A	N/A		
10. All samples locked up		yes	yes		
All sampling components clean and sealed		yes	yes		
1 * All data sheets submitted to observer		yes	yes		
– Orsat		yes	yes		
– Run isokenetic Team/Observer		~~[illegible]~~	103%		
– Particulate recovery		yes	yes		
– Process data		yes	yes		
* – Charts		~~[illegible]~~	N/A		
– Calibration sheets		yes	yes		

1 * Sample custodian

2 * Handled by RTI will be submitted to PES for inclusion into Final Report at later date

J. NOTES: Care should be taken, when sampling for organic compounds, to follow stringent quality control guidelines to avoid contamination of the sample and sampling train. Take note of any occurences which could bias the sample in any manner.

Include: (1) General comments; (2) Changes to pretest agreement with justification; (3) Identify (manufacturer) and describe condition of sampling equipment; (4) any abnormal occurrences during test program. (Additional page(s) attached: Yes ____, No ✓.)

Dennis P Hobschulz
Signature of Observer

PES
Affiliation of Observer

9-23-98
Date

ABC COKE
COKE OVEN EMISSION TEST
BIRMINGHAM, ALABAMA

Outlet Location
Trains Method 429 Method 315 Method NIOSH 5706 **Date** 9-21-98
MB operator Dennis Holzbach Paul Segal **Page** 1 of 2

Quality Control Check	Observation
Prior to Start of Tests	
Keep all cleaned glassware sealed until train assembly	done
Assemble trains in dust free environment	done
Visually inspect each train for proper assembly	done
Level and zero manometer	done
Calculate proper sampling nozzle size	done
Visually inspect sampling nozzle for chips	done
Visually inspect Type S Pitot tube	done
Leak check each leg of Type S Pitot tube	done
Leak check entire sampling train	done
During Testing	
Read temperatures and differential pressures at each traverse point	yes
Sample data and calculations recorded on preformatted data sheets	yes
Unusual occurrences noted in test log	yes
Properly maintain the roll and pitch of axis of Type S Pitots and sampling nozzle	N/A
Leak check train before and after any component changes during test	yes
Maintain the probe and filter temperature	yes
Maintain ice in ice water bath and maintain impinger exit temperature	yes
Calibration forms reviewed for completeness and accuracy	yes
Data sheets reviewed by PM daily during testing	yes

Method 429 - MB # 1
y = 1.012
ΔH = 1.954
K Factor = 2.25

Method 315 MB # 6
y = 1.005
ΔH = 1.778
K. Factor = 2.16

Quality Control Check	Observation
After Testing	
Visually inspect sampling nozzle	yes
Visually inspect Type S Pitot tube	yes
Leak check each leg of the Type S Pitot tube	yes
Leak check the entire sampling train	yes
Record observations if any	yes
Field Log	
Project name/ID and location	ABC Coke Birmingham, Ala
Sampling personnel (names/position)	D Holzschuh Paul Segal Amada Rickard
Geological observations including map	Flat to rolling Hills - Sampling 40 ft
Sample run times and dates	11:28 A - 7:11 PM 9-21-98
Sample descriptions	429 315 Particulate Organics D10574 550 Organics
Description of QC samples	N/A
Deviations from QAPP	no
Difficulties in sampling or unusual conditions	Batch Sampling Flow varies with the Coke Pushes
Sample Labels	yes
Sample ID	yes
Date and time of collection	9-21-98
Lab technician initials	RK & RD
Analytical parameter	PAH's EOM Particulate
Preservative required	after sample recovery they need to be kept cool until Analysis

ABC COKE
COKE OVEN EMISSION TEST
BIRMINGHAM, ALABAMA

Sept 21, 1998 Monday

Outlet Location

I. Test Run Observations R = Recommended M = Mandatory		Date	9-21-98	9-21-98		
			Test Run 1 M-429	Test Run 2 M-315	Test Run 3	Test Run 4
1. Train set up	filter ID		N/A	080798-08		
	filter weight		N/A	N/A	*	
	filter checked for holes		yes	yes		
	filter centered		yes	yes		
	nozzle clean		yes	yes		
	nozzle undamaged		yes	yes		
	nozzle diameter (in.)		.213	.216		
	probe liner clean		yes	yes		
	probe markings correct		yes	yes		
	probe heated along entire length		yes	yes		
	impingers charged		yes	yes		
	impingers iced		yes	yes		
	meter box leveled		yes	yes		
	pitot manometer zeroed		yes	yes		
	orifice manometer zeroed		yes	yes		
	filter box or holder at temp.		yes	yes		
	all ball joints lightly greased		N/A	N/A		
	all openings capped		yes	yes		
2. Train leak check at nozzle: (≤0.02 cfm @ 15 in. Hg initial. Intermediate and final at highest Vacuum during test run.)	initial (R)	LC	.004	.002		
		VAC	15" Hg	15" Hg		
	intermediate (R)	LC	—	—		
		VAC	—	—		
	intermediate (R)	LC	—	—		
		VAC	—	—		
	intermediate (R)	LC	—	—		
		VAC	—	—		
	final (M)	LC	.005	.001		
		VAC	11" Hg	6" Hg		
3. Pitot lines leak check: (hold 3 in. H_2O) on manometer for (15 sec.)	initial positive line (R)		5.6" ok	3" ok		
	negative line (R)		6.2" ok	3" ok		
	final positive line (M)		5.3" ok	7" ok		
	negative line (R)		>3" ok	>3" ok		
	pitot tube undamaged		yes	yes		
M-3 bag initial leak check (M) Tedlar bag:	Should hold 2 to 4 in. H_2O pressure for 10 minutes or		yes	yes		
	zero flow meter reading on continuous evacuation or		yes	yes		
	Completely fill bag and let stand overnight—no deflation.		yes	yes		

Outlet Location

	Test Run 1	Test Run 2	Test Run 3	Test Run 4
Date	9-21-98	9-21-98		
R = Recommended M = Mandatory	M-429	M-315		
4. M-3 sampling train check: initial (M)	* N/A	N/A		
(should hold 10 in. vacuum for 1/2 min.) final (M)	N/A	N/A		
	N/A	N/A		
Purge sample train with stack gas	yes	yes		
Constant rate sampling 1 pm	yes	yes		
5. Time test started	11:26 AM	11:26 AM		
Time test ended	7:11 PM	7:11 PM		
6. Dry gas meter volume: ( ) port initial	909.203	794.568		
final	—	—		
( ) port initial	—	—		
final	—	—		
( ) port initial	—	—		
final	—	—		
( ) port initial	—	—		
final	1064.950	976.253		
7. Train operation during run: Nozzle changed during run — NOT ALLOWED	no	no		
pitch and yaw of probe o.k.	yes	yes		
nozzle not scraped on nipple	no	no		
effective seal around probe	yes	yes		
probe moved at proper time	yes	yes		
probe heated	yes	yes		
calculator constants or nomograph changed when TS and/or TM changes significantly	N/A	N/A		
average time to set isokenetics after probe moved to next point	<.10 Sec	<.10 Sec		
Average values: impinger temperature should be ≤ 70°F	yes	yes		
Post filter gas stream or Filter box temperature 250°F ± 25, ≤320°F, °F circle one	yes	yes		
stack temperature	117.3	137°F		
barometric P taken and value	29.7	29.7		
was probe ever disconnected from filter holder while in stack?	no	no		
was filter changed during run?	no	no		

* Concerning M-3. These bags were run as integrated samples taken simultaneously with M-429 and M-315 Meter Box

	Outlet Location			
Date	9-21-98	9-21-98		
R = Recommended M = Mandatory	Test Run 1 M-429	Test Run 2 M-315	Test Run 3	Test Run 4
Check on filter holder loosening of clamping device holder	done	done		
was silica gel changed during run?	no	no		
was any particulate lost?	no	no		
Accurate reading of: ΔP	3 * .6523	.0271	.0375	.3145
ΔH	1.328	2.27	2.26	.9572
meter temperature	88.6	88.9		
stack temperature	111°F	118		
1 * meter vacuum	10" of Hg	3" of Hg		
time per point	*	*		
impinger temperature	> 70°F	> 70°F		
filter box temperature	250°F ± 25	250°F ± 25	250°F	
2 * Minimum sample time of ✓ min met Minimum sample volume of ✓ dscf collected	ok	ok		
8. Post test: - All openings sealed	yes	yes		
- recovery area clean sheltered	yes	yes		
- filter handled with gloves, forceps	yes	yes		
- petri dish sealed, labeled	yes	yes		
- any sample lost	no	no		
water measured ✓ mL grad cyl. weighed gms	110.2	103.9		
- silica gel weighed, net gms	78.0	32.3		
- condition - color	clear	clear		
% spent	50%	35%		
- probe cooled sufficiently	yes	yes		
- nozzle removed and brushed	yes	yes		
- probe brushed 6 times	yes	yes		
- nozzle brushes clean	yes	yes		
- wash bottles clean	yes	yes		
- acetone clean	yes	yes		
hexane & Methylene Chloride → - M-8 15 minute purge	N/A	N/A		
- water/solution clean	yes	yes		
- blank taken: acetone, water, other	yes	yes		
Probe brush and extension clean.	yes	yes		
Sample container: Clean	yes	yes		
Capped	yes	yes		
Labeled	yes	yes		
Sealed	yes	yes		
Liquid level marked	yes	yes		

1 * This represents the highest Meter Vaccum recorded.

2 * Because of the process, Coke Oven battery Sample time and vol. is based upon the number of pushes there are and what sampled. This was a pre-agreement with E1 and the facility.

3 * Average (time weighted)

Outlet Location Monday

R = Recommended M = Mandatory	Date	9-21-98	9-21-98		
		Test Run 1 M-429	Test Run 2 M-315	Test Run 3	Test Run 4
9. Post test Orsat Analysis of integrated bag sample Orsat analyzer - Analyzer leak check (levels should not fall below cap. tubing and not more than 0.2 mL in burrette for 2 min.)	Initial (M)	yes	yes		
	Final (M)	yes	yes		
		—	—		
Orsat samples: Each bag analyzed 3 times		yes	yes		
% CO_2 agrees within 0.2%		yes	yes		
% O_2 agrees within 0.2%		yes	yes		
% CO agrees within 0.2%		N/A	N/A		
Analysis at end of test. Orsat analyzer checked against air (20.9 ± 0.3)		yes	yes		
Orsat Analysis:					
CO_2%		0.2	0.2		
O_2%		20.4	20.4		
CO%		N/A	N/A		
$F_o = \frac{20.9 - \% O_2}{\% CO_2}$		N/A	N/A		
Fuel		N/A	N/A		
F_o range for fuel		N/A	N/A		
Orsat analysis valid		yes	yes		
Orsat solutions changed when calculated F_o exceeds fuel type range		N/A	N/A		
10. All samples locked up		yes	yes		
All sampling components clean and sealed		yes	yes		
1 * All data sheets submitted to observer X		yes	yes		
- Orsat		yes	yes		
- Run isokenetic Team/Observer		96.5	106.0		
- Particulate recovery		yes	yes		
2 * - Process data *		N/A	N/A		
- Charts		N/A	N/A		
- Calibration sheets		yes	yes		

* Sample & Water custodian

* Process data was gathered by another contractor (RTI) & will be submitted for inclusion into Final Report at a later date.

J. NOTES: Care should be taken, when sampling for organic compounds, to follow stringent quality control guidelines to avoid contamination of the sample and sampling train. Take note of any occurences which could bias the sample in any manner.

Include: (1) General comments; (2) Changes to pretest agreement with justification; (3) Identify (manufacturer) and describe condition of sampling equipment; (4) any abnormal occurrences during test program. (Additional page(s) attached: Yes ____, No ✓.)

Dennis P Hobschuh
Signature of Observer

PES
Affiliation of Observer

9-21-98
Date

ABC COKE
COKE OVEN EMISSION TEST
BIRMINGHAM, ALABAMA

Outlet Location

MB operator — Trains Method 429 Dennis Holzschuh — Method 315 Paul Segal — Method - M10SH 5J06

Date Tuesday Sept 22, 1998

RUN 2

Quality Control Check	Observation
Prior to Start of Tests	
Keep all cleaned glassware sealed until train assembly	done
Assemble trains in dust free environment	done
Visually inspect each train for proper assembly	done
Level and zero manometer	done
Calculate proper sampling nozzle size	done
Visually inspect sampling nozzle for chips	done
Visually inspect Type S Pitot tube	done
Leak check each leg of Type S Pitot tube	done
Leak check entire sampling train	done
During Testing	
Read temperatures and differential pressures at each traverse point	yes
Sample data and calculations recorded on preformatted data sheets	yes
Unusual occurrences noted in test log	yes
Properly maintain the roll and pitch of axis of Type S Pitots and sampling nozzle	N/A
Leak check train before and after any component changes during test	yes
Maintain the probe and filter temperature	yes
Maintain ice in ice water bath and maintain impinger exit temperature	yes
Calibration forms reviewed for completeness and accuracy	yes
Data sheets reviewed by PM daily during testing	yes

Method 429 — MB #1
y = 1.012
ΔH = 1.954
K Factor =

Method 315 MB #6
y = 1.005
ΔH = 1.778
K Factor = 2.16

Outlet Location

Quality Control Check	Observation
After Testing	
Visually inspect sampling nozzle	yes
Visually inspect Type S Pitot tube	yes
Leak check each leg of the Type S Pitot tube	yes
Leak check the entire sampling train	yes
Record observations if any	yes
Field Log	
Project name/ID and location	ABC Coke Birmingham, Alabama
Sampling personnel (names/position)	Dennis Holzschuh, Paul Segal, Amanda Rich Creek
Geological observations including map	Platte rolling hills NW, N, NE of Plant
Sample run times and dates	10:28 to 6:18 PM 9-22-98
Sample descriptions	Meth. 429 Organics & Particulate M=315 PAHs
Description of QC samples	N/A
Deviations from QAPP	NO
Difficulties in sampling or unusual conditions	Variation in Flow due to Pushy - Batch operation
Sample Labels	yes
Sample ID	yes
Date and time of collection	9-22-98 10:28AM to 6:18 PM
Lab technician initials	RD & RK
Analytical parameter	Organics, Particulates & PAH's
Preservative required	7. keep cool until analysis.

ABC COKE
COKE OVEN EMISSION TEST
BIRMINGHAM, ALABAMA

Sept. 22, 1998
Tuesday

Outlet Location

I. Test Run Observations		Date	9-22-98	9-22-98		
R = Recommended M = Mandatory			Test Run 1 M-429	Test Run 2 M-315	Test Run 3	Test Run 4
1. Train set up	filter ID		N/A	080898-20		
	filter weight		N/A	N/A	*	
	filter checked for holes		yes	yes		
	filter centered		yes	yes		
	nozzle clean		yes	yes		
	nozzle undamaged		yes	yes		
	nozzle diameter (in.)		.213	.216		
	probe liner clean		yes	yes		
	probe markings correct		yes	yes		
	probe heated along entire length		yes	yes		
	impingers charged		yes	yes		
	impingers iced		yes	yes		
	meter box leveled		yes	yes		
	pitot manometer zeroed		yes	yes		
	orifice manometer zeroed		yes	yes		
	filter box or holder at temp.		yes	yes		
	all ball joints lightly greased		N/A	N/A		
	all openings capped		yes	yes		
2. Train leak check at nozzle: (≤0.02 cfm @ 15 in. Hg initial. Intermediate and final at highest Vacuum during test run.)	initial (R)	LC	.004	.004		
		VAC	15" Hg	15" Hg		
	intermediate (R)	LC	—	—		
		VAC	—	—		
	intermediate (R)	LC	—	—		
		VAC	—	—		
	intermediate (R)	LC	—	—		
		VAC	—	—		
	final (M)	LC	.002	.005		
		VAC	15"	14"		
3. Pitot lines leak check: (hold 3 in. H_2O) on manometer for (15 sec.)	initial positive line (R)		5.8" ok	>4.0 ok		
	negative line (R)		3.5" ok	>3.9" ok		
	final positive line (M)		4.2" ok	4.5" ok		
	negative line (R)		7.4" ok	5.8" ok		
	pitot tube undamaged		yes	yes		
M-3 bag initial leak check (M) Tedlar bag:	Should hold 2 to 4 in. H_2O pressure for 10 minutes or		yes	yes		
	zero flow meter reading on continuous evacuation or		yes	yes		
	Completely fill bag and let stand overnight—no deflation.		yes	yes		

* Filter wt. will and was weighed by ERG. all we have is the I-D Number.

Outlet Location

	Date	9-22-98	9-22-98		
R = Recommended M = Mandatory		Test Run 2 M-29	Test Run 2 M-315	Test Run 3	Test Run 4
4. M-3 sampling train check:	initial (M)	N/A	N/A		
(should hold 10 in. vacuum for 1/2 min.)	final (M)	N/A	N/A		
Purge sample train with stack gas		N/A	N/A		
Constant rate sampling	1 pm	yes	yes		
5. Time test started		10:20	10:20 AM		
Time test ended		6:18 PM	6:18 PM		
6. Dry gas meter volume:	( ) port initial	965.262	971.596		
	final	—	—		
	( ) port initial	—	—		
	final	—	—		
	( ) port initial	—	—		
	final	—	—		
	( ) port initial	—	—		
	final	1165.923	1081.093		
7. Train operation during run	Nozzle changed during run — NOT ALLOWED	NO	NO		
pitch and yaw of probe o.k.		yes	yes		
nozzle not scraped on nipple		yes	yes		
effective seal around probe		yes	yes		
probe moved at proper time		yes	yes		
probe heated		yes	yes		
calculator constants or nomograph changed when TS and/or TM changes significantly		N/A	N/A		
average time to set isokenetics after probe moved to next point		<10 sec	<10 sec		
Average values: impinger temperature should be ≤ 70°F		yes	yes		
Post filter gas streamer or Filter box temperature 250°F ± 25, ≤320°F, °F circle one		yes	yes		
stack temperature					
barometric P taken and value		29.74	29.74		
was probe ever disconnected from filter holder while in stack?		no	no		
was filter changed during run?		no	no		

Outlet location

R = Recommended M = Mandatory	Test Run 1 M-429	Test Run 2 M315	Test Run 3	Test Run 4
Date	9-22-98	9-22-98		
Check on filter holder loosening of clamping device holder	Done	Done		
was silica gel changed during run?	no	no		
was any particulate lost?	no	no		
Accurate reading of: ΔP Average (time weighted)	.3131	.3227		
ΔH Average (time weighted)	.5316	.4694		
meter temperature	92°F	94°F		
stack temperature	128°F	133°F		
1* meter vacuum	10"	4"		
time per point	✓	✓		
2* impinger temperature	< 70°F	< 70°F		
filter box temperature	250°F±25	250°F±25		
2* < Minimum sample time of ✓ min met Minimum sample volume of ✓ dscf collected	ok	ok		
8. Post test: - All openings sealed	yes	yes		
- recovery area clean sheltered	yes	yes		
- filter handled with gloves, forceps	yes	yes		
- petri dish sealed, labeled	yes	yes		
- any sample lost	no	no		
water measured ✓ mL grad cyl. weighed gms	57.2	62.0		
- silica gel weighed, net gms	19.9	15.1		
- condition - color	Clear	Clear		
% spent	25%	25%		
- probe cooled sufficiently	yes	yes		
- nozzle removed and brushed	yes	yes		
- probe brushed 6 times	yes	yes		
- nozzle brushes clean	yes	yes		
- wash bottles clean	yes	yes		
Hexane & Methylene Chloride - acetone clean	yes	yes		
- M-8 15 minute purge	N/A	N/A		
- water/solution clean	yes	yes		
- blank taken: acetone, water, other	yes	yes		
Probe brush and extension clean	yes	yes		
Sample container: Clean	yes	yes		
Capped	yes	yes		
Labeled	yes	yes		
Sealed	yes	yes		
Liquid level marked	yes	yes		

1* This represents the highest Meter Vacuum recorded

2* Because of the process, Coke Oven Battery, Sample time and Volume is based upon the number of pushes there are and what's sampled. This was a pre-agreement with EPA and the host facility.

Outlet location Tuesday

	Date	9-29-98	9-22-98		
R = Recommended M = Mandatory		Test Run 3 M-429	Test Run 2 M-315	Test Run 3	Test Run 4
9. Post test Orsat Analysis of integrated bag sample Orsat analyzer - Analyzer leak check (levels should not fall below cap. tubing and not more than 0.2 mL in burrette for 2 min.)	Initial (M)	yes	yes		
	Final (M)	yes	yes		
		—	—		
Orsat samples: Each bag analyzed 3 times		yes	yes		
% CO_2 agrees within 0.2%		yes	yes		
% O_2 agrees within 0.2%		yes	yes		
% CO agrees within 0.2%		N/A	N/A		
Analysis at end of test. Orsat analyzer checked against air (20.9 ± 0.3)		yes	yes		
Orsat Analysis:					
CO_2%		0.2	0.2		
O_2%		20.4	20.4		
CO%		N/A	N/A		
$F_o = \frac{20.9 - \% O_2}{\% CO_2}$		N/A	N/A		
Fuel		N/A	N/A		
F_o range for fuel		N/A	N/A		
Orsat analysis valid		yes	yes		
Orsat solutions changed when calculated F_o exceeds fuel type range		N/A	N/A		
10. All samples locked up		yes	yes		
All sampling components clean and sealed		yes	yes		
1 * All data sheets submitted to observer		yes	yes		
- Orsat		yes	yes		
- Run isokenetic Team/Observer		yes	yes		
- Particulate recovery		yes	yes		
2 * - Process data		N/A	N/A		
- Charts		yes	yes		
- Calibration sheets					

1* Sample Custodian

2* Process data handled by another contractor and will be submitted at later date for inclusion into Final Report

J. NOTES: Care should be taken, when sampling for organic compounds, to follow stringent quality control guidelines to avoid contamination of the sample and sampling train. Take note of any occurences which could bias the sample in any manner.

Include: (1) General comments; (2) Changes to pretest agreement with justification; (3) Identify (manufacturer) and describe condition of sampling equipment; (4) any abnormal occurrences during test program. (Additional page(s) attached: Yes ___, No ✓.)

Dennis P Hobgebuch
Signature of Observer

P.E.S.
Affiliation of Observer

9-22-98
Date

ABC COKE
COKE OVEN EMISSION TEST
BIRMINGHAM, ALABAMA

Outlet Location

Trains M-429 Amanda Rutchek | Method 315 Dennis Holzschuh | NIOSH 9506 Paul Segal | Date Wednesday Sept 23, 1998 | Page 1 of 2

RUN 3

Quality Control Check	Observation
Prior to Start of Tests	
Keep all cleaned glassware sealed until train assembly	done
Assemble trains in dust free environment	done
Visually inspect each train for proper assembly	done
Level and zero manometer	done
Calculate proper sampling nozzle size	done
Visually inspect sampling nozzle for chips	done
Visually inspect Type S Pitot tube	done
Leak check each leg of Type S Pitot tube	done
Leak check entire sampling train	done
During Testing	
Read temperatures and differential pressures at each traverse point	yes
Sample data and calculations recorded on preformatted data sheets	yes
Unusual occurrences noted in test log	yes
Properly maintain the roll and pitch of axis of Type S Pitots and sampling nozzle	yes
Leak check train before and after any component changes during test	yes
Maintain the probe and filter temperature	yes
Maintain ice in ice water bath and maintain impinger exit temperature	yes
Calibration forms reviewed for completeness and accuracy	yes
Data sheets reviewed by PM daily during testing	yes

Method 429 MB #1
Y = 1.012
ΔH = 1.954
K. Factor = ~~2.25~~ ΔH
2.13

Method 315 MB #4
Y = 1.005
ΔH = 1.778
K. Factor 2.16

Quality Control Check	Observation
After Testing	
Visually inspect sampling nozzle	yes
Visually inspect Type S Pitot tube	yes
Leak check each leg of the Type S Pitot tube	yes
Leak check the entire sampling train	yes
Record observations if any	yes
Field Log	
Project name/ID and location	ABC Coke Birmingham, Alabama
Sampling personnel (names/position)	Dennis W Holzschuh, Paul Segal, Amanda Rieb
Geological observations including map	Flat rolling hills to NW, N, & NE of Plant
Sample run times and dates	10:20 Am to 6:06 PM 9-23-98
Sample descriptions	Method Curb-429, Method 315, NIOSH 55
Description of QC samples	N/A
Deviations from QAPP	no
Difficulties in sampling or unusual conditions	Flow variations due to Battery pushes
Sample Labels	yes
Sample ID	yes
Date and time of collection	9-23-98 10:20 Am to 6:06 PM
Lab technician initials	RD & RK
Analytical parameter	Particulates, Organics, PAH's
Preservative required	Handle with care Seal, mark level & keep cool until analysis.

ABC COKE
COKE OVEN EMISSION TEST
BIRMINGHAM, ALABAMA

Sept 23, 1998 Wednesday

Outlet Location

I. Test Run Observations		Date	9-23-98	9-23-98		
R = Recommended M = Mandatory			Test Run 3 M-429	Test Run 3 M-313	Test Run 3	Test Run 4
1. Train set up	filter ID		N/A	090898-24		
	filter weight		N/A	N/A	—*	
	filter checked for holes		yes	yes		
	filter centered		yes	yes		
	nozzle clean		yes	yes		
	nozzle undamaged		yes	yes		
	nozzle diameter (in.)		.213	.216		
	probe liner clean		yes	yes		
	probe markings correct		yes	yes		
	probe heated along entire length		yes	yes		
	impingers charged		yes	yes		
	impingers iced		yes	yes		
	meter box leveled		yes	yes		
	pitot manometer zeroed		yes	yes		
	orifice manometer zeroed		yes	yes		
	filter box or holder at temp.		yes	yes		
	all ball joints lightly greased		N/A	N/A		
	all openings capped		yes	yes		
2. Train leak check at nozzle: (≤0.02 cfm @ 15 in. Hg initial. Intermediate and final at highest Vacuum during test run.)	initial (R)	LC	.009	.009		
		VAC	15" Hg	15" Hg		
	intermediate (R)	LC	—	—		
		VAC	—	—		
	intermediate (R)	LC	—	—		
		VAC	—	—		
	intermediate (R)	LC	—	—		
		VAC	—	—		
	final (M)	LC	.002	.003		
		VAC	16"	15" Hg		
3. Pitot lines leak check: (hold 3 in. H_2O) on manometer for (15 sec.)	initial positive line (R)		5.6" ok	7.7" ok		
	negative line (R)		4.4" ok	4.5" ok		
	final positive line (M)		8.9" ok	7.2" ok		
	negative line (R)		3.5" ok	3.4" ok		
	pitot tube undamaged		yes	yes		
M-3 bag initial leak check (M) Tedlar bag:	Should hold 2 to 4 in. H_2O pressure for 10 minutes or		yes	yes		
	zero flow meter reading on continuous evacuation or		yes	yes		
	Completely fill bag and let stand overnight—no deflation.		yes	yes		

* Filter wt, was not will be weighed by EKG. We only have Filter ID Number.

R = Recommended M = Mandatory	Date 9-23-98	9-23-98		
	Test Run 3 M-429	Test Run 3 M-315	Test Run 3	Test Run 4
4. M-3 sampling train check: initial (M)	N/A	N/A		
(should hold 10 in. vacuum for 1/2 min.) final (M)	N/A	N/A		
	N/A	N/A		
Purge sample train with stack gas	yes	yes		
Constant rate sampling 1 pm	yes	yes		
5. Time test started	10:20 AM	10:20 AM		
Time test ended	6:06 PM	6:06 PM		
6. Dry gas meter volume: ( ) port initial	166.317	82.012		
final	—	—		
( ) port initial	—	—		
final	—	—		
( ) port initial	—	—		
final	—	—		
( ) port initial	—	—		
final	377.828	293.137		
7. Train operation during run — Nozzle changed during run — NOT ALLOWED	NO	NO		
pitch and yaw of probe o.k.	yes	yes		
nozzle not scraped on nipple	no	no		
effective seal around probe	yes	yes		
probe moved at proper time	yes	yes		
probe heated	yes	yes		
calculator constants or nomograph changed when TS and/or TM changes significantly	N/A	N/A		
average time to set isokenetics after probe moved to next point	<10 sec	<10 sec		
Average values: impinger temperature should be ≤ 70°F	yes	yes		
Post filter gas streamer or Filter box temperature 250°F + 25°, ≤320°F, °F circle one	yes	yes		
stack temperature				
barometric P taken and value	29.8	29.8		
was probe ever disconnected from filter holder while in stack?	NO	NO		
was filter changed during run?	NO	NO		

Date	9-23-98	9-23-98		
R = Recommended M = Mandatory	Test Run 3 M-429	Test Run 3 M-315	Test Run 3	Test Run 4
Check on filter holder loosening of clamping device holder	yes	yes		
was silica gel changed during run?	no	no		
was any particulate lost?	no	no		
Accurate reading of: ΔP Average (time weighted)	.4513	.4277		
ΔH Average (time weighted)	.9362	.7494		
meter temperature	92°F	88°F		
stack temperature	125°F	120°F		
meter vacuum	10" Hg	4" Hg		
/* time per point	✓	✓		
impinger temperature	<70°F	<70°F		
filter box temperature	250±25	250±25		
/* Minimum sample time of ✓ min met Minimum sample volume of ✓ dscf collected	o.k.	o.k.		
8. Post test: - All openings sealed	yes	yes		
- recovery area clean sheltered	yes	yes		
- filter handled with gloves, forceps	yes	yes		
- petri dish sealed, labeled	yes	yes		
- any sample lost	no	no		
grad cyl. weighed				
water measured mL ✓ gms	52.9	55.6		
- silica gel weighed, net gms	35.4	27.7		
- condition - color	Blue/white Pink			
% spent	35%	20%		
- probe cooled sufficiently	yes	yes		
- nozzle removed and brushed	yes	yes		
- probe brushed 6 times	yes	yes		
- nozzle brushes clean	yes	yes		
- wash bottles clean	yes	yes		
- acetone clean	yes	yes		
- M-8 15 minute purge	N/A	N/A		
- water/solution clean	yes	yes		
- blank taken: acetone, water, other	yes	yes		
Probe brush and extension clean.	yes	yes		
Sample container: Clean	yes	yes		
Capped	yes	yes		
Labeled	yes	yes		
Sealed	yes	yes		
Liquid level marked	yes	yes		

Note: Both impingers water clear.

Hexane, Methylene Chloride

/* Because of the process, Sample time and Volume is based upon the number of pushes there are and how long the pushes last. This was a pre-agreement w/ EPA and host facility

R = Recommended M = Mandatory	Date	9-23-98	9-23-98		
		Test Run 3 M-429	Test Run 3 M-315	Test Run 3	Test Run 4
9. Post test Orsat Analysis of integrated bag sample Orsat analyzer - Analyzer leak check (levels should not fall below cap. tubing and not more than 0.2 mL in burrette for 2 min.)	Initial (M)	yes	yes		
	Final (M)	yes	yes		
		—	—		
Orsat samples: Each bag analyzed 3 times		yes	yes		
% CO_2 agrees within 0.2%		yes	yes		
% O_2 agrees within 0.2%		yes	yes		
% CO agrees within 0.2%		N/A	N/A		
Analysis at end of test. Orsat analyzer checked against air (20.9 ± 0.3)		yes	yes		
Orsat Analysis:					
CO_2%		0.2	0.2		
O_2%		20.4	20.4		
CO%		N/A	N/A		
$Fo = \frac{20.9 - \% O_2}{\% CO_2}$		N/A	N/A		
Fuel		N/A	N/A		
F_o range for fuel		N/A	N/A		
Orsat analysis valid		yes	yes		
Orsat solutions changed when calculated F_o exceeds fuel type range		N/A	N/A		
10. All samples locked up		yes	yes		
All sampling components clean and sealed		yes	yes		
1 * All data sheets submitted to [redacted]		yes	yes		
- Orsat		yes	yes		
- Run isokenetic Team/Observer		98.7	98.04		
- Particulate recovery		yes	yes		
2 * - Process data		N/A	N/A		
- Charts		yes	yes		
- Calibration sheets					

1 * Sample Custodian
2 * Process data handled by RTI & will be turned over for inclusion into final report.

J. NOTES: Care should be taken, when sampling for organic compounds, to follow stringent quality control guidelines to avoid contamination of the sample and sampling train. Take note of any occurences which could bias the sample in any manner.

Include: (1) General comments; (2) Changes to pretest agreement with justification; (3) Identify (manufacturer) and describe condition of sampling equipment; (4) any abnormal occurrences during test program. (Additional page(s) attached: Yes ____, No ✓.)

Dennis P Hobschmidt
Signature of Observer

P.E.S.
Affiliation of Observer

9-23-98
Date

APPENDIX G

PARTICIPANTS

PROJECT PARTICIPANTS

Affiliation	Name	Responsibility
USEPA		
EMC	John C. Bosch, Jr.	Work Assignment Manager
ESD	Alfred E. Vervaert	Group Leader
	Lula H. Melton	Process Monitor and Observer
PES	John T. Chehaske	Program Manager
	Franklin Meadows	Project Manager
	Daniel F. Scheffel	Field Team Leader
	Dennis P. Holzschuh	QA Coordinator
	Ron Kolde	Sample Recovery
	Dennis P. Becvar	Laboratory Audit
	Dennis D. Holzschuh	Field Team Member
	Troy A. Abernathy	Field Team Member
	Gary M. Gay	Field Team Member
	Amanda Richcreek	Field Team Member
	Steven B. Blaine	Field Team Member
	Paul T. Siegel	Field Team Member
ATS	Steve Terrell	CARB Method 429 Sample Transport
DEECO	Richard Durham	Sample Recovery
	Marc Hamilton	QAPP
ERG	Joan T. Bursey	PM/MCEM Analysis
FAL	William H. Wadlin	Metals Analysis
Quanterra	Robert Weidenfeld	PAH Analysis
LabCorp		NIOSH PAH Analysis
RTI	Marvin Branscome	EPA/ESD Contractor
	Sandy George	EPA/ESD Contractor (Observer)
	Stacy Molinich	EPA/ESD Contractor (Observer)
ABC Coke	John Pearson	President
	Mark Poling	Manager, Engineering Environmental Compliance
	Bruce Wise	Facility Testing Coordinator

APPENDIX H

SAMPLING AND ANALYTICAL PROCEDURES

Method 1 - Sample and Velocity Traverses for Stationary Sources

1. PRINCIPLE AND APPLICABILITY

1.1 Principle. To aid in the representative measurement of pollutant emissions and/or total volumetric flow rate from a stationary source, a measurement site where the effluent stream is flowing in a known direction is selected, and the cross-section of the stack is divided into a number of equal areas. A traverse point is then located within each of these equal areas.

1.2 Applicability. This method is applicable to flowing gas streams in ducts, stacks, and flues. The method cannot be used when: (1) flow is cyclonic or swirling (see Section 2.4), (2) a stack is smaller than about 0.30 meter (12 in.) in diameter, or 0.071 m^2 (113 $in.^2$) in cross-sectional area, or (3) the measurement site is less than two stack or duct diameters downstream or less than a half diameter upstream from a flow disturbance.

The requirements of this method must be considered before construction of a new facility from which emissions will be measured; failure to do so may require subsequent alterations to the stack or deviation from the standard procedure. Cases involving variants are subject to approval by the Administrator, U.S. Environmental Protection Agency.

2. PROCEDURE

2.1 Selection of Measurement Site. Sampling or velocity measurement is performed at a site located at least eight stack or duct diameters downstream and two diameters upstream from any flow disturbance such as a bend, expansion, or contraction in the stack, or from a visible flame. If necessary, an alternative location may be selected, at a position at least two stack or duct diameters

downstream and a half diameter upstream from any flow disturbance. For a rectangular cross section, an equivalent diameter (D_e) shall be calculated from the following equation, to determine the upstream and downstream distances:

$$D_e = \frac{2LW}{(L + W)}$$

Eq. 1-1

Where
L = Length and W = width.

An alternative procedure is available for determining the acceptability of a measurement location not meeting the criteria above. This procedure, determination of gas flow angles at the sampling points and comparing the results with acceptability criteria, is described in Section 2.5.

2.2 Determining the Number of Traverse Points.

2.2.1 Particulate Traverses. When the eight- and two-diameter criterion can be met, the minimum number of traverse points shall be: (1) twelve, for circular or rectangular stacks with diameters (or equivalent diameters) greater than 0.61 meter (24 in.); (2) eight, for circular stacks with diameters between 0.30 and 0.61 meter (12 and 24 in.); and (3) nine, for rectangular stacks with equivalent diameters between 0.30 and 0.61 meter (12 and 24 in.).

When the eight- and two-diameter criterion cannot be met, the minimum number of traverse points is determined from Figure 1-1. Before referring to the figure, however, determine the distances from the chosen measurement site to the nearest upstream and downstream disturbances, and divide each distance by the stack

diameter or equivalent diameter, to determine the distance in terms of the number of duct diameters. Then, determine from Figure 1-1 the minimum number of traverse points that corresponds: (1) to the number of duct diameters upstream; and (2) to the number of diameters downstream. Select the higher of the two minimum numbers of traverse points, or a greater value, so that for circular stacks the number is a multiple of 4, and for rectangular stacks, the number is one of those shown in Table 1-1.

2.2.2 Velocity (Non-Particulate) Traverses. When velocity or volumetric flow rate is to be determined (but not particulate matter), the same procedure as that used for particulate traverses (Section 2.2.1) is followed, except that Figure 1-2 may be used instead of Figure 1-1.

2.3 Cross-Sectional Layout and Location of Traverse Points.

2.3.1 Circular Stacks. Locate the traverse points on two perpendicular diameters according to Table 1-2 and the example shown in Figure 1-3. Any equation (for examples, see Citations 2 and 3 in the Bibliography) that gives the same values as those in Table 1-2 may be used in lieu of Table 1-2.

For particulate traverses, one of the diameters must be in a plane containing the greatest expected concentration variation, e.g., after bends, one diameter shall be in the plane of the bend. This requirement becomes less critical as the distance from the disturbance increases; therefore, other diameter locations may be used, subject to the approval of the Administrator.

In addition, for stacks having diameters greater than 0.61 m (24 in.), no traverse points shall be within 2.5 centimeters (1.00 in.) of the stack walls; and for stack diameters equal to or less than 0.61 m (24 in.), no traverse points shall be located within 1.3 cm (0.50 in.) of the stack walls. To meet these criteria, observe the procedures given below.

2.3.1.1 Stacks With Diameters Greater Than 0.61 m (24 in.). When any of the traverse points as located in Section 2.3.1 fall within 2.5 cm (1.00 in.) of the stack walls, relocate them away from the stack walls to: (1) a distance of 2.5 cm (1.00 in.); or (2) a distance equal to the nozzle inside diameter, whichever is larger. These relocated traverse points (on each end of a diameter) shall be the "adjusted" traverse points.

Whenever two successive traverse points are combined to form a single adjusted traverse point, treat the adjusted point as two separate traverse points, both in the sampling (or velocity measurement) procedure, and in recording the data.

2.3.1.2 Stacks With Diameters Equal To or Less Than 0.61 m (24 in.). Follow the procedure in Section 2.3.1.1, noting only that any "adjusted" points should be relocated away from the stack walls to: (1) a distance of 1.3 cm (0.50 in.); or (2) a distance equal to the nozzle inside diameter, whichever is larger.

2.3.2 Rectangular Stacks. Determine the number of traverse points as explained in Sections 2.1 and 2.2 of this method. From Table 1-1, determine the grid configuration. Divide the stack cross-section into as many equal rectangular elemental areas as traverse points, and then locate a traverse point at the centroid of each equal area according to the example in Figure 1-4.
If the tester desires to use more than the minimum number of traverse points, expand the "minimum number of traverse points" matrix (see Table 1-1) by adding the extra traverse points along one or the other or both legs of the matrix; the final matrix need not be balanced. For example, if a 4 x 3 "minimum number of points" matrix were expanded to 36 points, the final matrix could be 9 x 4 or 12 x 3, and would not necessarily have to be 6 x 6. After constructing the final matrix, divide the stack cross-section into as many equal rectangular, elemental areas as traverse points, and locate a traverse point at the centroid of each equal area. The situation of traverse points being too close to the stack walls is not expected to arise with rectangular stacks. If this problem should ever arise, the Administrator must be contacted for resolution of the matter.

2.4 Verification of Absence of Cyclonic Flow. In most stationary sources, the direction of stack gas flow is essentially parallel to the stack walls. However, cyclonic flow may exist (1) after such devices as cyclones and inertial demisters following venturi scrubbers, or (2) in stacks having tangential inlets or other duct configurations which tend to induce swirling; in these instances, the presence or absence of cyclonic flow at the sampling location must be determined. The following techniques are acceptable for this determination. Level and zero the manometer. Connect a Type S pitot tube to the manometer. Position the Type S pitot tube at each traverse point, in succession, so that the planes of the face openings of the pitot tube are perpendicular to the stack cross-

sectional plane; when the Type S pitot tube is in this position, it is at "0° reference." Note the differential pressure (Δp) reading at each traverse point. If a null (zero) pitot reading is obtained at 0° reference at a given traverse point, an acceptable flow condition exists at that point. If the pitot reading is not zero at 0° reference, rotate the pitot tube (up to ±90° yaw angle), until a null reading is obtained. Carefully determine and record the value of the rotation angle (α) to the nearest degree. After the null technique
has been applied at each traverse point, calculate the average of the absolute values of α; assign α values of 0° to those points for which no rotation was required, and include these in the overall average. If the average value of α is greater than 20°, the overall flow condition in the stack is unacceptable, and alternative methodology, subject to the approval of the Administrator, must be used to perform accurate sample and velocity traverses. The alternative procedure described in Section 2.5 may be used to determine the rotation angles in lieu of the procedure described above.

2.5 Alternative Measurement Site Selection Procedure. This alternative applies to sources where measurement locations are less than 2 equivalent or duct diameters downstream or less than one-half duct diameter upstream from a flow disturbance. The alternative should be limited to ducts larger than 24 in. in diameter where blockage and wall effects are minimal. A directional flow-sensing probe is used to measure pitch and yaw angles of the gas flow at 40 or more traverse points; the resultant angle is calculated and compared with acceptable criteria for mean and standard deviation.

NOTE: Both the pitch and yaw angles are measured from a line passing through the traverse point and parallel to the stack axis. The pitch angle is the angle of the gas flow component in the plane that INCLUDES the traverse line and is parallel to the stack axis. The yaw angle is the angle of the gas flow component in the plane PERPENDICULAR to the traverse line at the traverse point and is measured from the line passing through the traverse point and parallel to the stack axis.

2.5.1 Apparatus.

2.5.1.1 Directional Probe. Any directional probe, such as United Sensor Type DA Three-Dimensional Directional Probe, capable of measuring both the pitch and yaw angles of gas flows is acceptable.

(**NOTE:** Mention of trade name or specific products does not constitute endorsement by the U.S. Environmental Protection Agency.) Assign an identification number to the directional probe, and permanently mark or engrave the number on the body of the probe. The pressure holes of directional probes are susceptible to plugging when used in particulate-laden gas streams. Therefore, a system for cleaning the pressure holes by "back-purging" with pressurized air is required.

2.5.1.2 Differential Pressure Gauges. Inclined manometers, U-tube manometers, or other differential pressure gauges (e.g., magnehelic gauges) that meet the specifications described in Method 2, Section 2.2.

NOTE: If the differential pressure gauge produces both negative and positive readings, then both negative and positive pressure readings shall be calibrated at a minimum of three points as specified in Method 2, Section 2.2.

2.5.2 Traverse Points. Use a minimum of 40 traverse points for circular ducts and 42 points for rectangular ducts for the gas flow angle determinations. Follow Section 2.3 and Table 1-1 or 1-2 for the location and layout of the traverse points. If the measurement location is determined to be acceptable according to the criteria in this alternative procedure, use the same traverse point number and locations for sampling and velocity measurements.

2.5.3 Measurement Procedure.

2.5.3.1 Prepare the directional probe and differential pressure gauges as recommended by the manufacturer. Capillary tubing or surge tanks may be used to dampen pressure fluctuations. It is recommended, but not required, that a pretest leak check be conducted. To perform a leak check, pressurize or use suction on the impact opening until a reading of at least 7.6 cm (3 in.) H_2O registers on the differential pressure gauge, then plug the impact opening. The pressure of a leak-free system will remain stable for at least 15 seconds.

2.5.3.2 Level and zero the manometers. Since the manometer level and zero may drift because of vibrations and temperature changes, periodically check the level and zero during the traverse.

2.5.3.3 Position the probe at the appropriate locations in the gas stream, and rotate until zero deflection is indicated for the yaw angle pressure gauge. Determine and record the yaw angle. Record the pressure gauge readings for the pitch angle, and determine the pitch angle from the calibration curve. Repeat this procedure for each traverse point. Complete a "back-purge" of the pressure lines and the impact openings prior to measurements of each traverse point.

A post-test check as described in Section 2.5.3.1 is required. If the criteria for a leak-free system are not met, repair the equipment, and repeat the flow angle measurements.

2.5.4 Calculate the resultant angle at each traverse point, the average resultant angle, and the standard deviation using the following equations. Complete the calculations retaining at least one extra significant figure beyond that of the acquired data. Round the values after the final calculations.

2.5.4.1 Calculate the resultant angle at each traverse point:

$$R_i = \text{arc cosine}[(\text{cosine}Y_i)(\text{cosine}P_i)]$$

Eq. 1-2

Where:

R_i = resultant angle at traverse point i, degree.
Y_i = yaw angle at traverse point i, degree.
P_i = pitch angle at traverse point i, degree.

2.5.4.2 Calculate the average resultant for the measurements:

$$\overline{R} = \frac{\Sigma R_i}{n}$$

Eq. 1-3

Where:

R_{avg} = average resultant angle, degree.
n = total number of traverse points.

2.5.4.3 Calculate the standard deviations:

$$S_d = \sqrt{\frac{\sum_{i=1}^{n} (R_i - \overline{R})^2}{(n-1)}}$$

Eq. 1-4

Where:

S_d = standard deviation, degree.

2.5.5 The measurement location is acceptable if $R_{avg} \leq 20°$ and $S_d \leq 10°$.

2.5.6 Calibration. Use a flow system as described in Sections 4.1.2.1 and 4.1.2.2 of Method 2. In addition, the flow system shall have the capacity to generate two test-section velocities: one between 365 and 730 m/min (1200 and 2400 ft/min) and one between 730 and 1100 m/min (2400 and 3600 ft/min).

2.5.6.1 Cut two entry ports in the test section. The axes through the entry ports shall be perpendicular to each other and intersect in the centroid of the test section. The ports should be elongated slots parallel to the axis of the test section and of sufficient length to allow measurement of pitch angles while maintaining the pitot head position at the test-section centroid. To facilitate alignment of the directional probe during calibration, the test section should be constructed of plexiglass or some other transparent material. All calibration measurements should be made at the same point in the test section, preferably at the centroid of the test section.

2.5.6.2 To ensure that the gas flow is parallel to the central axis of the test section, follow the procedure in Section 2.4 for cyclonic flow determination to measure the gas flow angles at the centroid of the test section from two test ports located 90° apart. The gas flow angle measured in each port must be ±2° of 0°. Straightening vanes should be installed, if necessary, to meet this criterion.

2.5.6.3 Pitch Angle Calibration. Perform a calibration traverse according to the manufacturer's recommended protocol in 5° increments for angles from -60° to +60° at one velocity in each of the two ranges specified above. Average the pressure ratio values obtained for each angle in the two flow ranges, and plot a

calibration curve with the average values of the pressure ratio (or other suitable measurement factor as recommended by the manufacturer) versus the pitch angle. Draw a smooth line through the data points. Plot also the data values for each traverse point. Determine the differences between the measured datavalues and the angle from the calibration curve at the same pressure ratio. The difference at each comparison must be within 2° for angles between 0° and 40° and within 3° for angles between 40° and 60°.

2.5.6.4 Yaw Angle Calibration. Mark the three-dimensional probe to allow the determination of the yaw position of the probe. This is usually a line extending the length of the probe and aligned with the impact opening. To determine the accuracy of measurements of the yaw angle, only the zero or null position need be calibrated as follows: Place the directional probe in the test section, and rotate the probe until the zero position is found. With a protractor or other angle measuring device, measure the angle indicated by the yaw angle indicator on the three-dimensional probe. This should be within 2° of 0°. Repeat this measurement for any other points along the length of the pitot where yaw angle measurements could be read in order to account for variations in the pitot markings used to indicate pitot head positions.

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Table 1-1. CROSS-SECTION LAYOUT FOR RECTANGULAR STACKS

Number of traverse points	Matrix layout
9	3x3
12	4x3
16	4x4
20	5x4
25	5x5
30	6x5
36	6x6
42	7x6
49	7x7

TABLE 1-2
LOCATION OF TRAVERSE POINTS IN CIRCULAR STACKS
(Percent of stack diameter from inside wall to traverse point)

Traverse Point Number on a Diameter	Number of traverse points on a diameter											
	2	4	6	8	10	12	14	16	18	20	22	24
1	14.6	6.7	4.4	3.2	2.6	2.1	1.8	1.6	1.4	1.3	1.1	1.1
2	85.4	25.0	14.6	10.5	8.2	6.7	5.7	4.9	4.4	3.9	3.5	3.2
3		75.0	29.6	19.4	14.6	11.8	9.9	8.5	7.5	6.7	6.0	5.5
4		93.3	70.4	32.3	22.6	17.7	14.6	12.5	10.9	9.7	8.7	7.9
5			85.4	67.7	34.2	25.0	20.1	16.9	14.6	112.9	11.6	10.5
6			95.6	80.6	65.8	35.6	26.9	22.0	18.8	16.5	14.6	13.2
7				89.5	77.4	64.4	36.6	28.3	23.6	20.4	18.0	16.1
8				96.8	85.4	75.0	63.4	37.5	29.6	25.0	21.8	19.4
9					91.8	82.3	73.1	62.5	38.2	30.6	26.2	23.0
10					97.4	88.2	79.9	71.7	61.8	38.8	31.5	27.2
11						93.3	85.4	78.0	70.4	61.2	39.3	32.3
12						97.9	90.1	83.1	76.4	69.4	60.7	39.8
13							94.3	87.5	81.2	75.0	68.5	60.2

14							98.2	91.5	85.4	79.6	73.8	67.7
15								95.1	89.1	83.5	78.2	72.8
16								98.4	92.5	87.1	82.0	77.0
17									95.6	90.3	85.4	80.6
18									98.6	93.3	88.4	83.9
19										96.1	91.3	86.8
20										98.7	94.0	89.5
21											96.5	92.1
22											98.9	94.5
23												96.8
24												98.9

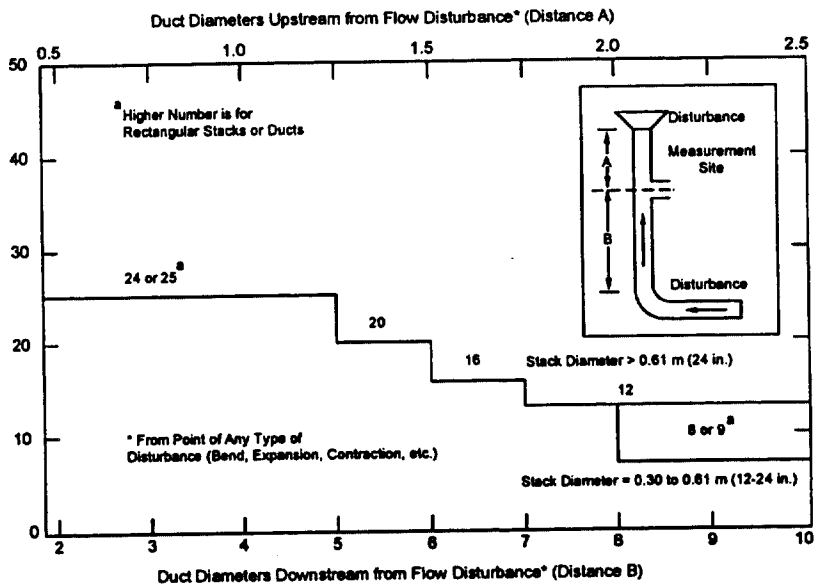

Figure 1-1. Minimum number of traverse points for particulate traverses.

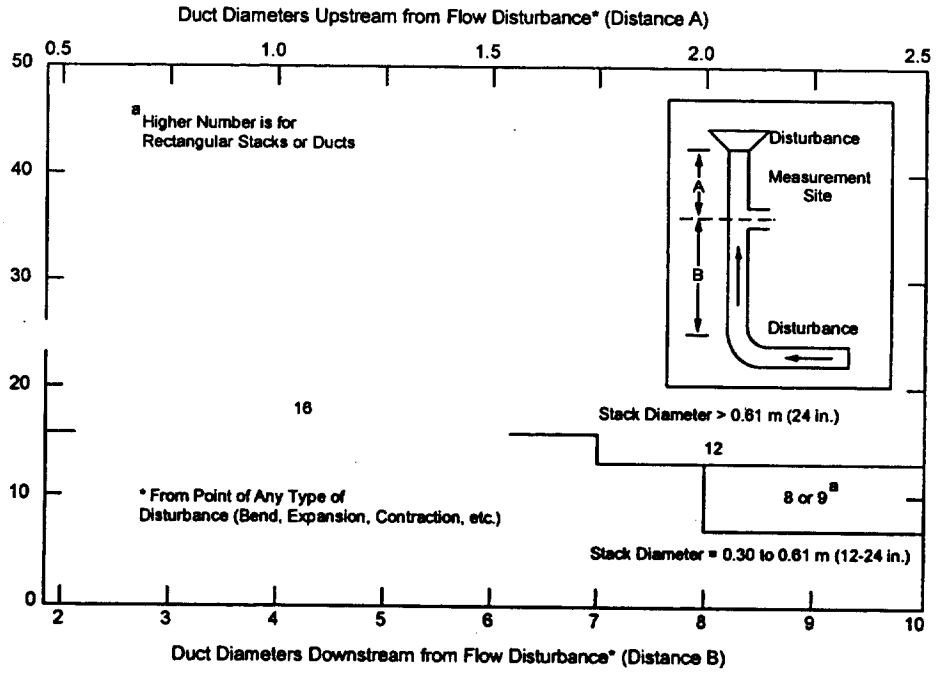

Figure 1-2. Minimum number of traverse points for velocity (nonparticulate) traverses.

Traverse Point	Distance % of diameter
1	4.4
2	14.7
3	29.5
4	70.5
5	85.3
6	95.6

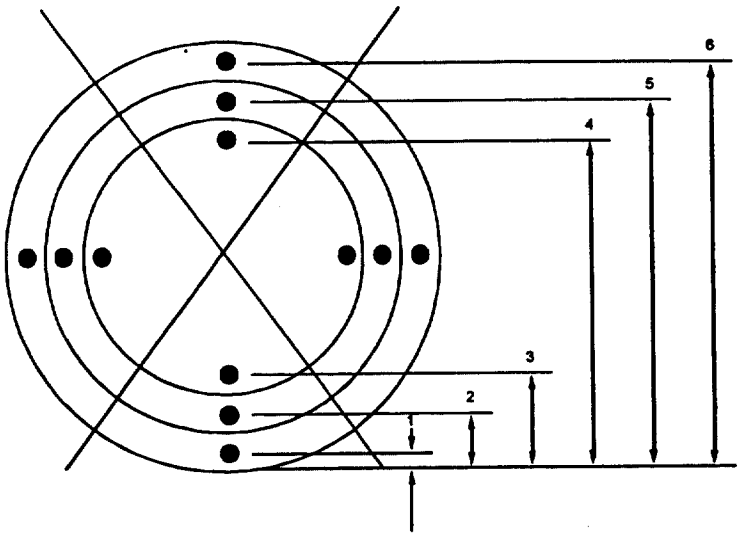

Figure 1-3. Example showing circular stack cross section divided into 12 equal areas, with location of traverse points indicated.

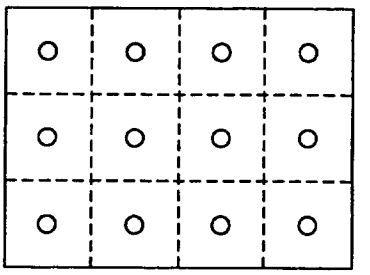

Figure 1-4. Example showing rectangular stack cross section divided into 12 equal areas, with a traverse point at centroid of each area.

Method 2 - Determination of Stack Gas Velocity and Volumetric Flow Rate (Type S Pitot Tube)

1. PRINCIPLE AND APPLICABILITY

1.1 Principle. The average gas velocity in a stack is determined from the gas density and from measurement of the average velocity head with a Type S (Stausscheibe or reverse type) pitot tube.

1.2 Applicability. This method is applicable for measurement of the average velocity of a gas stream and for quantifying gas flow.

This procedure is not applicable at measurement sites that fail to meet the criteria of Method 1, Section 2.1. Also, the method cannot be used for direct measurement in cyclonic or swirling gas streams; Section 2.4 of Method 1 shows how to determine cyclonic or swirling flow conditions. When unacceptable conditions exist, alternative procedures, subject to the approval of the Administrator, U.S. Environmental Protection Agency, must be employed to make accurate flow rate determinations; examples of such alternative procedures are: (1) to install straightening vanes; (2) to calculate the total volumetric flow rate stoichiometrically, or (3) to move to another measurement site at which the flow is acceptable.

2. APPARATUS

Specifications for the apparatus are given below. Any other apparatus that has been demonstrated (subject to approval of the Administrator) to be capable of meeting the specifications will be considered acceptable.

2.1 Type S Pitot Tube. Pitot tube made of metal tubing (e.g., stainless steel) as shown in Figure 2-1. It is recommended that the external tubing diameter (dimension D_t, Figure 2-2b) be between 0.48 and 0.95 cm (3/16 and 3/8 inch). There shall be an equal distance from the base of each leg of the pitot tube to its face-opening plane (dimensions P_A and P_B, Figure 2-2b); it is recommended that this distance be between 1.05 and 1.50 times the external tubing diameter. The face openings of the pitot tube shall, preferably, be aligned as shown in Figure 2-2; however, slight misalignments of the openings are permissible (see Figure 2-3).

The Type S pitot tube shall have a known coefficient, determined as outlined in Section 4. An identification number shall be assigned to the pitot tube; this number shall be permanently marked or engraved on the body of the tube. A standard pitot tube may be used instead of a Type S, provided that it meets the specifications of Sections 2.7 and 4.2; note, however, that the static and impact pressure holes of standard pitot tubes are susceptible to plugging in particulate-laden gas streams. Therefore, whenever a standard pitot tube is used to perform a traverse, adequate proof must be furnished that the openings of the

pitot tube have not plugged up during the traverse period; this can be done by taking a velocity head (Δp) reading at the final traverse point, cleaning out the impact and static holes of the standard pitot tube by "back-purging" with pressurized air, and then taking another Δp reading. If the Δp readings made before and after the air purge are the same (±5 percent), the traverse is acceptable. Otherwise, reject the run. Note that if Δp at the final traverse point is unsuitably low, another point may be selected. If "back-purging" at regular intervals is part of the procedure, then comparative Δp readings shall be taken, as above, for the last two back purges at which suitably high Δp readings are observed.

2.2 Differential Pressure Gauge. An inclined manometer or equivalent device. Most sampling trains are equipped with a 10-in. (water column) inclined-vertical manometer, having 0.01-in. H_2O divisions on the 0- to 1-in. inclined scale, and 0.1-in. H_2O divisions on the 1- to 10-in. vertical scale. This type of manometer (or other gauge of equivalent sensitivity) is satisfactory for the measurement of Δp values as low as 1.3 mm (0.05 in.) H_2O. However, a differential pressure gauge of greater sensitivity shall be used (subject to the approval of the Administrator), if any of the following is found to be true: (1) the arithmetic average of all Δp readings at the traverse points in the stack is less than 1.3 mm (0.05 in.) H_2O; (2) for traverses of 12 or more points, more than 10 percent of the individual Δp readings are below 1.3 mm (0.05 in.) H_2O; (3) for traverses of fewer than 12 points, more than one Δp reading is below 1.3 mm (0.05 in.) H_2O. Citation 18 in the Bibliography describes commercially available instrumentation for the measurement of low-range gas velocities.

As an alternative to criteria (1) through (3) above, the following calculation may be performed to determine the necessity of using a more sensitive differential pressure gauge:

$$T = \frac{\sum_{i=1}^{n} \sqrt{\Delta p_i + K}}{\sum_{i=1}^{n} \sqrt{\Delta p_i}}$$

Where:

Δp_i = Individual velocity head reading at a traverse point, mm (in.) H_2O.

n = Total number of traverse points.

K = 0.13 mm H_2O when metric units are used and 0.005 in. H_2O when English units are used.

If T is greater than 1.05, the velocity head data are unacceptable and a more sensitive differential pressure gauge must be used.

NOTE: If differential pressure gauges other than inclined manometers are used (e.g., magnehelic gauges), their calibration must be checked after each test series. To check the calibration of a differential pressure gauge, compare Δp readings of the gauge with those of a gauge-oil manometer at a minimum of three points, approximately representing the range of Δp values in the stack. If, at each point, the values of Δp as read by the differential pressure gauge and gauge-oil manometer agree to within 5 percent, the differential pressure gauge shall be considered to be in proper calibration. Otherwise, the test series shall either be voided, or procedures to adjust the measured Δp values and final results shall be used, subject to the approval of the Administrator.

2.3 Temperature Gauge. A thermocouple, liquid-filled bulb thermometer, bimetallic thermometer, mercury-in-glass thermometer, or other gauge capable of measuring temperature to within 1.5 percent of the minimum absolute stack temperature. The temperature gauge shall be attached to the pitot tube such that the sensor tip does not touch any metal; the gauge shall be in an interference-free arrangement with respect to the pitot tube face openings (see Figure 2-1 and also Figure 2-7 in Section 4). Alternative positions may be used if the pitot tube-temperature gauge system is calibrated according to the procedure of Section 4. Provided that a difference of not more than 1 percent in the average velocity measurement is introduced, the temperature gauge need not be attached to the pitot tube; this alternative is subject to the approval of the Administrator.

2.4 Pressure Probe and Gauge. A piezometer tube and mercury- or water-filled U-tube manometer capable of measuring stack pressure to within 2.5 mm (0.1 in.) Hg. The static tap of a standard type pitot tube or one leg of a Type S pitot tube with the face opening planes positioned parallel to the gas flow may also be used as the pressure probe.

2.5 Barometer. A mercury, aneroid, or other barometer capable of measuring atmospheric pressure to within 2.5 mm (0.1 in.) Hg. See **NOTE** in Method 5, Section 2.1.9.

2.6 Gas Density Determination Equipment. Method 3 equipment, if needed (see Section 3.6), to determine the stack gas dry molecular weight, and Reference Method 4 or Method 5 equipment for moisture content determination; other methods may be used subject to approval of the Administrator.

2.7 Calibration Pitot Tube. When calibration of the Type S pitot tube is necessary (see Section 4), a standard pitot tube for a reference. The standard pitot tube shall, preferably, have a known coefficient, obtained either (1) directly from the National Bureau of Standards, Route 70 S, Quince Orchard Road, Gaithersburg, Maryland, or (2) by calibration against another standard pitot tube with an NBS-traceable coefficient. Alternatively, a standard pitot tube designed according to the criteria given in Sections 2.7.1 through 2.7.5 below and illustrated in Figure 2-4 (see also Citations 7, 8, and 17 in the Bibliography) may be used. Pitot tubes designed according to these specifications will have baseline coefficients of about 0.99 ± 0.01.

2.7.1 Hemispherical (shown in Figure 2-4) ellipsoidal, or conical tip.

2.7.2 A minimum of six diameters straight run (based upon D, the external diameter of the tube) between the tip and the static pressure holes.

2.7.3 A minimum of eight diameters straight run between the static pressure holes and the centerline of the external tube, following the 90-degree bend.

2.7.4 Static pressure holes of equal size (approximately 0.1 D), equally spaced in a piezometer ring configuration.

2.7.5 Ninety-degree bend, with curved or mitered junction.

2.8 Differential Pressure Gauge for Type S Pitot Tube Calibration. An inclined manometer or equivalent. If the single-velocity calibration technique is employed (see Section 4.1.2.3), the calibration differential pressure gauge shall be readable to the nearest 0.13 mm (0.005 in.) H_2O. For multivelocity calibrations, the gauge shall be readable to the nearest 0.13 mm (0.005 in.) H_2O for Δp values between 1.3 and 25 mm (0.05 and 1.0 in.) H_2O, and to the nearest 1.3 mm (0.05 in.) H_2O for Δp values above 25 mm (1.0 in.) H_2O. A special, more sensitive gauge will be required to read Δp values below 1.3 mm (0.05 in.) H_2O (see Citation 18 in the Bibliography).

3. PROCEDURE

3.1 Set up the apparatus as shown in Figure 2-1. Capillary tubing or surge tanks installed between the manometer and pitot tube may be used to dampen Δp fluctuations. It is recommended, but not required, that a pretest leak-check be conducted as follows: (1) blow through the pitot impact opening until at least 7.6 cm (3 in.) H_2O velocity pressure registers on the manometer; then, close off the impact opening. The pressure shall remain stable for at least 15 seconds; (2) do the same for the static pressure side, except using suction to obtain the minimum of 7.6 cm (3 in.) H_2O. Other leak-check procedures, subject to the approval of the Administrator, may be used.

3.2 Level and zero the manometer. Because the manometer level and zero may drift due to vibrations and temperature changes, make periodic checks during the traverse. Record all necessary data as shown in the example data sheet (Figure 2-5).

3.3 Measure the velocity head and temperature at the traverse points specified by Method 1. Ensure that the proper differential pressure gauge is being used for the range of Δp values encountered (see Section 2.2). If it is necessary to change to a more sensitive gauge, do so, and remeasure the Δp and temperature readings at each traverse point. Conduct a post-test leak-check (mandatory), as described in Section 3.1 above, to validate the traverse run.

3.4 Measure the static pressure in the stack. One reading is usually adequate.

3.5 Determine the atmospheric pressure.

3.6 Determine the stack gas dry molecular weight. For combustion processes or processes that emit essentially CO_2, O_2, CO, and N_2, use Method 3. For processes emitting essentially air, an analysis need not be conducted; use a dry molecular weight of 29.0. For other processes, other methods, subject to the approval of the Administrator, must be used.

3.7 Obtain the moisture content from Reference Method 4 (or equivalent) or from Method 5.

3.8 Determine the cross-sectional area of the stack or duct at the sampling location. Whenever possible, physically measure the stack dimensions rather than using blueprints.

4. CALIBRATION

4.1 Type S Pitot Tube. Before its initial use, carefully examine the Type S pitot tube in top, side, and end views to verify that the face openings of the tube are aligned within the specifications illustrated in Figure 2-2 or 2-3. The pitot tube shall not be used if it fails to meet these alignment specifications.

After verifying the face opening alignment, measure and record the following dimensions of the pitot tube: (a) the external tubing diameter (dimension D_t, Figure 2-2b); and (b) the base-to-opening plane distances (dimensions P_A and P_B, Figure 2-2b). If D_t is between 0.48 and 0.95 cm (3/16 and 3/8 in.), and if P_A and P_B are equal and between 1.05 and 1.50 D_t, there are two possible options: (1) the pitot tube may be calibrated according to the procedure outlined in Sections 4.1.2 through 4.1.5 below, or (2) a baseline (isolated tube) coefficient value of 0.84 may be assigned to the pitot tube. Note, however, that if the pitot tube is part of an assembly, calibration may still be required, despite knowledge of the baseline coefficient value (see Section 4.1.1).

If D_t, P_A, and P_B are outside the specified limits, the pitot tube must be calibrated as outlined in Sections 4.1.2 through 4.1.5 below.

4.1.1 Type S Pitot Tube Assemblies. During sample and velocity traverses, the isolated Type S pitot tube is not always used; in many instances, the pitot tube is used in combination with other source-sampling components (thermocouple, sampling probe, nozzle) as part of an "assembly." The presence of other sampling components can sometimes affect the baseline value of the Type S pitot tube coefficient (Citation 9 in the Bibliography); therefore an assigned (or otherwise known) baseline coefficient value may or may not be valid for a given assembly. The baseline and assembly coefficient values will be identical only when the relative placement of the components in the assembly is such that aerodynamic interference effects are eliminated. Figures 2-6 through 2-8 illustrate interference-free component arrangements for Type S pitot tubes having external tubing diameters between 0.48 and 0.95 cm (3/16 and 3/8 in.). Type S pitot tube assemblies that fail to meet any or all of the specifications of Figures 2-6 through 2-8 shall be calibrated according to the procedure outlined in Sections 4.1.2 through 4.1.5 below, and prior to calibration, the values of the intercomponent spacings (pitot-nozzle, pitot-thermocouple, pitot-probe sheath) shall be measured and recorded.

NOTE: Do not use any Type S pitot tube assembly which is constructed such that the impact pressure opening plane of the pitot tube is below the entry plane of the nozzle (see Figure 2-6B).

4.1.2 Calibration Setup. If the Type S pitot tube is to be calibrated, one leg of the tube shall be permanently marked A, and the other, B. Calibration shall be done in a flow system having the following essential design features:

4.1.2.1 The flowing gas stream must be confined to a duct of definite cross-sectional area, either circular or rectangular. For circular cross sections, the minimum duct diameter shall be 30.5 cm (12 in.); for rectangular cross sections, the width (shorter side) shall be at least 25.4 cm (10 in.).

4.1.2.2 The cross-sectional area of the calibration duct must be constant over a distance of 10 or more duct diameters. For a rectangular cross section, use an equivalent diameter, calculated from the following equation, to determine the number of duct diameters:

$$D_e = \frac{2LW}{(L + W)}$$

Eq. 2-1

Where:

D_e = Equivalent diameter.
L = Length.
W = Width.

To ensure the presence of stable, fully developed flow patterns at the calibration site, or "test section," the site must be located at least eight diameters downstream and two diameters upstream from the nearest disturbances.

NOTE: The eight- and two-diameter criteria are not absolute; other test section locations may be used (subject to approval of the Administrator), provided that the flow at the test site is stable and demonstrably parallel to the duct axis.

4.1.2.3 The flow system shall have the capacity to generate a test-section velocity around 915 m/min (3,000 ft/min). This velocity must be constant with time to guarantee steady flow during calibration. Note that Type S pitot tube coefficients obtained by single-velocity calibration at 915 m/min (3,000 ft/min) will generally be valid to ±3 percent for the measurement of velocities above 305 m/min (1,000 ft/min) and to ±5 to 6 percent for the measurement of velocities between 180 and 305 m/min (600 and 1,000 ft/min). If a more precise correlation between C_p and velocity is desired, the flow system shall have the capacity to generate at least four distinct, time-invariant test-section velocities covering the velocity range from 180 to 1,525 m/min (600 to 5,000 ft/min), and calibration data shall be taken at regular velocity intervals over this range (see Citations 9 and 14 in the Bibliography for details).

4.1.2.4 Two entry ports, one each for the standard and Type S pitot tubes, shall be cut in the test section; the standard pitot entry port shall be located slightly downstream of the Type S port, so that the standard and Type S impact openings will lie in the same cross-sectional plane during calibration. To facilitate alignment of the pitot tubes during calibration, it is advisable that the test section be constructed of plexiglas or some other transparent material.

4.1.3 Calibration Procedure. Note that this procedure is a general one and must not be used without first referring to the special considerations presented in Section 4.1.5. Note also that this procedure applies only to single-velocity calibration. To obtain calibration data for the A and B sides of the Type S pitot tube, proceed as follows:

4.1.3.1 Make sure that the manometer is properly filled and that the oil is free from contamination and is of the proper density. Inspect and leak-check all pitot lines; repair or replace if necessary.

4.1.3.2 Level and zero the manometer. Turn on the fan, and allow the flow to

stabilize. Seal the Type S entry port.

4.1.3.3 Ensure that the manometer is level and zeroed. Position the standard pitot tube at the calibration point (determined as outlined in Section 4.1.5.1), and align the tube so that its tip is pointed directly into the flow. Particular care should be taken in aligning the tube to avoid yaw and pitch angles. Make sure that the entry port surrounding the tube is properly sealed.

4.1.3.4 Read Δp_{std}, and record its value in a data table similar to the one shown in Figure 2-9. Remove the standard pitot tube from the duct, and disconnect it from the manometer. Seal the standard entry port.

4.1.3.5 Connect the Type S pitot tube to the manometer. Open the Type S entry port. Check the manometer level and zero. Insert and align the Type S pitot tube so that its A side impact opening is at the same point as was the standard pitot tube and is pointed directly into the flow. Make sure that the entry port surrounding the tube is properly sealed.

4.1.3.6 Read Δp_s, and enter its value in the data table. Remove the Type S pitot tube from the duct, and disconnect it from the manometer.

4.1.3.7 Repeat Steps 4.1.3.3 through 4.1.3.6 above until three pairs of Δp readings have been obtained.

4.1.3.8 Repeat Steps 4.1.3.3 through 4.1.3.7 above for the B side of the Type S pitot tube.

4.1.3.9 Perform calculations, as described in Section 4.1.4 below.

4.1.4 Calculations.

4.1.4.1 For each of the six pairs of Δp readings (i.e., three from side A and three from side B) obtained in Section 4.1.3 above, calculate the value of the Type S pitot tube coefficient as follows:

$$C_{p(s)} = C_{p(std)} \sqrt{\frac{\Delta p_{std}}{\Delta p_s}}$$

Eq. 2-2

Where:

$C_{p(s)}$ = Type S pitot tube coefficient.

$C_{p(std)}$ = Standard pitot tube coefficient; use 0.99 if the coefficient is unknown and the tube is designed according to the criteria of Sections 2.7.1 to 2.7.5 of this method.

Δp_{std} = Velocity head measured by the standard pitot tube, cm (in.) H_2O.

Δp_s = Velocity head measured by the Type S pitot tube, cm (in.) H_2O.

4.1.4.2 Calculate $\overline{C}_p$ (side A), the mean A-side coefficient, and $\overline{C}_p$ (side B), the mean B-side coefficient; calculate the difference between these two average values.

4.1.4.3 Calculate the deviation of each of the three A-side values of $C_{p(s)}$ from $\overline{C}_p$ (side A), and the deviation of each B-side values of $C_{p(s)}$ from $\overline{C}_p$ (side B). Use the following equation:

$$\text{Deviation} = C_{p_{(s)}} - \overline{C_p}(\text{A or B})$$

Eq. 2-3

4.1.4.4 Calculate σ, the average deviation from the mean, for both the A and B sides of the pitot tube. Use the following equation:

$$\sigma(\text{side A or B}) = \frac{\sum_{1}^{3} \left| C_{p(s)} - \overline{C_p}(\text{A or B}) \right|}{3}$$

Eq. 2-4

4.1.4.5 Use the Type S pitot tube only if the values of σ (side A) and σ (side B) are less than or equal to 0.01 and if the absolute value of the difference between $\overline{C}_p$ (A) and $\overline{C}_p$ (B) is 0.01 or less.

4.1.5 Special Considerations.

4.1.5.1 Selection of Calibration Point.

4.1.5.1.1 When an isolated Type S pitot tube is calibrated, select a calibration point at or near the center of the duct, and follow the procedures outlined in Sections 4.1.3 and 4.1.4 above. The Type S pitot coefficients so obtained, i.e., $\overline{C}_p$ (side A) and $\overline{C}_p$ (side B), will be valid, so long as either: (1) the isolated pitot tube is used; or (2) the pitot tube is used with other components (nozzle, thermocouple, sample probe) in an arrangement that is free from aerodynamic interference effects (see Figures 2-6 through 2-8).

4.1.5.1.2 For Type S pitot tube-thermocouple combinations (without sample probe), select a calibration point at or near the center of the duct, and follow the procedures outlined in Sections 4.1.3 and 4.1.4 above. The coefficients so obtained will be valid so long as the pitot tube-thermocouple combination is used by itself or with other components in an interference-free arrangement (Figures 2-6 and 2-8).

4.1.5.1.3 For assemblies with sample probes, the calibration point should be located at or near the center of the duct; however, insertion of a probe sheath into a small duct may cause significant cross-sectional area blockage and yield incorrect coefficient values (Citation 9 in the Bibliography). Therefore, to minimize the blockage effect, the calibration point may be a few inches off-

center if necessary. The actual blockage effect will be negligible when the theoretical blockage, as determined by a projected-area model of the probe sheath, is 2 percent or less of the duct cross-sectional area for assemblies without external sheaths (Figure 2-10a), and 3 percent or less for assemblies with external sheaths (Figure 2-10b).

4.1.5.2 For those probe assemblies in which pitot tube-nozzle interference is a factor (i.e., those in which the pitot-nozzle separation distance fails to meet the specification illustrated in Figure 2-6A), the value of $C_{p(s)}$ depends upon the amount of free-space between the tube and nozzle, and therefore is a function of nozzle size. In these instances, separate calibrations shall be performed with each of the commonly used nozzle sizes in place. Note that the single-velocity calibration technique is acceptable for this purpose, even though the larger nozzle sizes (>0.635 cm or 1/4 in.) are not ordinarily used for isokinetic sampling at velocities around 915 m/min (3,000 ft/min), which is the calibration velocity; note also that it is not necessary to draw an isokinetic sample during calibration (see Citation 19 in the Bibliography).

4.1.5.3 For a probe assembly constructed such that its pitot tube is always used in the same orientation, only one side of the pitot tube need be calibrated (the side which will face the flow). The pitot tube must still meet the alignment specifications of Figure 2-2 or 2-3, however, and must have an average deviation (σ) value of 0.01 or less (see Section 4.1.4.4.)

4.1.6 Field Use and Recalibration.

4.1.6.1 Field Use.

4.1.6.1.1 When a Type S pitot tube (isolated or in an assembly) is used in the field, the appropriate coefficient value (whether assigned or obtained by calibration) shall be used to perform velocity calculations. For calibrated Type S pitot tubes, the A side coefficient shall be used when the A side of the tube faces the flow, and the B side coefficient shall be used when the B side faces the flow; alternatively, the arithmetic average of the A and B side coefficient values may be used, irrespective of which side faces the flow.

4.1.6.1.2 When a probe assembly is used to sample a small duct, 30.5 to 91.4 cm (12 to 36 in.) in diameter, the probe sheath sometimes blocks a significant part of the duct cross-section, causing a reduction in the effective value of $C_{p(s)}$. Consult Citation 9 in the Bibliography for details. Conventional pitot-sampling probe assemblies are not recommended for use in ducts having inside diameters smaller than 30.5 cm (12 in.) (see Citation 16 in the Bibliography).

4.1.6.2 Recalibration.

4.1.6.2.1 Isolated Pitot Tubes. After each field use, the pitot tube shall be carefully reexamined in top, side, and end views. If the pitot face openings are still aligned within the specifications illustrated in Figure 2-2 or 2-3, it can be assumed that the baseline coefficient of the pitot tube has not changed. If, however, the tube has been damaged to the extent that it no longer meets the specifications of the Figure 2-2 or 2-3, the damage shall either be repaired to restore proper alignment of the face openings, or the tube shall be discarded.

4.1.6.2.2 Pitot Tube Assemblies. After each field use, check the face opening alignment of the pitot tube, as in Section 4.1.6.2.1; also, remeasure the intercomponent spacings of the assembly. If the intercomponent spacings have not

changed and the face opening alignment is acceptable, it can be assumed that the coefficient of the assembly has not changed. If the face opening alignment is no longer within the specifications of Figure 2-2 or 2-3, either repair the damage or replace the pitot tube (calibrating the new assembly, if necessary). If the intercomponent spacings have changed, restore the original spacings, or recalibrate the assembly.

4.2 Standard Pitot Tube (if applicable). If a standard pitot tube is used for the velocity traverse, the tube shall be constructed according to the criteria of Section 2.7 and shall be assigned a baseline coefficient value of 0.99. If the standard pitot tube is used as part of an assembly, the tube shall be in an interference-free arrangement (subject to the approval of the Administrator).

4.3 Temperature Gauges. After each field use, calibrate dial thermometers, liquid-filled bulb thermometers, thermocouple-potentiometer systems, and other gauges at a temperature within 10 percent of the average absolute stack temperature. For temperatures up to 405°C (761°F), use an ASTM mercury-in-glass reference thermometer, or equivalent, as a reference; alternatively, either a reference thermocouple and potentiometer (calibrated by NBS) or thermometric fixed points, e.g., ice bath and boiling water (corrected for barometric pressure) may be used. For temperatures above 405°C (761°F), use an NBS-calibrated reference thermocouple-potentiometer system or an alternative reference, subject to the approval of the Administrator.

If, during calibration, the absolute temperature measured with the gauge being calibrated and the reference gauge agree within 1.5 percent, the temperature data taken in the field shall be considered valid. Otherwise, the pollutant emission test shall either be considered invalid or adjustments (if appropriate) of the test results shall be made, subject to the approval of the Administrator.

4.4 Barometer. Calibrate the barometer used against a mercury barometer.

5. CALCULATIONS

Carry out calculations, retaining at least one extra decimal figure beyond that of the acquired data. Round off figures after final calculation.

5.1 Nomenclature.

A = Cross-sectional area of stack, m^2 (ft^2).

B_{ws} = Water vapor in the gas stream (from Method 5 or Reference Method 4), proportion by volume.

C_p = Pitot tube coefficient, dimensionless.

K_p = Pitot tube constant,

$$34.97 \frac{m}{sec} \left[\frac{(g/g\text{-mole})\,(mmHg)}{(°K)\,(mmH_2O)} \right]^{1/2}$$

for the metric system.

$$85.49 \frac{ft}{sec} \left[\frac{lb/lb\text{-}mole)\ (in.Hg)}{(^{\circ}R)\ (in.H_2O)} \right]^{1/2}$$

for the English system.

M_d = Molecular weight of stack gas, dry basis (see Section 3.6), g/g-mole (lb/lb-mole).

M_s = Molecular weight of stack gas, wet basis, g/g-mole (lb/lb-mole).

$$= M_d(1 - B_{ws}) + 18.0B_{ws}$$

Eq. 2-5

P_{bar} = Barometric pressure at measurement site, mm Hg (in. Hg).

P_g = Stack static pressure, mm Hg (in. Hg).

P_s = Absolute stack pressure, mm Hg (in. Hg),

$$= P_{bar} + P_g$$

Eq. 2-6

P_{std} = Standard absolute pressure, 760 mm Hg (29.92 in. Hg).

Q_{sd} = Dry volumetric stack gas flow rate corrected to standard conditions, dsm^3/hr (dscf/hr).

t_s = Stack temperature, °C (°F).

T_s = Absolute stack temperature, °K (°R).

$$= 273 + t_s$$

Eq. 2-7

for metric.

$$= 460 + t_s$$

Eq. 2-8

for English.

T_{std} = Standard absolute temperature, 293°K (528°R).

v_s = Average stack gas velocity, m/sec (ft/sec).

Δp = Velocity head of stack gas, mm H_2O (in. H_2O).

3,600= Conversion factor, sec/hr.

18.0 = Molecular weight of water, g/g-mole (lb/lb-mole).

5.2 Average Stack Gas Velocity.

$$v_s = K_p C_p \left(\sqrt{\Delta p}\right)_{avg} \sqrt{\frac{T_{s\,(avg)}}{P_s M_s}}$$

Eq. 2-9

5.3 Average Stack Gas Dry Volumetric Flow Rate.

$$Q_{sd} = 3,600\,(1 - B_{ws})\, v_s A \; \frac{T_{std}}{T_{s\,(avg)}} \; \frac{P_s}{P_{std}}$$

Eq. 2-10

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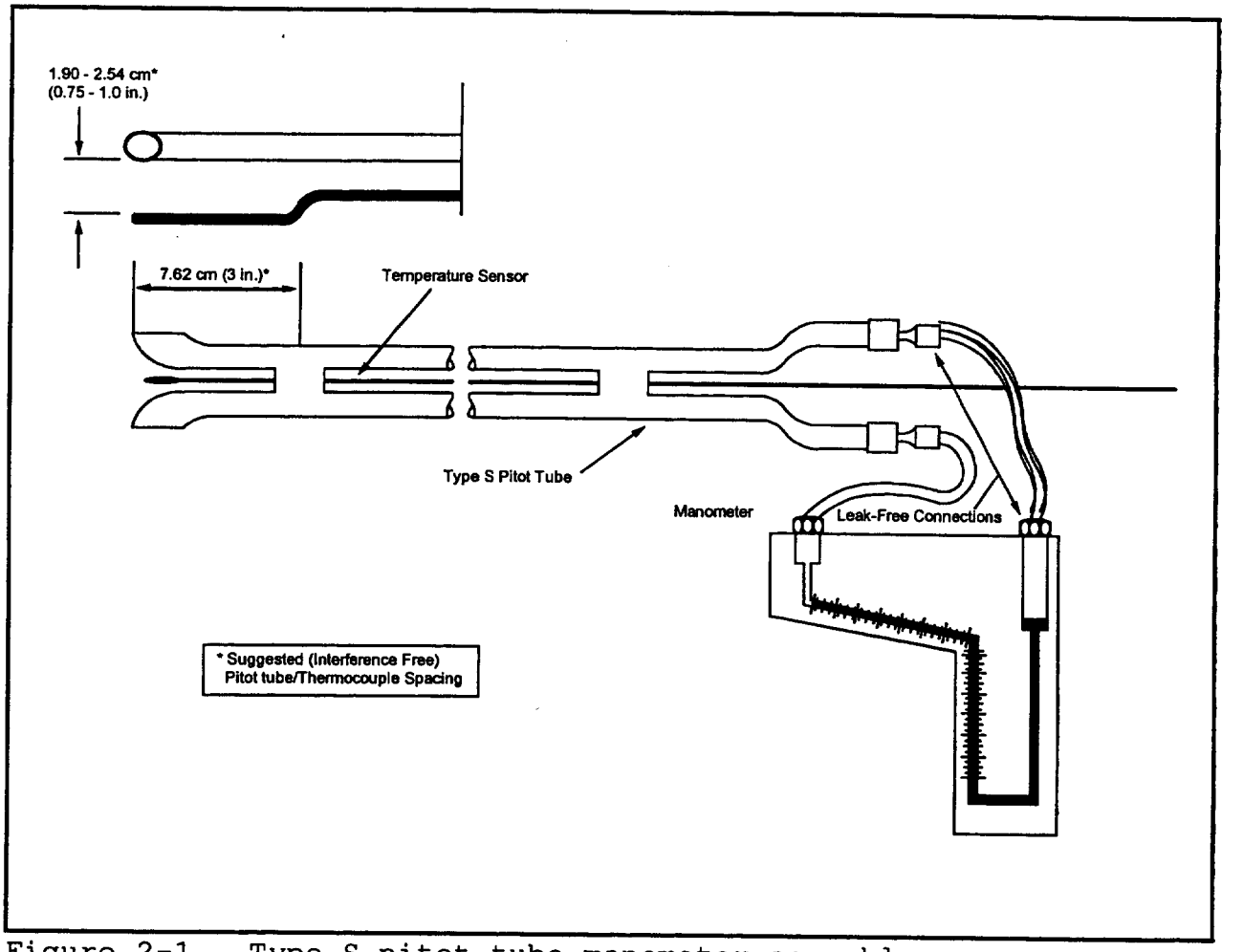


Figure 2-1. Type S pitot tube manometer assembly.

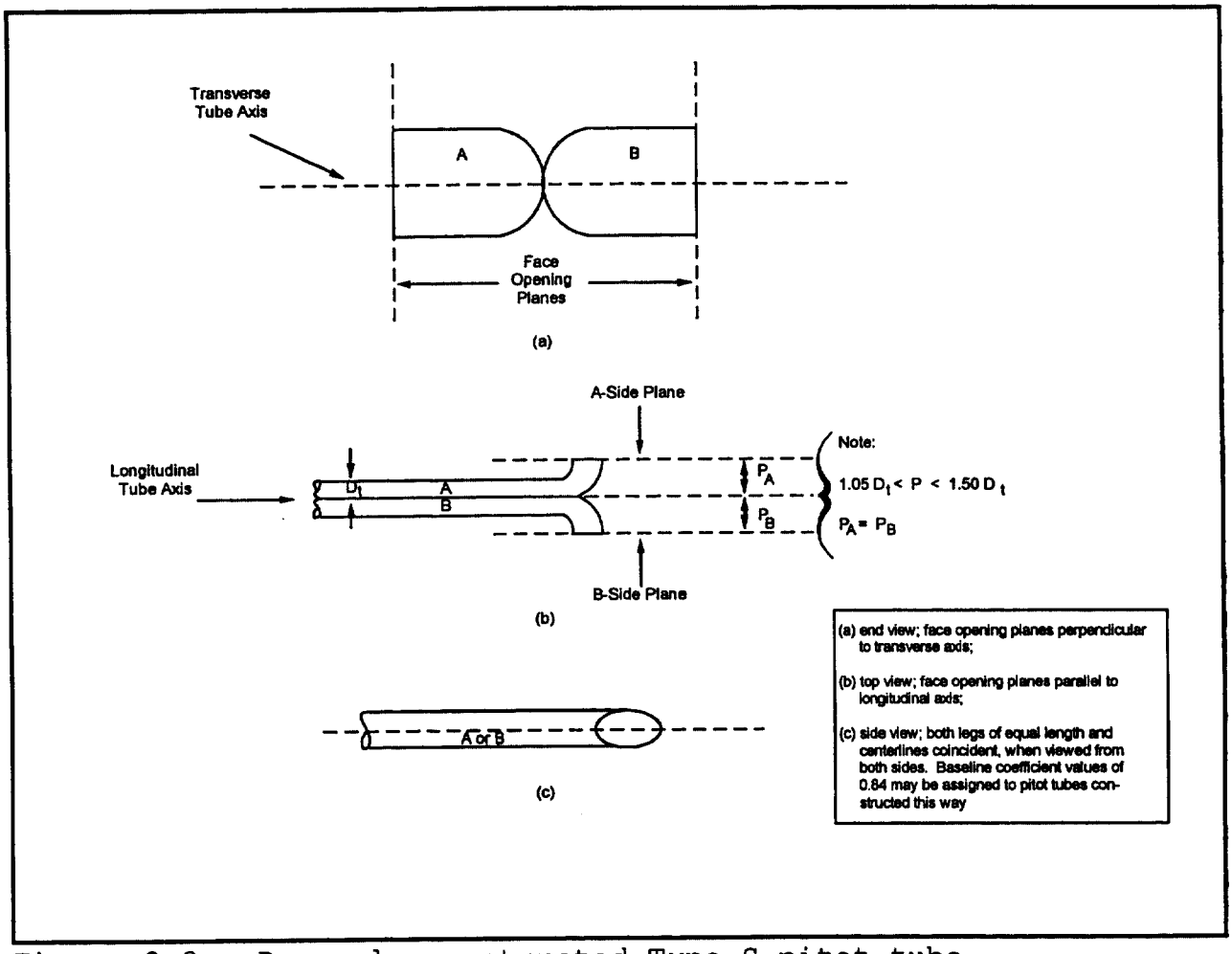


Figure 2-2. Properly constructed Type S pitot tube.

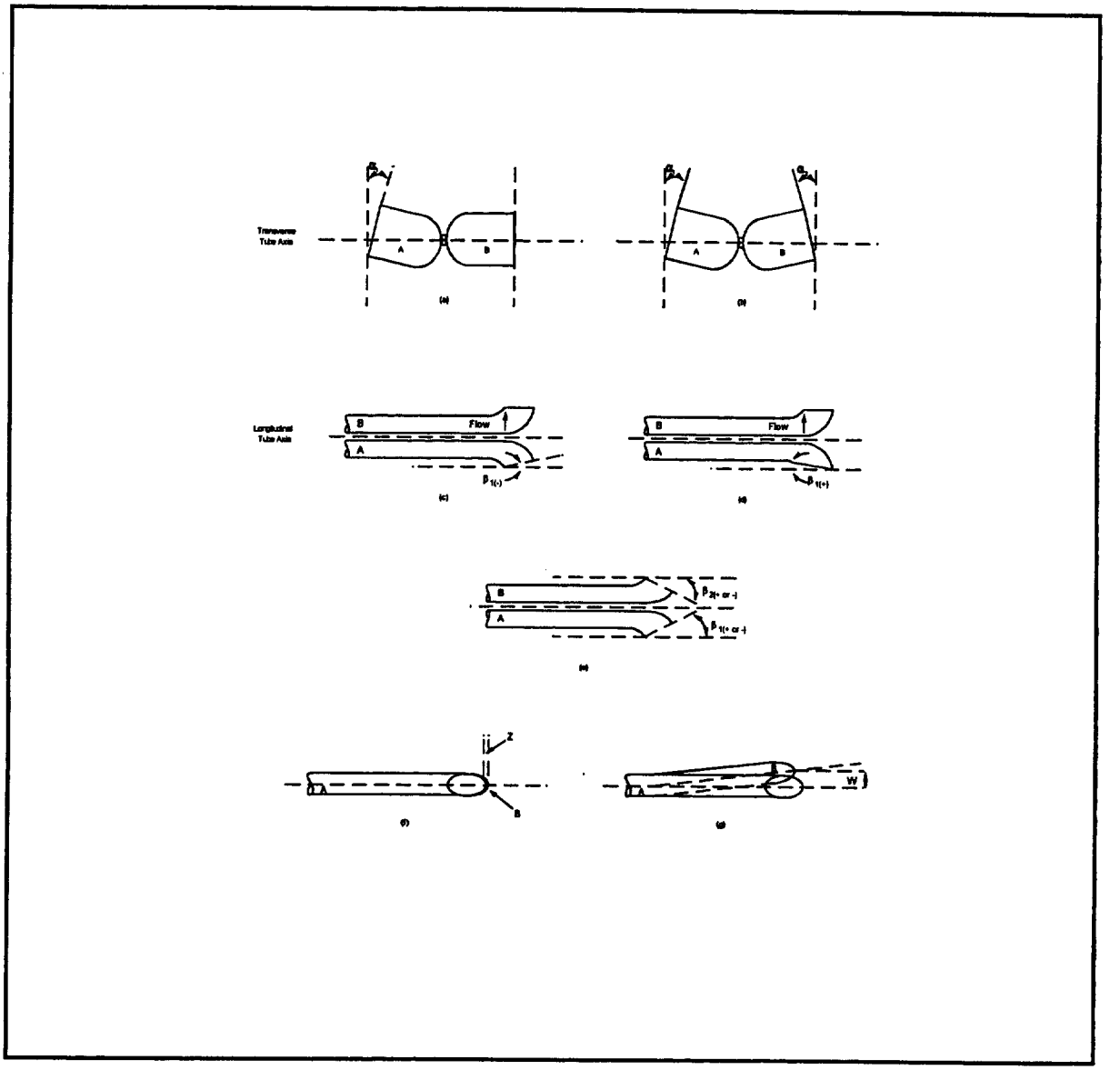


Figure 2-3. Types of face-opening misalignment that can result from field use or improper construction of Type S pitot tubes. These will not affect the baseline value of Cp(s) so long as α^1 and α^2 ≤10°, β^1 and β^2 ≤5°, z ≤0.32 cm (1/8 in.) and w ≤0.08 cm (1/32 in.) (citation 11 in Bibliography).

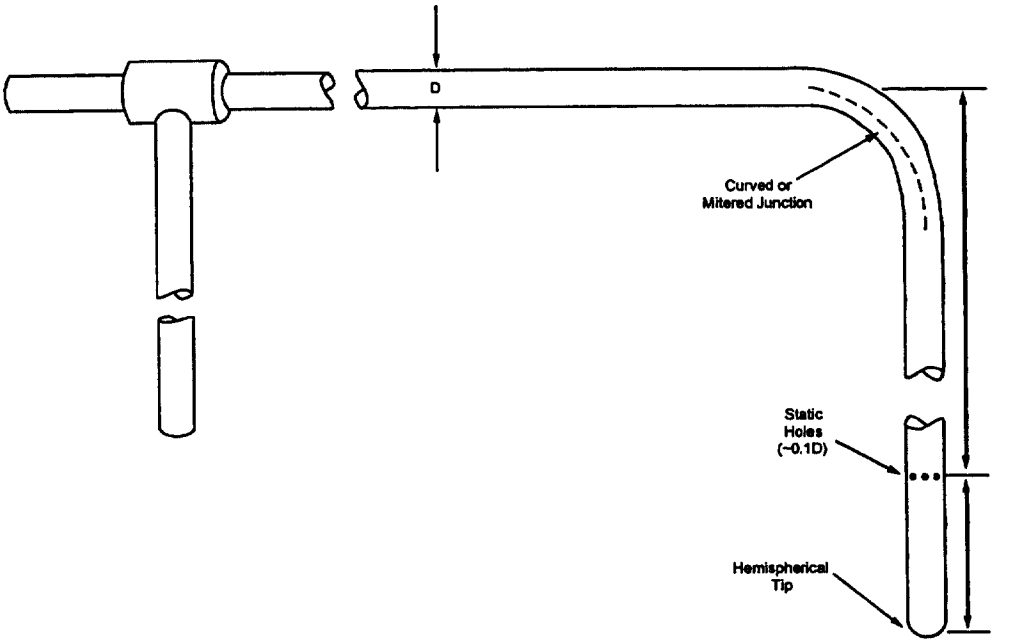


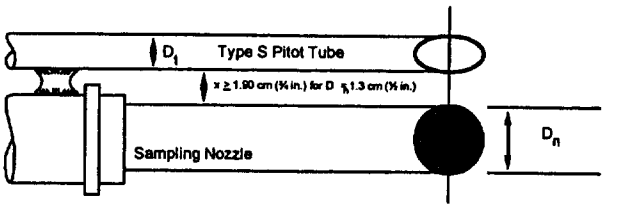
Figure 2-4. Standard pitot tube design specifications.

PLANT _____
DATE _____ RUN NO. _____STACK DIA. OR DIMENSIONS, m (in.) _____ BAROMETRIC PRESS., mm Hg (in. Hg) _____CROSS SECTIONAL AREA, m^2 (ft^2)_____
OPERATORS _____
PITOT TUBE I.D. NO. _____
AVG. COEFFICIENT, Cp = _____
LAST DATE CALIBRATED _____

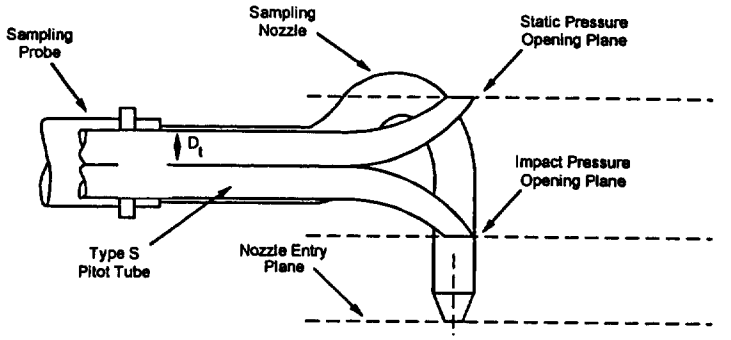
SCHEMATIC OF STACK
CROSS SECTION

Traverse Pt. No.	Vel. Hd., Δp mm (in.) H_2O	Stack Temperature		P_g mm Hg (in.Hg)	$(\Delta p)^{1/2}$
		T_s, °C (°F)	T_s, °K (°R)		
		Average			

Figure 2-5. Velocity traverse data.



A. Bottom View; showing minimum pitot tube-nozzle separation.



B. Side View; to prevent pitot tube from interfering with gas flow streamlines approaching the nozzle, the impact pressure opening plane of the pitot tube shall be even with or above the nozzle entry plane.

Figure 2-6. Proper pitot tube-sampling nozzle configuration to prevent aerodynamic interference; button-hook type nozzle; centers of nozzle and pitot opening aligned; D_t between 0.48 and 0.95 cm (3/16 and 3/8 in.).

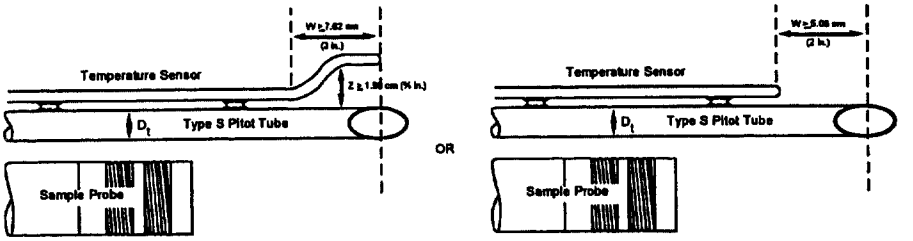


Figure 2-7. Proper thermocouple placement to prevent interference; D_t between 0.48 and 0.95 cm (3/16 and 3/8 in.).

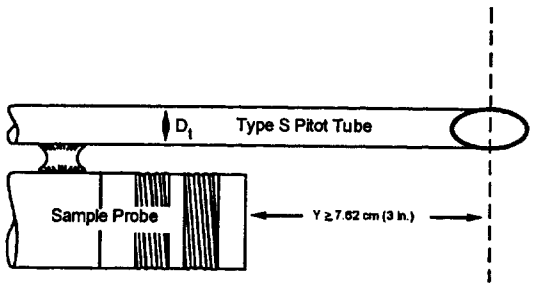


Figure 2-8. Minimum pitot-sample probe separation needed to prevent interference; D_t between 0.48 and 0.95 cm (3/16 and 3/8 in.).

PITOT TUBE IDENTIFICATION NUMBER: _____ DATE: _____ CALIBRATED BY: _____

	"A" SIDE CALIBRATION			
RUN NO.	ΔP_{std} cm H_2O (in H_2O)	$\Delta P_{(s)}$ cm H_2O (in H_2O)	$C_{p(s)}$	Deviation $C_{p(s)} - C_p(A)$
1				
2				
3				
		$C_{p,avg}$ (SIDE A)		

	"B" SIDE CALIBRATION			
RUN NO.	ΔP_{std} cm H_2O (in H_2O)	$\Delta P_{(s)}$ cm H_2O (in H_2O)	$C_{p(s)}$	Deviation $C_{p(s)} - C_p(B)$
1				
2				
3				
		$C_{p,avg}$ (SIDE B)		

$$\text{Average Deviation} = \sigma_{(A\,or\,B)} = \frac{\sum_{i=1}^{3} \left| C_{p(s)} - \overline{C}_{p(A\,or\,B)} \right|}{3} \leftarrow \text{Must Be} \leq 0.01$$

$$\left| \overline{C}_p(\text{SideA}) - \overline{C}_p(\text{SideB}) \right| \leftarrow \text{Must Be} \leq 0.01$$

Figure 2-9. Pitot tube calibration data.

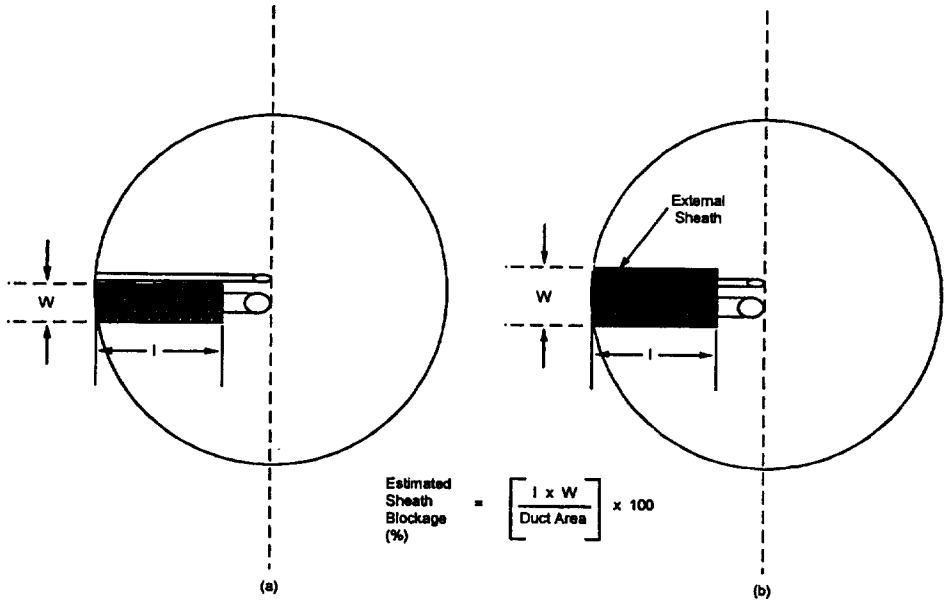


Figure 2-10. Projected-area models for typical pitot tube assemblies.

Method 3B - Gas Analysis for the Determination of Emission Rate Correction Factor or Excess Air

1. APPLICABILITY AND PRINCIPLE

1.1 Applicability.

1.1.1 This method is applicable for determining carbon dioxide (CO_2), oxygen (O_2), and carbon monoxide (CO) concentrations of a sample from a gas stream of a fossil-fuel combustion process for excess air or emission rate correction factor calculations.

1.1.2 Other methods, as well as modifications to the procedure described herein, are also applicable for all of the above determinations. Examples of specific methods and modifications include: (1) a multi-point sampling method using an Orsat analyzer to analyze individual grab samples obtained at each point, and (2) a method using CO_2 or O_2 and stoichiometric calculations to determine excess air. These methods and modifications may be used, but are subject to the approval of the Administrator, U.S. Environmental Protection Agency (EPA).

1.1.3 Note. Mention of trade names or specific products does not constitute endorsement by EPA.

1.2 Principle. A gas sample is extracted from a stack by one of the following methods: (1) single-point, grab sampling; (2) single-point, integrated sampling; or (3) multi-point, integrated sampling. The gas sample is analyzed for percent CO_2, percent O_2, and, if necessary, percent CO. An Orsat analyzer must be used for excess air or emission rate correction factor determinations.

2. APPARATUS

The alternative sampling systems are the same as those mentioned in Section 2 of Method 3.

2.1 Grab Sampling and Integrated Sampling. Same as in Sections 2.1 and 2.2, respectively, of Method 3.

2.2 Analysis. An Orsat analyzer only. For low CO_2 (less than 4.0 percent) or high O_2 (greater than 15.0 percent) concentrations, the measuring burette of the Orsat must have at least 0.1 percent subdivisions. For Orsat maintenance and operation procedures, follow the instructions recommended by the manufacturer, unless otherwise specified herein.

3. PROCEDURES

Each of the three procedures below shall be used only when specified in an applicable subpart of the standards. The use of these procedures for other purposes must have specific prior approval of the Administrator.
Note: A Fyrite-type combustion gas analyzer is not acceptable for excess air or emission rate correction factor determinations, unless approved by the Administrator. If both percent CO_2 and percent O_2 are measured, the analytical results of any of the three procedures given below may also be used for calculating the dry molecular weight (see Method 3).

3.1 Single-Point, Grab Sampling and Analytical Procedure.

3.1.1 The sampling point in the duct shall be as described in Section 3.1 of Method 3.

3.1.2 Set up the equipment as shown in Figure 3-1 of Method 3, making sure all connections ahead of the analyzer are tight. Leak check the Orsat analyzer according to the procedure described in Section 6 of Method 3. This leak check is mandatory.

3.1.3 Place the probe in the stack, with the tip of the probe positioned at the sampling point; purge the sampling line long enough to allow at least five exchanges. Draw a sample into the analyzer. For emission rate correction factor determinations, immediately analyze the sample, as outlined in Sections 3.1.4 and 3.1.5, for percent CO_2 or percent O_2. If excess air is desired, proceed as follows: (1) immediately analyze the sample, as in Sections 3.1.4 and 3.1.5, for percent CO_2, O_2, and CO; (2) determine the percentage of the gas that is N_2 by subtracting the sum of the percent CO_2, percent O_2, and percent CO from 100 percent, and (3) calculate percent excess air as outlined in Section 4.2.

3.1.4 To ensure complete absorption of the CO_2, O_2, or if applicable, CO, make repeated passes through each absorbing solution until two consecutive readings are the same. Several passes (three or four) should be made between readings. (If constant readings cannot be obtained after three consecutive readings, replace the absorbing solution.) Note: Since this single-point, grab sampling and analytical procedure is normally conducted in conjunction with a single-point, grab sampling and analytical procedure for a pollutant, only one analysis is ordinarily conducted. Therefore, great care must be taken to obtain a valid sample and analysis. Although in most cases, only CO_2 or O_2 is required, it is recommended that both CO_2 and O_2 be measured, and that Section 3.4 be used to validate the analytical data.

3.1.5 After the analysis is completed, leak check (mandatory) the Orsat analyzer once again, as described in Section 6 of Method 3. For the results of the analysis

to be valid, the Orsat analyzer must pass this leak test before and after the analysis.

3.2 Single-Point, Integrated Sampling and Analytical Procedure.

3.2.1 The sampling point in the duct shall be located as specified in Section 3.1.1.

3.2.2 Leak check (mandatory) the flexible bag as in Section 2.2.6 of Method 3. Set up the equipment as shown in Figure 3-2 of Method 3. Just before sampling, leak check (mandatory) the train as described in Section 4.2 of Method 3.

3.2.3 Sample at a constant rate, or as specified by the Administrator. The sampling run must be simultaneous with, and for the same total length of time as, the pollutant emission rate determination. Collect at least 30 liters (1.00 ft^3) of sample gas. Smaller volumes may be collected, subject to approval of the Administrator.

3.2.4 Obtain one integrated flue gas sample during each pollutant emission rate determination. For emission rate correction factor determination, analyze the sample within 4 hours after it is taken for percent CO_2 or percent O_2 (as outlined in Sections 3.2.5 through 3.2.7). The Orsat analyzer must be leak checked (see Section 6 of Method 3) before the analysis. If excess air is desired, proceed as follows: (1) within 4 hours after the sample is taken, analyze it (as in Sections 3.2.5 through 3.2.7) for percent CO_2, O_2, and CO; (2) determine the percentage of the gas that is N_2 by subtracting the sum of the percent CO_2, percent O_2, and percent CO from 100 percent; and (3) calculate percent excess air, as outlined in Section 4.2.

3.2.5 To ensure complete absorption of the CO_2, O_2, or if applicable, CO, follow the procedure described in Section 3.1.4. Note: Although in most instances only CO_2 or O_2 is required, it is recommended that both CO_2 and O_2 be measured, and that Section 3.4.1 be used to validate the analytical data.

3.2.6 Repeat the analysis until the following criteria are met:

3.2.6.1 For percent CO_2, repeat the analytical procedure until the results of any three analyses differ by no more than (a) 0.3 percent by volume when CO_2 is greater than 4.0 percent or (b) 0.2 percent by volume when CO_2 is less than or equal to 4.0 percent. Average three acceptable values of percent CO_2, and report the results to the nearest 0.1 percent.

3.2.6.2 For percent O_2, repeat the analytical procedure until the results of any three analyses differ by no more than (a) 0.3 percent by volume when O_2 is less than 15.0 percent or (b) 0.2 percent by volume when O_2 is greater than or equal to 15.0 percent. Average the three acceptable values of percent O_2, and report the results

to the nearest 0.1 percent.

3.2.6.3 For percent CO, repeat the analytical procedure until the results of any three analyses differ by no more than 0.3 percent. Average the three acceptable values of percent CO, and report the results to the nearest 0.1 percent.

3.2.7 After the analysis is completed, leak check (mandatory) the Orsat analyzer once again, as described in Section 6 of Method 3. For the results of the analysis to be valid, the Orsat analyzer must pass this leak test before and after the analysis.

3.3 Multi-Point, Integrated Sampling and Analytical Procedure.

3.3.1 The sampling points shall be determined as specified in Section 5.3 of Method 3.

3.3.2 Follow the procedures outlined in Sections 3.2.2 through 3.2.7, except for the following: Traverse all sampling points, and sample at each point for an equal length of time. Record sampling data as shown in Figure 3-3 of Method 3.

3.4 Quality Control Procedures.

3.4.1 Data Validation When Both CO_2 and O_2 Are Measured. Although in most instances, only CO_2 or O_2 measurement is required, it is recommended that both CO_2 and O_2 be measured to provide a check on the quality of the data. The following quality control procedure is suggested. Note: Since the method for validating the CO_2 and O_2 analyses is based on combustion of organic and fossil fuels and dilution of the gas stream with air, this method does not apply to sources that (1) remove CO_2 or O_2 through processes other than combustion, (2) add O_2 (e.g., oxygen enrichment) and N_2 in proportions different from that of air, (3) add CO_2 (e.g., cement or lime kilns), or (4) have no fuel factor, F_o, values obtainable (e.g., extremely variable waste mixtures). This method validates the measured proportions of CO_2 and O_2 for fuel type, but the method does not detect sample dilution resulting from leaks during or after sample collection. The method is applicable for samples collected downstream of most lime or limestone flue-gas desulfurization units as the CO_2 added or removed from the gas stream is not significant in relation to the total CO_2 concentration. The CO_2 concentrations from other types of scrubbers using only water or basic slurry can be significantly affected and would render the F_o check minimally useful.

3.4.1.1 Calculate a fuel factor, F_o, using the following equation:

$$F_o = \frac{20.9 - \%O_2}{\%CO_2} \qquad \text{Eq. 3B-1}$$

where:

$\%O_2$ = Percent O_2 by volume, dry basis.

$\%CO_2$ = Percent CO_2 by volume, dry basis.

20.9 = Percent O_2 by volume in ambient air.

If CO is present in quantities measurable by this method, adjust the O_2 and CO_2 values before performing the calculation for F_o as follows:

$$\%CO_2(adj) = \%CO_2 + \%CO$$

$$\%O_2(adj) = \%O_2 - 0.5\ \%CO$$

where:

%CO = Percent CO by volume, dry basis.

3.4.1.2 Compare the calculated F_o factor with the expected F_o values. The following table may be used in establishing acceptable ranges for the expected F_o if the fuel being burned is known. When fuels are burned in combinations, calculate the combined fuel F_d and F_c factors (as defined in Method 19) according to the procedure in Method 19, Section 5.2.3. Then calculate the F_o factor as follows:

$$F_o = \frac{0.209\ F_d}{F_c} \qquad \text{Eq. 3B-2}$$

Fuel type		F_o range
Coal:	Anthracite and lignite	1.016 - 1.130
	Bituminous	1.083 - 1.230
Oil:	Distillate	1.260 - 1.413
	Residual	1.210 - 1.370
Gas:	Natural	1.600 - 1.836
	Propane	1.434 - 1.586
	Butane	1.405 - 1.553
Wood		1.000 - 1.120
Wood bark		1.003 - 1.130

3.4.1.3 Calculated F_o values, beyond the acceptable ranges shown in this table, should be investigated before accepting the test results. For example, the strength of the solutions in the gas analyzer and the analyzing technique should be checked by sampling and analyzing a known concentration, such as air; the fuel factor should be reviewed and verified. An acceptability range of ±12 percent is appropriate for the F_o factor of mixed fuels with variable fuel ratios. The level of the emission rate relative to the compliance level should be considered in determining if a retest is appropriate, i.e.; if the measured emissions are much lower or much greater than the compliance limit,

repetition of the test would not significantly change the compliance status of the source and would be unnecessarily time consuming and costly.

4. CALCULATIONS

4.1 Nomenclature. Same as Section 5 of Method 3 with the addition of the following:

%EA = Percent excess air.

0.264 = Ratio of O_2 to N_2 in air, v/v.

4.2 Percent Excess Air. Calculate the percent excess air (if applicable) by substituting the appropriate values of percent O_2, CO, and N_2 (obtained from Section 3.1.3 or 3.2.4) into Equation 3B-3.

$$\%EA = \frac{\%O_2 - 0.5\ \%CO}{0.264\ \%N_2 - (\%O_2 - 0.5\ \%CO)} \times 100 \qquad \text{Eq. 3B-3}$$

Note: The equation above assumes that ambient air is used as the source of O_2 and that the fuel does not contain appreciable amounts of N_2 (as do coke oven or blast furnace gases). For those cases when appreciable amounts of N_2 are present (coal, oil, and natural gas do not contain appreciable amounts of N_2) or when oxygen enrichment is used, alternative methods, subject to approval of the Administrator, are required.

5. BIBLIOGRAPHY

Same as Method 3.

Method 4 - Determination of Moisture Content in Stack Gases

1. PRINCIPLE AND APPLICABILITY

1.1 Principle. A gas sample is extracted at a constant rate from the source; moisture is removed from the sample stream and determined either volumetrically or gravimetrically.

1.2 Applicability. This method is applicable for determining the moisture content of stack gas.

1.2.1 Two procedures are given. The first is a reference method, for accurate determinations of moisture content (such as are needed to calculate emission data). The second is an approximation method, which provides estimates of percent moisture to aid in setting isokinetic sampling rates prior to a pollutant emission measurement run. The approximation method described herein is only a suggested approach; alternative means for approximating the moisture content, e.g., drying tubes, wet bulb-dry bulb techniques, condensation techniques, stoichiometric calculations, previous experience, etc., are also acceptable.

1.2.2 The reference method is often conducted simultaneously with a pollutant emission measurement run; when it is, calculation of percent isokinetic, pollutant emission rate, etc., for the run shall be based upon the results of the reference method or its equivalent; these calculations shall not be based upon the results of the approximation method, unless the approximation method is shown, to the satisfaction of the Administrator, U.S. Environmental Protection Agency, to be capable of yielding results within 1 percent H_2O of the reference method.

1.2.3 Note: The reference method may yield questionable results

when applied to saturated gas streams or to streams that contain water droplets. Therefore, when these conditions exist or are suspected, a second determination of the moisture content shall be made simultaneously with the reference method, as follows: Assume that the gas stream is saturated. Attach a temperature sensor [capable of measuring to within 1°C (2°F)] to the reference method probe. Measure the stack gas temperature at each traverse point (see Section 2.2.1) during the reference method traverse; calculate the average stack gas temperature. Next, determine the moisture percentage, either by: (1) using a psychrometric chart and making appropriate corrections if stack pressure is different from that of the chart, or (2) using saturation vapor pressure tables. In cases where the psychrometric chart or the saturation vapor pressure tables are not applicable (based on evaluation of the process), alternative methods, subject to the approval of the Administrator, shall be used.

2. REFERENCE METHOD

The procedure described in Method 5 for determining moisture content is acceptable as a reference method.

2.1 Apparatus. A schematic of the sampling train used in this reference method is shown in Figure 4-1. All components shall be maintained and calibrated according to the procedures in Method 5.

2.1.1 Probe. Stainless steel or glass tubing, sufficiently heated to prevent water condensation, and equipped with a filter, either in-stack (e.g., a plug of glass wool inserted into the end of the probe) or heated out-stack (e.g., as described in Method 5), to remove particulate matter. When stack conditions permit, other metals or plastic tubing may be used for the probe, subject to the approval of the Administrator.

2.1.2 Condenser. See Method 5, Section 2.1.7, for a description

of an acceptable type of condenser and for alternative measurement systems.

2.1.3 Cooling System. An ice bath container and crushed ice (or equivalent), to aid in condensing moisture.

2.1.4 Metering System. Same as in Method 5, Section 2.1.8, except do not use sampling systems designed for flow rates higher than 0.0283 m^3/min (1.0 cfm). Other metering systems, capable of maintaining a constant sampling rate to within 10 percent and determining sample gas volume to within 2 percent, may be used, subject to the approval of the Administrator.

2.1.5 Barometer. Mercury, aneroid, or other barometer capable of measuring atmospheric pressure to within 2.5 mm (0.1 in.) Hg. See **NOTE** in Method 5, Section 2.1.9.

2.1.6 Graduated Cylinder and/or Balance. To measure condensed water and moisture caught in the silica gel to within 1 ml or 0.5 g. Graduated cylinders shall have subdivisions no greater than 2 ml. Most laboratory balances are capable of weighing to the nearest 0.5 g or less. These balances are suitable for use here.

2.2 Procedure. The following procedure is written for a condenser system (such as the impinger system described in Section 2.1.7 of Method 5) incorporating volumetric analysis to measure the condensed moisture, and silica gel and gravimetric analysis to measure the moisture leaving the condenser.

2.2.1 Unless otherwise specified by the Administrator, a minimum of eight traverse points shall be used for circular stacks having diameters less than 0.61 m (24 in.), a minimum of nine points shall be used for rectangular stacks
having equivalent diameters less than 0.61 m (24 in.), and a minimum of twelve traverse points shall be used in all other cases. The traverse points shall be located according to Method 1. The use of fewer points is subject to the approval of the Administrator. Select a suitable probe and probe length such that all traverse points can be sampled. Consider sampling from opposite sides
of the stack (four total sampling ports) for large stacks, to permit use of shorter probe lengths. Mark the probe with heat resistant tape or by some other method to denote the proper distance into the stack or duct for each sampling point. Place

known volumes of water in the first two impingers. Weigh and record the weight of the silica gel to the nearest 0.5 g, and transfer the silica gel to the fourth impinger; alternatively, the silica gel may first be transferred to the impinger, and the weight of the silica gel plus impinger recorded.

2.2.2 Select a total sampling time such that a minimum total gas volume of 0.60 scm (21 scf) will be collected, at a rate no greater than 0.021 m^3/min (0.75 cfm). When both moisture content and pollutant emission rate are to be determined, the moisture determination shall be simultaneous with, and for the same total length of time as, the pollutant emission rate run, unless otherwise specified in an applicable subpart of the standards.

2.2.3 Set up the sampling train as shown in Figure 4-1. Turn on the probe heater and (if applicable) the filter heating system to temperatures of about 120°C (248°F), to prevent water condensation ahead of the condenser; allow time for the temperatures to stabilize. Place crushed ice in the ice bath container. It is recommended, but not required, that a leak check be done, as follows: Disconnect the probe from the first impinger or (if applicable) from the filter holder. Plug the inlet to the first impinger (or filter holder), and pull a 380 mm (15 in.) Hg vacuum; a lower vacuum may be used, provided that it is not exceeded during the test. A leakage rate in excess of 4 percent of the average sampling rate or 0.00057 m^3/min (0.02 cfm), whichever is less, is unacceptable. Following the leak check, reconnect the probe to the sampling train.

2.2.4 During the sampling run, maintain a sampling rate within 10 percent of constant rate, or as specified by the Administrator. For each run, record the data required on the example data sheet shown in Figure 4-2. Be sure to record the dry gas meter reading at the beginning and end of each sampling time increment and whenever sampling is halted. Take other appropriate readings at each sample point, at least once during each time increment.

2.2.5 To begin sampling, position the probe tip at the first traverse point. Immediately start the pump, and adjust the flow to the desired rate. Traverse the cross section, sampling at each traverse point for an equal length of time. Add more ice and, if necessary, salt to maintain a temperature of less than 20°C (68°F) at the silica gel outlet.

2.2.6 After collecting the sample, disconnect the probe from the

filter holder (or from the first impinger), and conduct a leak check (mandatory) as described in Section 2.2.3. Record the leak rate. If the leakage rate exceeds the allowable rate, the tester shall either reject the test results or shall correct the sample volume as in Section 6.3 of Method 5. Next, measure the volume of the moisture condensed to the nearest ml. Determine the increase in weight of the silica gel (or silica gel plus impinger) to the nearest 0.5 g. Record this information (see example data sheet, Figure 4-3), and calculate the moisture percentage, as described in 2.3 below.

2.2.7 A quality control check of the volume metering system at the field site is suggested before collecting the sample following the procedure in Method 5, Section 4.4.

2.3 Calculations. Carry out the following calculations, retaining at least one extra decimal figure beyond that of the acquired data. Round off figures after final calculation.

2.3.1 Nomenclature.

B_{ws} = Proportion of water vapor, by volume, in the gas stream.

M_w = Molecular weight of water, 18.0 g/g-mole (18.0 lb/lb-mole).

P_m = Absolute pressure (for this method, same as barometric pressure) at the dry gas meter, mm Hg (in. Hg).

P_{std} = Standard absolute pressure, 760 mm Hg (29.92 in. Hg).

R = Ideal gas constant, 0.06236 (mm Hg)(m^3)/(g-mole)(°K) for metric units and 21.85 (in. Hg)(ft^3)/(lb-mole)(°R) for English units.

T_m = Absolute temperature at meter, °K (°R).

T_{std} = Standard absolute temperature, 293°K (528°R).

V_m = Dry gas volume measured by dry gas meter, dcm (dcf).

ΔV_m = Incremental dry gas volume measured by dry gas meter at each traverse point, dcm (dcf).

$V_{m(std)}$ = Dry gas volume measured by the dry gas meter, corrected to

standard conditions, dscm (dscf).

$V_{wc(std)}$ = Volume of water vapor condensed, corrected to standard conditions, scm (scf).

$V_{wsg(std)}$ = Volume of water vapor collected in silica gel, corrected to standard conditions, scm (scf).

V_f = Final volume of condenser water, ml.

V_i = Initial volume, if any, of condenser water, ml.

W_f = Final weight of silica gel or silica gel plus impinger, g.

W_i = Initial weight of silica gel or silica gel plus impinger, g.

Y = Dry gas meter calibration factor.

ρ_w = Density of water, 0.9982 g/ml (0.002201 lb/ml).

2.3.2 Volume of Water Vapor Condensed.

$$V_{wc(std)} = (V_f - V_i)\rho_w \frac{RT_{std}}{P_{std}M_w} = K_1 (V_f - V_i) \qquad \text{Eq. 4-1}$$

Where:

K_1 = 0.001333 m^3/ml for metric units,

= 0.04707 ft^3/ml for English units.

2.3.3 Volume of Water Collected in Silica Gel.

$$V_{wsg(std)} = \frac{(W_f - W_i)\ RT_{std}}{P_{std}M_w} = K_2 (W_f - W_i) \qquad \text{Eq. 4-2}$$

Where:

K_2 = 0.001335 m^3/g for metric units,

= 0.04715 ft^3/g for English units.

2.3.4 Sample Gas Volume.

$$V_{m(std)} = V_m Y \frac{(P_m)(T_{std})}{(P_{std})(T_m)} = K_3 Y \frac{V_m P_m}{T_m} \qquad \text{Eq. 4-3}$$

Where:

K_3 = 0.3858 °K/mm Hg for metric units,

= 17.64 °R/in. Hg for English units.

NOTE: If the post-test leak rate (Section 2.2.6) exceeds the allowable rate, correct the value of V_m in Equation 4-3, as described in Section 6.3 of Method 5.

2.3.5 Moisture Content.

$$B_{ws} = \frac{V_{wc(std)} + V_{wsg(std)}}{V_{wc(std)} + V_{wsg(std)} + V_{m(std)}} \qquad \text{Eq. 4-4}$$

NOTE: In saturated or moisture droplet-laden gas streams, two calculations of the moisture content of the stack gas shall be made, one using a value based upon the saturated conditions (see Section 1.2), and another based upon the results of the impinger analysis. The lower of these two values of B_{ws} shall be considered correct.

2.3.6 Verification of Constant Sampling Rate. For each time increment, determine the ΔV_m. Calculate the average. If the value for any time increment differs from the average by more than 10 percent, reject the results, and repeat the run.

3. APPROXIMATION METHOD

The approximation method described below is presented only as a suggested method (see Section 1.2).

3.1 Apparatus. See Figure 4-4.

3.1.1 Probe. Stainless steel or glass tubing, sufficiently heated to prevent water condensation and equipped with a filter (either in-stack or heated out-stack) to remove particulate matter. A plug of glass wool, inserted into the end of the probe, is a satisfactory filter.

3.1.2 Impingers. Two midget impingers, each with 30-ml capacity, or equivalent.

3.1.3 Ice Bath. Container and ice, to aid in condensing moisture in impingers.

3.1.4 Drying Tube. Tube packed with new or regenerated 6- to 16-mesh indicating-type silica gel (or equivalent desiccant), to dry the sample gas and to protect the meter and pump.

3.1.5 Valve. Needle valve, to regulate the sample gas flow rate.

3.1.6 Pump. Leak-free, diaphragm type, or equivalent, to pull the gas sample through the train.

3.1.7 Volume Meter. Dry gas meter, sufficiently accurate to measure the sample volume to within 2 percent, and calibrated over the range of flow rates and conditions actually encountered during sampling.

3.1.8 Rate Meter. Rotameter, to measure the flow range from 0 to 3 liters/min (0 to 0.11 cfm).

3.1.9 Graduated Cylinder. 25-ml.

3.1.10 Barometer. Mercury, aneroid, or other barometer, as described in Section 2.1.5 above.

3.1.11 Vacuum Gauge. At least 760-mm (30-in.) Hg gauge, to be used for the sampling leak check.

3.2 Procedure.

3.2.1 Place exactly 5 ml water in each impinger. Leak check the sampling train as follows: Temporarily insert a vacuum gauge at or near the probe inlet; then, plug the probe inlet, and pull a vacuum of at least 250 mm (10 in.) Hg. Note the time rate of change of the dry gas meter dial; alternatively, a rotameter (0 to 40 cc/min) may be temporarily attached to the dry gas meter outlet to determine the leakage rate. A leak rate not in excess of 2 percent of the average sampling rate is acceptable. **NOTE:** Carefully release the probe inlet plug before turning off the pump.

3.2.2 Connect the probe, insert it into the stack, and sample at

a constant rate of 2 liters/min (0.071 cfm). Continue sampling until the dry gas meter registers about 30 liters (1.1 ft^3) or until visible liquid droplets are carried over from the first impinger to the second. Record temperature, pressure, and dry gas meter readings as required by Figure 4-5.

3.2.3 After collecting the sample, combine the contents of the two impingers, and measure the volume to the nearest 0.5 ml.

3.3 Calculations. The calculation method presented is designed to estimate the moisture in the stack gas; therefore, other data, which are only necessary for accurate moisture determinations, are not collected. The following equations adequately estimate the moisture content, for the purpose of determining isokinetic sampling rate settings.

3.3.1 Nomenclature.

B_{wm} = Approximate proportion by volume of water vapor in the gas stream leaving the second impinger, 0.025.

B_{ws} = Water vapor in the gas stream, proportion by volume.

M_w = Molecular weight of water, 18.0 g/g-mole (18.0 lb/lb-mole).

P_m = Absolute pressure (for this method, same as barometric pressure) at the dry gas meter, mm Hg (in. Hg).

P_{std} = Standard absolute pressure, 760 mm Hg (29.92 in. Hg).

R = Ideal gas constant, 0.06236 [(mm Hg)(m^3)]/[(g-mole)(°K)] for metric units and 21.85 [(in. Hg)(ft^3)]/[(lb-mole)(°R)] for English units.

T_m = Absolute temperature at meter, °K (°R).

T_{std} = Standard absolute temperature, 293°R (528°R).

V_f = Final volume of impinger contents, ml.

V_i = Initial volume of impinger contents, ml.

V_m = Dry gas volume measured by dry gas meter, dcm (dcf).

$V_{m(std)}$ = Dry gas volume measured by dry gas meter, corrected to standard conditions, dscm (dscf).

Y = Dry gas meter calibration factor.

ρ_w = Density of water, 0.9982 g/ml (0.002201 lb/ml).

3.3.2 Volume of Water Vapor Collected.

$$V_{wc} = \frac{(V_f - V_i)\rho_w R T_{std}}{P_{std} M_w} = K_1 (V_f - V_i) \qquad \text{Eq. 4-5}$$

Where:

K_1 = 0.001333 m^3/ml for metric units,

= 0.04707 ft^3/ml for English units.

3.3.3 Gas Volume.

$$V_{m(std)} = V_m \left(\frac{P_m}{P_{std}} \right) \left(\frac{T_{std}}{T_m} \right) = K_2 \; V_m \frac{P_m}{T_m} \qquad \text{Eq. 4-6}$$

Where:

K_2 = 0.03858 °K/mm Hg for metric units,

= 17.64 °R/in. Hg for English units.

3.3.4 Approximate Moisture Content.

$$B_{ws} = \frac{V_{wc}}{V_{wc}+V_{m(std)}} + B_{wm}$$
$$= \frac{V_{wc}}{V_{wc}+V_{m(std)}} + (0.025) \qquad \text{Eq. 4-7}$$

4. CALIBRATION

4.1 For the reference method, calibrate the metering system, temperature gauges, and barometer according to Sections 5.3, 5.5, and 5.7, respectively, of Method 5. The recommended leak check of the metering system (Section 5.6 of Method 5) also applies to the reference method. For the approximation method, use the procedures outlined in Section 5.1.1 of Method 6 to calibrate the metering system, and the procedure of Method 5, Section 5.7, to calibrate the barometer.

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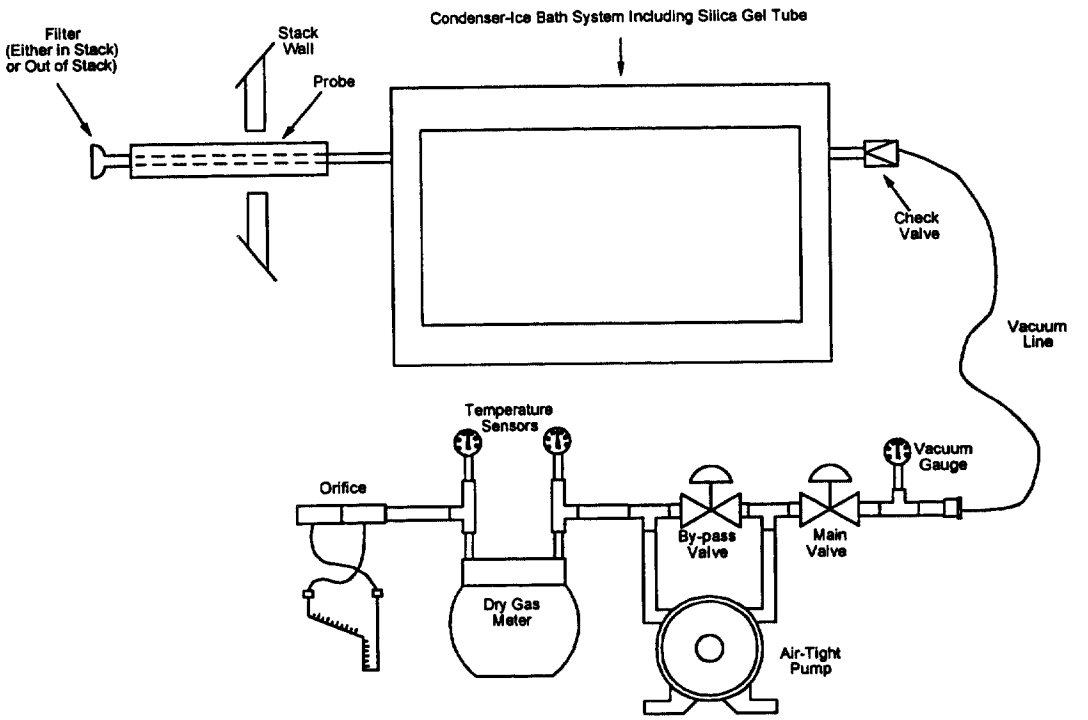

Figure 4-1. Moisture sampling train reference method.

Figure 4-2. Field Moisture Determination Reference Method.

Plant _____
Location _____
Operator _____
Date _____
Run No. _____
Ambient temperature _____
Barometric pressure _____
Probe Length _____

SCHEMATIC OF STACK CROSS SECTION

Traverse Pt. No.	Sampling Time (θ), min	Stack Temperature °C (°F)	Pressure differential across orifice meter ΔH mm (in.) H_2O	Meter Reading gas sample volume m^3 (ft^3)	ΔV_m m^3 (ft^3)	Gas sample temperature at dry gas meter		Temperature of gas leaving condenser or last impinger °C(°F)
						Inlet Tm_{in} °C(°F)	Outlet Tm_{out} °C(°F)	
Average								

Figure 4-3. Analytical data - reference method.

	Impinger volume, ml	Silica gel weight, g
Final	_____	_____
Initial	_____	_____
Difference	_____	_____

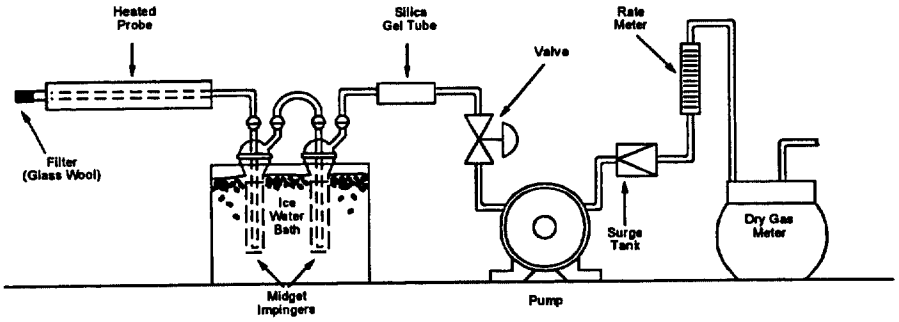

Figure 4-4. Moisture Samping Train - Approximation Method.

Figure 4-5. Field Moisture Determination - Approximation Method.

Location_____Comments:
Test_____
Date_____
Operator_____
Barometric pressure_____

Clock Time	Gas volume through meter, (V_m), m^3 (ft^3)	Rate meter setting m^3/min (ft^3/min)	Meter temperature ° C (° F)

APPENDIX A TO PART 63--TEST METHODS

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METHOD 315 - DETERMINATION OF PARTICULATE AND METHYLENE CHLORIDE EXTRACTABLE MATTER (MCEM) FROM SELECTED SOURCES AT PRIMARY ALUMINUM PRODUCTION FACILITIES

NOTE: This method does not include all of the specifications (e.g., equipment and supplies) and procedures (e.g., sampling and analytical) essential to its performance. Some material is incorporated by reference from other methods in this part. Therefore, to obtain reliable results, persons using this method should have a thorough knowledge of at least the following additional test methods: Method 1, Method 2, Method 3, and Method 5 of 40 CFR part 60, appendix A.

1.0 Scope and Application.

1.1 Analytes. Particulate matter (PM). No CAS number assigned. Methylene chloride extractable matter (MCEM). No CAS number assigned.

1.2 Applicability. This method is applicable for the simultaneous determination of PM and MCEM when specified in an applicable regulation. This method was developed by consensus with the Aluminum Association and the U.S. Environmental Protection Agency (EPA) and has limited precision estimates for MCEM; it should have similar precision to Method 5 for PM in 40 CFR part 60, appendix A since the procedures are similar for PM.

1.3 Data quality objectives. Adherence to the requirements of this method will enhance the quality of the data obtained from air pollutant sampling methods.

2.0 Summary of Method.

Particulate matter and MCEM are withdrawn isokinetically from the source. PM is collected on a glass fiber filter maintained at a temperature in the range of 120 ± 14°C (248 ± 25°F) or such other temperature as specified by an applicable subpart of the standards or approved by the Administrator for a particular application. The PM mass, which includes any material that condenses on the probe and is subsequently removed in an acetone rinse or on the filter at or above the filtration temperature, is determined gravimetrically after removal of uncombined water. MCEM is then determined by adding a methylene chloride rinse of the probe and filter holder, extracting the condensable hydrocarbons collected in the impinger water, adding an acetone rinse followed by a methylene chloride rinse of the sampling train components after the filter and before the silica gel impinger, and determining residue gravimetrically after evaporating the solvents.

3.0 Definitions. [Reserved]

4.0 Interferences. [Reserved]

5.0 Safety.

This method may involve hazardous materials, operations, and equipment. This method does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of this method to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to performing this test method.

6.0 Equipment and Supplies.

NOTE: Mention of trade names or specific products does not constitute endorsement by the EPA.

6.1 Sample collection. The following items are required for sample collection:

6.1.1 Sampling train. A schematic of the sampling train used in this method is shown in Figure 5-1, Method 5, 40 CFR part 60, appendix A. Complete construction details are given in APTD-0581 (Reference 2 in section 17.0 of this method); commercial models of this train are also available. For changes from APTD-0581 and for allowable modifications of the train shown in Figure 5-1, Method 5, 40 CFR part 60, appendix, A see the following subsections.

NOTE: The operating and maintenance procedures for the sampling train are described in APTD-0576 (Reference 3 in section 17.0 of this method). Since correct usage is important in obtaining

valid results, all users should read APTD-0576 and adopt the operating and maintenance procedures outlined in it, unless otherwise specified herein. The use of grease for sealing sampling train components is not recommended because many greases are soluble in methylene chloride. The sampling train consists of the following components:

6.1.1.1 Probe nozzle. Glass or glass lined with sharp, tapered leading edge. The angle of taper shall be ≤30°, and the taper shall be on the outside to preserve a constant internal diameter. The probe nozzle shall be of the button-hook or elbow design, unless otherwise specified by the Administrator. Other materials of construction may be used, subject to the approval of the Administrator. A range of nozzle sizes suitable for isokinetic sampling should be available. Typical nozzle sizes range from 0.32 to 1.27 cm (1/8 to 1/2 in.) inside diameter (ID) in increments of 0.16 cm (1/16 in.). Larger nozzle sizes are also available if higher volume sampling trains are used. Each nozzle shall be calibrated according to the procedures outlined in section 10.0 of this method.

6.1.1.2 Probe liner. Borosilicate or quartz glass tubing with a heating system capable of maintaining a probe gas temperature at the exit end during sampling of 120 ± 14°C (248 ± 25°F), or such other temperature as specified by an applicable subpart of the standards or approved by the Administrator for a particular application. Because the actual temperature at the outlet of the probe is not usually monitored during sampling, probes constructed according to APTD-0581 and using the calibration curves of APTD-0576 (or calibrated according to the procedure outlined in APTD-0576) will be considered acceptable. Either borosilicate or quartz glass probe liners may be used for stack temperatures up to about 480°C (900°F); quartz liners shall be used for temperatures between 480 and 900°C (900 and 1,650°F). Both types of liners may be used at higher temperatures than specified for short periods of time, subject to the approval of the Administrator. The softening temperature for borosilicate glass is 820°C (1,500°F) and for quartz glass it is 1,500°C (2,700°F).

6.1.1.3 Pitot tube. Type S, as described in section 6.1 of Method 2, 40 CFR part 60, appendix A, or other device approved by the Administrator. The pitot tube shall be attached to the probe (as shown in Figure 5-1 of Method 5, 40 CFR part 60, appendix A) to allow constant monitoring of the stack gas velocity. The impact (high pressure) opening plane of the pitot tube shall be even with or above the nozzle entry plane (see Method 2, Figure 2-6b, 40 CFR part 60, appendix A) during sampling. The Type S pitot tube assembly shall have a known coefficient, determined as outlined in section 10.0 of Method 2, 40 CFR part 60, appendix A.

6.1.1.4 Differential pressure gauge. Inclined manometer or equivalent device (two), as described in section 6.2 of Method 2, 40 CFR part 60, appendix A. One manometer shall be used for velocity head (Dp) readings, and the other, for orifice differential pressure readings.

6.1.1.5 Filter holder. Borosilicate glass, with a glass frit filter support and a silicone rubber gasket. The holder design shall provide a positive seal against leakage from the outside or around the filter. The holder shall be attached immediately at the outlet of the probe (or cyclone, if used).

6.1.1.6 Filter heating system. Any heating system capable of maintaining a temperature around the filter holder of 120 ± 14°C (248 ± 25°F) during sampling, or such other temperature as specified by an applicable subpart of the standards or approved by the Administrator for a particular application. Alternatively, the tester may opt to operate the equipment at a temperature lower than that specified. A temperature gauge capable of measuring temperature to within 3°C (5.4°F) shall be installed so that the temperature around the filter holder can be regulated and monitored during sampling. Heating systems other than the one shown in APTD-0581 may be used.

6.1.1.7 Temperature sensor. A temperature sensor capable of measuring temperature to within ±3°C (5.4°F) shall be installed so that the sensing tip of the temperature sensor is in direct contact with the sample gas, and the temperature around the filter holder can be regulated and monitored during sampling.

6.1.1.8 Condenser. The following system shall be used to determine the stack gas moisture content: four glass impingers connected in series with leak-free ground glass fittings. The first, third,

and fourth impingers shall be of the Greenburg-Smith design, modified by replacing the tip with a 1.3 cm (1/2 in.) ID glass tube extending to about 1.3 cm (1/2 in.) from the bottom of the flask. The second impinger shall be of the Greenburg-Smith design with the standard tip. The first and second impingers shall contain known quantities of water (section 8.3.1 of this method), the third shall be empty, and the fourth shall contain a known weight of silica gel or equivalent desiccant. A temperature sensor capable of measuring temperature to within 1°C (2°F) shall be placed at the outlet of the fourth impinger for monitoring.

6.1.1.9 Metering system. Vacuum gauge, leak-free pump, temperature sensors capable of measuring temperature to within 3°C (5.4°F), dry gas meter (DGM) capable of measuring volume to within 2 percent, and related equipment, as shown in Figure 5-1 of Method 5, 40 CFR part 60, appendix A. Other metering systems capable of maintaining sampling rates within 10 percent of isokinetic and of determining sample volumes to within 2 percent may be used, subject to the approval of the Administrator. When the metering system is used in conjunction with a pitot tube, the system shall allow periodic checks of isokinetic rates.

6.1.1.10 Sampling trains using metering systems designed for higher flow rates than that described in APTD-0581 or APTD-0576 may be used provided that the specifications of this method are met.

6.1.2 Barometer. Mercury, aneroid, or other barometer capable of measuring atmospheric pressure to within 2.5 mm (0.1 in.) Hg.

NOTE: The barometric reading may be obtained from a nearby National Weather Service station. In this case, the station value (which is the absolute barometric pressure) shall be requested and an adjustment for elevation differences between the weather station and sampling point shall be made at a rate of minus 2.5 mm (0.1 in) Hg per 30 m (100 ft) elevation increase or plus 2.5 mm (0.1 in) Hg per 30 m (100 ft) elevation decrease.

6.1.3 Gas density determination equipment. Temperature sensor and pressure gauge, as described in sections 6.3 and 6.4 of Method 2, 40 CFR part 60, appendix A, and gas analyzer, if necessary, as described in Method 3, 40 CFR part 60, appendix A. The temperature sensor shall, preferably, be permanently attached to the pitot tube or sampling probe in a fixed configuration, such that the tip of the sensor extends beyond the leading edge of the probe sheath and does not touch any metal. Alternatively, the sensor may be attached just prior to use in the field. Note, however, that if the temperature sensor is attached in the field, the sensor must be placed in an interference-free arrangement with respect to the Type S pitot tube openings (see Method 2, Figure 2-4, 40 CFR part 60, appendix A). As a second alternative, if a difference of not more than 1 percent in the average velocity measurement is to be introduced, the temperature sensor need not be attached to the probe or pitot tube. (This alternative is subject to the approval of the Administrator.)

6.2 Sample recovery. The following items are required for sample recovery:

6.2.1 Probe-liner and probe-nozzle brushes. Nylon or Teflon® bristle brushes with stainless steel wire handles. The probe brush shall have extensions (at least as long as the probe) constructed of stainless steel, nylon, Teflon®, or similarly inert material. The brushes shall be properly sized and shaped to brush out the probe liner and nozzle.

6.2.2 Wash bottles. Glass wash bottles are recommended. Polyethylene or tetrafluoroethylene (TFE) wash bottles may be used, but they may introduce a positive bias due to contamination from the bottle. It is recommended that acetone not be stored in polyethylene or TFE bottles for longer than a month.

6.2.3 Glass sample storage containers. Chemically resistant, borosilicate glass bottles, for acetone and methylene chloride washes and impinger water, 500 ml or 1,000 ml. Screw-cap liners shall either be rubber-backed Teflon® or shall be constructed so as to be leak-free and resistant to chemical attack by acetone or methylene chloride. (Narrow-mouth glass bottles have been found to be less prone to leakage.) Alternatively, polyethylene bottles may be used.

6.2.4 Petri dishes. For filter samples, glass, unless otherwise specified by the Administrator.

6.2.5 Graduated cylinder and/or balance. To measure condensed water, acetone wash and

methylene chloride wash used during field recovery of the samples, to within 1 ml or 1 g. Graduated cylinders shall have subdivisions no greater than 2 ml. Most laboratory balances are capable of weighing to the nearest 0.5 g or less. Any such balance is suitable for use here and in section 6.3.4 of this method.

6.2.6 Plastic storage containers. Air-tight containers to store silica gel.

6.2.7 Funnel and rubber policeman. To aid in transfer of silica gel to container; not necessary if silica gel is weighed in the field.

6.2.8 Funnel. Glass or polyethylene, to aid in sample recovery.

6.3 Sample analysis. The following equipment is required for sample analysis:

6.3.1 Glass or Teflon® weighing dishes.

6.3.2 Desiccator. It is recommended that fresh desiccant be used to minimize the chance for positive bias due to absorption of organic material during drying.

6.3.3 Analytical balance. To measure to within 0.1 mg.

6.3.4 Balance. To measure to within 0.5 g.

6.3.5 Beakers. 250 ml.

6.3.6 Hygrometer. To measure the relative humidity of the laboratory environment.

6.3.7 Temperature sensor. To measure the temperature of the laboratory environment.

6.3.8 Buchner fritted funnel. 30 ml size, fine (<50 micron)-porosity fritted glass.

6.3.9 Pressure filtration apparatus.

6.3.10 Aluminum dish. Flat bottom, smooth sides, and flanged top, 18 mm deep and with an inside diameter of approximately 60 mm.

7.0 Reagents and Standards.

7.1 Sample collection. The following reagents are required for sample collection:

7.1.1 Filters. Glass fiber filters, without organic binder, exhibiting at least 99.95 percent efficiency (<0.05 percent penetration) on 0.3 micron dioctyl phthalate smoke particles. The filter efficiency test shall be conducted in accordance with ASTM Method D 2986-95A (incorporated by reference in § 63.841 of this part). Test data from the supplier's quality control program are sufficient for this purpose. In sources containing $S0_2$ or $S0_3$, the filter material must be of a type that is unreactive to $S0_2$ or $S0_3$. Reference 10 in section 17.0 of this method may be used to select the appropriate filter.

7.1.2 Silica gel. Indicating type, 6 to 16 mesh. If previously used, dry at 175°C (350°F) for 2 hours. New silica gel may be used as received. Alternatively, other types of desiccants (equivalent or better) may be used, subject to the approval of the Administrator.

7.1.3 Water. When analysis of the material caught in the impingers is required, deionized distilled water shall be used. Run blanks prior to field use to eliminate a high blank on test samples.

7.1.4 Crushed ice.

7.1.5 Stopcock grease. Acetone-insoluble, heat-stable silicone grease. This is not necessary if screw-on connectors with Teflon® sleeves, or similar, are used. Alternatively, other types of stopcock grease may be used, subject to the approval of the Administrator. [Caution: Many stopcock greases are methylene chloride-soluble. Use sparingly and carefully remove prior to recovery to prevent contamination of the MCEM analysis.]

7.2 Sample recovery. The following reagents are required for sample recovery:

7.2.1 Acetone. Acetone with blank values < 1 ppm, by weight residue, is required. Acetone blanks may be run prior to field use, and only acetone with low blank values may be used. In no case shall a blank value of greater than 1E-06 of the weight of acetone used be subtracted from the sample weight.

NOTE: This is more restrictive than Method 5, 40 CFR part 60, appendix A. At least one vendor (Supelco Incorporated located in Bellefonte, Pennsylvania) lists <1 mg/l as residue for its Environmental Analysis Solvents.

7.2.2 Methylene chloride. Methylene chloride with a blank value <1.5 ppm, by weight, residue. Methylene chloride blanks may be run prior to field use, and only methylene chloride with low blank values may be used. In no case shall a blank value of greater than 1.6E-06 of the weight of methylene chloride used be subtracted from the sample weight.

NOTE: A least one vendor quotes <1 mg/l for Environmental Analysis Solvents-grade methylene chloride.

7.3 Sample analysis. The following reagents are required for sample analysis:

7.3.1 Acetone. Same as in section 7.2.1 of this method.

7.3.2 Desiccant. Anhydrous calcium sulfate, indicating type. Alternatively, other types of desiccants may be used, subject to the approval of the Administrator.

7.3.3 Methylene chloride. Same as in section 7.2.2 of this method.

8.0 Sample Collection, Preservation, Storage, and Transport.

NOTE: The complexity of this method is such that, in order to obtain reliable results, testers should be trained and experienced with the test procedures.

8.1 Pretest preparation. It is suggested that sampling equipment be maintained according to the procedures described in APTD-0576.

8.1.1 Weigh several 200 g to 300 g portions of silica gel in airtight containers to the nearest 0.5 g. Record on each container the total weight of the silica gel plus container. As an alternative, the silica gel need not be preweighed but may be weighed directly in its impinger or sampling holder just prior to train assembly.

8.1.2 A batch of glass fiber filters, no more than 50 at a time, should placed in a soxhlet extraction apparatus and extracted using methylene chloride for at least 16 hours. After extraction, check filters visually against light for irregularities, flaws, or pinhole leaks. Label the shipping containers (glass or plastic petri dishes), and keep the filters in these containers at all times except during sampling and weighing.

8.1.3 Desiccate the filters at 20 ± 5.6°C (68 ± 10°F) and ambient pressure for at least 24 hours and weigh at intervals of at least 6 hours to a constant weight, i.e., <0.5 mg change from previous weighing; record results to the nearest 0.1 mg. During each weighing the filter must not be exposed to the laboratory atmosphere for longer than 2 minutes and a relative humidity above 50 percent. Alternatively (unless otherwise specified by the Administrator), the filters may be oven-dried at 104°C (220°F) for 2 to 3 hours, desiccated for 2 hours, and weighed. Procedures other than those described, which account for relative humidity effects, may be used, subject to the approval of the Administrator.

8.2 Preliminary determinations.

8.2.1 Select the sampling site and the minimum number of sampling points according to Method 1, 40 CFR part 60, appendix A or as specified by the Administrator. Determine the stack pressure, temperature, and the range of velocity heads using Method 2, 40 CFR part 60, appendix A; it is recommended that a leak check of the pitot lines (see section 8.1 of Method 2, 40 CFR part 60, appendix A) be performed. Determine the moisture content using Approximation Method 4 (section 1.2 of Method 4, 40 CFR part 60, appendix A) or its alternatives to make isokinetic sampling rate settings. Determine the stack gas dry molecular weight, as described in section 8.6 of Method 2, 40 CFR part 60, appendix A; if integrated Method 3 sampling is used for molecular weight determination, the integrated bag sample shall be taken simultaneously with, and for the same total length of time as, the particulate sample run.

8.2.2 Select a nozzle size based on the range of velocity heads such that it is not necessary to change the nozzle size in order to maintain isokinetic sampling rates. During the run, do not change the nozzle size. Ensure that the proper differential pressure gauge is chosen for the range of velocity heads encountered (see section 8.2 of Method 2, 40 CFR part 60, appendix A).

8.2.3 Select a suitable probe liner and probe length such that all traverse points can be sampled. For large stacks, consider sampling from opposite sides of the stack to reduce the required probe length.

8.2.4 Select a total sampling time greater than or equal to the minimum total sampling time specified in the test procedures for the specific industry such that: (1) The sampling time per point is not less than 2 minutes (or some greater time interval as specified by the Administrator); and (2) the sample volume taken (corrected to standard conditions) will exceed the required minimum total gas sample volume. The latter is based on an approximate average sampling rate.

8.2.5 The sampling time at each point shall be the same. It is recommended that the number of

minutes sampled at each point be an integer or an integer plus one-half minute, in order to eliminate timekeeping errors.

8.2.6 In some circumstances (e.g., batch cycles), it may be necessary to sample for shorter times at the traverse points and to obtain smaller gas sample volumes. In these cases, the Administrator's approval must first be obtained.

8.3 Preparation of sampling train.

8.3.1 During preparation and assembly of the sampling train, keep all openings where contamination can occur covered until just prior to assembly or until sampling is about to begin. Place 100 ml of water in each of the first two impingers, leave the third impinger empty, and transfer approximately 200 to 300 g of preweighed silica gel from its container to the fourth impinger. More silica gel may be used, but care should be taken to ensure that it is not entrained and carried out from the impinger during sampling. Place the container in a clean place for later use in the sample recovery. Alternatively, the weight of the silica gel plus impinger may be determined to the nearest 0.5 g and recorded.

8.3.2 Using a tweezer or clean disposable surgical gloves, place a labeled (identified) and weighed filter in the filter holder. Be sure that the filter is properly centered and the gasket properly placed so as to prevent the sample gas stream from circumventing the filter. Check the filter for tears after assembly is completed.

8.3.3 When glass liners are used, install the selected nozzle using a Viton A 0-ring when stack temperatures are less than 260°C (500°F) and an asbestos string gasket when temperatures are higher. See APTD-0576 for details. Mark the probe with heat-resistant tape or by some other method to denote the proper distance into the stack or duct for each sampling point.

8.3.4 Set up the train as in Figure 5-1 of Method 5, 40 CFR part 60, appendix A, using (if necessary) a very light coat of silicone grease on all ground glass joints, greasing only the outer portion (see APTD-0576) to avoid possibility of contamination by the silicone grease. Subject to the approval of the Administrator, a glass cyclone may be used between the probe and filter holder when the total particulate catch is expected to exceed 100 mg or when water droplets are present in the stack gas.

8.3.5 Place crushed ice around the impingers.

8.4 Leak-check procedures.

8.4.1 Leak check of metering system shown in Figure 5-1 of Method 5, 40 CFR part 60, appendix A. That portion of the sampling train from the pump to the orifice meter should be leak-checked prior to initial use and after each shipment. Leakage after the pump will result in less volume being recorded than is actually sampled. The following procedure is suggested (see Figure 5-2 of Method 5, 40 CFR part 60, appendix A): Close the main valve on the meter box. Insert a one-hole rubber stopper with rubber tubing attached into the orifice exhaust pipe. Disconnect and vent the low side of the orifice manometer. Close off the low side orifice tap. Pressurize the system to 13 to 18 cm (5 to 7 in.) water column by blowing into the rubber tubing. Pinch off the tubing, and observe the manometer for 1 minute. A loss of pressure on the manometer indicates a leak in the meter box; leaks, if present, must be corrected.

8.4.2 Pretest leak check. A pretest leak-check is recommended but not required. If the pretest leak-check is conducted, the following procedure should be used.

8.4.2.1 After the sampling train has been assembled, turn on and set the filter and probe heating systems to the desired operating temperatures. Allow time for the temperatures to stabilize. If a Viton A 0-ring or other leak-free connection is used in assembling the probe nozzle to the probe liner, leak-check the train at the sampling site by plugging the nozzle and pulling a 380 mm (15 in.) Hg vacuum.

NOTE: A lower vacuum may be used, provided that it is not exceeded during the test.

8.4.2.2 If an asbestos string is used, do not connect the probe to the train during the leak check. Instead, leak-check the train by first plugging the inlet to the filter holder (cyclone, if applicable) and pulling a 380 mm (15 in.) Hg vacuum. (See NOTE in section 8.4.2.1 of this method). Then connect the probe to the train and perform the leak check at approximately 25 mm (1 in.) Hg vacuum; alternatively, the probe may be leak-checked with the rest of the sampling train, in one step, at 380 mm (15 in.) Hg

vacuum. Leakage rates in excess of 4 percent of the average sampling rate or 0.00057 m^3/min (0.02 cfm), whichever is less, are unacceptable.

8.4.2.3 The following leak check instructions for the sampling train described in APTD-0576 and APTD-0581 may be helpful. Start the pump with the bypass valve fully open and the coarse adjust valve completely closed. Partially open the coarse adjust valve and slowly close the bypass valve until the desired vacuum is reached. Do not reverse the direction of the bypass valve, as this will cause water to back up into the filter holder. If the desired vacuum is exceeded, either leak-check at this higher vacuum or end the leak check as shown below and start over.

8.4.2.4 When the leak check is completed, first slowly remove the plug from the inlet to the probe, filter holder, or cyclone (if applicable) and immediately turn off the vacuum pump. This prevents the water in the impingers from being forced backward into the filter holder and the silica gel from being entrained backward into the third impinger.

8.4.3 Leak checks during sample run. If, during the sampling run, a component (e.g., filter assembly or impinger) change becomes necessary, a leak check shall be conducted immediately before the change is made. The leak check shall be done according to the procedure outlined in section 8.4.2 of this method, except that it shall be done at a vacuum equal to or greater than the maximum value recorded up to that point in the test. If the leakage rate is found to be no greater than 0.00057 m^3/min (0.02 cfm) or 4 percent of the average sampling rate (whichever is less), the results are acceptable, and no correction will need to be applied to the total volume of dry gas metered; if, however, a higher leakage rate is obtained, either record the leakage rate and plan to correct the sample volume as shown in section 12.3 of this method or void the sample run.

NOTE: Immediately after component changes, leak checks are optional; if such leak checks are done, the procedure outlined in section 8.4.2 of this method should be used.

8.4.4 Post-test leak check. A leak check is mandatory at the conclusion of each sampling run. The leak check shall be performed in accordance with the procedures outlined in section 8.4.2 of this method, except that it shall be conducted at a vacuum equal to or greater than the maximum value reached during the sampling run. If the leakage rate is found to be no greater than 0.00057 m^3/min (0.02 cfm) or 4 percent of the average sampling rate (whichever is less), the results are acceptable, and no correction need be applied to the total volume of dry gas metered. If, however, a higher leakage rate is obtained, either record the leakage rate and correct the sample volume, as shown in section 12.4 of this method, or void the sampling run.

8.5 Sampling train operation. During the sampling run, maintain an isokinetic sampling rate (within 10 percent of true isokinetic unless otherwise specified by the Administrator) and a temperature around the filter of 120 ± 14°C (248 ± 25°F), or such other temperature as specified by an applicable subpart of the standards or approved by the Administrator.

8.5.1 For each run, record the data required on a data sheet such as the one shown in Figure 5-2 of Method 5, 40 CFR part 60, appendix A. Be sure to record the initial reading. Record the DGM readings at the beginning and end of each sampling time increment, when changes in flow rates are made, before and after each leak-check, and when sampling is halted. Take other readings indicated by Figure 5-2 of Method 5, 40 CFR part 60, appendix A at least once at each sample point during each time increment and additional readings when significant changes (20 percent variation in velocity head readings) necessitate additional adjustments in flow rate. Level and zero the manometer. Because the manometer level and zero may drift due to vibrations and temperature changes, make periodic checks during the traverse.

8.5.2 Clean the portholes prior to the test run to minimize the chance of sampling deposited material. To begin sampling, remove the nozzle cap and verify that the filter and probe heating systems are up to temperature and that the pitot tube and probe are properly positioned. Position the nozzle at the first traverse point with the tip pointing directly into the gas stream. Immediately start the pump and adjust the flow to isokinetic conditions. Nomographs are available, which aid in the rapid adjustment of the isokinetic sampling rate without excessive computations. These nomographs are designed for use when the Type S pitot tube coefficient (C_p) is 0.85 ± 0.02 and the stack gas equivalent density (dry

molecular weight) is 29 ± 4. APTD-0576 details the procedure for using the nomographs. If C_p and M_d are outside the above-stated ranges, do not use the nomographs unless appropriate steps (see Reference 7 in section 17.0 of this method) are taken to compensate for the deviations.

8.5.3 When the stack is under significant negative pressure (height of impinger stem), close the coarse adjust valve before inserting the probe into the stack to prevent water from backing into the filter holder. If necessary, the pump may be turned on with the coarse adjust valve closed.

8.5.4 When the probe is in position, block off the openings around the probe and porthole to prevent unrepresentative dilution of the gas stream.

8.5.5 Traverse the stack cross-section, as required by Method 1, 40 CFR part 60, appendix A or as specified by the Administrator, being careful not to bump the probe nozzle into the stack walls when sampling near the walls or when removing or inserting the probe through the portholes; this minimizes the chance of extracting deposited material.

8.5.6 During the test run, make periodic adjustments to keep the temperature around the filter holder at the proper level; add more ice and, if necessary, salt to maintain a temperature of less than 20°C (68°F) at the condenser/silica gel outlet. Also, periodically check the level and zero of the manometer.

8.5.7 If the pressure drop across the filter becomes too high, making isokinetic sampling difficult to maintain, the filter may be replaced in the midst of the sample run. It is recommended that another complete filter assembly be used rather than attempting to change the filter itself. Before a new filter assembly is installed, conduct a leak check (see section 8.4.3 of this method). The total PM weight shall include the summation of the filter assembly catches.

8.5.8 A single train shall be used for the entire sample run, except in cases where simultaneous sampling is required in two or more separate ducts or at two or more different locations within the same duct, or in cases where equipment failure necessitates a change of trains. In all other situations, the use of two or more trains will be subject to the approval of the Administrator.

NOTE: When two or more trains are used, separate analyses of the front-half and (if applicable) impinger catches from each train shall be performed, unless identical nozzle sizes were used in all trains, in which case the front-half catches from the individual trains may be combined (as may the impinger catches) and one analysis of the front-half catch and one analysis of the impinger catch may be performed.

8.5.9 At the end of the sample run, turn off the coarse adjust valve, remove the probe and nozzle from the stack, turn off the pump, record the final DGM reading, and then conduct a post-test leak check, as outlined in section 8.4.4 of this method. Also leak-check the pitot lines as described in section 8.1 of Method 2, 40 CFR part 60, appendix A. The lines must pass this leak check in order to validate the velocity head data.

8.6 Calculation of percent isokinetic. Calculate percent isokinetic (see Calculations, section 12.12 of this method) to determine whether a run was valid or another test run should be made. If there was difficulty in maintaining isokinetic rates because of source conditions, consult the Administrator for possible variance on the isokinetic rates.

8.7 Sample recovery.

8.7.1 Proper cleanup procedure begins as soon as the probe is removed from the stack at the end of the sampling period. Allow the probe to cool.

8.7.2 When the probe can be safely handled, wipe off all external PM near the tip of the probe nozzle and place a cap over it to prevent losing or gaining PM. Do not cap off the probe tip tightly while the sampling train is cooling down. This would create a vacuum in the filter holder, thus drawing water from the impingers into the filter holder.

8.7.3 Before moving the sample train to the cleanup site, remove the probe from the sample train, wipe off the silicone grease, and cap the open outlet of the probe. Be careful not to lose any condensate that might be present. Wipe off the silicone grease from the filter inlet where the probe was fastened and cap it. Remove the umbilical cord from the last impinger and cap the impinger. If a flexible line is used between the first impinger or condenser and the filter holder, disconnect the line at the filter holder and let any condensed water or liquid drain into the impingers or condenser. After

wiping off the silicone grease, cap off the filter holder outlet and impinger inlet. Ground-glass stoppers, plastic caps, or serum caps may be used to close these openings.

8.7.4 Transfer the probe and filter-impinger assembly to the cleanup area. This area should be clean and protected from the wind so that the chances of contaminating or losing the sample will be minimized.

8.7.5 Save a portion of the acetone and methylene chloride used for cleanup as blanks. Take 200 ml of each solvent directly from the wash bottle being used and place it in glass sample containers labeled "acetone blank" and "methylene chloride blank," respectively.

8.7.6 Inspect the train prior to and during disassembly and note any abnormal conditions. Treat the samples as follows:

8.7.6.1 Container No. 1. Carefully remove the filter from the filter holder, and place it in its identified petri dish container. Use a pair of tweezers and/or clean disposable surgical gloves to handle the filter. If it is necessary to fold the filter, do so such that the PM cake is inside the fold. Using a dry nylon bristle brush and/or a sharp-edged blade, carefully transfer to the petri dish any PM and/or filter fibers that adhere to the filter holder gasket. Seal the container.

8.7.6.2 Container No. 2. Taking care to see that dust on the outside of the probe or other exterior surfaces does not get into the sample, quantitatively recover PM or any condensate from the probe nozzle, probe fitting, probe liner, and front half of the filter holder by washing these components with acetone and placing the wash in a glass container. Perform the acetone rinse as follows:

8.7.6.2.1 Carefully remove the probe nozzle and clean the inside surface by rinsing with acetone from a wash bottle and brushing with a nylon bristle brush. Brush until the acetone rinse shows no visible particles, after which make a final rinse of the inside surface with acetone.

8.7.6.2.2 Brush and rinse the inside parts of the Swagelok fitting with acetone in a similar way until no visible particles remain.

8.7.6.2.3 Rinse the probe liner with acetone by tilting and rotating the probe while squirting acetone into its upper end so that all inside surfaces are wetted with acetone. Let the acetone drain from the lower end into the sample container. A funnel (glass or polyethylene) may be used to aid in transferring liquid washes to the container. Follow the acetone rinse with a probe brush. Hold the probe in an inclined position, squirt acetone into the upper end as the probe brush is being pushed with a twisting action through the probe, hold a sample container under the lower end of the probe, and catch any acetone and PM that is brushed from the probe. Run the brush through the probe three times or more until no visible PM is carried out with the acetone or until none remains in the probe liner on visual inspection. With stainless steel or other metal probes, run the brush through in the above-described manner at least six times, since metal probes have small crevices in which PM can be entrapped. Rinse the brush with acetone and quantitatively collect these washings in the sample container. After the brushing, make a final acetone rinse of the probe as described above.

8.7.6.2.4 It is recommended that two people clean the probe to minimize sample losses. Between sampling runs, keep brushes clean and protected from contamination.

8.7.6.2.5 After ensuring that all joints have been wiped clean of silicone grease, clean the inside of the front half of the filter holder by rubbing the surfaces with a nylon bristle brush and rinsing with acetone. Rinse each surface three times or more if needed to remove visible particulate. Make a final rinse of the brush and filter holder. Carefully rinse out the glass cyclone also (if applicable).

8.7.6.2.6 After rinsing the nozzle, probe, and front half of the filter holder with acetone, repeat the entire procedure with methylene chloride and save in a separate No. 2M container.

8.7.6.2.7 After acetone and methylene chloride washings and PM have been collected in the proper sample containers, tighten the lid on the sample containers so that acetone and methylene chloride will not leak out when it is shipped to the laboratory. Mark the height of the fluid level to determine whether leakage occurs during transport. Label each container to identify clearly its contents.

8.7.6.3 Container No. 3. Note the color of the indicating silica gel to determine whether it has been completely spent, and make a notation of its condition. Transfer the silica gel from the fourth impinger to its original container and seal the container. A funnel may make it easier to pour the silica

gel without spilling. A rubber policeman may be used as an aid in removing the silica gel from the impinger. It is not necessary to remove the small amount of dust particles that may adhere to the impinger wall and are difficult to remove. Since the gain in weight is to be used for moisture calculations, do not use any water or other liquids to transfer the silica gel. If a balance is available in the field, follow the procedure for Container No. 3 in section 11.2.3 of this method.

8.7.6.4 Impinger water. Treat the impingers as follows:

8.7.6.4.1 Make a notation of any color or film in the liquid catch. Measure the liquid that is in the first three impingers to within 1 ml by using a graduated cylinder or by weighing it to within 0.5 g by using a balance (if one is available). Record the volume or weight of liquid present. This information is required to calculate the moisture content of the effluent gas.

8.7.6.4.2 Following the determination of the volume of liquid present, rinse the back half of the train with water, add it to the impinger catch, and store it in a container labeled 3W (water).

8.7.6.4.3 Following the water rinse, rinse the back half of the train with acetone to remove the excess water to enhance subsequent organic recovery with methylene chloride and quantitatively recover to a container labeled 3S (solvent) followed by at least three sequential rinsings with aliquots of methylene chloride. Quantitatively recover to the same container labeled 3S. Record separately the amount of both acetone and methylene chloride used to the nearest 1 ml or 0.5g.

NOTE: Because the subsequent analytical finish is gravimetric, it is okay to recover both solvents to the same container. This would not be recommended if other analytical finishes were required.

8.8 Sample transport. Whenever possible, containers should be shipped in such a way that they remain upright at all times.

9.0 Quality Control.

9.1 Miscellaneous quality control measures.

Section	Quality Control Measure	Effect
8.4, 10.1-10.6	Sampling and equipment leak check and calibration	Ensure accurate measurement of stack gas flow rate, sample volume

9.2 Volume metering system checks. The following quality control procedures are suggested to check the volume metering system calibration values at the field test site prior to sample collection. These procedures are optional.

9.2.1 Meter orifice check. Using the calibration data obtained during the calibration procedure described in section 10.3 of this method, determine the $\Delta H_@$ for the metering system orifice. The $\Delta H_@$ is the orifice pressure differential in units of in. H_20 that correlates to 0.75 cfm of air at 528°R and 29.92 in. Hg. The $\Delta H_@$ is calculated as follows:

$$\Delta H_@ = 0.0319\ \Delta H\ \frac{T_m\ \Theta^2}{P_{bar}\ Y^2\ V_m^2}$$

where

0.0319 = (0.0567 in. Hg/°R)(0.75 cfm)^2;

ΔH = Average pressure differential across the orifice meter, in. H_20;

T_m = Absolute average DGM temperature, °R;

Θ = Total sampling time, min;

P_{bar} = Barometric pressure, in. Hg;

Y = DGM calibration factor, dimensionless;
V_m = Volume of gas sample as measured by DGM, dcf.

9.2.1.1 Before beginning the field test (a set of three runs usually constitutes a field test), operate the metering system (i.e., pump, volume meter, and orifice) at the $\Delta H_@$ pressure differential for 10 minutes. Record the volume collected, the DGM temperature, and the barometric pressure. Calculate a DGM calibration check value, Y_c, as follows:

$$Y_c = \frac{10}{V_m}\left[\frac{0.0319\ T_m}{P_{bar}}\right]^{\frac{1}{2}}$$

where
Y_c = DGM calibration check value, dimensionless;
10 = Run time, min.

9.2.1.2 Compare the Y_c value with the dry gas meter calibration factor Y to determine that: $0.97\ Y < Y_c < 1.03Y$. If the Y_c value is not within this range, the volume metering system should be investigated before beginning the test.

9.2.2 Calibrated critical orifice. A calibrated critical orifice, calibrated against a wet test meter or spirometer and designed to be inserted at the inlet of the sampling meter box, may be used as a quality control check by following the procedure of section 16.2 of this method.

10.0 Calibration and Standardization.

NOTE: Maintain a laboratory log of all calibrations.

10.1 Probe nozzle. Probe nozzles shall be calibrated before their initial use in the field. Using a micrometer, measure the ID of the nozzle to the nearest 0.025 mm (0.001 in.). Make three separate measurements using different diameters each time, and obtain the average of the measurements. The difference between the high and low numbers shall not exceed 0.1 mm (0.004 in.). When nozzles become nicked, dented, or corroded, they shall be reshaped, sharpened, and recalibrated before use. Each nozzle shall be permanently and uniquely identified.

10.2 Pitot tube assembly. The Type S pitot tube assembly shall be calibrated according to the procedure outlined in section 10.1 of Method 2, 40 CFR part 60, appendix A.

10.3 Metering system.

10.3.1 Calibration prior to use. Before its initial use in the field, the metering system shall be calibrated as follows: Connect the metering system inlet to the outlet of a wet test meter that is accurate to within 1 percent. Refer to Figure 5-5 of Method 5, 40 CFR part 60, appendix A. The wet test meter should have a capacity of 30 liters/revolution (1 ft^3/rev). A spirometer of 400 liters (14 ft^3) or more capacity, or equivalent, may be used for this calibration, although a wet test meter is usually more practical. The wet test meter should be periodically calibrated with a spirometer or a liquid displacement meter to ensure the accuracy of the wet test meter. Spirometers or wet test meters of other sizes may be used, provided that the specified accuracies of the procedure are maintained. Run the metering system pump for about 15 minutes with the orifice manometer indicating a median reading, as expected in field use, to allow the pump to warm up and to permit the interior surface of the wet test meter to be thoroughly wetted. Then, at each of a minimum of three orifice manometer settings, pass an exact quantity of gas through the wet test meter and note the gas volume indicated by the DGM. Also note the barometric pressure and the temperatures of the wet test meter, the inlet of the DGM, and the outlet of the DGM. Select the highest and lowest orifice settings to bracket the expected field operating range of the orifice. Use a minimum volume of 0.15 m^3 (5 cf) at all orifice settings. Record all the data on a form similar to Figure 5-6 of Method 5, 40 CFR part 60, appendix A, and calculate Y (the DGM calibration factor) and $\Delta H_@$ (the orifice calibration factor) at each orifice setting, as shown on Figure 5-6 of Method 5, 40 CFR part 60, appendix A. Allowable tolerances for individual Y and $\Delta H_@$ values are given in

Figure 5-6 of Method 5, 40 CFR part 60, appendix A. Use the average of the Y values in the calculations in section 12 of this method.

10.3.1.1. Before calibrating the metering system, it is suggested that a leak check be conducted. For metering systems having diaphragm pumps, the normal leak check procedure will not detect leakages within the pump. For these cases the following leak check procedure is suggested: make a 10-minute calibration run at 0.00057 m^3/min (0.02 cfm); at the end of the run, take the difference of the measured wet test meter and DGM volumes; divide the difference by 10 to get the leak rate. The leak rate should not exceed 0.00057 m^3/min (0.02 cfm).

10.3.2 Calibration after use. After each field use, the calibration of the metering system shall be checked by performing three calibration runs at a single, intermediate orifice setting (based on the previous field test) with the vacuum set at the maximum value reached during the test series. To adjust the vacuum, insert a valve between the wet test meter and the inlet of the metering system. Calculate the average value of the DGM calibration factor. If the value has changed by more than 5 percent, recalibrate the meter over the full range of orifice settings, as previously detailed.

NOTE: Alternative procedures, e.g., rechecking the orifice meter coefficient, may be used, subject to the approval of the Administrator.

10.3.3 Acceptable variation in calibration. If the DGM coefficient values obtained before and after a test series differ by more than 5 percent, either the test series shall be voided or calculations for the test series shall be performed using whichever meter coefficient value (i.e., before or after) gives the lower value of total sample volume.

10.4 Probe heater calibration. Use a heat source to generate air heated to selected temperatures that approximate those expected to occur in the sources to be sampled. Pass this air through the probe at a typical sample flow rate while measuring the probe inlet and outlet temperatures at various probe heater settings. For each air temperature generated, construct a graph of probe heating system setting versus probe outlet temperature. The procedure outlined in APTD-0576 can also be used. Probes constructed according to APTD-0581 need not be calibrated if the calibration curves in APTD-0576 are used. Also, probes with outlet temperature monitoring capabilities do not require calibration.

NOTE: The probe heating system shall be calibrated before its initial use in the field.

10.5 Temperature sensors. Use the procedure in section 10.3 of Method 2, 40 CFR part 60, appendix A to calibrate in-stack temperature sensors. Dial thermometers, such as are used for the DGM and condenser outlet, shall be calibrated against mercury-in-glass thermometers.

10.6 Barometer. Calibrate against a mercury barometer.

11.0 Analytical Procedure.

11.1 Record the data required on a sheet such as the one shown in Figure 315-1 of this method.

11.2 Handle each sample container as follows:

11.2.1 Container No. 1.

11.2.1.1 PM analysis. Leave the contents in the shipping container or transfer the filter and any loose PM from the sample container to a tared glass weighing dish. Desiccate for 24 hours in a desiccator containing anhydrous calcium sulfate. Weigh to a constant weight and report the results to the nearest 0.1 mg. For purposes of this section, the term "constant weight" means a difference of no more than 0.5 mg or 1 percent of total weight less tare weight, whichever is greater, between two consecutive weighings, with no less than 6 hours of desiccation time between weighings (overnight desiccation is a common practice). If a third weighing is required and it agrees within ±0.5 mg, then the results of the second weighing should be used. For quality assurance purposes, record and report each individual weighing; if more than three weighings are required, note this in the results for the subsequent MCEM results.

11.2.1.2 MCEM analysis. Transfer the filter and contents quantitatively into a beaker. Add 100 ml of methylene chloride and cover with aluminum foil. Sonicate for 3 minutes then allow to stand for 20 minutes. Set up the filtration apparatus. Decant the solution into a clean Buchner fritted funnel. Immediately pressure filter the solution through the tube into another clean, dry beaker. Continue decanting and pressure filtration until all the solvent is transferred. Rinse the beaker and filter with 10 to

20 ml methylene chloride, decant into the Buchner fritted funnel and pressure filter. Place the beaker on a low-temperature hot plate (maximum 40°C) and slowly evaporate almost to dryness. Transfer the remaining last few milliliters of solution quantitatively from the beaker (using at least three aliquots of methylene chloride rinse) to a tared clean dry aluminum dish and evaporate to complete dryness. Remove from heat once solvent is evaporated. Reweigh the dish after a 30-minute equilibrium in the balance room and determine the weight to the nearest 0.1 mg. Conduct a methylene chloride blank run in an identical fashion.

11.2.2 Container No. 2.

11.2.2.1 PM analysis. Note the level of liquid in the container, and confirm on the analysis sheet whether leakage occurred during transport. If a noticeable amount of leakage has occurred, either void the sample or use methods, subject to the approval of the Administrator, to correct the final results. Measure the liquid in this container either volumetrically to ±l ml or gravimetrically to ±0.5 g. Transfer the contents to a tared 250 ml beaker and evaporate to dryness at ambient temperature and pressure. Desiccate for 24 hours, and weigh to a constant weight. Report the results to the nearest 0.l mg.

11.2.2.2 MCEM analysis. Add 25 ml methylene chloride to the beaker and cover with aluminum foil. Sonicate for 3 minutes then allow to stand for 20 minutes; combine with contents of Container No. 2M and pressure filter and evaporate as described for Container 1 in section 11.2.1.2 of this method.

NOTES FOR MCEM ANALYSIS:

1. Light finger pressure only is necessary on 24/40 adaptor. A Chemplast adapter #15055-240 has been found satisfactory.

2. Avoid aluminum dishes made with fluted sides, as these may promote solvent "creep," resulting in possible sample loss.

3. If multiple samples are being run, rinse the Buchner fritted funnel twice between samples with 5 ml solvent using pressure filtration. After the second rinse, continue the flow of air until the glass frit is completely dry. Clean the Buchner fritted funnels thoroughly after filtering five or six samples.

11.2.3 Container No. 3. Weigh the spent silica gel (or silica gel plus impinger) to the nearest 0.5 g using a balance. This step may be conducted in the field.

11.2.4 Container 3W (impinger water).

11.2.4.1 MCEM analysis. Transfer the solution into a 1,000 ml separatory funnel quantitatively with methylene chloride washes. Add enough solvent to total approximately 50 ml, if necessary. Shake the funnel for 1 minute, allow the phases to separate, and drain the solvent layer into a 250 ml beaker. Repeat the extraction twice. Evaporate with low heat (less than 40°C) until near dryness. Transfer the remaining few milliliters of solvent quantitatively with small solvent washes into a clean, dry, tared aluminum dish and evaporate to dryness. Remove from heat once solvent is evaporated. Reweigh the dish after a 30-minute equilibration in the balance room and determine the weight to the nearest 0.1 mg.

11.2.5 Container 3S (solvent).

11.2.5.1 MCEM analysis. Transfer the mixed solvent to 250 ml beaker(s). Evaporate and weigh following the procedures detailed for container 3W in section 11.2.4 of this method.

11.2.6 Blank containers. Measure the distilled water, acetone, or methylene chloride in each container either volumetrically or gravimetrically. Transfer the "solvent" to a tared 250 ml beaker, and evaporate to dryness at ambient temperature and pressure. (Conduct a solvent blank on the distilled deionized water blank in an identical fashion to that described in section 11.2.4.1 of this method.) Desiccate for 24 hours, and weigh to a constant weight. Report the results to the nearest 0.l mg.

NOTE: The contents of Containers No. 2, 3W, and 3M as well as the blank containers may be evaporated at temperatures higher than ambient. If evaporation is done at an elevated temperature, the temperature must be below the boiling point of the solvent; also, to prevent "bumping," the evaporation process must be closely supervised, and the contents of the beaker must be swirled occasionally to maintain an even temperature. Use extreme care, as acetone and methylene chloride are highly flammable and have a low flash point.

12.0 Data Analysis and Calculations.

12.1 Carry out calculations, retaining at least one extra decimal figure beyond that of the acquired data. Round off figures after the final calculation. Other forms of the equations may be used as long as they give equivalent results.

12.2 Nomenclature.

A_n	=	Cross-sectional area of nozzle, m^3 (ft^3).
B_{ws}	=	Water vapor in the gas stream, proportion by volume.
C_a	=	Acetone blank residue concentration, mg/g.
C_s	=	Concentration of particulate matter in stack gas, dry basis, corrected to standard conditions, g/dscm (g/dscf).
I	=	Percent of isokinetic sampling.
L_a	=	Maximum acceptable leakage rate for either a pretest leak check or for a leak check following a component change; equal to 0.00057 m^3/min (0.02 cfm) or 4 percent of the average sampling rate, whichever is less.
L_i	=	Individual leakage rate observed during the leak check conducted prior to the "i^{th}" component change (I = 1, 2, 3...n), m^3/min (cfm).
L_p	=	Leakage rate observed during the post-test leak check, m^3/min (cfm).
m_a	=	Mass of residue of acetone after evaporation, mg.
m_n	=	Total amount of particulate matter collected, mg.
M_w	=	Molecular weight of water, 18.0 g/g-mole (18.0 lb/lb-mole).
P_{bar}	=	Barometric pressure at the sampling site, mm Hg (in Hg).
P_s	=	Absolute stack gas pressure, mm Hg (in. Hg).
P_{std}	=	Standard absolute pressure, 760 mm Hg (29.92 in. Hg).
R	=	Ideal gas constant, 0.06236 [(mm Hg)(m^3)]/[(°K) (g-mole)] {21.85 [(in. Hg)(ft^3)]/[(°R)(lb-mole)]}.
T_m	=	Absolute average dry gas meter (DGM) temperature (see Figure 5-2 of Method 5, 40 CFR part 60, appendix A), °K (°R).
T_s	=	Absolute average stack gas temperature (see Figure 5-2 of Method 5, 40 CFR part 60, appendix A), °K(°R).
T_{std}	=	Standard absolute temperature, 293°K (528°R).
V_a	=	Volume of acetone blank, ml.
V_{aw}	=	Volume of acetone used in wash, ml.
V_t	=	Volume of methylene chloride blank, ml.
V_{tw}	=	Volume of methylene chloride used in wash, ml.
V_{lc}	=	Total volume liquid collected in impingers and silica gel (see Figure 5-3 of Method 5, 40 CFR part 60, appendix A), ml.
V_m	=	Volume of gas sample as measured by dry gas meter, dcm (dcf).
$V_{m(std)}$	=	Volume of gas sample measured by the dry gas meter, corrected to standard conditions, dscm (dscf).
$V_{w(std)}$	=	Volume of water vapor in the gas sample, corrected to standard conditions, scm (scf).
V_s	=	Stack gas velocity, calculated by Equation 2-9 in Method 2, 40 CFR part 60, appendix A, using data obtained from Method 5, 40 CFR part 60, appendix A, m/sec (ft/sec).
W_a	=	Weight of residue in acetone wash, mg.
Y	=	Dry gas meter calibration factor.
ΔH	=	Average pressure differential across the orifice meter (see Figure 5-2 of Method 5, 40 CFR part 60, appendix A), mm H_20 (in H_20).
ρ_a	=	Density of acetone, 785.1 mg/ml (or see label on bottle).
ρ_w	=	Density of water, 0.9982 g/ml (0.00220l lb/ml).
ρ_t	=	Density of methylene chloride, 1316.8 mg/ml (or see label on bottle).
Θ	=	Total sampling time, min.
Θ_i	=	Sampling time interval, from the beginning of a run until the first component change,

min.

Θ_i = Sampling time interval, between two successive component changes, beginning with the interval between the first and second changes, min.

Θ_p = Sampling time interval, from the final (n^{th}) component change until the end of the sampling run, min.

13.6 = Specific gravity of mercury.

60 = Sec/min.

100 = Conversion to percent.

12.3 Average dry gas meter temperature and average orifice pressure drop. See data sheet (Figure 5-2 of Method 5, 40 CFR part 60, appendix A).

12.4 Dry gas volume. Correct the sample volume measured by the dry gas meter to standard conditions (20°C, 760 mm Hg or 68°F, 29.92 in Hg) by using Equation 315-1.

$$V = V_m Y \frac{T_{std}\left(P_{bar} + \frac{\Delta H}{13.6}\right)}{T_m P_{std}} \qquad \text{Eq. 315-1}$$

$$= V = K_1 V_m Y \frac{P_{bar} + \left(\frac{\Delta H}{13.6}\right)}{T_m}$$

where

K_1 = 0.3858 °K/mm Hg for metric units,

= 17.64 °R/in Hg for English units.

NOTE: Equation 315-1 can be used as written unless the leakage rate observed during any of the mandatory leak checks (i.e., the post-test leak check or leak checks conducted prior to component changes) exceeds L_a. If L_p or L_i exceeds L_a, Equation 315-1 must be modified as follows:

(a) Case I. No component changes made during sampling run. In this case, replace V_m in Equation 315-1 with the expression:

$$[V_m - (L_p - L_a)\,\Theta]$$

(b) Case II. One or more component changes made during the sampling run. In this case, replace V_m in Equation
315-1 by the expression:

$$[V_m - (L_1 - L_a)\,\Theta_1 - \sum_{i=2}^{n} (L_i - L_a)\,\Theta_i - (L_p - L_a)\,\Theta_p]$$

and substitute only for those leakage rates (L_i or L_p) which exceed L_a.

12.5 Volume of water vapor condensed.

$$V_{w(std)} = V_{lc} \frac{\rho_w \; R \; T_{std}}{M_w \; P_{std}} = K_2 \; V_{lc}$$ Eq. 315-2

where

K_2 = 0.001333 m^3/ml for metric units;
= 0.04706 ft^3/ml for English units.

12.6 Moisture content.

$$B_{ws} = \frac{V_{w(std)}}{V_{m(std)} + V_{w(std)}}$$ Eq. 315-3

NOTE: In saturated or water droplet-laden gas streams, two calculations of the moisture content of the stack gas shall be made, one from the impinger analysis (Equation 315-3), and a second from the assumption of saturated conditions. The lower of the two values of B_{ws} shall be considered correct. The procedure for determining the moisture content based upon assumption of saturated conditions is given in section 4.0 of Method 4, 40 CFR part 60, appendix A. For the purposes of this method, the average stack gas temperature from Figure 5-2 of Method 5, 40 CFR part 60, appendix A may be used to make this determination, provided that the accuracy of the in-stack temperature sensor is ±l°C (2°F).

12.7 Acetone blank concentration.

$$C_a = \frac{M_a}{V_a \; \rho_a}$$ Eq. 315-4

12.8 Acetone wash blank.

$$W_a = C_a \; V_{aw} \; \rho_a$$ Eq. 315-5

12.9 Total particulate weight. Determine the total PM catch from the sum of the weights obtained from Containers l and 2 less the acetone blank associated with these two containers (see Figure 315-1).

NOTE: Refer to section 8.5.8 of this method to assist in calculation of results involving two or more filter assemblies or two or more sampling trains.

12.10 Particulate concentration.

$$c_s = K_3 \; m_n / V_{m(std)}$$ Eq. 315-6

where

K = 0.001 g/mg for metric units;
= 0.0154 gr/mg for English units.

12.11 Conversion factors.

From	To	Multiply by
ft^3	m^3	0.02832
gr	mg	64.80004
gr/ft^3	mg/m3	2288.4
mg	g	0.001
gr	lb	1.429×10^{-4}

12.12 Isokinetic variation.

12.12.1 Calculation from raw data.

$$I = \frac{100\ T_s \left[K_4\ V_{lc} + \left(\frac{V_m\ Y}{T_m} \right) \left(P_{bar} + \frac{\Delta H}{13.6} \right) \right]}{60\ \Theta\ v_s\ P_s\ A_n} \qquad \text{Eq. 315-7}$$

where

K_4 = 0.003454 [(mm Hg)(m³)]/[(ml)(°K)] for metric units;
= 0.002669 [(in Hg)(ft³)]/[(ml)(°R)] for English units.

12.12.2 Calculation from intermediate values.

$$I = \frac{T_s\ V_{m(std)}\ P_{std}\ 100}{T_{std}\ v_s\ \Theta\ A_n\ P_s\ 60\ (1 - B_{ws})} \qquad \text{Eq. 315-8}$$

$$= K_5 \frac{T_s\ V_{m(std)}}{P_s\ v_s\ A_n\ \Theta\ (1 - B_{ws})}$$

where

K_5 = 4.320 for metric units;
= 0.09450 for English units.

12.12.3 Acceptable results. If 90 percent ≤ I ≤ 110 percent, the results are acceptable. If the PM or MCEM results are low in comparison to the standard, and "I" is over 110 percent or less than 90 percent, the Administrator may opt to accept the results. Reference 4 in the Bibliography may be used to make acceptability judgments. If "I" is judged to be unacceptable, reject the results, and repeat the test.

12.13 Stack gas velocity and volumetric flow rate. Calculate the average stack gas velocity and volumetric flow rate, if needed, using data obtained in this method and the equations in sections 5.2 and 5.3 of Method 2, 40 CFR part 60, appendix A.

12.14 MCEM results. Determine the MCEM concentration from the results from Containers 1, 2, 2M, 3W, and 3S less the acetone, methylene chloride, and filter blanks value as determined in the following equation:

$$m_{mcem} = \Sigma m_{total} - w_a - w_t - f_b$$

13.0 Method Performance. [Reserved]

14.0 Pollution Prevention. [Reserved]

15.0 Waste Management. [Reserved]

16.0 Alternative Procedures.

16.1 Dry gas meter as a calibration standard. A DGM may be used as a calibration standard for volume measurements in place of the wet test meter specified in section 16.1 of this method, provided that it is calibrated initially and recalibrated periodically as follows:

16.1.1 Standard dry gas meter calibration.

16.1.1.1. The DGM to be calibrated and used as a secondary reference meter should be of high quality and have an appropriately sized capacity, e.g., 3 liters/rev (0.1 ft^3/rev). A spirometer (400 liters or more capacity), or equivalent, may be used for this calibration, although a wet test meter is usually more practical. The wet test meter should have a capacity of 30 liters/rev (1 ft^3/rev) and be capable of measuring volume to within 1.0 percent; wet test meters should be checked against a spirometer or a liquid displacement meter to ensure the accuracy of the wet test meter. Spirometers or wet test meters of other sizes may be used, provided that the specified accuracies of the procedure are maintained.

16.1.1.2 Set up the components as shown in Figure 5-7 of Method 5, 40 CFR part 60, appendix A. A spirometer, or equivalent, may be used in place of the wet test meter in the system. Run the pump for at least 5 minutes at a flow rate of about 10 liters/min (0.35 cfm) to condition the interior surface of the wet test meter. The pressure drop indicated by the manometer at the inlet side of the DGM should be minimized (no greater than 100 mm H_2O [4 in. H_2O] at a flow rate of 30 liters/min [1 cfm]). This can be accomplished by using large- diameter tubing connections and straight pipe fittings.

16.1.1.3 Collect the data as shown in the example data sheet (see Figure 5-8 of Method 5, 40 CFR part 60, appendix A). Make triplicate runs at each of the flow rates and at no less than five different flow rates. The range of flow rates should be between 10 and 34 liters/min (0.35 and 1.2 cfm) or over the expected operating range.

16.1.1.4 Calculate flow rate, Q, for each run using the wet test meter volume, V_w, and the run time, q. Calculate the DGM coefficient, Y_{ds}, for each run. These calculations are as follows:

$$Q = K_1 \frac{P_{bar} V_w}{(t_w + t_{std}) \Theta} \qquad \text{Eq. 315-9}$$

$$Y_{ds} = \frac{V_w (T_{ds} + T_{std}) P_{bar}}{V_{ds} (T_w + T_{std})(P_{bar} + \frac{\Delta p}{13.6})} \qquad \text{Eq. 315-10}$$

where

K_1 = 0.3858 for international system of units (SI);
17.64 for English units;

P_{bar} = Barometric pressure, mm Hg (in Hg);

V_w = Wet test meter volume, liter (ft^3);

t_w = Average wet test meter temperature, °C (°F);

t_{std} = 273°C for SI units; 460°F for English units;

Θ = Run time, min;

t_{ds} = Average dry gas meter temperature, °C (°F);

V_{ds} = Dry gas meter volume, liter (ft^3);

Δp = Dry gas meter inlet differential pressure, mm H_2O (in H_2O).

16.1.1.5 Compare the three Y_{ds} values at each of the flow rates and determine the maximum and minimum values. The difference between the maximum and minimum values at each flow rate should be no greater than 0.030. Extra sets of triplicate runs may be made in order to complete this requirement. In addition, the meter coefficients should be between 0.95 and 1.05. If these specifications cannot be

met in three sets of successive triplicate runs, the meter is not suitable as a calibration standard and should not be used as such. If these specifications are met, average the three Y_{ds} values at each flow rate resulting in five average meter coefficients, Y_{ds}.

16.1.1.6 Prepare a curve of meter coefficient, Y_{ds}, versus flow rate, Q, for the DGM. This curve shall be used as a reference when the meter is used to calibrate other DGMs and to determine whether recalibration is required.

16.1.2 Standard dry gas meter recalibration.

16.1.2.1 Recalibrate the standard DGM against a wet test meter or spirometer annually or after every 200 hours of operation, whichever comes first. This requirement is valid provided the standard DGM is kept in a laboratory and, if transported, cared for as any other laboratory instrument. Abuse to the standard meter may cause a change in the calibration and will require more frequent recalibrations.

16.1.2.2 As an alternative to full recalibration, a two-point calibration check may be made. Follow the same procedure and equipment arrangement as for a full recalibration, but run the meter at only two flow rates (suggested rates are 14 and 28 liters/min [0.5 and 1.0 cfm]). Calculate the meter coefficients for these two points, and compare the values with the meter calibration curve. If the two coefficients are within 1.5 percent of the calibration curve values at the same flow rates, the meter need not be recalibrated until the next date for a recalibration check.

16.2 Critical orifices as calibration standards. Critical orifices may be used as calibration standards in place of the wet test meter specified in section 10.3 of this method, provided that they are selected, calibrated, and used as follows:

16.2.1 Selection of critical orifices.

16.2.1.1 The procedure that follows describes the use of hypodermic needles or stainless steel needle tubing that has been found suitable for use as critical orifices. Other materials and critical orifice designs may be used provided the orifices act as true critical orifices; i.e., a critical vacuum can be obtained, as described in section 7.2.2.2.3 of Method 5, 40 CFR part 60, appendix A. Select five critical orifices that are appropriately sized to cover the range of flow rates between 10 and 34 liters/min or the expected operating range. Two of the critical orifices should bracket the expected operating range. A minimum of three critical orifices will be needed to calibrate a Method 5 DGM; the other two critical orifices can serve as spares and provide better selection for bracketing the range of operating flow rates. The needle sizes and tubing lengths shown in Table 315-1 give the approximate flow rates indicated in the table.

16.2.1.2 These needles can be adapted to a Method 5 type sampling train as follows: Insert a serum bottle stopper, 13 x 20 mm sleeve type, into a 0.5 in Swagelok quick connect. Insert the needle into the stopper as shown in Figure 5-9 of Method 5, 40 CFR part 60, appendix A.

16.2.2 Critical orifice calibration. The procedure described in this section uses the Method 5 meter box configuration with a DGM as described in section 6.1.1.9 of this method to calibrate the critical orifices. Other schemes may be used, subject to the approval of the Administrator.

16.2.2.1 Calibration of meter box. The critical orifices must be calibrated in the same configuration as they will be used; i.e., there should be no connections to the inlet of the orifice.

16.2.2.1.1 Before calibrating the meter box, leak-check the system as follows: Fully open the coarse adjust valve and completely close the bypass valve. Plug the inlet. Then turn on the pump and determine whether there is any leakage. The leakage rate shall be zero; i.e., no detectable movement of the DGM dial shall be seen for 1 minute.

16.2.2.1.2 Check also for leakages in that portion of the sampling train between the pump and the orifice meter. See section 5.6 of Method 5, 40 CFR part 60, appendix A for the procedure; make any corrections, if necessary. If leakage is detected, check for cracked gaskets, loose fittings, worn 0-rings, etc. and make the necessary repairs.

16.2.2.1.3 After determining that the meter box is leakless, calibrate the meter box according to the procedure given in section 5.3 of Method 5, 40 CFR part 60, appendix A. Make sure that the wet test meter meets the requirements stated in section 7.1.1.1 of Method 5, 40 CFR part 60, appendix A. Check the water level in the wet test meter. Record the DGM calibration factor, Y.

Particulate analysis			
Plant			
Date			
Run No.			
Filter No.			
Amount liquid lost during transport			
Acetone blank volume (ml)			
Acetone blank concentration (Eq.315-4) (mg/mg)			
Acetone wash blank (Eq.315-5) (mg)			
	Final weight (mg)	Tare weight (mg)	Weight gain (mg)
Container No. 1			
Container No. 2			
Total			
Less Acetone blank			
Weight of particulate matter			
Moisture analysis			
	Final volume (mg)	Initial volume (mg)	Liquid collected (mg)
Impingers	Note 1	Note 1	
Silica gel			
Total			

FIGURE 315-1. Particulate and MCEM Analyses

Note 1: Convert volume of water to weight by multiplying by the density of water (1 g/ml).

MCEM analysis					
Container No.	Final weight (mg)	Tare of aluminum dish (mg)	Weight gain	Acetone wash volume (ml)	Methylene chloride wash volume (ml)
1					
2+2M					
3W					
3S					
Total			$\sum m_{total}$	$\sum v_{aw}$	$\sum v_{tw}$
Less acetone wash blank (mg) (not to exceed 1 mg/l of acetone used)			$w_a = c_a \rho_a \sum v_{aw}$		
Less methylene chloride wash blank (mg) (not to exceed 1.5 mg/l of methylene chloride used)			$w_t = c_t \rho_t \sum v_{tw}$		
Less filter blank (mg) (not to exceed.... (mg/filter)			F_b		
MCEM weight (mg)			$m_{MCEOM} = \sum m_{total} - w_a - w_t - f_b$		

FIGURE 315-1 (Continued). Particulate And MCEM Analyses

* * * * *

State of California
California Environmental Protection Agency
Air Resources Board

Method 429

Determination of Polycyclic Aromatic Hydrocarbon (PAH) Emissions from Stationary Sources

Adopted: September 12, 1989
Amended: [insert date of amendment]

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Determination of the Method Detection Limit 119

Method 429

Determination of Polycyclic Aromatic Hydrocarbon (PAH) Emissions From Stationary Sources

1. INTRODUCTION

1.1 APPLICABILITY

This method applies to the determination of nineteen polycyclic aromatic hydrocarbons (PAH) in emissions from stationary sources. These are listed in Table 1. The sensitivity which can ultimately be achieved for a given sample will depend upon the types and concentrations of other chemical compounds in the sample as well as the original sample size and instrument sensitivity.

Any modification of this method beyond those expressly permitted shall be considered a major modification subject to approval by the Executive Officer of the California Air Resources Board or his or her authorized representative.

1.2 PRINCIPLE

Particulate and gaseous phase PAH are extracted isokinetically from the stack and collected on XAD-2 resin, in impingers, or in upstream sampling train components (filter, probe, nozzle). Only the total amounts of each PAH in the stack emissions can be determined with this method. It has not been demonstrated that the partitioning in the different parts of the sampling train is representative of the partitioning in the stack gas sample for particulate and gaseous PAH.

The required analytical method is isotope dilution mass spectrometry combined with high resolution gas chromatography. This entails the addition of internal standards to all samples in known quantities, matrix-specific extraction of the sample with appropriate organic solvents, preliminary fractionation and cleanup of extracts and analysis of the processed extract for PAH using high-resolution capillary column gas chromatography coupled with either low resolution mass spectrometry (HRGC/LRMS), or high resolution mass spectrometry (HRGC/HRMS). To ensure comparable results, the same MS method must be used for samples collected at all tested locations at those sources where more than one location is tested.

Minimum performance criteria are specified herein which must be satisfied to ensure the quality of the sampling and analytical data.

1.3 DEFINITIONS AND ABBREVIATIONS

1.3.1 Internal Standard

An internal standard is a ^{2}H-labelled PAH which is added to all field samples, blanks and other quality control samples before extraction. It is also present in the calibration solutions. Internal standards are used to measure the

concentration of the analyte and surrogate compounds. There is one internal standard assigned to each of the target analytes and surrogates.

1.3.2 Surrogate Standard

A surrogate standard is a labelled compound added in a known amount to the XAD-2 resin of the sampling train, and allowed to equilibrate with the matrix before the gaseous emissions are sampled. The surrogate standard has to be a component that can be completely resolved, is not present in the sample, and does not have any interference effects. Its measured concentration in the extract is an indication of the how effectively the sampling train retains PAH collected on the XAD-2 resin. The recovery of the surrogate standards in the field blanks can be used to determine whether there are any matrix effects caused by time or conditions under which the sample is transported and stored prior to analysis.

1.3.3 Alternate Standard

An alternate standard is a ^{2}H-labelled PAH compound which is added to the impinger contents prior to extraction to estimate the extraction efficiency for PAHs in the impinger sample.

1.3.4 Recovery Standard

A recovery standard is a ^{2}H-labelled PAH compound which is added to the extracts of all field samples, blanks, and quality control samples before HRGC/MS analysis. It is also present in the calibration solution. The response of the internal standards relative to the recovery standard is used to estimate the recovery of the internal standards. The internal standard recovery is an indicator of the overall performance of the analysis.

1.3.5 Relative Response Factor

The relative response factor is the response of the mass spectrometer to a known amount of an analyte or labelled compound (internal standard or surrogate standard) relative to a known amount of an internal standard or another labelled compound (recovery standard or internal standard).

1.3.6 Performance Standard

A performance standard is a mixture of known amounts of selected standard compounds. It is used to demonstrate continued acceptable performance of the GC/MS system. These checks include system performance checks, calibration checks, quality checks, matrix recovery, and surrogate recoveries.

1.3.7 Performance Evaluation Sample

A performance evaluation sample is one prepared by EPA or other laboratories that contains known concentrations of method analytes, and has been analyzed by multiple laboratories to determine statistically the accuracy and precision that can be expected when a method is performed by a

competent analyst. Concentrations must be in the same range as typical field samples. Analyte concentrations are not known by the analyst.

1.3.8 Laboratory Control Sample

A laboratory control sample is one that contains known concentrations of method analytes that is analyzed by a laboratory to demonstrate that it can obtain acceptable identifications and measurements with procedures to be used to analyze field samples containing the same analytes. Analyte concentrations are known by the analyst. The laboratory must prepare the control sample from stock standards prepared independently from those used for calibration.

1.3.9 End User

The regulating agency shall be considered the end user if this test method is conducted for regulatory purposes, or the regulating agency shall designate the end user for the purposes of this method. Otherwise the end user shall be the party who defrays the cost of performing this test method. In any case, the pre-test protocol (Section 2) must identify the end user.

1.3.10 Tester

Usually the tester is a contract engineering firm that performs the sampling procedures and delegates responsibility for specific analytical procedures to an analytical group (usually part of a subcontracting laboratory firm). In some cases, the tester may be part of the regulating agency. The tester shall be the party ultimately responsible for the performance of this test method whether directly or indirectly through the co-ordination of the efforts of the analytical group and the efforts of the sampling group.

1.3.11 Analyst

This term refers to the analytical group that performs the analytical procedures to generate the required analytical data.

1.3.12 Source Target Concentration

This is the target concentration for each emitted PAH of interest specified by the end user of the test results. The target concentration shall be expressed in units of mass of target substance per volume of emissions; typical units are nanograms per dry standard cubic meter or micrograms per dry standard cubic meter (ng/dscm or μg/dscm)

1.3.13 The Method Detection Limit

The method detection limit (MDL) is based on the precision of detection of the analyte concentration near the detection limit. It is the product of the standard deviation of seven replicate analyses of resin samples spiked with low concentrations of the analyte and Student's t value for 6 degrees of freedom at a confidence level of 99 %.

1.3.14 The Practical Quantitation Limit

The practical quantitation limit (PQL) is a limit for each compound at or below which data must not be reported. It is the minimum sample mass that must be collected in the sampling train to allow detection during routine laboratory operation within the precision limits established by the MDL determination. The PQLs will be estimated at 5 times the MDL for those PAH that are not contaminants of the resin. The PQL for the remainder will be estimated at 5 times the blank XAD-2 resin level.

2. THE SOURCE TEST PROTOCOL

Every performance of this test method shall have an identified operator of the source to be tested, an identified end user of the test method results, and an identified tester who performs this test method. Figure 1 is a summary of the responsibilities of the parties involved in the coordination and performance of the source test. The protocol for the entire test procedure should be understood and agreed upon by the responsible parties prior to the start of the test.

2.1 RESPONSIBILITIES OF THE END USER AND THE TESTER

2.1.1 The End User

Before testing may begin, the end user of the test results (1.3.9) shall specify a source target concentration for each of the PAH to be determined by this method using the guidelines of Section 2.2.1.

The end user shall approve the source test protocol only after reviewing the document and determining that the minimum pre-test requirements (Sections 2.2 to 2.5) have been met.

2.1.2 The Tester

The tester (1.3.10) shall have the primary responsibility for the performance of the test method, and shall co-ordinate the efforts of the analytical group and the efforts of the sampling group.

The tester shall be responsible for the selection of an analyst with documented experience in the satisfactory performance of the method. The tester shall obtain from the analyst all of the analytical data (Section 2.3) that are required for pre-test calculations of sampling parameters.

Before performing the rest of this method, the tester shall develop and write a source test protocol (Section 2.2) to help ensure that useful test method results are obtained. The tester shall plan the test based on the information provided by the end user, the results of pre-test surveys of the source, and the tester's calculations of target source testing parameters (Section 2,2).

The tester shall be responsible for ensuring that all of the sampling and analytical reporting requirements (Section 10) are met.

2.1.3 The Analyst

The analyst shall be responsible for performing all of the required analytical procedures described in this test method and reporting the results as required by Sections 2.3, 4.2.1, 4.2.2, 10.1.1, 10.1.2, 10.1.3, and 10.2).

2.2 PRE-TEST REQUIREMENTS

The source test protocol shall specify the test performance criteria of the end user and all assumptions, required data and calculated targets for the following testing parameters:

(1) source target concentration of each emitted PAH of interest (2.2.1),

(2) preliminary analytical data (2.3) for each target PAH, and

(3) planned sampling parameters (2.5.4, 2.5.5, and 2.5.6).

The protocol must demonstrate that the testing parameters calculated by the tester will meet the needs of the end user. The source test protocol shall describe the procedures for all aspects of the source test including information on supplies, logistics, personnel and other resources necessary for an efficient and coordinated test.

The source test protocol shall identify the end user of the results, the tester, the analytical group, and the sampling group, and the protocol shall be signed by the end user of the results and the tester.

The tester shall not proceed with the performance of the remainder of this method unless the source test protocol is signed by the tester and the end user.

2.2.1 Source Target Concentration (STC)

The tester shall not proceed with the test unless a target concentration has been chosen. This will be the primary reporting objective of the emissions test. The end user shall select a basis for determining each target concentration from: a) regulatory limits, b) environmental risk assessments, and (c) the interests of the end user, the tester, and the stationary source.

2.2.1.1 Regulatory Limits

The regulatory limit shall be the basis for determining a target concentration for stationary source emissions in those cases where the purpose of the emissions test is to demonstrate compliance with the established regulatory limit.

2.2.1.2 Environmental Risk Assessments

In some cases testing is conducted for an environmental risk assessment. A pre-test estimate of the permissible risk shall then be used to determine the target concentration for stationary source emissions.

Note that some risk assessment methodologies will assume that a PAH is present at the detection limit or one half of the detection limit even when the compound is not detected. This is inappropriate for planning for the performance of the test method because by definition a substance cannot be detected at one half of its detection limit. In such cases, the target sampling parameter must be the maximum practical sample volume.

2.2.1.3 Interests of the End User, the Tester and the Stationary Source

In cases where the emissions test is not being performed to demonstrate compliance with a regulation, nor is it required for a risk assessment, the end user may use emissions results from previous tests of the facility or from similar facilities.

If estimates of the emissions are not availble, the tester must conduct a preliminary test at each emissions point of interest. This target concentration is necessary for the calculation of the target sampling parameters required by Section 2.5. Therefore, the emissions measured during the preliminary test must be representative of source operation. The tester must document operating conditions, and know from historical data, the extent to which the results of this preliminary run are representative of emissions from the source. This will require documentation of operating conditions during the preliminary test, and a knowledge of the potential variability in emissions with differences in source operation.

As an alternative to conducting a preliminary test, the end user may specify, as a sampling target, the longest practical sampling time so as to obtain the lowest practically achievable source reporting limit (Section 2.5.6).

2.3 REQUIRED PRELIMINARY ANALYTICAL DATA

2.3.1 Results of Blank Contamination Checks

The tester must obtain from the analyst the results of the PAH contamination checks. The analytical report must satisfy the reporting requirements of Sections 10 and 10.1.

The analyst shall use the procedures described in Sections 4.2.1 and 4.2.2 to clean the sampling media (filters and XAD-2 resin) and check for PAH contamination.

Table 3 shows the results of analyses of different lots of re-cleaned XAD-2 resin. The purpose of this table is to show typical variability. Actual results may vary from one test to another.

2.3.2 The Method Detection Limit

The method detection limit (MDL) must be determined by the same analyst (1.3.11) that will perform the analyses subsequent to sampling. Before estimating the method detection limit (MDL), the analyst shall identify those PAH that are contaminants of the XAD-2 resin using the procedures described in Sections 4.2.2.1 to 4.2.2.4. The analyst shall determine the MDL as described in Section 8.3 and Appendix A.

2.3.3 The Practical Quantitation Limit

The analyst shall calculate the practical quantitation limits (PQLs) for the target PAH. This value will be 5 times the MDL or 5 times the XAD-2 background level for those compounds that have been identified by the analyst as contaminants.

Table 2 lists practical quantitation limits obtained during ARB's development of this method. The values for the PQLs will vary with the performance of individual laboratories. Therefore, the tester must obtain PQL values for all of the target analytes from the analyst .

2.4 EXPECTED RANGE IN TARGET CONCENTRATIONS OF INDIVIDUAL PAHs

The PAH compounds in a source test sample can show large differences in concentrations. A sample that might provide sufficient analyte for the detection and quantitation of the lowest concentration PAH could contain levels of other PAHs that exceed the upper limit of the method.

In some cases the solution is two GC/MS injections - first with the undiluted extract, and then again after appropriate dilution of the extract. At other times the required minimum dilution might be so large as to result in the reduction of the internal standard response below the minimum required by the method. With prior notification of expected levels of the target analytes, the analyst can modify the preparation of the samples so that useful results might be obtained. All major modifications must be approved by the Executive Officer.

2.5 SAMPLING RUNS, TIME, AND VOLUME

2.5.1 Sampling Runs

A test shall include at least three sampling runs in series and a blank sampling train.

2.5.2 Minimum Sample Volume (MSV)

This is the minimum sample volume that must be collected in the sampling train to provide the minimum reportable mass of PAH for quantitation. It must be based on a) the practical quantitation limit (2.3.3), b) the source target concentration (2.2.1), and c) sampling limitations. Use Equation 429-1 to calculate the target MSV for each PAH analyte.

$$MSV(dscm) = PQL \times \frac{1}{STC} \qquad 429\text{-}1$$

Where:

PQL = The practical quantitation limit, ng/sample (Section 2.3.3)
STC = The source target concentration, ng/dscm (Section 2.2.1)

2.5.3 Minimum Sampling Time (MST)

This is the minimum time required to collect the minimum sample volume at the expected average volumetric sampling rate (VSR). Use Equation 429-2 to calculate the minimum sampling time (MST) required to collect the minimum sample volume calculated in Section 2.5.2. The tester must use an average volumetric sampling rate (VSR) appropriate for the source to be tested.

$$MST(hours) = \frac{MSV}{VSR} \times \frac{1}{0.028317} \times \frac{1}{60} \qquad 429\text{-}2$$

Where:

VSR = Expected average volumetric sampling rate, dscfm
60 = Factor to convert minutes to hours
0.028317 = Factor to convert dscf to dscm

The end user must decide whether the MSTs are all practically feasible and whether they can be increased to allow for any deviation from the sampling and analytical conditions assumed by the test plan. Based on this decision, the tester must use either Section 2.5.4 (a) or 2.5.4 (b) to calculate a planned sample volume (PSV).

2.5.4 Planned Sample Volume (PSV)

This is the volume of emissions that must be sampled to provide the target analytes at levels between the PQL and the limit of linearity. The planned sample volume is the primary sampling target whenever practically feasible. The PSV is calculated according to either 2.5.4 (a) or 2.5.4 (b).

(a) If the end user has decided that the MSTs can be increased, the tester must use Equation 429-3 to calculate the PSV using the largest of the 19 MSV values calculated in Section 2.5.2. and the largest value for F that will give a practically achievable sample volume that provides the target analytes at levels between the PQL and the limit of linearity. Use this PSV to calculate the planned sampling time (Section 2.5.5 a) and Equation 429-6.

(b) If the MSTs are not all practically achievable, the tester and the end user must agree on a maximum practical sampling time (Section 2.5.5b). This value must then be used for the PST in Equation 429-4 to calculate the PSV. The tester must identify in the

source test protocol the target analytes for which the PSV is lower than the MSV. The primary reporting objective of the test cannot be achieved for those analytes. If the primary reporting objective cannot be achieved for all of the target analytes, it must be discussed in the protocol and the alternative reporting objective (Section 2.5.6) must be approved by the end user of the results.

The volume of sample that is actually collected will be determined by practical sampling limitations, the intended use of the data and the level of uncertainty that the end user can tolerate in the measurement of the target concentrations. This uncertainty will decrease as the value of F (Equation 429-5) increases.

$$PSV(dscm) = MSV \times F \qquad 429\text{-}3$$

$$PSV(dscm) = PST \times VSR \qquad 429\text{-}4$$

$$F = \frac{PSV}{MSV} \qquad 429\text{-}5$$

Where:

PST = Planned sampling time from Section 2.5.5
F = A safety factor (> 1) that allows for deviation from ideal sampling and analytical conditions

2.5.5 Planned Sampling Time (PST)

Two options are available for calculating the planned sampling time depending on whether the primary objective can be achieved for all of the target analytes.

(a) The planned sampling time (PST) shall be long enough to 1) collect the planned sample volume with reportable levels of the target analytes and 2) sample representative operating conditions of the source. If the average sampling rate (VSR) used to estimate the planned sampling time cannot be achieved in the field (Section 4.4.4.1), the sampling time must be recalculated using the actual VSR and the target PSV in equation 429-6.

(b) The planned sampling time shall be a practical maximum approved by the end user and it shall be long enough to sample representative operating conditions of the source.

$$PST(hours) = \frac{PSV}{VSR} \times \frac{1}{0.028317} \times \frac{1}{60} \qquad 429\text{-}6$$

2.5.6 Preliminary Estimate of Source Reporting Limit (SRL)

Before the test proceeds, the end user and the tester shall agree on a preliminary estimate of the source reporting limit for each target PAH. The SRL shall be calculated using Equation 429-7. The planned sample volume will contain reportable levels of a given analyte if that analyte is present in the emissions at a concentration that is equal to or greater than the calculated SRL.

$$SRL(ng/dscm) = \frac{PQL}{PSV} \qquad 429\text{-}7$$

Where:

SRL = Preliminary estimate of source reporting limit, ng/dscm
PQL = Practical quantitation limit, ng
PSV = Planned sample volume, dscm

2.5.7 Example Calculations

Figure 9 B is an example of the minimum required calculations of sampling parameters for the source test protocol.

3. INTERFERENCES

Interferences may be caused by contaminants in solvents, reagents, sorbents, glassware, and other sample processing hardware that lead to discrete artifacts and/or elevated backgrounds at the ions monitored. All of these materials must be routinely demonstrated to be free from interferences under the conditions of the analysis by running laboratory reagent blanks as described in Section 6.1.1.

The use of high purity reagents and solvents helps to minimize interference problems. Purification of solvents by distillation in all-glass systems may be required.

Transformation of PAH and the formation of artifacts can occur in the sampling train. PAH degradation and transformation on sampling train filters have been demonstrated. Certain reactive PAH such as benzo[a]pyrene, benzo[a]anthracene, and fluoranthene when trapped on filters can readily react with stack gases. These PAH are transformed by reaction with low levels of nitric acid and higher levels of nitrogen oxides, ozone, and sulfur oxides.

PAH degradation may be of even greater concern when they are trapped in the impingers. When stack gases such as sulfur oxides and nitrogen oxides come in contact with the impinger water they are converted into sulfuric acid and nitric acid respectively. There is evidence that under such conditions certain PAH will be degraded. It is recommended that the PAH levels in the impingers be used as a qualitative tool to determine if breakthrough has occurred in the resin.

4. SAMPLING APPARATUS, MATERIALS AND REAGENTS

4.1 SAMPLING APPARATUS

The sampling train components listed below are required. The tester may use an alternative to the required sampling apparatus only if, after review by the Executive Officer, it is deemed equivalent for the purposes of this test method.

Mention of trade names or specific products does not constitute endorsement by the California Air Resources Board. In all cases, equivalent items from other suppliers may be used.

A schematic of the sampling train is shown in Figure 2. The train consists of nozzle, probe, heated particulate filter, condenser, and sorbent module followed by three impingers and a silica gel drying cartridge. An in-stack filter may not be used because at the in-stack temperatures the filter material must be of a material other than the Teflon required by the method. A cyclone or similar device in the heated filter box may be used for sources emitting a large amount of particulate matter.

For sources with a high moisture content, a water trap may be placed between the heated filter and the sorbent module. Additional impingers may also be placed after the sorbent module. If any of these options are used, details must be provided in the test report. The train may be constructed by adaptation of an ARB Method 5 train. Descriptions of the train components are contained in the following sections.

4.1.1 Probe Nozzle

Quartz, or borosilicate glass with sharp, tapered leading edge. The angle of taper shall be 30° and the taper shall be on the outside to preserve a constant internal diameter. The probe nozzle shall be of the button-hook or elbow design, unless otherwise approved by the Executive Officer.

A range of sizes suitable for isokinetic sampling should be available, e.g., 0.32 to 1.27 cm (1/8 to 1/2 in.) - or larger if higher volume sampling trains are used - inside diameter (ID) nozzles in increments of 0.16 cm (1/16 in.). Each nozzle shall be calibrated according to the procedures outlined in Section 5.1 of ARB method 5.

4.1.2 Probe

The probe should be lined or made of Teflon, quartz, or borosilicate glass. The liner or probe is to provide an inert surface for the PAH in the stack gas. The liner or probe extends past the retaining nut into the stack. A temperature-controlled jacket provides protection of the liner or probe. The liner shall be equipped with a connecting fitting that is capable of forming a leak-free, vacuum tight connection without the use of sealing greases.

4.1.3 **Preseparator**

A cyclone, a high capacity impactor or other device may be used if necessary to remove the majority of the particles before the gas stream is filtered. This catch must be used for any subsequent analysis. The device shall be constructed of quartz or borosilicate glass. Other materials may be used subject to approval by the Executive Officer.

4.1.4 **Filter Holder**

The filter holder shall be constructed of borosilicate glass, with a Teflon frit or Teflon coated wire support and glass-to-glass seal or Teflon gasket. The holder design shall provide a positive seal against leakage from the outside or around the filter. The holder shall be attached immediately at the outlet of the probe, cyclone, or nozzle depending on the configuration used. Other holder and gasket materials may be used subject to approval by the Executive Officer.

4.1.5 **Sample Transfer Line**

The sample transfer line shall be Teflon (1/4 in. O.D. x 1/32 in. wall) with connecting fittings that are capable of forming leak-free, vacuum tight connections without using sealing greases. The line should be as short as possible.

4.1.6 **Condenser**

The condenser shall be constructed of borosilicate glass and shall be designed to allow the cooling of the gas stream to at least 20°C before it enters the sorbent module. Design for the normal range of stack gas conditions is shown in Figure 3.

4.1.7 **Sorbent Module**

The sorbent module shall be made of glass with connecting fittings that are able to form leak-free, vacuum tight seals without the use of sealant greases (Figure 3). The vertical resin trap is preceded by a coil-type condenser, also oriented vertically, with circulating cold water. Gas entering the sorbent module must have been cooled to 20 °C (68°F) or less. The gas temperature shall be monitored by a thermocouple placed either at the inlet or exit of the sorbent trap. The sorbent bed must be firmly packed and secured in place to prevent settling or channeling during sample collection. Ground glass caps (or equivalent) must be provided to seal the sorbent-filled trap both prior to and following sampling. All sorbent modules must be maintained in the vertical position during sampling.

4.1.8 **Impinger Train**

Connect three or more impingers in series with ground glass fittings able to form leak-free, vacuum tight seals without sealant greases. All impingers shall be of the Greenburg-Smith design modified by replacing the tip with a

1.3 cm (1/2 in.) I.D. glass tube extending to 1.3 cm (1/2 in.)from the bottom of the flask.

The first impinger may be oversized for sampling high moisture streams. The first and second impingers shall contain 100 mL of 3 mM sodium bicarbonate ($NaHCO_3$) and 2.4 mM sodium carbonate Na_2CO_3) (Section 4.2.5). This is intended to neutralize any acids that might form in the impingers. The third impinger shall be empty. Silica gel shall be added to the fourth impinger. A thermometer which measures temperatures to within 1°C (2°F), shall be placed at the outlet of the third impinger.

4.1.9 Silica Gel Cartridge

This may be used instead of a fourth impinger. It shall be sized to hold 200 to 300 gm of silica gel.

4.1.10 Pitot Tube

Type S, as described in Section 2.1 of ARB Method 2 or other devices approved by the Executive Officer. The pitot tube shall be attached to the probe extension to allow constant monitoring of the stack gas velocity as required by Section 2.1.3 of ARB Method 5. When the pitot tube occurs with other sampling components as part of an assembly, the arrangements must meet the specifications required by Section 4.1.1 of ARB Method 2. Interference-free arrangements are illustrated in Figures 2-6 through 2-8 of ARB Method 2 for Type S pitot tubes having external tubing diameters between 0.48 and 0.95 cm (3/16 and 3/8 in.).

Source-sampling assemblies that do not meet these minimum spacing requirements (or the equivalent of these requirements) may be used only if the pitot tube coefficients of such assemblies have been determined by calibration procedures approved by the Executive Officer.

4.1.11 Differential Pressure Gauge

Two inclined manometers or equivalent devices, as described in Section 2.2 of ARB Method 2. One manometer shall be used for velocity head (ΔP) readings and the other for orifice differential pressure readings.

4.1.12 Metering System

Vacuum gauge, leak-free pump, thermometers accurate to within 3°C (5.4°F), dry gas meter capable of measuring volume to within 2 percent, and related equipment, as shown in Figure 2. Other metering systems must meet the requirements stated in Section 2.1.8 of ARB Method 5.

4.1.13 Barometer

Mercury, aneroid, or other barometer capable of measuring atmospheric pressure to within 2.5 mm Hg (0.1 in. Hg). In many cases, the barometric reading may be obtained from a nearby national weather service station, in which case the station value (which is the absolute barometric pressure) shall

be requested and an adjustment for elevation differences between the weather station and sampling point shall be applied at a rate of minus 2.5 mm Hg (0.1 in. Hg) per 30 m (100 ft) elevation increase or vice versa for elevation decrease.

4.1.14 Gas Density Determination Equipment

Temperature sensor and pressure gauge, as described in Section 2.3 and 2.4 of Method 2, and gas analyzer, if necessary, as described in Method 3. The preferred configuration and alternative arrangements of the temperature sensor shall be the same as those described in Section 2.1.10 of ARB Method 5.

4.1.15 Filter Heating System

The heating system must be capable of maintaining a temperature around the filter holder during sampling of (120 ± 14°C) (248 ± 25°F). A temperature gauge capable of measuring temperature to within 3°C (5.4°F) shall be installed so that the temperature around the filter holder can be regulated and monitored during sampling.

4.1.16 Balance

To weigh the impingers and silica gel cartridge to within 0.5 g.

4.2 SAMPLING MATERIALS AND REAGENTS

4.2.1 Filters

The filters shall be Teflon coated glass fiber filters without organic binders, or Teflon membrane filters, and shall exhibit at least 99.95 percent efficiency (0.05 percent penetration) on 0.3 micron dioctyl phthalate smoke particles. The filter efficiency test shall be conducted in accordance with ASTM standard Method D 2986-71. Test data from the supplier's quality control program are sufficient for this purpose. Record the manufacturer's lot number.

4.2.1.1 Contamination Check of Filter

The tester must have the filters cleaned by the analyst and checked for contamination prior to use in the field. The contamination check must confirm that there are no PAH contaminants present that will interfere with the analysis of the sample PAHs of interest at the target reporting limits. The analyst must record the date the filter was cleaned.

The filters shall be cleaned in batches not to exceed 50 filters. To clean the filters, shake for one hour in methylene chloride in a glass dish that has been cleaned according to Section 6.2. After extraction, remove the filters and dry them under a clean N_2 stream. Analyze one filter using the same extraction, clean-up and analysis procedures to be used for the field samples (Sections 6.5.1.2, 6.6, and 7.5).

$$\text{Blank value per filter} = \frac{\text{Total mass (ng) of analyte}}{\text{No. filters extracted}} \qquad 429\text{-}8$$

The acceptance criteria for filter cleanliness depends on 1) the method reporting limit, 2) the expected field sample volume and 3) the desired reporting limit for the sampled emissions stream. Filters with PAH levels equal to or greater than the target reporting limit for the analyte(s) of concern shall be rejected for field use.

If the filter does not pass the contamination check, re-extract the batch and analyze a clean filter from the re-extracted batch. Repeat the re-extraction and analysis until an acceptably low background level is achieved. Store the remainder tightly wrapped in clean hexane-rinsed aluminum foil as described in Section 4.3.3.

Record the date of the last cleaning of the filters and the date of the PAH analysis, and prepare a laboratory report of the analytical results that includes all of the information required by Section 10.2.

The tester shall obtain this laboratory report with the date of cleaning of the filters, and the date of the filter contamination check from the analyst, and report them in the source test protocol and the test report as required by Sections 10.1 and 10.3.

4.2.2 Amberlite XAD-2 Resin

The XAD-2 resin must be purchased precleaned and then cleaned again as described below before use in the sampling train.

4.2.2.1 Cleaning XAD-2 Resin

This procedure must be carried out in a giant Soxhlet extractor which will hold enough XAD-2 for several sorbent traps, method blanks and QC samples. Use an all glass thimble containing an extra coarse frit for extraction of the XAD-2. The frit is recessed 10 to 15 mm above a crenelated ring at the bottom of the thimble to facilitate drainage. The resin must be carefully retained in the extractor cup with a glass wool plug and stainless steel screen to prevent floating on the methylene chloride.

Clean the resin by two sequential 24 hour Soxhlet extractions with methylene chloride. Replace with fresh methylene chloride after the first 24 hour period.

4.2.2.2 Drying Cleaned XAD-2 Resin

The adsorbent must be dried with clean inert gas. Liquid nitrogen from a standard commercial liquid nitrogen cylinder has proven to be a reliable source of large volumes of gas free from organic contaminants. A 10.2 cm ID Pyrex pipe 0.6 m long with suitable retainers as shown in Figure 4 will serve as a satisfactory column. Connect the liquid nitrogen

cylinder to the column by a length of cleaned 0.95 cm ID copper tubing, coiled to pass through a heat source. A convenient heat source is a water bath heated from a steam line. The final nitrogen temperature should only be warm to the touch and not over 40 °C.

Continue the flow of nitrogen through the adsorbent until all the residual solvent is removed. The rate of flow should be high enough that the particles are gently agitated but not so high as to cause the particles to break up.

4.2.2.3 **Residual Methylene Chloride Check.**

Extraction: Weigh a 1.0 g sample of dried resin into a small vial, add 3 mL of hexane, cap the vial and shake it well.

Analysis: Inject a 2 µL sample of the extract into a gas chromatograph operated under the following conditions:

Column:	6 ft x 1/8 in stainless steel containing 10% OV-101 on 100/120 Supelcoport.
Carrier Gas:	Helium at a rate of 30 mL/min.
Detector:	Flame ionization detector operated at a sensitivity of 4 X 10^{-11} A/mV.
Injection Port Temperature:	250 °C.
Detector Temperature:	305 °C.
Oven Temperature:	30 °C for 4 min; programmed to rise at 40 °C per min until it reaches 250 °C; return to 30 °C after 1000 seconds.

Compare the results of the analysis to the results from a reference solution prepared by adding 2.5 µL of methylene chloride into 100 mL of hexane. This corresponds to 100 µg of methylene chloride per g of adsorbent. The maximum acceptable concentration is 1000 µg/g of adsorbent. If the methylene chloride in the adsorbent exceeds this level, drying must be continued until the excess methylene chloride is removed.

4.2.2.4 **Contamination Check of XAD-2 Resin**

The cleaned, dried XAD-2 resin must be checked for PAH contamination. Analyze a sample of the resin equivalent in size to the amount required to charge one sorbent cartridge for a sampling train. The extraction, concentration, cleanup and GC/MS analytical procedures shall be the

same for this sample as for the field samples (Sections 6.5.1.2, 6.6, and 7.5).

The acceptance limit will depend on the PQL, the expected concentration in the sampled gas stream, and the planned sample volume. The contamination level must be less than the PQL or no more than 20 percent of the expected sample level.

If the cleaned resin yields a value for a target analyte which is not acceptable for the end user's intended application of the test results, repeat the extraction unless the analyst has historical data that demonstrate that re-extraction cannot reasonably be expected to further reduce the contamination levels. The tester must obtain these data from the analyst and include them in both the source test protocol and the emissions test report.

The contamination check shall be repeated if the analyst does not have such historical data. The analyst shall reclean and dry the resin (4.2.2.1, 4.2.2.2, and 4.2.2.3) and repeat the PAH analysis of the re-cleaned resin. If the repeat analysis yields a similar result to the first, record the contamination level for both the initial cleaning and the re-cleaning.

The analyst shall record the dates of the cleaning and extraction of the resin, and prepare a laboratory report of the analytical results that includes all of the information required by Section 10.2.

The tester shall obtain the dates of cleaning and the laboratory report of the results of the contamination check from the analyst, and report them in both the source test protocol and the emissions test report as required by Sections 10.1 and 10.3.

The tester shall identify the analytes for which the PQLs will be based on a blank contamination value, and calculate the PQLs as required by Section 2.3.3.

4.2.2.5 Storage of XAD-2 Resin

After cleaning, the resin may be stored in a wide mouth amber glass container with a Teflon-lined cap, or placed in one of the glass adsorbent modules wrapped in aluminum foil and capped or tightly sealed with Teflon film at each end. The containers and modules shall then be stored away from light at temperatures 4 °C or lower until the resin is used in the sampling train.

The adsorbent must be used within twenty one (21) days of cleaning. If the adsorbent is not used within 21 days, it must be re-checked for contamination before use.

4.2.3 **Silica Gel**

Indicating type, 6 to 16 mesh. If previously used, dry at 175°C (350°F) for 2 hours. New silica gel may be used as received. Alternatively, other desiccants (equivalent or better) may be used, subject to approval by the Executive Officer.

4.2.4 **Reagent Water**

Deionized, then glass-distilled, and stored in hexane- and methylene chloride-rinsed glass containers with TFE-lined screw caps.

4.2.5 **Impinger Solution**

Sodium bicarbonate 3 mM, and sodium carbonate 2.4 mM. Dissolve 1.0081 g sodium bicarbonate ($NaHCO_3$) and 1.0176 g of sodium carbonate (Na_2CO_3) in reagent water (4.2.4), and dilute to 4 liters.

4.2.6 **Crushed Ice**

Place crushed ice in the water bath around the impingers.

4.2.7 **Glass Wool**

Cleaned by sequential rinsing in three aliquots of hexane, dried in a 110 °C oven, and stored in a hexane-washed glass jar with TFE-lined screw cap.

4.2.8 **Chromic Acid Cleaning Solution**

Dissolve 200 g of sodium dichromate in 15 mL of reagent water, and then carefully add 400 mL of concentrated sulfuric acid.

4.3 **PRE-TEST PREPARATION**

The positive identification and quantitation of PAH in an emissions test of stationary sources are strongly dependent on the integrity of the samples received and the precision and accuracy of all analytical procedures employed. The QA procedures described in Sections 4.3.7 and 8 are to be used to monitor the performance of the sampling methods, identify problems, and take corrective action.

4.3.1 **Calibration**

All sampling train components shall be maintained and calibrated according to the procedure described in APTD-0576 (Section 11.7), unless otherwise specified herein. The tester shall maintain a record of all calibration data.

4.3.1.1 **Probe Nozzle**

Probe nozzles shall be calibrated according to the procedure described in ARB Method 5.

4.3.1.2 Pitot Tube

Calibrate the Type S pitot tube assembly according to the procedure described in Section 4 of ARB Method 2.

4.3.1.3 **Metering System**

Calibrate the metering system before and after use according to the requirements of Section 5.3 of ARB Method 5.

4.3.1.4 **Temperature Gauges**

Use the procedure in Section 4.3 of ARB Method 2 to calibrate in-stack temperature gauges. Dial thermometers, such as those used for the dry gas meter and condenser outlet, shall be calibrated against mercury-in-glass thermometers.

4.3.1.5 **Leak Check of Metering System Shown in Figure 1**

The tester shall use the procedure described in Section 5.6 of ARB Method 5

4.3.1.6 **Barometer**

Calibrate against a mercury barometer.

4.3.2 **Cleaning Glassware for Sampling and Recovery**

All glass parts of the train upstream of and including the sorbent module and the first impingers shall be cleaned as described in Section 3A of the 1974 issue of Manual of Analytical Methods for Analysis of Pesticide Residues in Human and Environmental Samples (Reference 11.4). Take special care to remove residual silicone grease sealants on ground glass connections of used glassware. These greasy residues shall be removed by soaking several hours in a chromic acid cleaning solution (4.2.8) prior to routine cleaning as described above. Other cleaning procedures may be used as long as acceptable blanks are obtained. Acceptance criteria for blanks are stated in Section 8.2.

Rinse all glassware with acetone, hexane, and methylene chloride prior to use in the PAH sampling train.

Glassware used in sample recovery procedures must be rinsed as soon as possible after use with the last solvent used in it. This must be followed by detergent washing with hot water, and rinses with tap water, deionized water, acetone, hexane, and methylene chloride. Other cleaning procedures may be used as long as acceptable blanks are obtained. Acceptance criteria for blanks are stated in Section 8.2.

4.3.3 **Preparation of Filter**

The clean dry filter (4.2.1) must be kept tightly wrapped in hexane-rinsed aluminum foil and stored at 0 to 4°C in a container away from light until

sampling. Before inserting the filter in the sampling train, check visually against light for irregularities and flaws or pinhole leaks.

4.3.4 Preparation of Sorbent Cartridge, Method Blank, and Laboratory Control Samples

Sorbent Cartridge

Use a sufficient amount (at least 30 gms or 5 gms/m^3 of stack gas to be sampled) of cleaned resin to completely fill the glass sorbent cartridge which has been thoroughly cleaned as prescribed (4.2.2).

Add the required surrogate standards (Table 7) to the sorbent cartridges for all of the sampling and blank trains for each series of test runs. Follow the resin with hexane-rinsed glass wool, cap both ends, and wrap the cartridge in aluminum foil. Store the prepared cartridges as required by Section 4.3.5.

The sorbent cartridges must be loaded, and the surrogate standards must be added to the resin in a clean area in the laboratory. There must be no turnaround of a used cartridge in the field.

The analyst shall record the date that the surrogate standards were added to the resin and the amount of each compound. The tester shall obtain these data from the analyst and report them in the source test protocol and the test report.

The appropriate levels for the surrogate standards are given in Table 7 which shows the spiking plan for surrogate standards, internal standards, alternate standards, and recovery standards. All of these required compounds are generally available. Additional labelled PAH may also be used if available. The labelled compounds used as surrogate standards must be different from the internal standards used for quantitation, and from the alternate and recovery standards. If the spiking scheme (Table 7) is modified, the tester must demonstrate that the proposed modification will generate data of satisfactory quality. Table 7A shows an approved modification that has been used in ARB's method development. All modifications must be approved by the Executive Officer before the emissions test is performed.

Laboratory Method Blank

Take a sample of XAD-2 resin from the same batch used to prepare the sampling cartridge. This will serve as the laboratory method blank (Section 8.1.1). The mass of this sample must be the same as that used in the sampling train. Spike with the same surrogate standards at the same levels used in the sampling cartridges.

Laboratory Control Sample

Set aside two samples of XAD-2 resin from the same batch used to prepare the sampling cartridge. These will serve as the laboratory control samples. (Section 8.1.3). The mass of each sample must be the same as that used in the sampling train.

4.3.5 Storage of Prepared Cartridges, Method Blank and Laboratory Control Sample

Store the aluminum foil wrapped sorbent cartridges away from light at 4 °C or lower until they are fitted into the sampling trains. Do not remove the caps before the setup of the sampling train.

The maximum storage time from cleaning of the resin to sampling with the spiked resin cartridge must not exceed 21 days (4.2.2.5).

Store the laboratory method blank and laboratory control samples in amber glass jars with Teflon lined lids at temperatures no higher than 4 °C.

4.4 SAMPLE COLLECTION

Because of the complexity of this method, testers must be experienced with the test procedures in order to ensure reliable results.

4.4.1 Preliminary Field Determinations

Select the sampling site and the minimum number of sampling points according to ARB Method 1 or as specified by the Executive Officer.

Determine the stack pressure, temperature, and the range of velocity heads using ARB Method 2. Conduct a leak-check of the pitot lines according to ARB Method 2, Section 3.1.

Determine the moisture content using ARB Method 4 or its alternatives for the purpose of making isokinetic sampling rate settings.

Determine the stack gas dry molecular weight, as described in ARB Method 2, Section 3.6. If integrated sampling (ARB Method 3) is used for molecular weight determination, the integrated bag sample shall be taken simultaneously with, and for the same total length of time as, the sample run.

Select a nozzle size based on the range of velocity heads, such that it is not necessary to change the nozzle size in order to maintain isokinetic sampling rates. Do not change the nozzle size during the run. Ensure that the proper differential pressure gauge is chosen for the range of velocity heads encountered (see Section 2.2 of ARB Method 2).

Select a probe extension length such that all traverse points can be sampled. For large stacks, consider sampling from opposite sides of the stack to reduce the length of probes.

The target sample volume and sampling time must already have been calculated for the source test protocol and approved by the end user as required by Sections 2.2 and 2.5. The total sampling time must be such that (1) the sampling time per point is not less than 2 minutes (or some greater time interval as specified by the Executive Officer), and (2) the total gas sample volume collected (corrected to standard conditions) will not be less than the target value calculated for the source test protocol (Section 2.5.5).

To avoid timekeeping errors, the number of minutes sampled at each point should be an integer or an integer plus one-half minute.

4.4.2 Preparation of Collection Train

Keep all openings where contamination can occur covered until just prior to assembly or until sampling is about to begin.

Caution: Do not use sealant greases in assembling the sampling train.

Record the performance of the setup procedures for the sampling train. Figure 10 is an example of a form for recording the sampling train setup data. The tester must record all of the routine information indicated on this form as well as any additional data which are necessary for documenting the quality of any reported results.

Place 100 ml of the impinger solution (4.2.5) in the first impinger and weigh. Record the total weight. Repeat the procedure for the second impinger. Leave the third impinger empty. Weigh the empty third impinger and record the weight.

Weigh 200 to 300 g of silica gel to the nearest 0.5 g directly into a tared impinger or silica gel cartridge just prior to assembly of the sampling train. The tester may optionally measure and record in advance of test time the weights of several portions of silica gel in air-tight containers. One portion of the preweighed silica gel must then be transferred from its container to the silica gel cartridge or fourth impinger. Place the container in a clean place for later use in the sample recovery.

Using tweezers or clean disposable surgical gloves, place a filter in the filter holder. Be sure that the filter is properly centered and the gasket properly placed so as to prevent the sample gas stream from circumventing the filter. Check the filter for tears after assembly of the filter holder is completed.

Mark the probe extension with heat resistant tape or by some other method to denote the proper distance into the stack or duct for each sampling point.

Assemble the train as in Figure 2. Place crushed ice around the impingers.

4.4.3 Leak Check Procedures

4.4.3.1 Pretest Leak Check

After the sampling train has been assembled, turn on and set the filter and probe heating systems at the desired operating temperatures. Allow time for the temperature to stabilize. Leak-check the train at the sampling site by plugging the nozzle with a TFE plug and pulling a vacuum of at least 380 mm Hg (15 in. Hg).

Note: A lower vacuum may be used, provided that it is not exceeded during the test.

The following leak-check instructions for the sampling train are described in Section 4.1.4.1 of ARB Method 5. Start the pump with by-pass valve fully open and coarse adjust valve completely closed. Partially open the coarse adjust valve and slowly close the by-pass valve until the desired vacuum is reached. Do not reverse the direction of the by-pass valve. This will cause water to back up into the filter holder. If the desired vacuum is exceeded, either leak-check at this higher vacuum or end the leak-check as described below and start over.

Determine the leakage rate. A leakage rate in excess of 4 percent of the average sampling rate or 0.00057 m^3 per min. (0.02 cfm), whichever is less, is unacceptable. Repeat the leak check procedure until an acceptable leakage rate is obtained. Record the leakage rate on the field data sheet (Figure 5).

When the leak-check is completed, first slowly remove the plug from the inlet to the probe nozzle and immediately turn off the vacuum pump. This prevents water from being forced backward and keeps silica gel from being entrained backward.

4.4.3.2 **Leak Checks During Sample Run**

If, during the sampling run, it becomes necessary to change a component (e.g., filter assembly or impinger), a leak check shall be conducted immediately before the change is made. The leak-check shall be done according to the procedure described in Section 4.4.3.1 above, except that it shall be done at a vacuum equal to or greater than the maximum value recorded up to that point in the test. If the leakage rate is found to be no greater than 0.00057 m^3/min (0.02 cfm) or 4 percent of the average sampling rate (whichever is less), the results are acceptable, and no correction will need to be applied to the total volume of dry gas metered. If, however, a higher leakage rate is obtained, the tester shall either (1) record the leakage rate and correct the volume of gas sampled since the last leak check as shown in Section 4.4.3.4 below, or (2) void the sampling run. Record the leakage rate.

Immediately after component changes, leak-checks must be conducted according to the procedure outlined in Section 4.4.3.1 above. Record the leakage rate on the field data sheet (Figure 5).

4.4.3.3 **Post Test Leak Check**

A leak-check is mandatory at the conclusion of each sampling run. The leak-check shall be done in accordance with the procedures outlined in Section 4.4.3.1 except that it shall be conducted at a vacuum equal to or greater than the maximum value recorded during the sampling run. Record the leakage rate on the field data sheet (Figure 5). If the leakage rate is found to be no greater than 0.00057 m^3/min (0.02 cfm) or 4 percent of the average sampling rate (whichever is less), the results are acceptable, and no correction need be applied to the total volume of dry gas metered. If, however, a higher leakage rate is obtained, the tester

shall either, (1) record the leakage rate and correct the sample volume as shown in Section 4.4.3.4 below, or (2) void the sampling run.

4.4.3.4 **Correcting for Excessive Leakage Rates**

If the leakage rate observed during any leak-check after the start of a test exceeds the maximum leakage rate L_a (see definition below), replace V_m in Equation 429-9 with the following expression.

$$V_m - \sum_{i=1}^{n} (L_i - L_a)\theta_i - (L_p - L_a)\theta_p \qquad 429\text{-}9$$

Where:

V_m = Volume of gas sampled as measured by the dry gas meter (dscf).

L_a = Maximum acceptable leakage rate equal to 0.00057 m^3/min (0.02 ft^3/min) or 4% of the average sampling rate, whichever is smaller.

L_p = Leakage rate observed during the post-test leak-check, m^3/min (ft^3/min).

L_i = Leakage rate observed during the leak-check performed prior to the "ith" leakcheck (i = 1,2,3...n), m^3/min (ft^3/min).

θ_i = Sampling time interval between two successive leak-checks beginning with the interval between the first and second leak-checks, min.

θ_p = Sampling time interval between the last (n^{th}) leak-check and the end of the test, min.

Substitute only for those leakage rates (L_i or L_p) which exceed L_a.

4.4.4 **Train Operation**

4.4.4.1 **Sampling Train**

During the sampling run maintain a sampling rate within 10 percent of true isokinetic, unless otherwise specified or approved by the Executive Officer. The actual sampling rate must be at or above the VSR (Equation 429-4) to collect the target sample mass in the estimated sampling time. If the target sampling rate cannot be achieved, adjust the planned sampling time to achieve the target sample volume (PSV).

For each run, record the data required on the sample data sheet shown in Figure 5. The operator must record the dry gas meter reading at the beginning of the test, at the beginning and end of each sampling time

increment, when changes in flow rates are made, before and after each leak check, and when sampling is halted.

Record other readings required by Figure 5 at least once at each sample point during each time increment and additional readings when significant changes (20 percent variation in velocity head readings) necessitate additional adjustments in flow rate.

Level and zero the manometer. Because the manometer level and zero may drift due to vibrations and temperature changes, make periodic checks during the traverse.

Clean the portholes prior to the test run to minimize the chance of sampling the deposited material. To begin sampling, remove the nozzle cap and verify that the pitot tube and probe extension are properly positioned. Position the nozzle at the first traverse point with the tip pointing directly into the gas stream.

Immediately start the pump and adjust the flow to isokinetic conditions. Nomographs are available, which aid in the rapid adjustment of the isokinetic sampling rate without excessive computations. These nomographs are designed for use when the Type S pitot tube coefficient (C_p) is 0.85 ± 0.02, and the stack gas equivalent density (dry molecular weight) (M_d) is equal to 29 ± 4. APTD-0576 (Reference 11.7) details the procedure for using the nomographs. If C_p and M_d are outside the above stated ranges, do not use the nomographs unless appropriate steps (see Reference 11.8) are taken to compensate for the deviations.

When the stack is under significant negative pressure (height of impinger stem), take care to close the coarse adjust valve before inserting the probe extension assembly into the stack to prevent water from being forced backward. If necessary, the pump may be turned on with the coarse adjust valve closed.

When the probe is in position, block off the openings around the probe and porthole to prevent unrepresentative dilution of the gas stream.

Turn on the recirculating pump for the adsorbent module and the condenser, and begin monitoring the temperature of the gas entering the adsorbent trap. Ensure that the temperature of the gas is 20 °C or lower before sampling is started.

Traverse the stack cross section, as required by ARB Method 1 or as specified by the Executive Officer, being careful not to bump the probe nozzle into the stack walls when sampling near the walls or when removing or inserting the probe extension through the portholes. This minimizes the chance of extracting deposited material.

During the test run, take appropriate steps (e.g., adding crushed ice to the impinger ice bath) to maintain the temperature at the condenser outlet below 20°C (68°F). Also, periodically check the level and zero of the manometer.

If the pressure drop across the filter becomes too high, making isokinetic sampling difficult to maintain, the filter may be replaced during a sample run. Another complete filter assembly must be used rather than changing the filter itself. Before a new filter assembly is installed, conduct a leak-check as outlined in Section 4.4.3.2. The total PAH analysis shall include the combined catches of all filter assemblies.

A single train shall be used for the entire sample run, except in cases where simultaneous sampling is required in two or more separate ducts or at two or more different locations within the same duct, or, in cases where equipment failure necessitates a change of trains. In all other situations, the use of two or more trains will be subject to approval by the Executive Officer.

Note that when two or more trains are used, a separate analysis of each train shall be performed, unless identical nozzle sizes were used on all trains, in which case the catches from the individual trains may be combined and a single analysis performed.

At the end of the sample run, turn off the pump, remove the probe extension assembly from the stack, and record the final dry gas meter reading. Perform a leak-check, as outlined in Section 4.4.3.3. Also, leak-check the pitot lines as described in ARB Method 2; the lines must pass this leak-check, in order to validate the velocity head data. Record leakage rates.

Record any unusual events during the sampling period.

4.4.4.2 Blank Train

There shall be at least one blank train for each series of three or fewer test runs. For those sources at which emissions are sampled at more than one sampling location, there shall be at least one blank train assembled at each location for each set of three or fewer runs.

Prepare and set up the blank train in a manner identical to that described above for the sampling trains. The blank train shall be taken through all of the sampling train preparation steps including the leak check without actual sampling of the gas stream. Recover the blank train as described in Section 5.3. Follow all subsequent steps specified for the sampling train including extraction, analysis, and data reporting.

4.4.5 Calculation of Percent Isokinetic

Calculate percent isokinetic (Section 4.5.7) to determine whether the run should be repeated. If there was difficulty in maintaining isokinetic rates because of source conditions, consult with the Executive Officer for possible variance on the isokinetic rates.

4.5 CALCULATIONS

Carry out calculations retaining at least one extra decimal figure beyond that of the acquired data. Round off figures after the final calculation.

4.5.1 Nomenclature

A = Cross-sectional area of stack, ft^2.

A_n = Cross-sectional area of nozzle, ft^2.

B_{ws} = Water vapor in the gas stream, proportion by volume.

C_s = Concentration of PAH in stack gas, ng/dscm, corrected to standard conditions of 20°C, 760 mm Hg (68°F, 29.92 in. Hg) on dry basis.

G_s = Total mass of PAH in stack gas sample, ng.

ΔH = Average pressure differential across the orifice meter, mm H_2O (in. H_2O).

I = Percent isokinetic sampling.

L_a = Maximum acceptable leakage rate for either a pretest leak-check or for a leak check following a component change; equal to 0.00057 m^3/min (0.02 cfm) or 4 percent of the average sampling rate, whichever is less.

L_i = Individual leakage rate observed during the leak-check conducted prior to the "ith" component change (i = 1, 2, 3, ...n), m^3/min (cfm).

L_p = Leakage rate observed during the post-test leak check, m^3/min (cfm).

M_d = Molecular weight of stack gas, dry basis, lb/lb-mole (g/g-mole).

M_w = Molecular weight of water, 18.0 g/g-mole (18.0 lb/lb-mole).

M_s = Molecular weight of stack gas, wet basis, lb/lb-mole (g/g-mole).

P_{bar} = Barometric pressure at the sampling site, mm Hg (in. Hg).

P_s = Absolute stack gas pressure, mm Hg (in Hg).

P_{std} = Standard absolute pressure, 760 mm Hg (29.92 in. Hg).

Q_{std} = Dry volumetric stack gas flow rate corrected to standard conditions, dscf/min (dscm/min).

ρ_w = Density of water, 0.9982 g/mL (0.002201 lb/mL).

R = Ideal gas constant 0.06236 mm Hg-m^3/°K-g-mole (21.85 in Hg-ft^3/R-lb-mole).

T_m = Absolute average dry gas meter temperature, °K (°R).

T_s = Absolute average stack gas temperature °K (°R).

T_{std} = Standard absolute temperature, 293°K (528°R).

V_{1c} = Total volume of liquid collected in impingers and silica gel, mL.

V_m = Volume of gas sample as measured by dry gas meter, dcm (dcf).

$V_{m(std)}$ = Volume of gas sample measured by the dry gas meter, corrected to standard conditions, dscm (dscf).

$V_{w(std)}$ = Volume of water vapor in the gas sample, corrected to standard conditions, dscm (dscf).

v_s = Stack gas velocity, calculated by ARB Method 2, Equation 2-9, ft/sec (m/sec).

Y = Dry gas meter calibration factor.

θ = Total sampling time, min.

θ_1 = Sampling time interval, from the beginning of a run until the first component change, min.

θ_i = Sampling time interval between two successive component changes, beginning with the interval between the first and second changes, min.

θ_p = Sampling time interval, from the final (n^{th}) component change until the end of the sampling run, min.

φ_w = Sampling time interval, from the final (n^{th}) component change until

13.6 = Specific gravity of mercury.

60 = Conversion factor, sec/min.

100 = Conversion to percent.

4.5.2 **Average Dry Gas Meter Temperature and Average Orifice Pressure Drop**

See sampling run record (Figure 5).

4.5.3 **Dry Gas Volume**

Use Equation 429-10 to correct the sample volume measured by the dry gas meter to standard conditions (20°C, 760 mm Hg or 68°F, 29.92 in Hg).

$$V_{m(std)} = V_m Y \frac{T_{std}}{T_m} \frac{\left(P_{bar} + \frac{\Delta H}{13.6}\right)}{P_{std}} = K_1 V_m Y \frac{\left(P_{bar} + \frac{\Delta H}{13.6}\right)}{T_m} \qquad 429\text{-}10$$

Where:

$$K_1 = \frac{T_{std}}{P_{std}} = 0.3858\ ^{o}K/mm\ Hg \text{ for metric units}$$

$$= 17.65\ ^{o}R/in\ Hg \text{ for English units}$$

NOTE: Equation 429-10 may be used as written unless the leakage rate observed during any of the mandatory leak-checks (i.e., the post-test leak-check or leak-checks conducted prior to component changes) exceeds L_a. If L_p or L_i exceeds L_a, V_m in Equation 429-10 must be modified as described in Section 4.4.3.4.

4.5.4 Average Stack Gas Velocity

Calculate the average stack gas velocity, v_s, as specified in ARB Method 2, Section 5.2.

4.5.5 Volume of Water Vapor

Calculate the volume of water vapor using Equation 429-11 and the weight of the liquid collected during sampling (Sections 5.3.6 and 5.3.8).

$$V_{w(std)} = V_{1c} \frac{\rho_w}{M_w} \frac{RT_{std}}{P_{std}} = K_2 V_{1c} \qquad 429\text{-}11$$

Where:

K_2 = 0.001333 m_3/mL for metric units, or
= 0.04707 ft_3/mL for English units.

4.5.6 Moisture Content

Calculate the moisture content of the gas, B_{ws}.

$$B_{ws} = \frac{V_{w(std)}}{V_{m(std)} + V_{w(std)}} \qquad 429\text{-}12$$

NOTE: In saturated or water-droplet laden streams, the procedure for determining the moisture content is given in the note to Section 1.2 of Method 4. For the purpose of this method, the average stack-gas temperature from Figure 5 may be used for this determination, provided that the accuracy of the in-stack temperature sensor is ±1°C (2°F)

4.5.7 **Isokinetic Variation**

4.5.7.1 **Calculation from Raw Data**

$$I = \frac{100 T_s \left[K_3 V_{1c} + \frac{V_m Y}{T_m} \left(P_{bar} + \frac{\Delta H}{13.6} \right) \right]}{60\ \theta\ v_s\ P_s\ A_n} \qquad 429\text{-}13$$

Where:

K_3 = 0.003454 mm Hg-m^3/mL-^{o}K for metric units

= 0.002669 in Hg-ft^3/mL-^{o}R for English units

4.5.7.2 **Calculation from Intermediate Values**

$$I = \frac{100 T_s\ V_{m(std)}\ P_{std}}{T_{std}\ v_s\ \theta\ A_n\ P_s\ 60\ (1 - B_{ws})} \qquad 429\text{-}14$$

$$= K_4 \frac{T_s\ V_{m(std)}}{P_s\ v_s\ \theta\ A_n\ (1 - B_{ws})}$$

Where:

K_4 = 4.320 for metric units.

= 0.09450 for English units.

4.5.8 **Average stack gas dry volumetric flow rate**

Use Equation 429-15 to calculate the average dry volumetric flow rate of the gas.

$$Q_{std} = 60\ K_1\ (1 - B_{ws})\ v_s\ A \left(\frac{P_s}{T_s} \right) \qquad 429\text{-}15$$

Where:

$K_1 = \frac{T_{std}}{P_{std}}$ = 0.3858 ^{o}K/mm Hg for metric units

= 17.65 ^{o}R/in Hg for English units

4.6 **ISOKINETIC CRITERIA**

If 90 percent < I < 110 percent, the isokinetic results are acceptable. If there is a bias to the results because I < 90 percent or I > 110 percent, then the results must be rejected and the test repeated, unless the test results are accepted by the Executive Officer.

5 SAMPLE RECOVERY

5.1 SAMPLE RECOVERY APPARATUS

5.1.1 Probe Nozzle Brush

Inert bristle brush with stainless steel wire handle. The brush shall be properly sized and shaped to brush out the probe nozzle.

5.1.2 Wash Bottles

Teflon wash bottles are required; Teflon FEP®.

5.1.3 Glass Sample Storage Containers

Precleaned narrow mouth amber glass bottles, 500 mL or 1000 mL. Screw cap liners shall be Teflon.

5.1.4 Filter Storage Containers

Sealed filter holder or precleaned, wide-mouth amber glass containers with Teflon lined screw caps.

5.1.5 Balance

To measure condensed water to within 0.5 g.

5.1.6 Silica Gel Storage Containers

Air tight metal containers to store silica gel.

5.1.7 Funnel and Rubber Policeman

To aid in transfer of silica gel to container; not necessary if silica gel is weighed in the field.

5.1.8 Funnel

To aid in sample recovery. Glass or Teflon® must be used.

5.1.9 Ground Glass Caps or Hexane Rinsed Aluminum Foil

To cap off adsorbent tube and the other sample-exposed portions of the aluminum foil.

5.1.10 Aluminum Foil

Heavy-duty, precleaned with methylene chloride.

5.2 SAMPLE RECOVERY REAGENTS

5.2.1 Reagent Water

Deionized (DI), then glass distilled, and stored in hexane and methylene chloride-rinsed glass containers with TFE-lined screw caps.

5.2.2 Acetone

Nanograde quality. "Distilled in Glass" or equivalent, stored in original containers. A blank must be screened by the analytical detection method.

5.2.3 Hexane

Nanograde quality. "Distilled in Glass" or equivalent, stored in original containers. A blank must be screened by the analytical detection method.

5.2.4 Methylene Chloride

Nanograde quality or equivalent. A blank must be screened by the analytical detection method.

5.3 SAMPLE RECOVERY PROCEDURE

Proper cleanup procedure begins as soon as the probe is removed from the stack at the end of the sampling period and a post test leak check has been performed (4.4.3.3). Allow the probe to cool.

When the probe can be safely handled, wipe off all external particulate matter near the tip of the probe nozzle. Conduct the post test leak check as described in Section 4.4.3.3. Remove the probe from the train and close off both ends of the probe with precleaned aluminum foil (5.1.10). Seal off the inlet to the train with a ground glass cup or precleaned aluminum foil.

Transfer the probe and impinger assembly to the cleanup area. This area must be clean, and enclosed so that the chances of contaminating the sample will be minimized.

No smoking is allowed.

Inspect the train prior to and during disassembly and note any abnormal conditions, broken filters, color of the impinger liquid, etc. Figure 6 summarizes the recovery procedure described in Sections 5.3.1 to 5.3.8.

Figure 11 is an example of a form for recording the performance of the sample recovery procedure. The tester must record all of the routine information indicated on this form as well as any additional data which are necessary for documenting the quality of any reported results.

5.3.1 **Sample Container No. 1 (front half rinses)**

Quantitatively recover material deposited in the nozzle, probe, the front half of the filter holder, and the cyclone, if used, first by brushing and then by sequentially rinsing with acetone, hexane, and methylene chloride three times each. Place all these rinses in Container No.1. Mark the liquid level.

5.3.2 **Cyclone Catch**

If the optional cyclone is used, quantitatively recover the particulate matter by sequentially rinsing the cyclone with acetone, hexane, and methylene chloride. Store in a clean sample container and cap.

5.3.3 **Sample Container No. 2 (filter)**

Carefully remove the filter from the filter holder and place it in its identified container. Use a pair of precleaned tweezers to handle the filter. Do not wrap the filter in aluminum foil. If it is necessary to fold the filter, make sure that the particulate cake is inside the fold. Carefully transfer to the container any particulate matter and/or filter fibers which adhere to the filter holder gasket by using a dry inert bristle brush and/or a sharp-edged blade. Seal the container.

5.3.4 **Sorbent Module**

Remove the sorbent module from the train and cap it.

5.3.5 **Sample Container No. 3 (back half rinses)**

Rinse the back half of the filter holder, the transfer line between the filter and the condenser, and the condenser (if using the separate condenser-sorbent trap) three times each with acetone, hexane and methylene chloride, and collect all rinses in Container No. 3. If using the combined condenser/sorbent trap, the rinse of the condenser shall be performed in the laboratory after removal of the XAD-2 portion. If the optional water knockout trap has been employed, the contents and rinses shall be placed in Container No. 3. Rinse it three times each with acetone, hexane, and methylene chloride. Mark the liquid level.

The back half rinses may also be combined in a single container with the front half rinses (Section 5.3.1).

5.3.6 **Sample Container No. 4 (Impinger contents)**

Wipe off the outside of each of the first three impingers to remove excess water and other material. Weigh the impingers and contents to the nearest ±0.5 g using a balance. Record the weight. Calculate and then record the weight of liquid collected during sampling. Use this weight and the weight of liquid collected in the silica gel (Section 5.3.8) to calculate the moisture content of the effluent gas (Sections 4.5.5 and 4.5.6). Pour the impinger catch directly into Container No. 4. Mark the liquid level.

5.3.7 **Sample Container No. 5 (Impinger rinses)**

Rinse each impinger sequentially three times with acetone, hexane, and methylene chloride and pour rinses into Container No. 5. Mark the liquid level. These rinses may be combined with the previously weighed impinger contents in Container No. 4.

5.3.8 **Weighing Silica Gel**

Weigh the spent silica gel to the nearest 0.5 g using a balance. Record the weight. Calculate and then record the weight of liquid collected during sampling. Use this weight and the weight of liquid collected in the impingers (Section 5.3.6) to calculate the moisture content of the effluent gas (Sections 4.5.5 and 4.5.6). .

5.4 SAMPLE PRESERVATION AND HANDLING

From the time of collection to extraction, maintain all samples (Sections 5.3.1 to 5.3.7) at 4°C or lower and protect from light. All samples must be extracted as soon as practically feasible, but within 21 days of collection; and all extracts must be analyzed as soon as practically feasible, but within 40 days of extraction. Success in meeting the holding time requirement will depend on pre-test planning by the tester and the laboratory.

6 ANALYTICAL PREPARATION

This method is restricted to use only by or under the supervision of analysts experienced in the use of capillary column gas chromatography/mass spectrometry and skilled in the interpretation of mass spectra. Each analyst must demonstrate the ability to generate acceptable results with this method using the procedures described in Sections 7.3, 8.2.6, and 8.3.1.

6.1 SAFETY

The toxicity or carcinogenicity of each reagent used in this method has not been precisely defined. Nevertheless, each chemical compound should be treated as a potential health hazard and exposure to these chemicals must be reduced to the lowest possible level by whatever means available. The laboratory is responsible for maintaining a current file of OSHA regulations regarding the safe handling of the chemicals specified in this method. A reference file of material data handling sheets should also be made available to all personnel involved in the chemical analysis. Reference 11.9 describes procedures for handling hazardous chemicals in laboratories.

The following method analytes have been classified as known or suspected human or mammalian carcinogens: benzo(a)anthracene and dibenzo-(a,h,)anthracene. A guideline for the safe handling of carcinogens can be found in Section 5209 of Title 8 of the California Administrative Code.

6.2 CLEANING OF LABORATORY GLASSWARE

Glassware used in the analytical procedures (including the Soxhlet apparatus and disposable bottles) must be cleaned as soon as possible after use by rinsing with the last solvent used in it. This must be followed by detergent washing with hot water, and rinses with tap water, deionized water, acetone, hexane, and methylene chloride. Other cleaning procedures may be used as long as acceptable blanks are obtained. Acceptance criteria for blanks are given in Section 8.2.

Clean aluminum foil with acetone followed by hexane and methylene chloride.

6.3 APPARATUS

6.3.1 Grab Sample Bottle

Amber glass, 125-mL and 250-mL, fitted with screw caps lined with Teflon. The bottle and cap liner must be acid washed and solvent rinsed with acetone and methylene chloride, and dried before use.

6.3.2 Concentrator Tube, Kuderna-Danish

10-mL, graduated (Kontes-K-570050-1025 or equivalent). Calibration must be checked at the volumes employed in the test. A ground glass stopper must be used to prevent evaporation of extracts.

6.3.3 Evaporation Flask, Kuderna-Danish

500-mL (Kontes K-570001-0500 or equivalent). (Attached to concentrator tube with springs).

6.3.4 Snyder Column, Kuderna-Danish

Three-ball macro (Kontes K-569001-0121 or equivalent).

6.3.5 Snyder Column, Kuderna-Danish

Two-ball micro (Kontes K-569001-0219 or equivalent).

6.3.6 Minivials

1.0 mL vials; cone-shaped to facilitate removal of very small samples; heavy wall borosilicate glass; with Teflon-faced rubber septa and screw caps.

6.3.7 Soxhlet Apparatus

1 liter receiver, 1 heating mantle, condenser, Soxhlet extractor.

6.3.8 Rotary Evaporator

Rotovap R (or equivalent), Brinkmann Instruments, Westbury, NY.

6.3.9 **Nitrogen Blowdown Apparatus**

N-Evap Analytical Evaporator Model 111 (or equivalent), Organomation Associates Inc., Northborough, MA.

6.3.10 **Analytical Balance**

Analytical. Capable of accurately weighing to the nearest 0.0001 g.

6.3.11 **Disposable Pipet**

5 3/4 inch x 7.0 mm OD.,

6.4 SAMPLE PREPARATION REAGENTS

6.4.1 **Reagent water**

Same as 5.2.1.

6.4.2 **Acetone**

Same as 5.2.2.

6.4.3 **Hexane**

Same as 5.2.3.

6.4.4 **Methylene Chloride**

Same as 5.2.4.

6.4.5 **Sulfuric Acid**

ACS. Reagent grade. Concentrated, sp. gr. 1.84.

6.4.6 **Sodium Sulfate**

ACS. Reagent grade. Granular, anhydrous. Purify prior to use by extracting with methylene chloride and oven drying for 4 or more hours in a shallow tray. Place the cleaned material in a glass container with a Teflon lined screw cap, and store in a desiccator.

6.4.7 **Silica Gel**

For column chromatography, type 60, EM reagent, 100-200 mesh, or equivalent. Soxhlet extract with methylene chloride, and activate by heating in a foil covered glass container for longer than 16 hours at 130 °C, then store in a desiccator. The storage period shall not exceed two days.

NOTE: The performance of silica gel in the column cleanup procedure varies with manufacturers and with the method of storage. The analyst shall establish a procedure that satisfies the performance criteria of Section 6.6.1.

6.4.8 Alumina: Acidic

Soxhlet extract with methylene chloride, and activate in a foil covered glass container for 24 hours at 190 °C.

NOTE: The performance of alumina in the column cleanup procedure varies with manufacturers and with the method of storage. The analyst shall establish a procedure that meets the performance criteria of Section 6.6.1.

6.4.9 Nitrogen

Obtained from bleed from liquid nitrogen tank.

6.5 SAMPLE EXTRACTION

WARNING: Stack sampling will yield both liquid and solid samples for PAH analysis. Samples must not be split prior to extraction even when they appear homogeneous as in the case of single liquid phase samples. Solid samples such as the resin are not homogeneous and particulate matter may not be uniformly distributed on the filter. In addition, filter samples are generally so small that the desired detection limit might not be achieved if the sample were split.

The recovered samples may be combined as follows:

1) Particulate filter and particulate matter collected on the filter (Section 5.3.3), cyclone catch (Section 5.3.2) and sample container No. 1 (Section 5.3.1).

2) Sample container No. 3 (Section 5.3.5), resin (Section 5.3.4) and rinse of resin cartridge.

3) Sample container No.4 (Section 5.3.6) and sample container No.5 (Section 5.3.7)

Two schemes for sample preparation are described in Sections 6.5.1 and 6.5.2 below. One of these must be used.

Section 6.5.1 describes sample preparation procedures for separate GC/MS analyses of impingers and the remainder of the sampling train. Figure 7 is a flowchart of the extraction and cleanup procedures.

Section 6.5.2 describes sample preparation procedures for GC/MS analysis of a single composite extract from each sampling train. The recovered samples are combined as shown in Figure 8.

6.5.1 Separate Analysis of Impingers

A separate analysis of the impingers can be used to determine whether there has been breakthrough of PAHs past the resin.

6.5.1.1 **Extraction of Liquid Samples**

A. **Sample Container No. 1 (Front half rinses)**

Concentrate the contents of sample container No. 1 (Section 5.3.1) to a volume of about 1-5 mL using the nitrogen blowdown apparatus. Rinse the sample container three times with small amounts of methylene chloride and add these rinses to the concentrated solution. Concentrate further to about 1-5 mL. This residue will likely contain particulate matter which was removed in the rinses of the probe and nozzle. Transfer the residue (along with three rinses of the final sample vessel) to the Soxhlet apparatus with the filter and particulate catch and proceed as described under Section 6.5.1.2 below.

B. **Sample Container No. 3 (Back half rinses)**

Concentrate the contents of sample container No. 3 (Section 5.3.5) to a volume of about 1-5 mL using the nitrogen blowdown apparatus. Rinse the sample container three times with small amounts of methylene chloride and add these rinses to the concentrated solution. Concentrate further to about 1-5 mL. Combine this residue (along with three rinses of the final sample vessel) in the Soxhlet apparatus with the resin sample, and proceed as described under Section 6.5.1.2 below.

C. **Containers No. 4 and No. 5 (Impinger contents and rinses)**

Place the contents of Sample Containers No. 4 and No. 5 (Sections 5.4.6 and 5.4.7) in a separatory funnel. Add the appropriate amount of ^{2}H-labelled alternate standard solution (Section 7 and Table 7 or 7A) to achieve the final extract concentrations indicated in Table 8 or 8A. The amounts required by Section 7.2.4 are based on a final volume of 500 μL for analysis (450 μL of sample extract and 50 μL of recovery standard solution). Extract the sample three times with 60 mL aliquots of methylene chloride. Combine the organic fractions. Divide the extract in two - one half to be archived, and the other for cleanup and GC/MS analysis. Store the archive sample at 4°C away from light.

Pour the remaining extract through Na_2SO_4 into a round bottom flask. Add 60 to 100 mL hexane and evaporate to about 10 mL. Repeat three times or less if the methylene chloride can be removed with less hexane. Add the appropriate amount of alternate standard (Section 7.2.7) to achieve the final extract concentrations shown in Table 6 or 6A. This standard must be used to monitor the efficiency of the cleanup procedure.

Concentrate the remaining sample to 2 mL with a Kuderna-Danish concentrator or rotary evaporator, then transfer the extract to a 8-mL test tube with hexane. Proceed with sample cleanup procedures below (Section 6.6).

6.5.1.2 **Extraction of Solid Samples**

Filter, Particulate matter, and Resin

The Soxhlet apparatus must be large enough to allow extraction of the sample in a single batch. Clean the Soxhlet apparatus by a 4 to 8-hr Soxhlet with methylene chloride at a cycling rate of 3 cycles per hour. Discard the solvent. Add 20 g Na_2SO_4 to the thimble. Combine the filter, resin, glass wool, and concentrated front and back half rinses (6.5.1.1A and 6.5.1.1B) and place on top of the Na_2SO_4. Add the appropriate amount of internal standard (Section 7.2.4 and Table 7) to achieve the final extract concentrations indicated in Table 8.

Place the thimble in the Soxhlet apparatus, and add about 700 mL of methylene chloride to the receiver. Assemble the Soxhlet, turn on the heating controls and cooling water, and allow to reflux for 16 hours at a rate of 3 cycles per hour. After extraction, allow the Soxhlet to cool. Divide the sample in two - one half to be archived, and the other for cleanup and GC/MS analysis. Store the archive sample at 4°C away from light.

Exchange the remaining extract to hexane. Add 60 to 100 mL hexane and evaporate to about 10 mL. Repeat three times or as necessary to remove the methylene chloride. Add the appropriate amount of alternate standard (Section 7.2.7 and Table 7 or 7A) to achieve the final extract concentrations shown in Table 8 or 8A. This alternate standard must be used to monitor the efficiency of the cleanup procedure when the impingers are analyzed separately from the remainder of the sampling train.

Concentrate the remaining sample to about 2 mL with a Kuderna-Danish concentrator or rotoevaporator, then transfer the extract to a 8-mL test tube with hexane. Proceed with sample cleanup procedures below (Section 6.6).

6.5.2 **Single Composite Extract For Analysis**

6.5.2.1 **Extraction of Aqueous Samples**

Containers No. 4 and No. 5 (Impinger contents and rinses)

Pour the contents of Sample Containers No. 4 and No. 5 (Sections 5.3.6 and 5.3.7) into an appropriate size separatory funnel. Do not add internal standards. Instead, add the appropriate amount of alternate standard spiking solution (Section 7 and Table 7 or 7A) to achieve the final extract concentrations indicated in Table 8 or 8A.

Extract the sample three times with 60 mL aliquots of methylene chloride. Combine the organic fractions with the solid samples and concentrated rinses (6.5.2.2) in a Soxhlet extractor.

6.5.2.2 **Extraction of Solid Samples**

Concentrate the front and back half rinses as described in Sections 6.5.1.1A and 6.5.1.1B. Clean the Soxhlet apparatus as in Section 6.5.1.2. Place the filter and resin in the Soxhlet apparatus along with the concentrated front and back half rinses and the impinger extract. Add the internal standards, extract the sample, and concentrate the extract as described in Section 6.5.1.2. Divide the extract into two equal portions. Store one of these, the archive sample, at 4 °C away from light. The remaining extract must be exchanged to hexane as described in Section 6.5.1.2. Do not add the alternate standard to this composite extract. It has already been added to the impinger sample (6.5.2.1).

Concentrate the extract to 2 mL with a Kuderna-Danish concentrator or rotary evaporator, then transfer to a 8-mL test tube with hexane or equivalent non-polar solvent such as isooctane. Proceed with sample cleanup procedures below (Section 6.6)

6.6 COLUMN CLEANUP

Several column chromatographic cleanup options are available. Either of the two described below may be sufficient. Before using a procedure for the cleanup of sample extracts, the analyst must demonstrate that the requirements of Sections 8.1.3.1 and 8.2.6 can be met using the cleanup procedure. Acceptable alternative cleanup procedures may also be used provided that the analyst can demonstrate that the performance requirements of Sections 8.1.3.1 and 8.2.6 can be met. Compliance with the requirements of Sections 8.1.1.1 and 8.2.6 must also be demonstrated whenever there is a change in the column cleanup procedure used for the initial demonstration.

The sample extract obtained as described in Sections 6.5.1C and 6.5.1.2 or 6.5.2.2 is concentrated to a volume of about 1 mL using the nitrogen blowdown apparatus, and this is transferred quantitatively with hexane rinsings to at least one of the columns described below.

6.6.1 Column Preparation

A. Silica Gel Column

Pack a glass gravity column (250 mm x 10 mm) in the following manner:

Insert a clean glass wool plug (Section 4.2.7) into the bottom of the column and add 10 grams of activated silica gel (Section 6.4.7) in methylene chloride. Tap the column to settle the silica gel, and then add a 1 cm layer of anhydrous sodium sulfate (Section 6.4.6)

Variations among batches of silica gel may affect the elution volume of the various PAH. Therefore, the volume of solvent required to completely elute all of the PAH must be verified by the analyst. The weight of the silica gel can then be adjusted accordingly. Satisfactory

recovery (as defined in Section 6.6) of each native PAH in the LCS (8.1.3) must be demonstrated whenever there is a change in the method of preparing the silica gel columns.

B. Acid Alumina Column

Pack a 250 mm x 10 mm glass gravity column as follows:

Insert a clean glass wool plug (Section 4.2.7) into the bottom of the column. Add 6 g of acid alumina prepared as described in Section 6.4.8. Tap the column gently to settle the alumina, and add 1 cm of anhydrous sodium sulfate to the top.

Satisfactory recovery (as defined in Section 6.6) of each native PAH in the LCS (8.1.3) must be demonstrated whenever there is a change in the method of preparing the acid alumina columns.

6.6.2 Column Chromatography Procedure

A. Silica Gel Column

Elute the column with 40 mL of hexane. The rate for all elutions should be about 2 mL/min. Discard the eluate and just prior to exposure of the sodium sulfate layer to the air, transfer the 1 mL sample extract onto the column using two additional 2 mL rinses of hexane to complete the transfer. Just prior to exposure of the sodium sulfate layer to the air, begin elution of the column with 25 mL of hexane followed by 25 mL of methylene chloride/hexane (2:3)(v/v). Collect the entire eluate. Concentrate the collected fraction to about 5 mL using the K-D apparatus or a rotary evaporator. Do not allow the extract to go to dryness.

Transfer to a minivial using a hexane rinse and concentrate to 450 μL using a gentle stream of nitrogen. Store the extracts in a refrigerator at 4 ^{o}C or lower away from light until GC/MS analysis (Section 7).

B. Alumina Column

Elute the column with 50 mL of hexane. Let the solvent flow through the column until the head of the liquid in the column is just above the sodium sulfate layer. Close the stopcock to stop solvent flow.

Transfer 1 mL of the sample extract onto the column. Rinse out extract vial with two 1 mL rinses of hexane and add it to the top of the column immediately. To avoid overloading the column, it is suggested that no more than 300 mg of extractable organics be placed on the column.

Just prior to exposure of the sodium sulfate to the air, elute the column with a total of 15 mL of hexane. If the extract is in 1 mL of hexane, and if 2 mL of hexane was used as a rinse, then 12 mL of additional hexane should be used. Collect the effluent and concentrate to about 2 mL using the K-D apparatus or a rotary evaporator.

Transfer to a minivial using a hexane rinse and concentrate to 450 μL using a gentle stream of nitrogen. Store the extracts at 4°C or lower away from light until GC/MS analysis.

7 GC/MS ANALYSIS

7.1 APPARATUS

7.1.1 Gas Chromatograph

An analytical system complete with a temperature programmable gas chromatograph and all required accessories including syringes, analytical columns, and gases. The GC injection port must be designed for capillary columns. Splitless injection is recommended.

7.1.2 Column

Fused silica columns are required.

A. 30 M long x 0.32 mm ID fused silica capillary column coated with a crosslinked phenyl methyl silicone such as DB-5.

B. Any column equivalent to the DB-5 column may be used as long as it has the same separation capabilities as the DB-5.

7.1.3 Mass Spectrometer

7.1.3.1 Low Resolution

A low resolution mass spectrometer (LRMS) equipped with a 70 eV (nominal) ion source operated in the electron impact ionization mode, and capable of monitoring all of the ions in each Selected Ion Monitoring (SIM) group (Table 13) with a total cycle time of 1 second or less.

7.1.3.2 High Resolution

The high resolution mass spectrometer (HRMS) must be capable of operation in the SIM mode at a resolving power of 8,000. Electron impact ionization must be used. The mass spectrometer must be capable of monitoring all of the ions listed in each of the three SIM descriptors (Table 14) with a total cycle time of 1 second or less.

7.1.4 GC/MS Interface

Any gas chromatograph to mass spectrometer interface may be used as long as it gives acceptable calibration response for each analyte of interest at the desired concentration and achieves the required tuning performance criteria (Sections 7.3.5 and 7.3.6). All components of the interface must be glass or glass-lined materials. To achieve maximum sensitivity, the exit end of the capillary column should be placed in the mass spectrometer ion source without being exposed to the ionizing electron beam.

7.1.5 Data Acquisition System

A computer system must be interfaced to the mass spectrometer. The system must allow the continuous acquisition and storage on machine-readable media of all data obtained throughout the duration of the chromatographic program. The computer must have software that can search any GC/MS data file for ions of a specific mass and plot a Selected Ion Current Profile or SICP (a plot of the abundances of the selected ions versus time or scan number). Software must also be able to integrate, in any SICP, the abundance between specified time or scan-number limits.

The data system must provide hard copies of individual ion chromatograms for selected gas chromatographic time intervals.

The data system must also be able to provide hard copies of a summary report of the results of the GC/MS runs. Figures 14A to 14C show the minimum data that the system must be available to provide.

7.2 REAGENTS

7.2.1 Stock Standard Solution (1.00 µg/µL)

Standard solutions can be prepared from pure standard materials or purchased as certified solutions.

7.2.2 Preparation of Stock Solutions

A. Calibration standards. Prepare stock calibration standard solutions of each of the PAH analytes by accurately weighing the required amount of pure material. Dissolve the material in isooctane and dilute to volume. When compound purity is assayed to be 96% or greater, the weight may be used without correction to calculate the concentration of the stock standard.

   Commercially prepared stock standards may be used at any concentration if they are certified by the manufacturer or by an independent source.

B. Internal standards. Prepare stock solutions in isooctane of the fourteen internal standards listed in Table 4 or 4A at concentrations of 1000 ng/µL.

C. Recovery standards. Prepare stock solutions in isooctane of the three recovery standards listed in Table 4 or 4A at concentrations of 1000 ng/µL.

D. Alternate standard. Prepare a stock solution in isooctane of the alternate standard listed in Table 4 or 4A at a concentration of 1000 ng/µL.

E. Surrogate standards. Prepare stock solutions in isooctane of the surrogate standards listed in Table 4 or 4A at a concentration of 1000 ng/μL.

Store stock standard solutions in Teflon®-sealed screw-cap bottles at 4°C and protect from light. Stock standard solutions must be checked frequently for signs of degradation or evaporation, especially just before using them to prepare calibration standard solutions or spiking solutions.

Replace stock standard solutions every 12 months or more frequently if comparison with quality control check samples according to Section 7.4.1 indicates a problem.

7.2.3 Calibration Standards

Prepare calibration standards at a minimum of five concentration levels. One of the calibration standards should be at a concentration near, but above, the method detection limit. The others should include the range of concentrations found in real samples but should not exceed the linear range of the GC/MS system.

Prepare calibration working standard solutions by combining appropriate volumes of individual or mixed calibration standards with internal standard, recovery standards, and alternate standard spiking solution and making up to volume with hexane to obtain the solution concentrations given in Tables 5, 6, and 6A. The suggested ranges are 0.25 ng/μL to 5.0 ng/μL for LRMS and 10 pg/μL to 500 pg/μL for HRMS.

All standards must be stored at 4°C or lower and must be freshly prepared if the check according to Section 7.4.1 indicates a problem.

7.2.4 Internal Standard (IS) Spiking Solution

The concentration of internal standard in the IS spiking solution must be such that the amount of solution added to the calibration standard solution and the sample is at least 2 mL.

Prepare the internal standard spiking solution by using appropriate volumes of stock solutions of Section 7.2.2B to give the concentrations shown in Table 4 or 4A. A volume of 2 mL of either the LRMS or HRMS spiking solution will provide the amount of the internal standards that must be added to the sample (Table 7 or 7A) before extraction to achieve, in a final volume of 500 μL, the sample extract concentrations shown in Table 8 for LRMS and Table 8 or 8A for HRMS analysis. The target concentrations in Tables 8 and 8A are based on a final volume of 500 μL and 100 percent recovery of the internal standards added to the sample.

7.2.5 Recovery Standard Spiking Solution

The concentration of recovery standard in this spiking solution must be such that the amount of solution added to the concentrated sample extract is 50 μL to give a final extract volume of 500 μL.

Use an appropriate volume of stock solution of Section 7.2.2C to prepare a recovery standard spiking solution with the concentrations shown in Table 4or 4A. Store at 4 °C or lower.

A volume of 50 µL of the recovery standard spiking solution shown in Table 4 or 4A will provide the amount of each recovery standard required by Table 7 or 7A to achieve the target sample concentration of Table 8 or 8A. Final volumes, may be adjusted depending on the target detection limit.

7.2.6 Surrogate Standard Spiking Solution

The concentration of surrogate standard in this spiking solution must be such that the amount of solution added to the calibration standard solution and the sorbent module is at least 2 mL.

Prepare the surrogate standard spiking solution by using the appropriate volume of stock solution of Section 7.2.2E to give the concentration shown in Table 4 or 4A. A volume of 2 mL of either the LRMS or HRMS spiking solution will provide the amount of the surrogate standards that must be added to the sample (Table 7 or 7A) before sampling to achieve the sample extract concentrations shown in Table 8 or 8A in a final sample volume of 500 µL.

7.2.7 Alternate Standard Spiking Solution

The concentration of alternate standard in this spiking solution must be such that the amount of solution added to the calibration standard solution and the sample extracts is at least 2 mL.

Prepare the alternate standard spiking solution by using the appropriate volume of stock solution of Section 7.2.2D to give the concentration shown in Table 4 or 4A. A volume of 2 mL of either the LRMS or HRMS spiking solution will provide the amount of the alternate standard that must be added to the sample (Table 7 or 7A) before extraction to achieve the sample extract concentrations shown in Table 8 or 8A in a final sample volume of 500 µL.

7.2.8 Calibration Check Standard

The calibration check standard shall be used for column performance checks, and for continuing calibration checks. Solution #3 from Table 5 shall be the calibration check standard for LRMS, while Solution #3 from Table 6 or 6A shall be the calibration check standard for HRMS.

7.3 INITIAL CALIBRATION

An acceptable initial calibration (7.3.8) is required before any samples are analyzed, and then intermittently throughout sample analyses as dictated by results of the continuing calibration procedures described in Section 7.4. The GC/MS system must be properly calibrated and the performance documented during the initial calibration.

7.3.1 **Retention Time Windows**

Before sample analysis, determine the retention time windows during which the selected ions will be monitored. Determine Relative Retention Time (RRTs) for each analyte by using the corresponding ^{2}H - labelled standard.

7.3.2 **GC Operating Conditions**

The GC column performance (Section 7.3.5) must be documented during the initial calibration. Table 10 summarizes GC operating conditions known to produce acceptable results with the column listed. The GC conditions must be established by each analyst for the particular instrumentation by injecting aliquots of the calibration check standard (7.2.8). It may be necessary to adjust the operating conditions slightly based on observations from analysis of these solutions. Other columns and/or conditions may be used as long as column performance criteria of Section 7.3.5 are satisfied.

Thereafter the calibration check standard must be analyzed daily to verify the performance of the system (Section 7.4).

7.3.3 **GC/MS Tuning Criteria**

A. **Low Resolution Mass Spectrometry**

Use a compound such perfluorotributylamine (PFTBA) to verify that the intensity of the peaks is acceptable. If PFTBA is used, mass spectral peak profiles for m/z 69, 219 and 264 must be recorded, plotted, and reported. The scan should include a minimum of +/- two peaks (i.e, m/z 67-71 for the m/z 69 profile).

B. **High Resolution Mass Spectrometry**

Tune the instrument to meet the minimum required resolving power of 8,000 at 192.9888 or any other PFK reference signal close to 128.0626 (naphthalene). Use peak matching and the chosen PFK reference peak to verify that the exact mass of m/z 242.9856 is within 5 ppm of the required value. The selection of the low and high mass ions must be such that they provide the largest voltage jump performed in any of the three mass descriptors.

7.3.4 **MS Operating Conditions**

A. **Low Resolution Mass Spectrometry**

Analyze standards and samples with the mass spectrometer operating in the Selected Ion Monitoring (SIM) mode with a total cycle time of 1 second or less.

B. **High Resolution Mass Spectrometry**

Analyze standards and samples with the mass spectrometer operating in the SIM mode with a total cycle time (including the voltage reset time) of one second or less.

A reference compound such as Perfluorokerosene (PFK) must be used to calibrate the SIM mass range. One PFK ion per mass descriptor is used as a lock-mass ion to correct for mass drifts that occur during the analysis. In addition to the lock-mass ion, several ions characteristic of PFK are monitored as QC check ions (Table 13).

7.3.5 **GC Column Performance Criteria**

A. The height of the valley between anthracene and phenanthrene at m/z 178 or the ^{2}H-analogs at m/z 188 shall not exceed 50 percent of the taller of the two peaks.

B. The height of the valley between benzo(b)fluoranthene and benzo(k)fluoranthene shall not exceed 60 percent of the taller of the two peaks.

If these criteria are not met and normal column maintenance procedures are not successful, the column must be replaced and the initial calibration repeated.

7.3.6 **Mass Spectrometer Performance**

A. **Low Resolution Mass Spectrometry**

Verify acceptable sensitivity during initial calibration. Demonstrate that the instrument will achieve a minimum signal-to-noise ratio of 10:1 for the quantitation and confirmation ions when the calibration standard with the lowest concentration is injected into the GC/MS system.

B. **High Resolution Mass Spectrometry**

Record the peak profile of the high mass reference signal (m/z 242.9856) obtained during peak matching by using the low-mass PFK ion at m/z 192.9888 (or lower in mass) as a reference. The minimum resolving power of 8,000 must be demonstrated on the high-mass ion while it is transmitted at a lower accelerating voltage than the low-mass reference ion, which is transmitted at full sensitivity.

The format of the peak profile representation must allow manual determination of the resolution, that is, the horizontal axis must be a calibrated mass scale (amu or ppm per division).

The peak width of the high mass ion at 5 percent of the peak height must not exceed 125 ppm in mass.

7.3.7 Calibration Procedure

Using stock standards, prepare at least five calibration standard solutions, using the same solvent that was used in the final sample extract. Keep the recovery standards and the internal standards at fixed concentrations. Adjust the concentrations recommended in Tables 5 and 6, if necessary, to ensure that the sample analyte concentration falls within the calibration range. The calibration curve must be described within the linear range of the method. Calibrate the mass spectrometer response using a 2 μL aliquot of each calibration solution. Analyze each solution once.

Calculate:

A. the relative response factors (RRFs) for each analyte as described in Sections 7.7.1.1, 7.7.1.2, and 7.7.1.3.

B. the mean RRFs as required by Section 7.7.1.4.

C. the standard deviation (SD) and relative standard deviation (RSD) as required by Section 7.7.2.

Report all results as required by Section 10.2.

7.3.8 Criteria for Acceptable Initial Calibration

An acceptable initial calibration must satisfy the following performance criteria:

A. The requirements of Sections 7.3.5 and 7.4.6 must be met.

B. The signal to noise ratio (S/N) for the GC signals present in every selected ion current profile (SICP) must be > 10:1 for the labelled standards and unlabelled analytes.

C. The percent relative standard deviation for the mean relative response factors must be no greater than 30 percent for both the unlabelled analytes and internal standards (Section 7.7.2). Otherwise, take corrective action as required by Section 7.7.2.

7.4 CONTINUING CALIBRATION

The continuing calibration consists of an analysis of the calibration check standard (Section 7.2.8) once during each 12-hour shift as described in Section 7.4.1.

The criteria for acceptable continuing calibration are given in Section 7.4.2. These must be satisfied or else corrective action must be taken as required by Section 7.4.2.

7.4.1 Calibration Check

The calibration check standard (Section 7.2.8) must be analyzed at the beginning and end of each analysis period, or at the beginning of every 12-hour shift if the laboratory operates during consecutive 12 hour shifts.

Inject a 2-μL aliquot of the calibration check standard (Section 7.2.8) into the GC/MS. Use the same data acquisition parameters as those used during the initial calibration.

Check the retention time windows for each of the compounds. They must satisfy the criterion of Section 7.4.2C

Check for GC resolution and peak shape. Document acceptable column performance as described in Section 7.3.5. If these criteria are not met, and normal column maintenance procedures are unsuccessful, the column must be replaced and the calibration repeated.

Calculate the continuing RRF and ΔRRF, the relative percent difference (RPD) between the daily RRF and the initial calibration mean RRF as described in Section 7.7.1.5.

Report the results as required by Section 10.2.

7.4.2 Continuing Calibration Performance Criteria

An acceptable continuing calibration must satisfy the following performance criteria:

A. The signal to noise ratio (S/N) for the GC signals present in the selected ion current profile (SICP) for all labelled and unlabelled standards must be ≥ 10:1.

B. The measured RRFs of *all* analytes (labelled and unlabelled) must be within 30 percent of the mean values established during the initial calibration. If this criterion is not satisfied, a new initial calibration curve must be established *before* sample extracts can be analyzed.

C. The retention time for any internal standard must not change by more than 30 seconds from the most recent calibration check. Otherwise, inspect the chromatographic system for malfunctions and make the necessary corrections. Document acceptable performance with a new initial calibration curve.

7.5 GC/MS ANALYSIS

The laboratory may proceed with the analysis of samples and blanks only after demonstrating acceptable performance as specified in Sections 7.3 and 7.4.

Analyze standards, field samples and QA samples (Section 8.1) with the gas chromatograph and mass spectrometer operating under the conditions recommended in Sections 7.3.2 and 7.3.4.

Approximately I hr before HRGC/LRMS or HRGC/HRMS analysis, adjust the sample extract volume to approximately 500 µL. This is done by adding 50 µL of the recovery standard spike solution (Section 7.2.5, and Table 4 or 4A) to the 450 µL final volume (Section 6.6.2) of the concentrated sample extract give the sample extract concentration required by Table 8 or 8A. If the sample volume must be changed to achieve a desired detection limit, the recovery spike solution concentration must be adjusted accordingly to achieve the target concentrations of Table 8 or 8A.

Inject a 2 µL aliquot of the sample extract (Section 6.6.2) on to the DB-5 column. Use the same volume as that used during calibration. Recommended GC/MS operating conditions are described in Section 7.3.

The presence of a given PAH is qualitatively confirmed if the criteria of Section 7.6.1 are satisfied.

The response for any quantitation or confirmation ion in the sample extract must not exceed the response of the highest concentration calibration standard.

Collect, record, and store the data for the calculations required by Sections 9.1.7, 9.1.8, 9.1.9, and 9.1.10. Report the results as required by Section 10.2.

7.6 QUALITATIVE ANALYSIS

7.6.1 Identification Criteria

7.6.1.1 Ion Criteria

For LRMS analysis, all quantitation and confirmation ions (Table 13) must be present.

7.6.1.2 Relative Retention Time (RRT) Criteria

The relative retention time (RRT) of the analyte compared to the RRT for the ^{2}H-standards must be within ±0.008 RRT units of the relative retention times obtained from the continuing calibration (or initial calibration if this applies).

7.6.1.3 Signal to Noise Ratio

The signal to mean noise ratio must be 10:1 for the internal standards. This ratio for the unlabelled compounds must be greater than 2.5 to 1 for the quantitation ions for HRMS and for both quantitation and confirmation ions for LRMS.

If broad background interference restricts the sensitivity of the GC/MS analysis, the analyst must employ additional cleanup on the archive sample and reanalyze.

7.7 QUANTITATIVE ANALYSIS

7.7.1 Relative Response Factors (RRFs)

7.7.1.1 RRF for Unlabelled PAH and Surrogate Standards from Initial Calibration Data

Use the results of the calibration and Equation 429-13 to calculate the relative response factors (RRFs) for each calibration compound and surrogate standard in each calibration solution (Tables 5 or 5A). Table 11 shows the assignments of the internal standards for calculation of the RRFs for the calibration solution shown in Table 5. Table 11A shows the assignments of the internal standards for calculation of the RRFs for the calibration solution shown in Table 5A. Report the results as required by Section 10.2.

7.7.1.2 RRF for Determining Internal Standard Recovery

Use the results of the calibration in Equation 429-18 to calculate the relative response factor for each internal standard relative to an appropriate recovery standard. Table 11 shows the assignments of the recovery standards for calculating internal standard recoveries for the calibration solution shown in Table 5. Table 11A shows the assignments of the recovery standards for calculating internal standard recoveries for the calibration solution shown in Table 5A. Report the results as required by Section 10.2.

7.7.1.3 RRF for Determining Alternate Standard Recovery

Use the calibration results and Equation 429-19 to calculate the response factor for the alternate standard relative to the appropriate recovery standard. Table 11 shows the assignment of the recovery standards for calculating alternate standard recovery for the calibration solution shown in Table 5. for the calibration solution shown in Table 5. Report the results as required by Section 10.2.

7.7.1.4 Mean Relative Response Factor

Use Equation 429-20 to calculate the mean RRF for each compound (unlabelled calibration standards, surrogate standards, internal standards and alternate standard). This is the average of the five RRFs calculated for each compound (one RRF calculated for each calibration solution). The mean RRF may be used if the linearity criterion of Section 7.7.2 is satisfied.
Report the results as required by Section 10.2.

7.7.1.5 RRF from Continuing Calibration Data

Analyze one or more calibration standards (one must be the medium level standard) on each work shift of 12 hours or less. Use Equations 429-17, 429-18, and 429-19 to calculate the RRFs for each analyte. Use Equation 429-22 to calculate ΔRRF, the relative percent difference

between the daily RRF and the mean RRF calculated during initial calibration. Check whether the performance criterion of Section 7.4.2B is satisfied. Report the results as required by Section 10.2.

7.7.2 Relative Standard Deviation of Relative Response Factors

For each analyte, calculate the sample standard deviation (SD) of the RRFs used to calculate the mean RRF. Use Equation 429-21 to calculate the percent relative standard deviation (%RSD) for each analyte. The analyst may use the mean RRF if the percent relative standard deviation of the RRFs is 30% or less. If the RSD requirement is not satisfied, analyze additional aliquots of appropriate calibration solutions to obtain an acceptable RSD of RRFs over the entire concentration range, or take action to improve GC/MS performance. Otherwise, use the complete five point calibration curve for that compound.

8 QUALITY ASSURANCE/QUALITY CONTROL

Each laboratory that uses this method is required to operate a formal quality control program. The minimum quality control requirements of this program consists of an initial demonstration of laboratory capability (according to Sections 7.3 and 8.1.3.1), and periodic analysis of blanks and spiked samples as required in Sections 8.1.1 and 8.1.3.2 as a continuing check on performance.

The laboratory must maintain performance records to document the quality of data that are generated. The results of the data quality checks must be compared with the method performance criteria to determine if the analytical results meet the performance requirements of the method. The laboratory must generate accuracy statements as described in Section 8.4.1.

8.1 QA SAMPLES

8.1.1 Laboratory Method Blank

The analyst must run a laboratory method blank with each set of 15 or fewer samples. The method blank must be a resin sample from the same batch used to prepare the sampling cartridge and the laboratory control samples. The method blank must be prepared and stored as described in Sections 4.3.4 and 4.3.5.

The analyst shall perform all of the same procedures on the method blank as are performed on the solid samples (Section 6.5.2.1) from the beginning of sample extraction through to the end of the GC/MS analytical procedures.

8.1.2 Performance Evaluation Samples

The laboratory should analyze performance evaluation samples quarterly when these samples become available. These samples must be prepared and analyzed by the same methods used for the field samples. Performance for the most recent quarter should be reported with the results of the sample analysis.

8.1.3 Laboratory Control Sample (LCS)

8.1.3.1 Initial Demonstration of Laboratory Capability

Before performing sample analyses for the first time, the analyst shall demonstrate the ability to generate results of acceptable precision and accuracy by using the following procedures.

Prepare spiking solutions from stock standards prepared independently from those used for calibration. Spike at least four resin samples cleaned as described in Section 4.2.2 with each of the target unlabelled analytes as indicated in Table 9. Blank resin contamination levels must be no greater than 10 percent of the levels of the spiked analytes. Add the amounts of internal standards required by Table 7 or 7A. Add the alternate standard to the extract to monitor the efficiency of the cleanup procedure.

The LCS spikes shall undergo all of the same procedures as are performed on the solid samples (Section 6.5.1.2) from the beginning of sample extraction through to the end of the GC/MS analytical procedures.

Calculate:

(A) percent recoveries for the internal standards and alternate standard,
(B) the mass of each target analyte in µg/sample or ng/sample,
(C) the average of the results for the four analyses in µg/sample or ng/sample,
(D) the average recovery (R) as a percentage of the amount added, and
(E) the relative standard deviation S_R.

Report the results as required by Section 10.2.4.

If all the acceptance criteria of Section 8.2.6 are satisfied for all of the target PAH, the analyst may begin analysis of blanks and samples. Otherwise, corrective action must be taken as required by Section 8.2.6.

8.1.3.2 Ongoing Analysis of LCS

The analyst must run two laboratory control samples with each set of 15 or fewer samples. The resin for the LCS must be taken from the same batch used to prepare the sampling cartridge and the laboratory method blank. The LCS resin must be prepared and stored as described in Sections 4.3.4 and 4.3.5.

Prepare spiking solutions from stock standards prepared independently from those used for calibration. Spike each resin sample with each of the target unlabelled analytes as indicated in Table 9. Blank resin contamination levels must be no greater than 10 percent of the levels of the spiked analytes. Add the amounts of internal standards required by Table 7 or 7A. Add the alternate standard to the extract to monitor the efficiency of the cleanup procedure.

The LCS spikes shall undergo all of the same procedures as are performed on the solid samples (Section 6.5.1.2) from the beginning of sample extraction through to the end of the GC/MS analytical procedures.

Calculate:

(A) percent recoveries for the internal standards and alternate standard,
(B) the mass of each target analyte in μg/sample or ng/sample,
(C) the average of the results for the two analyses in μg/sample or ng/sample,
(D) the average recovery as a percentage of the amount added, and
(E) the relative percent difference for the two analyses.

Report the results as required by Section 10.2.

Add the results which satisfy the performance requirements of Section 8.2.6 to the results of the initial LCS analyses (8.1.3.1) and previous ongoing data for each compound in the LCS sample.

Update the charts as described in Section 8.4.1.

8.2 ACCEPTANCE CRITERIA

8.2.1 Blank Trains

The levels of any unlabelled analyte quantified in the blank train must not exceed 20 percent of the level of that analyte in the sampling train. If this criterion cannot be met, calculate a reporting limit that is five times the blank value (Equations 429-32 and 429-33). Do not subtract the blank value from the sample value.

8.2.2 Surrogate Standard Recovery

Acceptable surrogate (field spike) recoveries should range from 50 to 150 percent. If field spike recoveries are not within the acceptable range, this must be clearly indicated in the laboratory report. The affected sampling run must be identified in the report of the calculated emissions data.

8.2.3 Internal Standard Recovery

Recoveries for each of the internal standards must be greater than 50 percent and less than 150 percent of the known value.

If internal standard recoveries are outside of the acceptable limits, the signal to noise ratio of the internal standard must be greater than 10. Otherwise the analytical procedure must be repeated on the stored portion of the extract.

NOTE: This criterion is used to assess method performance. As this is an isotope dilution technique, it is, when properly applied, independent of internal standard recovery. Lower recoveries do not necessarily

invalidate the analytical results for PAH, but they may result in higher detection limits than are desired.

If low internal standard recoveries result in detection limits that are unacceptable, the cleanup and GC/MS analysis must be repeated with the stored portion of the extract. If the analysis of the archive sample gives low recoveries and high detection limits, the results of both analyses must be reported.

8.2.4 Laboratory Method Blank

The laboratory method blank must not contain any of the target analytes listed in Table 1 at levels exceeding the PQL or 5 percent of the analyte concentration in the field sample.

If the method blank is contaminated, check solvents, reagents, standard solutions apparatus and glassware to locate and eliminate the source of contamination before any more samples are analyzed. Table 3 shows those compounds that commonly occur as contaminants in the method blank, and the ranges of concentrations that have been reported.

If field samples were processed with a laboratory method blank that showed PAH levels greater than 5 percent of the field sample, they must be re-analyzed using the archived portion of the sample extract.

Recoveries of the internal standards must satisfy the requirements of 8.2.3. If the internal standard recoveries are less than 50%, the S/N ratio must be greater than 10 for the internal standard.

8.2.5 Performance Evaluation Sample

The following will be a requirement when performance evaluation samples become available, and performance criteria have been established:

Performance for the most recent quarter must be reported with the results of the sample analysis. If the performance criteria (to be established) are not achieved, corrective action must be taken and acceptable performance demonstrated before sample analysis can be resumed.

8.2.6 Laboratory Control Samples

8.2.6.1 Initial and Ongoing Analysis

The signal of each analyte in the initial and ongoing laboratory control samples must be at least 10 times that of the background.

Acceptable accuracy is a percent recovery between 50 and 150 percent.
Acceptable precision for the initial LCS samples is a relative standard deviation (RSD) of 30 percent or less.
Acceptable precision for the ongoing analysis of duplicate samples is a relative percent difference of 50 percent or less.

If the RSD for the initial demonstration exceeds the precision limit, or any calculated recovery falls outside the range for accuracy, the laboratory performance for that analyte is unacceptable.
If the RPD for any ongoing duplicate analyses exceeds the precision limit, or any calculated recovery falls outside the range for accuracy, the laboratory performance for that analyte is unacceptable.

Beginning with Section 8.1.3.1, repeat the test for those analytes that failed to meet the performance criteria. Repeated failure, however, will confirm a general problem with the measurement system. If this occurs, locate and correct the source of the problem and repeat the test for all compounds of interest beginning with Section 8.1.3.1 for the initial analysis and Section 8.3.1.2 for the ongoing analysis.

8.3 ESTIMATION OF THE METHOD DETECTION LIMIT (MDL) AND PRACTICAL QUANTITATION LIMIT (PQL)

8.3.1 Initial Estimate of MDL and PQL

The analyst shall prepare a batch of XAD-2 resin as described in Sections 4.2.2.1 to 4.2.2.3, then check for contamination as required by Section 4.2.2.4. Identify those PAH analytes present at background levels that are too high for the MDL determination. Use the procedure of Appendix A to calculate MDLs for the remaining target PAH compounds. A suggested initial spike level for the MDL determination is 5 times a theoretical method quantitation limit (TMQL) estimated according to Equation 429-16.

$$TMQL = C \times \frac{V}{P} \times 100 \times 2 \qquad \text{429-16}$$

Where:

C = the concentration of the PAH in the lowest concentration calibration standard used in the initial calibration, (ng/μL)

V = the final extract volume, (μL)

P = the assumed percent recovery (50%) of the internal standard

2 = a factor to account for the fact that the final extract volume (V) contains one half of the analyte in the sample. The other half is archived.

8.3.2 Ongoing Estimation of MDL and PQL

Once every quarter in which this method is used, the analytical laboratory must analyze one spiked resin sample as described in Appendix A. Include all initial and quarterly results in the calculation of the standard deviation and MDL for each analyte that has not been identified as a common contaminant of the XAD-2 resin.

If the MDL for any analyte exceeds the MDL established during the initial determination, take corrective action as necessary, and repeat the monthly analysis. If any MDL still exceeds the initial MDL, then the initial standard deviation estimation procedure (Appendix A) must be repeated.

8.4 LABORATORY PERFORMANCE

The analyst must have documented standard operating procedures (SOPs) that contain specific stepwise instructions for carrying out this method. The SOPs must be readily available and followed by all personnel conducting the work. The SOP must be made available for review upon request by the Executive Officer, the tester or reviewer of the analytical results. The analyst may impose restrictions on the dissemination of the information in the SOP.

The analyst must have documented precision and accuracy statements (Section 8.4.1) readily available.

The analyst must have results of the initial and ongoing estimates of the MDL (Sections 8.3.1 and 8.3.2) readily available.

8.4.1 Precision and Accuracy Statement

The precision and accuracy statements for the analytical procedure shall be based on the results of the initial and ongoing LCS analyses. The frequency of analysis is stated in Section 8.1.3.

Prepare a table of the recoveries and the relative percent difference for each ongoing analysis of the LCS and LCS duplicate. Figure 15A is an example of such a table. This must be included in the analytical data package submitted for each set of sample analyses.

Prepare a quality control chart for each target analyte that provides a graphic representation of continued laboratory performance for that target analyte. Figure 15B is an example QC chart for benzo(a)pyrene.

9. CALCULATIONS

Carry out calculations retaining at least one extra decimal figure beyond that of the acquired data. Round off figures after the final calculation.

9.1 ANALYST'S CALCULATIONS

The analyst shall carry out the calculations described in Sections 9.1.1 to 9.1.11.

9.1.1 Relative Response Factors (RRF) for Unlabelled PAH and Surrogate Standards

Calculate the RRF for each target unlabelled PAH analyte and surrogate standard in each calibration solution . Use Equation 429-17 and the data obtained during initial calibration (7.3.7) or continuing calibration (7.4.1).

$$RRF_s = \frac{A_s \times Q_{is}}{A_{is} \times Q_s} \qquad 429\text{-}17$$

Where:

A_s = Area of the response for characteristic ions of the unlabelled analyte or surrogate standard (Tables 11 or 11A, 13, and 14).

A_{is} = Area of the response for characteristic ions of the appropriate internal standard (Tables 11 or 11A, 13, and 14).

Q_s = Amount of the unlabelled PAH calibration analyte or surrogate standard injected on to GC column, ng.

Q_{is} = Amount of the appropriate internal standard injected on to GC column, ng.

9.1.2 RRF for Determination of Internal Standard Recovery

Calculate RRF_{is} according to Equation 429-18, using data obtained from the analysis of the calibration standards.

$$RRF_{is} = \frac{A_{is} \times Q_{rs}}{A_{rs} \times Q_{is}} \qquad 429\text{-}18$$

Where:

A_{rs} = Area of the response for characteristic ions of the appropriate recovery standard (Tables 11 or 11A, 13, and 14).

Q_{rs} = Amount of the appropriate recovery standard injected on to GC column, ng.

9.1.3 RRF for Determination of Alternate Standard Recovery

Calculate RRF_{as} according to Equation 429-19, using data obtained from the analysis of the calibration standards.

$$RRF_{as} = \frac{A_{as} \times Q_{rs}}{A_{rs} \times Q_{as}} \qquad 429\text{-}19$$

Where:

A_{as} = Area of the response for characteristic ions of the alternate standard (Tables 13 and 14).

Q_{as} = Amount of alternate standard injected on to the GC column, ng.

9.1.4 Mean Relative Response Factors ($\overline{RRF}$)

Calculate the mean RRF for each target unlabelled PAH, surrogate standard, internal standard and alternate standard using Equation 429-20 and the RRFs calculated according to Sections 9.1.1, 9.1.2, and 9.1.3.

$$\overline{RRF} = \frac{1}{n} \sum_{i=1}^{n} (RRF)_i \qquad 429\text{-}20$$

Where:

RRF_i = RRF calculated for calibration solution "i" using one of Equations 429-17, 429-18 or 429-19.

n = The number of data points derived from the calibration. The minimum requirement is a five-point calibration (Section 7.2.3, Tables 5 and 6 or 6A)

9.1.5 Percent Relative Standard Deviation (%RSD) of Relative Response Factors

Use Equation 429-21 to calculate the relative standard deviation of the Relative Response Factors for each analyte.

$$\%RSD = \frac{SD}{\overline{RRF}} \times 100\% \qquad 429\text{-}21$$

Where:

$\overline{RRF}$ = Mean relative response factor of a given analyte as defined in Sections 7.7.1.4 and 9.1.4.

SD = The sample standard deviation of the relative response factors used to calculate the mean RRF.

9.1.6 Continuing Calibration ΔRRF

Use Equation 429-22 to calculate ΔRRF, the relative percent difference (RPD) between the daily RRF and the mean RRF calculated during initial calibration.

$$\Delta RRF = \frac{RRF_c - \overline{RRF}}{\overline{RRF}} \times 100\% \qquad 429\text{-}22$$

Where:

RRF_c = The RRF of a given analyte obtained from the continuing calibration (Section 7.4).

9.1.7 Percent Recovery of Internal Standard, R_{is}

Calculate the percent recovery, R_{is} for each internal standard in the sample extract, using Equation 429-23.

$$R_{is} = \frac{A_{is} \times Q_{rs}}{A_{rs} \times \overline{RRF_{is}} \times Q_{is}} \times 100\% \qquad 429\text{-}23$$

Where:

$\overline{RRF}_{is}$ = Mean relative response factor for internal standard (Equations 429-18 and 429-20).

9.1.8 Percent Recovery of Surrogate Standard, R_{ss}

Calculate the percent recovery, R_{ss} for each surrogate standard in the sample extract, using Equation 429-24.

$$R_{ss} = \frac{A_{ss} \times Q_{is}}{A_{is} \times \overline{RRF_s} \times Q_{ss}} \times 100\% \qquad 429\text{-}24$$

Where:

A_{ss} = Area of the response for characteristic ions of the surrogate standard (Tables 13 and 14).

Q_{ss} = Amount of the surrogate standard added to resin cartridge before sampling, ng.

$\overline{RRF}_s$ = Mean relative response factor for surrogate standard (Equations 429-17 and 429-20).

9.1.9 Percent Recovery of Alternate Standard, R_{as}

Calculate the percent recovery, R_{as} for the alternate standard in the sample extract, using Equation 429-25.

$$R_{as} = \frac{A_{as} \times Q_{rs}}{A_{rs} \times \overline{RRF_{as}} \times Q_{as}} \times 100\% \qquad 429\text{-}25$$

Where:

$\overline{RRF}_{as}$ = Mean relative response factor for alternate standard (Equations 429-19 and 429-20).

9.1.10 Mass of the Target Analytes and Surrogate Standards in Emissions Sample or Blank Train

Use Equation 429-26 to determine the total mass of each PAH compound or surrogate standard in the sample:

Report the PQL (9.1.11) for those analytes that were not present at levels higher than the PQL provided to the tester prior to testing (2.3.3).

$$M = \frac{Q_{is} \times A_s}{A_{is} \times \overline{RRF}} \qquad 429\text{-}26$$

Where:

M = Mass (ng) of surrogate standard (M_s) or target analyte (M_t) detected in the sample.

Q_{is} = Amount of internal standard or surrogate standard added to each sample.

A_s = Area of the response for characteristic ions of the unlabelled analyte or surrogate standard (Tables 13 and 14).

A_{is} = Area of the response for characteristic ions of the appropriate internal standard (Tables 13, and 14).

$\overline{RRF}$ = Mean relative response factor of a given analyte calculated as required by Sections 7.7.1.4 and 9.1.4.

9.1.11 Analytical Reporting Limit

The analyst shall report the PQL (Section 2.3.3) for those analytes that were not present in the emissions sample or blank train at levels higher than the pre-test estimate of the PQL.

9.2 TESTER'S CALCULATIONS

9.2.1 Sample/Blank Train PAH Mass Ratio

Use Equation 429-27 to calculate the sample/blank train mass ratio for each PAH detected at levels above the MDL in both the field sample and the blank train.

$$RATIO = \frac{M_t}{M_{BT}} \qquad 429\text{-}27$$

Where:

M_t = Mass of target PAH analyte detected in the sampling train (Equation 429-26).

M_{BT} = Mass of the same PAH analyte detected in the blank train.

If the sample to blank train PAH mass ratio is less than five, calculate the reporting limit for the tested source as required by Section 9.2.4.2. Do not calculate M_c (Section 9.2.2) or M_e (Section 9.2.3) for the emissions report.

9.2.2 PAH Concentration in Emissions

Use Equation 429-28 to calculate the concentration in the emissions of 1) the PAH analytes detected in the sampling train but not in the blank train, and 2) the PAH analytes that satisfy the minimum sample to blank train mass ratio required by Section 9.2.1.

$$M_c = \frac{M_t}{V_{m(std)}} \times \frac{1}{0.028317} \qquad 429\text{-}28$$

Where:

M_c = Concentration of PAH in the gas, ng/dscm, corrected to standard conditions of 20°C, 760 mm Hg (68°F, 29.92 in. Hg) on dry basis.

M_t = Mass of PAH compound in gas sample, ng (Equation 429-26)

$V_{m(std)}$ = Volume of gas sample measured by the dry gas meter, corrected to standard conditions, dscf (Equation 429-10)

0.028317 = Factor for converting dscf to dscm.

9.2.3 PAH Mass Emission Rate

Use Equation 429-29 to calculate the mass emission rate for each PAH compound that satisfies the minimum sample/blank train PAH mass ratio (Section 9.2.1).

$$M_e = \frac{M_s}{V_{m(std)}} \times \frac{Q_{std}}{60} \qquad 429\text{-}29$$

Where:

M_e = Mass emission rate for PAH analyte, ng/second

M_t = Mass of PAH compound in the gas sample, ng (Equation 429-26)

Q_{std} = Average stack gas dry volumetric flow rate corrected to standard conditions, dscf/min.

60 = Factor for converting minutes to seconds

9.2.4 Source Reporting Limit

9.2.4.1 PAH Not Detected in Either Sampling or Blank Train

Use Equation 429-30 or 429-31 to calculate the reporting limit for those analytes that were not detected at levels above the PQL in either the sampling or blank train.

$$RL_{cs} = \frac{PQL}{V_{m(std)}} \times \frac{1}{0.028317} \qquad 429\text{-}30$$

$$RL_{es} = \frac{PQL}{V_{m(std)}} \times \frac{Q_{std}}{60} \qquad 429\text{-}31$$

Where:

RL_{cs} = Reporting limit for the tested source, (ng/dscm), corrected to standard conditions of 20°C, 760 mm Hg (68°F, 29-92 in. Hg) on dry basis.

RL_{es} = Reporting limit for the tested source, (ng/sec.).

0.028317 = Factor for converting dscf to dscm.

60 = Factor for converting minutes to seconds.

9.2.4.2 PAH Detected in Blank Train and Sample/Blank Train Ratio <5

If the sample to blank train PAH mass ratio is less than five, then Equation 429-32 or 429-33 shall be used to calculate the reporting limit for that PAH.

$$RL_{cb} = \frac{5 \times M_{BT}}{V_{m(std)}} \times \frac{1}{0.028317} \qquad 429\text{-}32$$

$$RL_{eb} = \frac{5 \times M_{BT}}{V_{m(std)}} \times \frac{Q_{std}}{60} \qquad 429\text{-}33$$

Where:

RL_{cb} = Reporting limit for the tested source, (ng/dscm), corrected to standard conditions of 20°C, 760 mm Hg (68°F, 29-92 in. Hg) on dry basis.

RL_{eb} = Reporting limit for the tested source, (ng/sec.).

M_{BT} = The total mass of that PAH analyte in the field blank train.

10. REPORTING REQUIREMENTS

The source test protocol must contain all the sampling and analytical data required by Sections 2.2 to 2.5, 4.2.1.1, and 4.2.2.4, as well as the information listed in Sections 10.1 and 10.2 that pertain to identification and quantitation of the samples.

The emissions test report must contain all of the sampling and analytical data necessary to calculate emissions values for the target analytes or to demonstrate satisfactory performance of the method.

The end user or reviewer should be able to obtain from the source test report all information necessary to recalculate all reported test method results or to verify that all required procedures were performed.

Any deviations from the procedures described in this method must be documented in the analytical and sampling report.

10.1 SOURCE TEST PROTOCOL

At a minimum, the source test protocol must include all of the data required by Section 2.2 and the information listed in Sections 10.1.1 through 10.1.4.

10.1.1 Preparation of Filters

A. Manufacturer's lot number for the batch of filters to be used in the test.

B. Contamination check of filter (Section 4.2.1.1)

(i) Date of cleaning.
(ii) Date of PAH analysis.
(iii) Table of results of PAH analysis required by Section 4.2.1. The analytical report must include all of the data listed in Section 10.2.

C. Storage conditions prior to the test (4.3.3)

10.1.2 Preparation of XAD-2 resin

A. ID for the batch to be used in the test. The same batch must be used for the sampling train and the laboratory QC samples.

B. Contamination check of resin (Sections 4.2.2.1 to 4.2.2.4)

(i) Date of cleaning.
(ii) Date of PAH analysis.
(iii) Table of results of PAH analysis required by Secton 4.2.2.4. The analytical report must include all of the data listed in Section 10.2.

C. Addition of surrogate standards to the resin cartridge.

(i) Amount of each compound.
(ii) Date of spiking.

D. Storage conditions prior to the test (Section 4.3.3)

10.1.3 Method Detection Limits and Practical Quantitation Limits

The MDL and PQL for each target analyte determined as required by Sections 2.3.2 and 2.3.3.

10.1.4 Target Sampling Parameters

A. Source target concentration of each emitted PAH of interest.

B. Results of calculations required by Sections 2.5.2 to 2.5.5.

Figure 9 shows the minimum required calculations of target sampling parameters.

10.2 LABORATORY REPORT

The analyst must generate a laboratory report for each pre-test analysis of the sampling media (Sections 2.3, 4.2.2.1, and 4.2.2.4) and each post-test analysis of the sampling trains and laboratory QC samples.

A minimum of 7 post-test analyses are required to determine the emissions from the source and to document the quality of the emissions data. These are the analyses of three sampling runs, one blank train, one laboratory method blank and two laboratory control samples.

At a minimum, any report (data package) from the analyst to the tester shall contain the information listed in Sections 10.2.1 to 10.2.6 pertaining to identification and PAH quantitation of all samples.

10.2.1 Five-point Initial Calibration

The report of the results of the initial five-point calibration must include the data listed in A, B, and C below:

A. Mass chromatograms for each initial calibration solution that show at a minimum:

(i) Instrument ID,
(ii) laboratory sample ID on each chromatogram.
(iii) date and time of GC/MS analysis,
(iv) mass of monitored ions for each compound in the calibration solution - unlabelled PAH, internal standard, surrogate standard, alternate standard and recovery standard,
(v) retention time for each compound in the calibration solution, and
(vi) either peak height or area of the signals observed for the monitored ion masses.

B. A summary table of the data obtained for each initial calibration solution that shows at a minimum:

(i) Instrument ID,
(ii) laboratory sample ID,
(iii) date and time of GC/MS analysis,
(iv) retention time for each compound - unlabelled PAH, internal standard, surrogate standard, alternate standard and recovery standard,
(v) relative retention time for each unlabelled PAH,
(vi) either peak height or area of the signals observed for the monitored ion masses,
(vii) the relative response factors for each unlabelled PAH, internal standard, surrogate standard, and alternate standard, and
(viii) analyst's signature

Figure 14A is an example of a summary table that contains the minimum required information for the analysis of a single calibration solution.

C. A summary table that shows at a minimum:

(i) Instrument ID,
(ii) the date and time of the GC/MS analysis,
(iii) the relative response factor (RRF) calculated for each unlabelled PAH, internal standard, surrogate standard, and alternate standard in each calibration solution,
(iv) the average relative response factor ($\overline{RRF}$) calculated for the five point calibration,
(v) the relative standard deviation of the relative response factors, and
(vi) the recovery of each internal standard in percent.

Figure 14B is an example of a report that contains the minimum required information for a five point calibration summary.

10.2.2 **Continuing Calibration**

The report of the results of a continuing calibration must include the data listed in 10.2.2 A, B, and C below:

A. Mass chromatogram that shows at a minimum the information listed in 10.2.1 A.

B. A summary table of the raw data obtained for the continuing calibration that shows at a minimum, the information listed in 10.2.1 B.

C. A summary table that shows at a minimum:

(i) the relative response factor (RRF) for each unlabelled PAH, internal standard, surrogate standard, and alternate standard in the continuing calibration solution,
(ii) the average relative response factor ($\overline{RRF}$) for each compound calculated for the five point calibration,

(iii) ΔRRF for each unlabelled PAH, internal standard, surrogate standard, and alternate standard in the continuing calibration solution,
(iv) the recovery of each internal standard in percent.

Figure 14C is an example of a summary report that contains the minimum information required by Section 10.2.2C for the analysis of the continuing calibration solution.

10.2.3 Laboratory Method Blank

The laboratory report of the results of the analysis of the method blank must include at a minimum the data listed in 10.2.3 A, B, and C below:

A. Mass chromatograms that show at a minimum the information listed in 10.2.1 A.

B. A summary table of the data obtained for each method blank that shows at a minimum, the information listed in 10.2.5 B.

C. A summary table that reports the same data as listed in 10.2.5 C below.

10.2.4 Laboratory Control Samples

The report of the results of the analysis of the LCS samples must include at a minimum the data listed in 10.2.4 A, B, and C below:

A. Mass chromatograms that show at a minimum the information listed in 10.2.1 A.

B. A summary table of the raw data for each sample that shows at a minimum, the information listed in 10.2.1 B, and in addition:

(i) Client's sample ID
(ii) mass of each analyte,
(iii) the recovery of each internal standard, and alternate standard,

Figure 16A is an example of a summary table that contains the minimum information required by 10.2.4 B.

C. A summary table that reports for the two LCS analyses:

(i) client's sample ID,
(ii) sample matrix description,
(iii) date of cleaning of the XAD-2 resin,
(iv) lot number for the resin (resin for all field samples and QA samples must come from the same lot),
(v) date of extraction of LCS samples,

Figure 15A is an example of a summary table that contains the minimum information required by 10.2.4 C.

10.2.5 Emissions Samples

The report of the results of the analyses of the three sampling trains and the blabk train must include the data listed in 10.2.5 A, B, and C below:

A. Mass chromatograms that show at a minimum the information listed in 10.2.1 A, and in addition,

(i) client's sample ID

B. A summary table of the data for the analysis of each sample that shows at a minimum, the information listed in 10.2.1 B, and in addition,

(i) client's sample ID
(ii) Date of five point initial calibration (ICAL)
(iii) ICAL ID,
(iv) mass of each analyte,
(v) the recovery of each internal standard, alternate standard and surrogate standards in percent.

Figure 16A is an example of a summary table that contains the minimum information required by 10.2.5 B.

C. A summary table that reports:

(i) client's sample ID (from a chain of custody record submitted by the tester),
(ii) sample matrix description,
(iii) date of cleaning of the XAD-2 resin,
(iv) lot number for the resin (resin for all field samples and QA samples must come from the same lot),
(ii) date of submittal of the tester's samples
(v) date of extraction of samples,
(vi) Initial calibration Run ID,
(vii) Continuing calibration ID

Figure 16B is an example of a summary table that contains the minimum information required by 10.2.5C.

10.2.6 Data Flags

The laboratory report must include an explanation of any qualifiers that are used to indicate specific qualities of the data.

10.3 EMISSIONS TEST REPORT

The emissions test report should include narrative that describes how the test was done. The tester's report must also include all the appropriate sections used in a report from a Method 5 test such as a description of the plant process, sampling port locations, control equipment, fuel being used, generai plant load

conditions during the test (description of plant production equipment problems, etc.), and anything else necessary to characterize the condition being tested.

The tester's report must also include all of the information listed in Sections 10.3.1 to 10.3.4.

10.3.1 Tester's Summary of Analytical Results

The tester must summarize the results of the minimum seven analyses required for each source test. At a minimum, the summary must contain the information listed in Figure 17A including all data flags.

The tester must obtain the detailed analytical results (Section 10.2) from the laboratory and include them in the appendices as required below.

10.3.2 Field Data Summary

The report from the tester to the end user must contain a field data summary. This summary must include at a minimum a table of the results of the calculations required by Section 4.5. as well as the values which were used to calculate the reported results. Figure 17B is an example of a field data summary that contains the minimum required information.

10.3.3 PAH Emissions Results

Figure 17C show the calculations of the concentrations and mass emission rates of the target PAH. The reviewer should be able to use the data in Figures 17A and 17B to check the calculations in Figure 17C. The reviewer should also be able to check the appendix to the report to determine the accuracy and the quality of the data summarized by the tester in Figures 17A and 17B.

10.3.4 Appendix to the Emissions Test Report

At a minimum, the following raw data or signed copies must be included in an appendix to the emissions test report.

A. Record of data for sample site selection and minimum number of traverse points.

B. Moisture determination for isokinetic settings.

C. Velocity traverse data.

D. Gas analysis for determination of molecular weight.

E. Calibration records.

F. Method 429 sampling run sheets.

G. PAH laboratory reports listed in Section 10.2

The information listed above is to be considered as the minimum that should be included to characterize a given operating condition. The end user or the executive officer may require additional information for any given project.

11. BIBLIOGRAPHY

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11.7 Rom, Jerome J., Maintenance, Calibration, and Operation of Isokinetic Source Sampling Equipment. Environmental Protection Agency. Research Triangle Park, NC. APTD-0576. March, 1972.

11.8 Shigehara, R.T., Adjustments in the EPA Nomograph for Different Pitot Tube Coefficients and Dry Molecular Weights. Stack Sampling News, 2: 4-11. October, 1974

11.9 "Prudent Practices in the Laboratory. Handling and Disposal of Chemicals," National Academy Press. Washington D.C. 1995.

TABLE 1

METHOD 429 TARGET ANALYTES

Naphthalene
2-Methylnaphthalene
Acenaphthene
Acenaphthylene
Fluorene
Phenanthrene
Anthracene
Fluoranthene
Pyrene
Benzo(a)anthracene
Chrysene
Benzo(b)fluoranthene
Benzo(k)fluoranthene
Benzo(e)pyrene
Benzo(a)pyrene
Perylene
Indeno(1,2,3-cd)pyrene
Dibenz(a,h)anthracene
Benzo(ghi)perylene

TABLE 2

PRACTICAL QUANTITATION LIMITS FOR TARGET PAHs

	LRMS (µg/sample)	HRMS (ng/sample)	
Naphthalene	1.00 244	480	370
2-Methylnaphthalene	1.25	66	19
Acenaphthene	0.210	5.0	5.0
Acenaphthylene	0.104	5.0	5.0
Fluorene	0.207	16.5	5.5
Phenanthrene	0.85	22	14
Anthracene	0.146	5.0	5.0
Fluoranthene	0.346	5.0	5.0
Pyrene	0.191	5.0	5.0
Benzo(a)anthracene	0.167	5.0	5.0
Chrysene	0.272	5.0	5.0
Benzo(b)fluoranthene	1.119	5.0	5.0
Benzo(k)fluoranthene	0.738	5.0	5.0
Benzo(e)pyrene	0.146	5.0	5.0
Benzo(a)pyrene	0.191	5.0	5.0
Perylene	0.143	5.0	5.0
Indeno(1,2,3-cd)pyrene	0.798	5.0	5.0
Dibenz(a,h)anthracene	0.465	5.0	5.0
Benzo(ghi)perylene	0.305	5.0	5.0

TABLE 3

PAH ANALYSIS BY HRMS OF DIFFERENT LOTS OF CLEANED RESIN

PAH ANALYTES	CONCENTRATION (ng/sample)												
	SAMPLE IDENTIFICATION												
	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13
Naphthalene	480	220	198	120	350	340	320	360	370	380	340	520	220
2-Methylnaphthalene	65	32	38	15.6	32	15.6	32	26	19	45	15	32	48
Acenaphthylene	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Acenaphthene	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Fluorene	16.5	9.8	13	< 5.0	5.7	5.4	7.4	5.8	5.5	10	5.5	6.8	5.0
Phenanthrene	22	16	32	<12.5*	14	14.8	16	12	14	24	13	<13.0*	14
Anthracene	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Fluoranthene	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Pyrene	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Benzo(a)anthracene	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Chrysene	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Benzo(b)fluoranthene	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Benzo(k)fluoranthene	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Benzo(e)pyrene	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Benzo(a)pyrene	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Perylene	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Indeno(1,2,3-cd)pyrene	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Dibenzo(a,h)anthracene	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Benzo(g,h,i)perylene	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0

* 5 x the concentration of the lowest calibration standard

TABLE 4

COMPOSITION OF THE SAMPLE SPIKING SOLUTIONS

Spiking Solutions	Analytes	Concentration ng/µl LRMS	Concentration pg/µl HRMS
1.	**Surrogate Standards**		
	d_{10}-Fluorene	1.0	250
	d_{14}-Terphenyl	1.0	250
2.	**Internal Standards**		
	d_8-Naphthalene	1.0	100
	d_{10}-2-Methylnaphthalene	1.0	100
	d_8-Acenaphthylene	1.0	100
	d_{10}-Phenanthrene	1.0	100
	d_{10}-Fluoranthene	1.0	100
	d_{12}-Benzo(a)anthracene	1.0	100
	d_{12}-Chrysene	1.0	100
	d_{12}-Benzo(b)fluoranthene	1.0	200
	d_{12}-Benzo(k)fluoranthene	1.0	200
	d_{12}-Benzo(a)pyrene	1.0	200
	d_{12}-Perylene	1.0	200
	d_{12}-Indeno(1,2,3,c-d)pyrene	1.0	200
	d_{14}-Dibenz(a,h)anthracene	1.0	200
	d_{12}-Benzo(ghi)perylene	1.0	200
3.	**Alternate Standard**		
	d_{10}-Anthracene	1.0	100
4.	**Recovery Standards**		
	d_{10}-Acenaphthene	20.0	2000
	d_{10}-Pyrene	20.0	2000
	d_{12}-benzo(e)pyrene	20.0	2000

TABLE 4A

COMPOSITION OF ALTERNATIVE SAMPLE SPIKING SOLUTIONS

Spiking Solutions	Analytes	Concentration pg/µl HRMS
1A.	**Surrogate Standards**	
	d_{12}-Benzo(e)pyrene	250
	d_{14}-Terphenyl	250
2A.	**Internal Standards**	
	d_8-Naphthalene	100
	d_8-Acenaphthylene	100
	d_{10}-Acenaphthene	100
	d_{10}-Fluorene	100
	d_{10}-Phenanthrene	100
	d_{10}-Fluoranthene	100
	d_{12}-Benzo(a)anthracene	100
	d_{12}-Chrysene	100
	d_{12}-Benzo(b)fluoranthene	200
	d_{12}-Benzo(k)fluoranthene	200
	d_{12}-Benzo(a)pyrene	200
	d_{12}-Indeno(1,2,3,c-d)pyrene	200
	d_{14}-Dibenz(a,h)anthracene	200
	d_{12}-Benzo(ghi)perylene	200
3A.	**Alternate Standard**	
	d_{10}-Anthracene	100
4A.	**Recovery Standards**	
	d_{10}-2-Methylnaphthalene	2000
	d_{10}-Pyrene	2000
	d_{12}-Perylene	2000

TABLE 5

CONCENTRATIONS OF PAHs IN WORKING GC/MS CALIBRATION STANDARD SOLUTIONS FOR LOW RESOLUTION MASS SPECTROMETRY

	CONCENTRATIONS (ng/μL)				
	Solutions				
	1	2	3	4	5
Calibration Standards					
Naphthalene	0.25	0.5	1.0	2.5	5.0
2-Methylnaphthalene	0.25	0.5	1.0	2.5	5.0
Acenaphthene	0.25	0.5	1.0	2.5	5.0
Acenaphthylene	0.25	0.5	1.0	2.5	5.0
Fluorene	0.25	0.5	1.0	2.5	5.0
Phenanthrene	0.25	0.5	1.0	2.5	5.0
Anthracene	0.25	0.5	1.0	2.5	5.0
Fluoranthene	0.25	0.5	1.0	2.5	5.0
Pyrene	0.25	0.5	1.0	2.5	5.0
Benzo(a)anthracene	0.25	0.5	1.0	2.5	5.0
Chrysene	0.25	0.5	1.0	2.5	5.0
Benzo(b)fluoranthene	0.25	0.5	1.0	2.5	5.0
Benzo(k)fluoranthene	0.25	0.5	1.0	2.5	5.0
Benzo(e)pyrene	0.25	0.5	1.0	2.5	5.0
Benzo(a)pyrene	0.25	0.5	1.0	2.5	5.0
Perylene	0.25	0.5	1.0	2.5	5.0
Indeno(1,2,3-cd)pyrene	0.25	0.5	1.0	2.5	5.0
Dibenz(a,h)anthracene	0.25	0.5	1.0	2.5	5.0
Benzo(ghi)perylene	0.25	0.5	1.0	2.5	5.0
Internal Standards					
d_8-Naphthalene	1.0	1.0	1.0	1.0	1.0
d_{10}-2-Methylnaphthalene	1.0	1.0	1.0	1.0	1.0
d_8-Acenaphthylene	1.0	1.0	1.0	1.0	1.0
d_{10}-Phenanthrene	1.0	1.0	1.0	1.0	1.0
d_{10}-Fluoranthene	1.0	1.0	1.0	1.0	1.0
d_{12}-Benzo(a)anthracene	1.0	1.0	1.0	1.0	1.0
d_{12}-Chrysene	1.0	1.0	1.0	1.0	1.0
d_{12}-Benzo(b)fluoranthene	1.0	1.0	1.0	1.0	1.0
d_{12}-Benzo(k)fluoranthene	1.0	1.0	1.0	1.0	1.0
d_{12}-Benzo(a)pyrene	1.0	1.0	1.0	1.0	1.0
d_{12}-Perylene	1.0	1.0	1.0	1.0	1.0
d_{12}-Indeno(1,2,3,c-d)pyrene	1.0	1.0	1.0	1.0	1.0
d_{14}-Dibenz(a,h)anthracene	1.0	1.0	1.0	1.0	1.0
d_{12}-Benzo(ghi)perylene	1.0	1.0	1.0	1.0	1.0

TABLE 5 (CONT)

CONCENTRATIONS OF PAHs IN WORKING GC/MS CALIBRATION STANDARD SOLUTIONS FOR LOW RESOLUTION MASS SPECTROMETRY

	CONCENTRATIONS (ng/μL)				
	Solutions				
	1	2	3	4	5
Surrogate Standards					
d_{10}-Fluorene	1.0	1.0	1.0	1.0	1.0
d_{14}-Terphenyl	1.0	1.0	1.0	1.0	1.0
Alternate Standard					
d_{10}-Anthracene	1.0	1.0	1.0	1.0	1.0
Recovery Standards					
d_{10}-Acenaphthene	1.0	1.0	1.0	1.0	1.0
d_{10}-Pyrene	1.0	1.0	1.0	1.0	1.0
d_{12}-benzo(e)pyrene	1.0	1.0	1.0	1.0	1.0

TABLE 6

CONCENTRATIONS OF PAHs IN WORKING GC/MS CALIBRATION STANDARD SOLUTIONS FOR HIGH RESOLUTION MASS SPECTROMETRY

	CONCENTRATIONS (pg/μL)				
	Solutions				
	1	2	3	4	5
Calibration Standards					
Naphthalene	10	50	100	200	500
2-Methylnaphthalene	10	50	100	200	500
Acenaphthylene	10	50	100	200	500
Acenaphthene	10	50	100	200	500
Fluorene	10	50	100	200	500
Phenanthrene	10	50	100	200	500
Anthracene	10	50	100	200	500
Fluoranthene	10	50	100	200	500
Pyrene	10	50	100	200	500
Benzo(a)anthracene	10	50	100	200	500
Chrysene	10	50	100	200	500
Benzo(b)fluoranthene	10	50	100	200	500
Benzo(k)fluoranthene	10	50	100	200	500
Benzo(e)pyrene	10	50	100	200	500
Benzo(a)pyrene	10	50	100	200	500
Perylene	10	50	100	200	500
Indeno(1,2,3-cd)pyrene	10	50	100	200	500
Dibenz(a,h)anthracene	10	50	100	200	500
Benzo(ghi)perylene	10	50	100	200	500
Internal Standards					
d_8-Naphthalene	100	100	100	100	100
d_8Methylnaphthalene	100	100	100	100	100
d_8-Acenaphthylene	100	100	100	100	100
d_{10}-Phenanthrene	100	100	100	100	100
d_{10}-Fluoranthene	100	100	100	100	100
d_{12}-Benzo(a)anthracene	100	100	100	100	100
d_{12}-Chrysene	100	100	100	100	100
d_{12}-Benzo(b)fluoranthene	200	200	200	200	200
d_{12}-Benzo(k)fluoranthene	200	200	200	200	200
d_{12}-Benzo(a)pyrene	200	200	200	200	200
d_{12}-Perylene	200	200	200	200	200
d_{12}-Indeno(1,2,3,c-d)pyrene	200	200	200	200	200
d_{14}-Dibenz(a,h)anthracene	200	200	200	200	200
d_{12}-Benzo(ghi)perylene	200	200	200	200	200

TABLE 6 (CONT)

CONCENTRATIONS OF PAHs IN WORKING GC/MS CALIBRATION STANDARD SOLUTIONS FOR HIGH RESOLUTION MASS SPECTROMETRY

	CONCENTRATIONS (pg/μL)				
	Solutions				
	1	2	3	4	5
Surrogate Standards					
d_{10}-Fluorene	100	100	100	100	100
d_{14}-Terphenyl	100	100	100	100	100
Alternate Standard					
d_{10}-Anthracene	100	100	100	100	100
Recovery Standards					
d_{10}-Acenaphthene	200	200	200	200	200
d_{10}-Pyrene	200	200	200	200	200
d_{12}-benzo(e)pyrene	200	200	200	200	200

TABLE 6A

CONCENTRATIONS OF PAHs IN ALTERNATIVE WORKING GC/MS CALIBRATION STANDARD SOLUTIONS FOR HIGH RESOLUTION MASS SPECTROMETRY

	CONCENTRATIONS (pg/μL)				
	Solutions				
	1	2	3	4	5
Calibration Standards					
Naphthalene	10	50	100	200	500
2-Methylnaphthalene	10	50	100	200	500
Acenaphthylene	10	50	100	200	500
Acenaphthene	10	50	100	200	500
Fluorene	10	50	100	200	500
Phenanthrene	10	50	100	200	500
Anthracene	10	50	100	200	500
Fluoranthene	10	50	100	200	500
Pyrene	10	50	100	200	500
Benzo(a)anthracene	10	50	100	200	500
Chrysene	10	50	100	200	500
Benzo(b)fluoranthene	10	50	100	200	500
Benzo(k)fluoranthene	10	50	100	200	500
Benzo(e)pyrene	10	50	100	200	500
Benzo(a)pyrene	10	50	100	200	500
Perylene	10	50	100	200	500
Indeno(1,2,3-cd)pyrene	10	50	100	200	500
Dibenz(a,h)anthracene	10	50	100	200	500
Benzo(ghi)perylene	10	50	100	200	500
Internal Standards					
d_8-Naphthalene	100	100	100	100	100
d_8-Acenaphthylene	100	100	100	100	100
d_{10}-Acenaphthene	100	100	100	100	100
d_{10}-Fluorene	100	100	100	100	100
d_{10}-Phenanthrene	100	100	100	100	100
d_{10}-Fluoranthene	100	100	100	100	100
d_{12}-Benzo(a)anthracene	100	100	100	100	100
d_{12}-Chrysene	100	100	100	100	100
d_{12}-Benzo(b)fluoranthene	200	200	200	200	200
d_{12}-Benzo(k)fluoranthene	200	200	200	200	200
d_{12}-Benzo(a)pyrene	200	200	200	200	200
d_{12}-Indeno(1,2,3,c-d)pyrene	200	200	200	200	200
d_{14}-Dibenz(a,h)anthracene	200	200	200	200	200
d_{12}-Benzo(ghi)perylene	200	200	200	200	200

TABLE 6A (CONT)

CONCENTRATIONS OF PAHs IN ALTERNATIVE WORKING GC/MS CALIBRATION STANDARD SOLUTIONS FOR HIGH RESOLUTION MASS SPECTROMETRY

	CONCENTRATIONS (pg/μL)				
	Solutions				
	1	2	3	4	5
Surrogate Standards					
d_{12}-benzo(e)pyrene	100	100	100	100	100
d_{14}-Terphenyl	100	100	100	100	100
Alternate Standard					
d_{10}-Anthracene	100	100	100	100	100
Recovery Standards					
d_{10}-2-Methylnaphthalene	200	200	200	200	200
d_{10}-Pyrene	200	200	200	200	200
d_{12}-Perylene	200	200	200	200	200

TABLE 7

SPIKE LEVELS FOR LABELLED STANDARDS

Time of Addition	Analyte	LRMS (µg/sample)	HRMS (ng/sample)
Before sampling	**Surrogate Standards**		
	d_{10}-Fluorene	2.0	500
	d_{14}-Terphenyl	2.0	500
Before extraction	**Internal Standards**		
	d_8-Naphthalene	2.0	200
	d_{10}-2-Methylnaphthalene	2.0	200
	d_8-Acenaphthylene	2.0	200
	d_{10}-Phenanthrene	2.0	200
	d_{10}-Fluoranthene	2.0	200
	d_{12}-Benzo(a)anthracene	2.0	200
	d_{12}-Chrysene	2.0	200
	d_{12}-Benzo(b)fluoranthene	2.0	400
	d_{12}-Benzo(d)fluoranthene	2.0	400
	d_{12}-Benzo(a)pyrene	2.0	400
	d_{12}-Perylene	2.0	400
	d_{12}-Indeno(1,2,3,c-d)pyrene	2.0	400
	d_{14}-Dibenz(a,h)anthracene	2.0	400
	d_{12}-Benzo(ghi)perylene	2.0	400
Before extraction	**Alternate Standard**		
	d_{10}-Anthracene	2.0	200
Before GC/MS	**Recovery Standards**		
	d_{10}-Acenaphthene	1.0	100
	d_{10}-Pyrene	1.0	100
	d_{12}-benzo(e)pyrene	1.0	100

TABLE 7A

SPIKE LEVELS FOR LABELLED STANDARDS FOR ALTERNATIVE HRMS SPIKING SCHEME

Time of Addition	Analyte	HRMS (ng/sample)
Before sampling	**Surrogate Standards**	
	d_{12}-benzo(e)pyrene	500
	d_{14}-Terphenyl	500
Before extraction	**Internal Standards**	
	d_8-Naphthalene	200
	d_8-Acenaphthylene	200
	d_{10}-Acenaphthene	200
	d_{10}-Fluorene	200
	d_{10}-Phenanthrene	200
	d_{10}-Fluoranthene	200
	d_{12}-Benzo(a)anthracene	200
	d_{12}-Chrysene	200
	d_{12}-Benzo(b)fluoranthene	400
	d_{12}-Benzo(d)fluoranthene	400
	d_{12}-Benzo(a)pyrene	400
	d_{12}-Indeno(1,2,3,c-d)pyrene	400
	d_{14}-Dibenz(a,h)anthracene	400
	d_{12}-Benzo(ghi)perylene	400
Before extraction	**Alternate Standard**	
	d_{10}-Anthracene	200
Before GC/MS	**Recovery Standards**	
	d_{10}-2-Methylnaphthalene	100
	d_{10}-Pyrene	100
	d_{12}-Perylene	100

TABLE 8

TARGET CONCENTRATIONS FOR LABELLED STANDARDS IN SAMPLE EXTRACT[1]

	ng/µl LRMS	pg/µl HRMS
Surrogate Standards		
d_{10}-Fluorene	2.0	500
d_{14}-Terphenyl	2.0	500
Internal Standards		
d_8-Naphthalene	2.0	200
d_{10}-2-Methylnaphthalene	2.0	200
d_8-Acenaphthylene	2.0	200
d_{10}-Phenanthrene	2.0	200
d_{10}-Fluoranthene	2.0	200
d_{12}-Benzo(a)anthracene	2.0	200
d_{12}-Chrysene	2.0	200
d_{12}-Benzo(b)fluoranthene	2.0	400
d_{12}-Benzo(k)fluoranthene	2.0	400
d_{12}-Benzo(a)pyrene	2.0	400
d_{12}-Perylene	2.0	400
d_{12}-Indeno(1,2,3,c-d)pyrene	2.0	400
d_{14}-Dibenz(a,h)anthracene	2.0	400
d_{12}-Benzo(ghi)perylene	2.0	400
Alternate Standard		
d_{10}-Anthracene	1.0	200
Recovery Standards		
d_{10}-Acenaphthene	1.0	200
d_{10}-Pyrene	1.0	200
d_{12}-benzo(e)pyrene	1.0	200

[1] Assuming 100 percent recovery.

TABLE 8A

TARGET CONCENTRATIONS FOR LABELLED STANDARDS IN SAMPLE EXTRACT OBTAINED WITH ALTERNATIVE HRMS SPIKING SCHEME[1]

	pg/µl HRMS
Surrogate Standards	
d_{12}-benzo(e)pyrene	500
d_{14}-Terphenyl	500
Internal Standards	
d_8-Naphthalene	200
d_8-Acenaphthylene	200
d_{10}-Acenaphthene	200
d_{10}-Fluorene	200
d_{10}-Phenanthrene	200
d_{10}-Fluoranthene	200
d_{12}-Benzo(a)anthracene	200
d_{12}-Chrysene	200
d_{12}-Benzo(b)fluoranthene	400
d_{12}-Benzo(k)fluoranthene	400
d_{12}-Benzo(a)pyrene	400
d_{12}-Indeno(1,2,3,c-d)pyrene	400
d_{14}-Dibenz(a,h)anthracene	400
d_{12}-Benzo(ghi)perylene	400
Alternate Standard	
d_{10}-Anthracene	200
Recovery Standards	
d_{10}-2-Methylnaphthalene	200
d_{10}-Pyrene	200
d_{12}-Perylene	200

[1] Assuming 100 percent recovery.

TABLE 9

CONCENTRATIONS OF COMPOUNDS IN LABORATORY CONTROL SPIKE SAMPLE

	ng/sample	
	LRMS	HRMS
Unlabelled Compounds		
Naphthalene	2.0	1000
2-Methylnaphthalene	2.0	200
Acenaphthylene	2.0	200
Acenaphthene	2.0	200
Fluorene	2.0	200
Phenanthrene	2.0	500
Anthracene	2.0	200
Fluoranthene	2.0	200
Pyrene	2.0	200
Benzo(a)anthracene	2.0	200
Chrysene	2.0	200
Benzo(b)fluoranthene	2.0	200
Benzo(k)fluoranthene	2.0	200
Benzo(e)pyrene	2.0	200
Benzo(a)pyrene	2.0	200
Perylene	2.0	200
Indeno(1,2,3,c-d)pyrene	2.0	200
Dibenz(a,h)anthracene	2.0	200
Benzo(ghi)perylene	2.0	200
Alternate Standard		
d_{10}-Anthracene	2.0	200

TABLE 10

RECOMMENDED GAS CHROMATOGRAPHIC OPERATING CONDITIONS FOR PAH ANALYSIS

Column Type	DB-5
Length (m)	30
ID (mm)	0.25
Film Thickness (μm)	0.32
Helium Linear Velocity (cm/sec)	30
Injection mode	Splitless
Splitless Time (sec)	30
Initial Temperature (°C)	45
Initial Time (min)	4
Program Rate (°C/min)	8
Final Temperature (°C)	300
Final Hold Time	until benzo(ghi) perylene has eluted
Injector Temperature (°C)	320

TABLE 11

ASSIGNMENTS OF INTERNAL STANDARDS FOR CALCULATION OF RRFs AND QUANTITATION OF TARGET PAHs AND SURROGATE STANDARDS

Analyte	Internal Standards
Unlabeled PAH	
Naphthalene	d_8-Naphthalene
2-Methylnaphthalene	d_{10}-2-Methylnaphthalene
Acenaphthylene	d_8-Acenaphthylene
Acenaphthene	d_8-Acenaphthylene
Fluorene	d_{10}-Phenanthrene
Phenanthrene	d_{10}-Phenanthrene
Anthracene	d_{10}-Phenanthrene
Fluoranthene	d_{10}-Fluoranthene
Pyrene	d_{10}-Fluoranthene
Benzo(a)anthracene	d_{12}-Benzo(a)anthracene
Chrysene	d_{12}-Chrysene
Benzo(b)fluoranthene	d_{12}-Benzo(b)fluoranthene
Benzo(k)fluoranthene	d_{12}-Benzo(k)fluoranthene
Benzo(e)pyrene	d_{12}-Benzo(a)pyrene
Benzo(a)pyrene	d_{12}-Benzo(a)pyrene
Perylene	d_{12}-Perylene
Indeno(1,2,3-cd)pyrene	d_{12}-Indeno(1,2,3,c-d)pyrene
Dibenz(a,h)anthracene	d_{14}-Dibenz(a,h)anthracene
Benzo(ghi)perylene	d_{12}-Benzo(ghi)perylene
Surrogate Standards	
d_{10}-Fluorene	d_{10}-Phenanthrene
d_{14}-Terphenyl	d_{10}-Fluoranthene

TABLE 11A

ASSIGNMENTS OF INTERNAL STANDARDS FOR CALCULATION OF RRFs AND QUANTITATION OF TARGET PAHs AND SURROGATE STANDARDS USING ALTERNATIVE HRMS SPIKING SCHEME

Analyte	Internal Standards
Unlabeled PAH	
Naphthalene	d_8-Naphthalene
2-Methylnaphthalene	d_{10}-Acenaphthene
Acenaphthylene	d_8-Acenaphthylene
Acenaphthene	d_{10}-Acenaphthene
Fluorene	d_{10}-Fluorene
Phenanthrene	d_{10}-Phenanthrene
Anthracene	d_{10}-Phenanthrene
Fluoranthene	d_{10}-Fluoranthene
Pyrene	d_{10}-Fluoranthene
Benzo(a)anthracene	d_{12}-Benzo(a)anthracene
Chrysene	d_{12}-Chrysene
Benzo(b)fluoranthene	d_{12}-Benzo(b)fluoranthene
Benzo(k)fluoranthene	d_{12}-Benzo(k)fluoranthene
Benzo(e)pyrene	d_{12}-Benzo(a)pyrene
Benzo(a)pyrene	d_{12}-Benzo(a)pyrene
Perylene	d_{12}-Benzo(a)pyrene
Indeno(1,2,3-cd)pyrene	d_{12}-Indeno(1,2,3,c-d)pyrene
Dibenz(a,h)anthracene	d_{14}-Dibenz(a,h)anthracene
Benzo(ghi)perylene	d_{12}-Benzo(ghi)perylene
Surrogate Standards	
d_{14}-Terphenyl	d_{10}-Fluoranthene
d_{12}-Benzo(e)pyrene	d_{12}-Benzo(a)pyrene

TABLE 12

ASSIGNMENTS OF RECOVERY STANDARDS FOR DETERMINATION OF PERCENT RECOVERIES OF INTERNAL STANDARDS AND THE ALTERNATE STANDARD

Analyte	Recovery Standard
Internal Standards	
d_8-Naphthalene	d_{10}-Acenaphthene
d_{10} -2-Methylnaphthalene	d_{10}-Acenaphthene
d_8-Acenaphthylene	d_{10}-Acenaphthene
d_{10}-Phenanthrene	d_{10}-Pyrene
d_{10}-Fluoranthene	d_{10}-Pyrene
d_{12}-Benzo(a)anthracene	d_{10}-Pyrene
d_{12}-Chrysene	d_{10}-Pyrene
d_{12}-Benzo(b)fluoranthene	d_{12}-Benzo(e)pyrene
d_{12}-Benzo(k)fluoranthene	d_{12}-Benzo(e)pyrene
d_{12}-Benzo(a)pyrene	d_{12}-Benzo(e)pyrene
d_{12}-Perylene	d_{12}-Benzo(e)pyrene
d_{12}-Indeno(1,2,3,c-d)pyrene	d_{12}-Benzo(e)pyrene
d_{14}-Dibenz(a,h)anthracene	d_{12}-Benzo(e)pyrene
d_{12}-Benzo(ghi)perylene	d_{12}-Benzo(e)pyrene
Alternate Standard	
d_{10}-Anthracene	d_{10}-Pyrene

TABLE 12A

ASSIGNMENTS OF RECOVERY STANDARDS FOR DETERMINATION OF PERCENT RECOVERIES OF INTERNAL STANDARDS AND THE ALTERNATE STANDARD USING ALTERNATIVE HRMS SPIKING SCHEME

Analyte	Recovery Standard
Internal Standards	
d_8-Naphthalene	d_{10}-2-Methylnaphthalene
d_{10} -2-Methylnaphthalene	d_{10}-2-Methylnaphthalene
d_8-Acenaphthylene	d_{10}-2-Methylnaphthalene
d_{10}-Phenanthrene	d_{10}-Pyrene
d_{10}-Fluoranthene	d_{10}-Pyrene
d_{12}-Benzo(a)anthracene	d_{10}-Pyrene
d_{12}-Chrysene	d_{10}-Pyrene
d_{12}-Benzo(b)fluoranthene	d_{12}-Perylene
d_{12}-Benzo(k)fluoranthene	d_{12}-Perylene
d_{12}-Benzo(a)pyrene	d_{12}-Perylene
d_{12}-Perylene	d_{12}-Perylene
d_{12}-Indeno(1,2,3,c-d)pyrene	d_{12}-Perylene
d_{14}-Dibenz(a,h)anthracene	d_{12}-Perylene
d_{12}-Benzo(ghi)perylene	d_{12}-Perylene
Alternate Standard	
d_{10}-Anthracene	d_{10}-Pyrene

TABLE 13

QUANTITATION AND CONFIRMATION IONS FOR SELECTED ION MONITORING OF PAHs BY HRGC/LRMS

Analyte	Quant. Ion	Confirm. Ion	%Relative Abundance of Confirm. Ion
Naphthalene	128	127	10
d_8-Naphthalene	136	68	80
2-Methylnaphthalene	142	141	80
d_{10}-2-Methylnaphthalene	152		
Acenaphthylene	152	153	15
d_8-Acenaphthylene	160		
Acenaphthene	154	153	86
d_{10}-Acenaphthene	164		
Fluorene	166	165	80
d_{10}-Fluorene	176		
Phenanthrene	178	176	15
d_{10}-Phenanthrene	188	94	
Anthracene	178	176	15
d_{10}-Anthracene	188	94	
Fluoranthene	202	101	15
d_{10}-Fluoranthene	212	106	
Pyrene	202	101	15
d_{10}-Pyrene	212	106	
Benzo(a)anthracene	228	114	15
d_{12}-Benzo(a)anthracene	240	120	
Chrysene	228	114	15
d_{12}-Chrysene	240	120	
d_{14}-Terphenyl	244	122	15

TABLE 13 (CONT)

QUANTITATION AND CONFIRMATION IONS FOR SELECTED ION MONITORING OF PAHs BY HRGC/LRMS

Analyte	Quant. Ion	Confirm. Ion	%Relative Abundance of Confirm. Ion
Benzo(b)fluoranthene	252	126	25
d_{12}-Benzo(b)fluoranthene	264	132	
Benzo(k)fluoranthene	252	126	25
d_{12}-Benzo(k)fluoranthene	264	132	
Benzo(e)pyrene	252	126	25
d_{12}-Benzo(e)pyrene	264	132	
Benzo(a)pyrene	252	126	25
d_{12}-Benzo(a)pyrene	264	132	
Perylene	252	126	26
d_{12}-Perylene	264	132	
Indeno(1,2,3-cd)pyrene	276	138	28
d_{12}-Indeno(1,2,3-cd)pyrene	288		
Dibenz(ah)anthracene	278	139	24
d_{14}-Dibenz(ah)anthracene	292		
Benzo(ghi)perylene	276	138	37
d_{12}-Benzo(ghi)perylene	288		

TABLE 14

MASS DESCRIPTORS USED FOR SELECTED ION MONITORING FOR HRGC/HRMS

Descriptor No.	Analyte	Ion Type	Accurate m/z
1	Naphthalene	M	128.0626
	PFK	LOCK	130.9920
	d_8-Naphthalene	IS	136.1128
	2-Methylnaphthalene	M	142.0782
	d_{10}-2-Methylnaphthalene	IS	152.1410
	Acenaphthylene	M	152.0626
	d_8-Acenaphthylene	IS	160.1128
	Acenaphthene	M	154.0782
	d_{10}-Acenaphthene	RS	164.1410
	PFK	QC	169.9888
2	Fluorene	M	166.0782
	d_{10}-Fluorene	SS	176.1410
	Phenanthrene	M	178.0782
	d_{10}-Phenanthrene	IS	188.1410
	Anthracene	M	178.0782
	d_{10}-Anthracene	AS	188.1410
	Fluoranthene	M	202.0782
	d_{10}-Fluoranthene	IS	212.1410
	Pyrene	M	202.0782
	PFK	QC	204.9888
	d_{10}-Pyrene	RS	212.1410
	Benzo(a)anthracene	M	228.0939
	d_{12}-Benzo-a-Anthracene	IS	240.1692
	Chrysene	M	228.0939
	d_{12}-Chrysene	IS	240.1692
	PFK	LOCK	230.9856
	d_{14}-Terphenyl	SS	244.1974

IS = Internal Standard
SS = Surrogate Standard
AS = Alternate Standard
RS = Recovery Standard
LOCK = Lock-Mass Ion
QC = Quality Control Check Ion

TABLE 14 (CONT)

MASS DESCRIPTORS USED FOR SELECTED ION MONITORING FOR HRGC/HRMS

Descriptor No.	Analyte	Ion Type	Accurate m/z
3	Perylene	M	252.0939
	d_{12}-Perylene	IS	264.1692
	PFK	QC	268.9824
	Benzo(b)fluoranthene	M	252.0939
	d_{12}-Benzo(b)fluoranthene	IS	264.1692
	Benzo(k)fluoranthene	M	252.0939
	d_{12}-Benzo-k-fluoranthene	IS	264.1692
	Benzo(e)pyrene	M	252.0939
	d_{12}-Benzo(e)pyrene	RS	264.1692
	Benzo(a)pyrene	M	252.0939
	d_{12}-Benzo(a)pyrene	IS	264.1692
	Benzo(ghi)perylene	M	276.0939
	d_{12}-Benzo(ghi)perylene	IS	288.1692
	Indeno(1,2,3-cd)pyrene	M	276.0939
	d_{12}-Indeno(1,2,3-cd)pyrene	IS	288.1692
	Dibenzo(ah)anthracene	M	278.1096
	PFK	LOCK	280.9824
	d_{14}-Dibenzo(ah)anthracene	IS	292.1974

The following nuclidic masses were used:

H = 1.007825 ^{2}H = 2.014102 C = 12.000000

IS = Internal Standard
SS = Surrogate Standard
AS = Alternate Standard
RS = Recovery Standard
LOCK = Lock-Mass Ion
QC = Quality Control Check Ion

FIGURE 1

METHOD 429 FLOWCHART

1

§1.3.9 *The end user is identified*
§1.3.10 *The tester is designated*

2

The end user chooses:
§2.1.1 • source target concentration

3

§2.1.2 *The tester selects analyst with documented*
§8.4 *experience in satisfactory performance of analytical*
§8.4.1 *procedures*

4

Tester and laboratory coordinate:
§4.3.2 • pre-test cleaning of glassware
§4.2 • pre-test cleaning, contamination checks, and
§4.3.3 storage of sampling materials and reagents
§4.3.4 • preparation of filter, sorbent cartridges, method blanks, and LCS

5

Tester requests pre-test analytical results from laboratory:
§10.1.1 • contamination check of filters
§10.1.2 • contamination check of XAD-2 resin
§10.1.3 • Method detection limits (MDLs) and Practical quantitation limits (PQLs)

6

Tester calculates and plans:
§2.5 • ≥3 sampling runs and ≥1 blank sampling train
• sample volume
• sampling time
• source reporting limit
• chain of custody

7

Tester performs:
§4.3.1 • calibration of equipment

8

Tester writes:
§2.2 • pre-test protocol

9

Tester performs:
§4.4.1 • preliminary field sampling determinations
§4.4.2 • sampling train preparation
§4.4.3 • leak checks
§4.4.4 • sampling procedure
• ≥3 sampling runs
• ≥1 blank sampling train
§5 • recovery of all runs and blank sampling train

10

Tester delivers:
§5.3 • recovered sampling runs and blank train(s)
§5.4 • chain of custody record

11

Laboratory performs:
§6 • extraction of field samples
§7 • analyses
§8 • QA/QC procedures
§9 • chain of custody
§10.2 • reporting requirements

12

Tester performs:
§4.3.1 • post-test calibrations
§9.2 • calculations
§10.3 • data recording and chain of custody
• reporting requirements

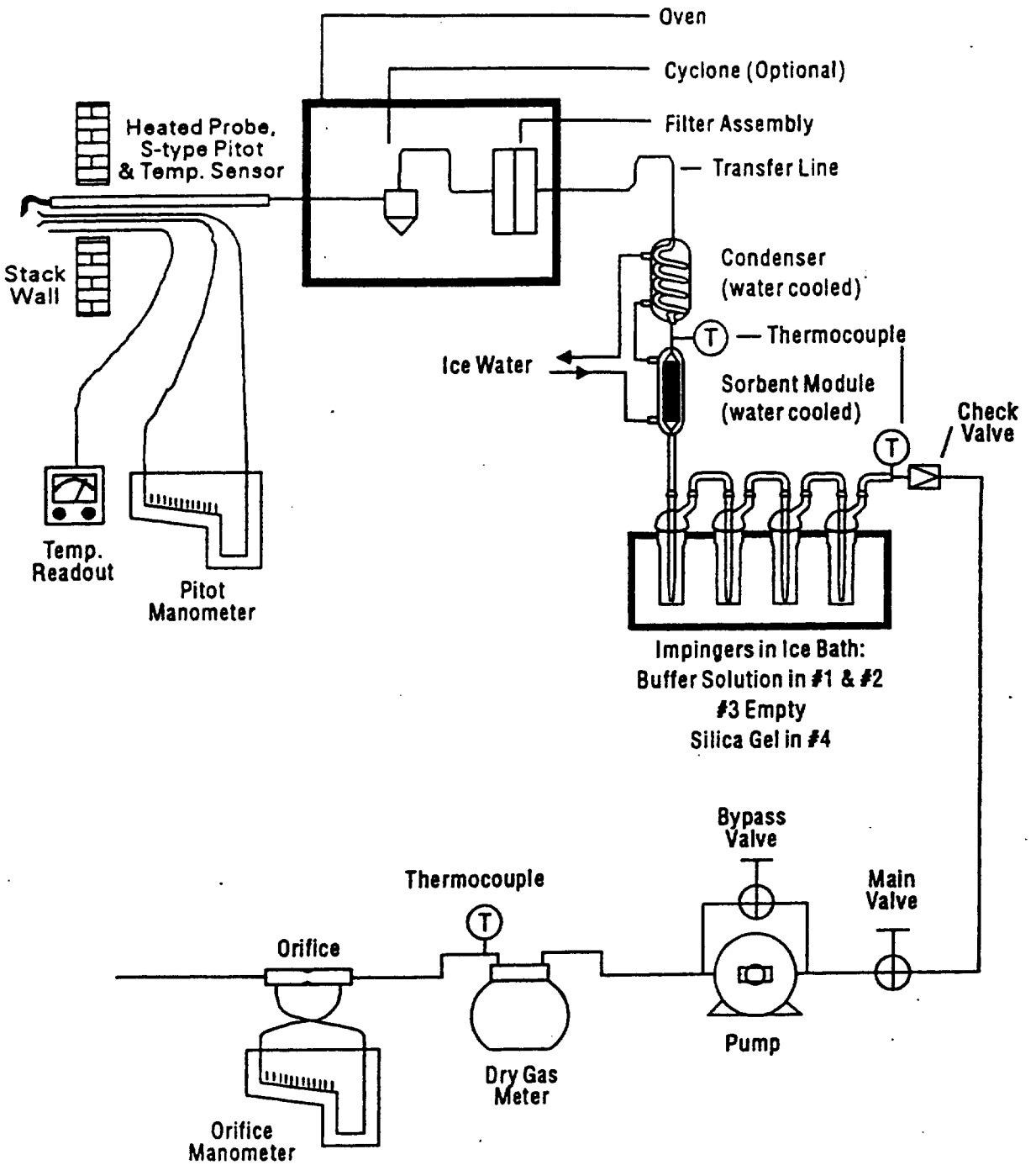


Figure 2
PAH Sampling Train

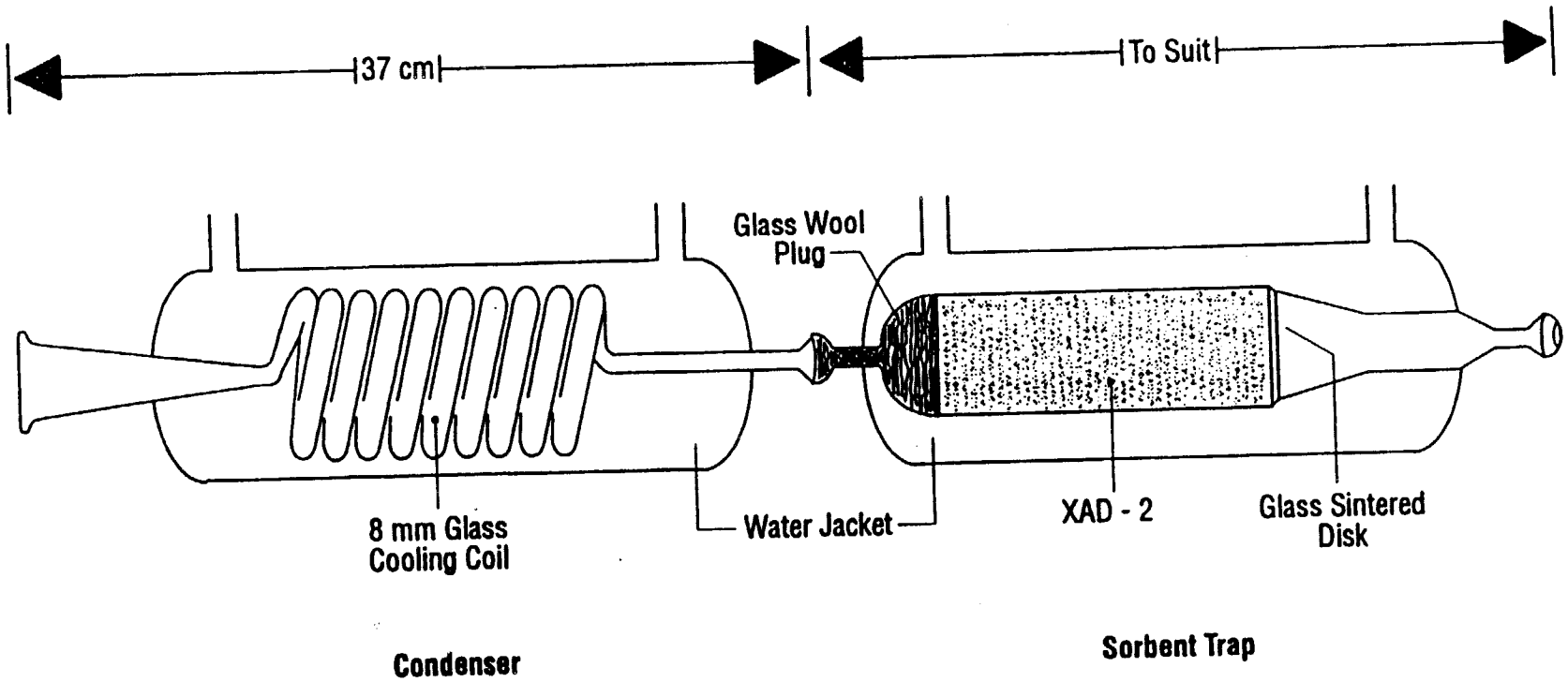


Figure 3

Condenser and Sorbent Trap for Collection of Gaseous PAHs

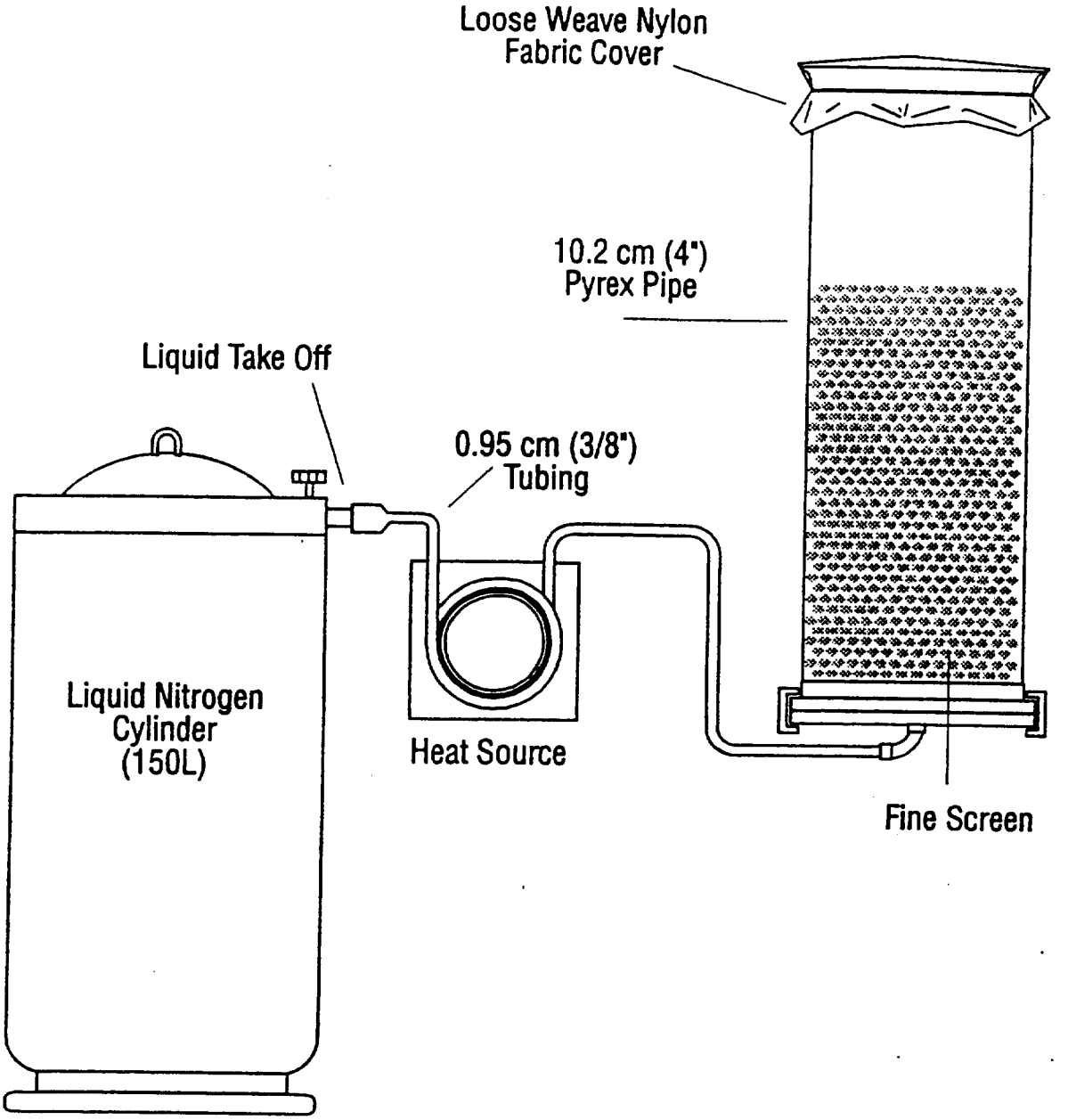


Figure 4

XAD-2 Fluidized Bed Drying Apparatus

FIGURE 5

METHOD 429 FIELD DATA RECORD

Run No. _____
Location _____
Date _____
Operator _____
Meter Box No. _____
Local Time
Start/Stop _____
ΔH@ _____
Stack Diameter _____
Meter Box Calibration
Factor (Y) _____

Pitot Tube Factor _____
Probe Tip Dia, in. _____
Probe Length _____
Sampling Train Leak Test Leak Rate
Before _____ in. Hg _____ cu.ft/min
After _____ in. Hg _____ cu.ft/min
Leak Check Volume _____ cu. ft.
Pitot Tube Leak Check
Before _____ After _____

Project No. _____
Plant Name _____
Ambient Temp °F _____
Meter Temp °F _____
Bar. Press, "Hg _____
Stack Press, "H_2O _____
Assumed Moisture, % _____
Heater Box Setting, °F _____
Probe Heater Setting, °F _____
Assumed M.W. (wet%) _____
Assumed M.W. (dry%) _____

Sampling Point	Clock Time	Dry Gas Meter, cu, ft.	Pitot ΔP in. H_2O	Orifice ΔH "H_2O		Temperature (°F)			Pump Vacuum in. Hg
				Desired	Actual	Impinger	Filter box	Stack	
Start									

Figure 6

Recovery of PAH Sampling Train

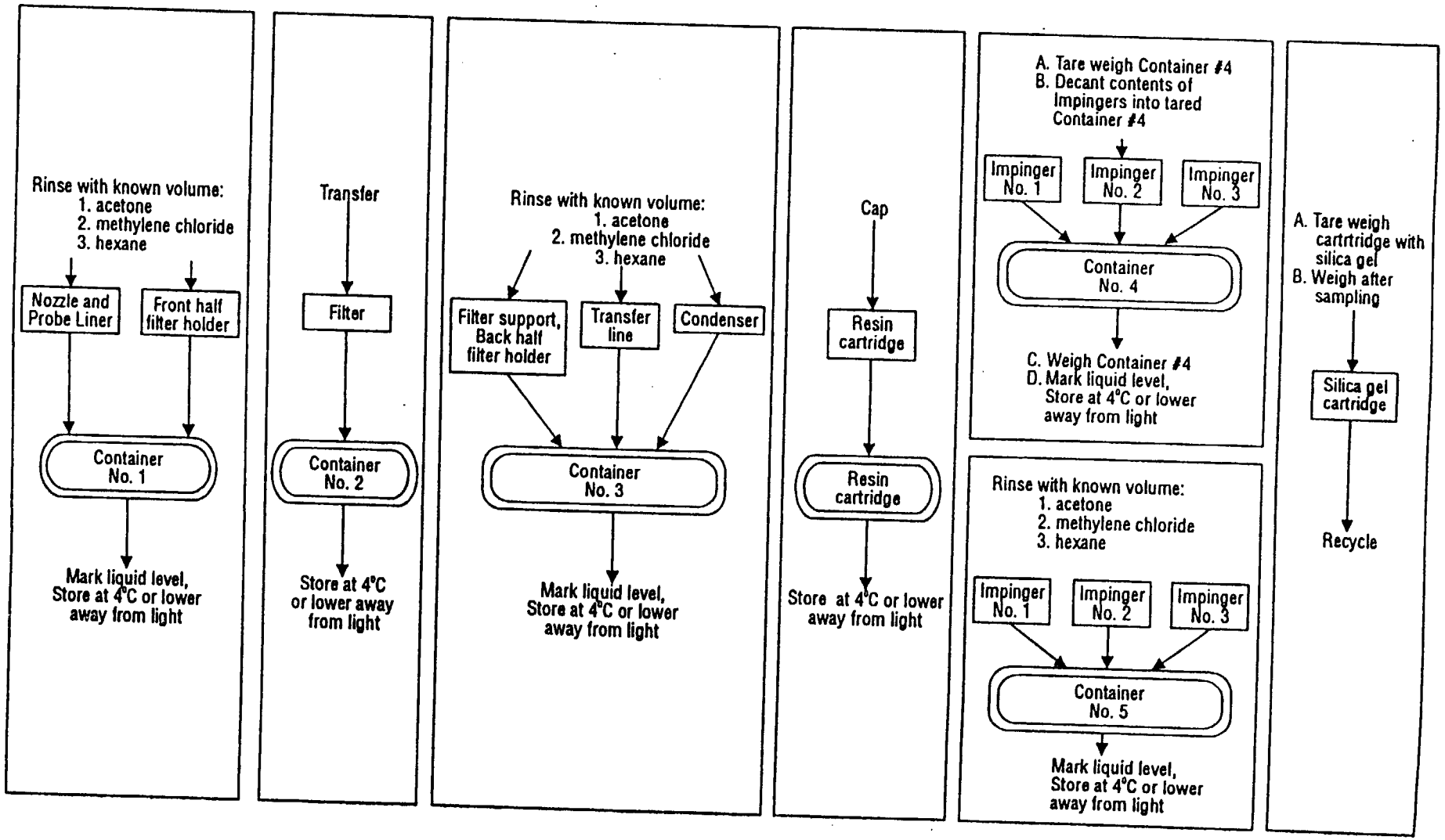


Figure 7

Flow Chart for Sampling, Extraction and Cleanup for Determination of PAH in a Split Sample

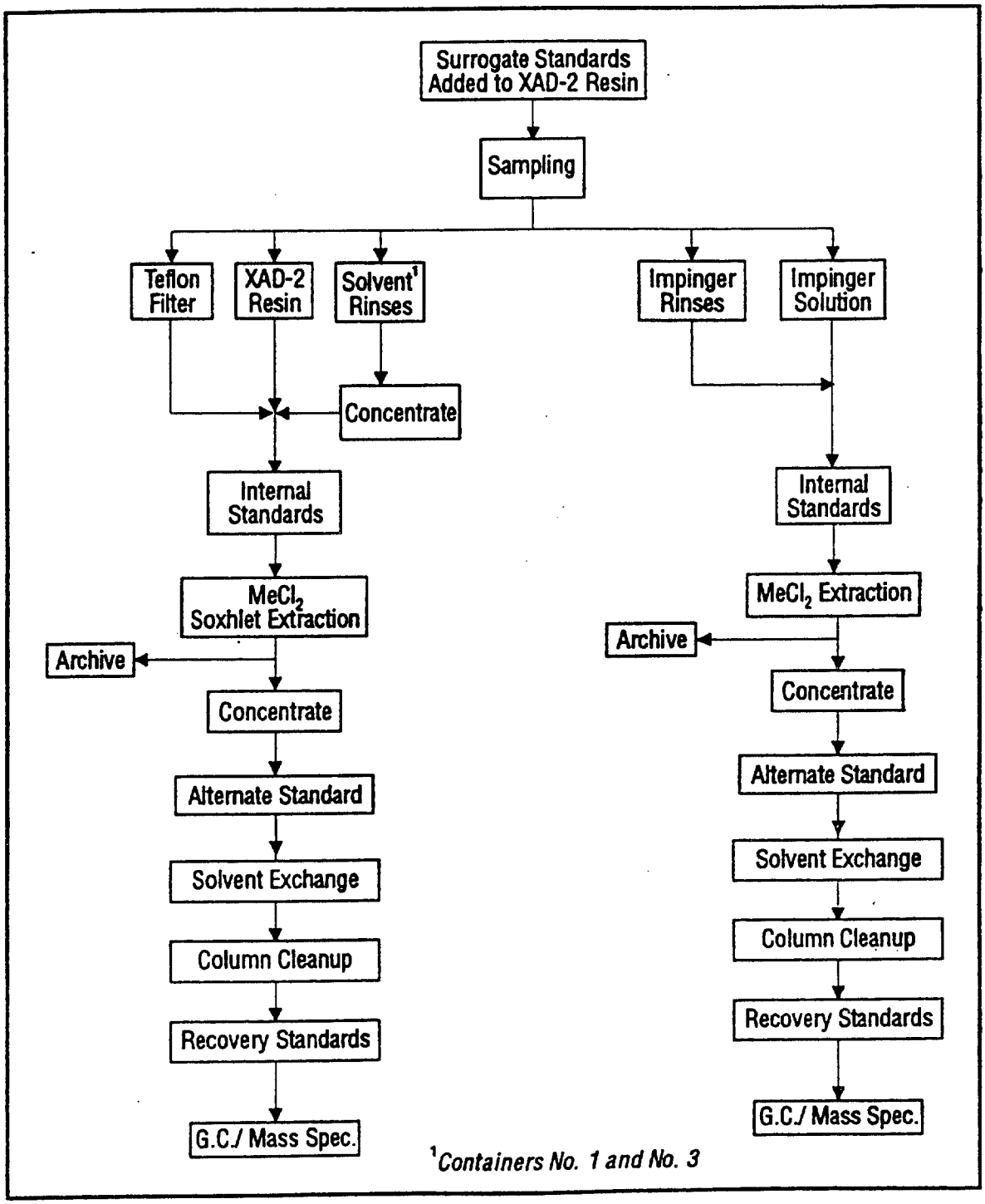


Figure 8
Flow Chart for Sampling, Extraction and Cleanup for Determination of PAH in a Composite Sample

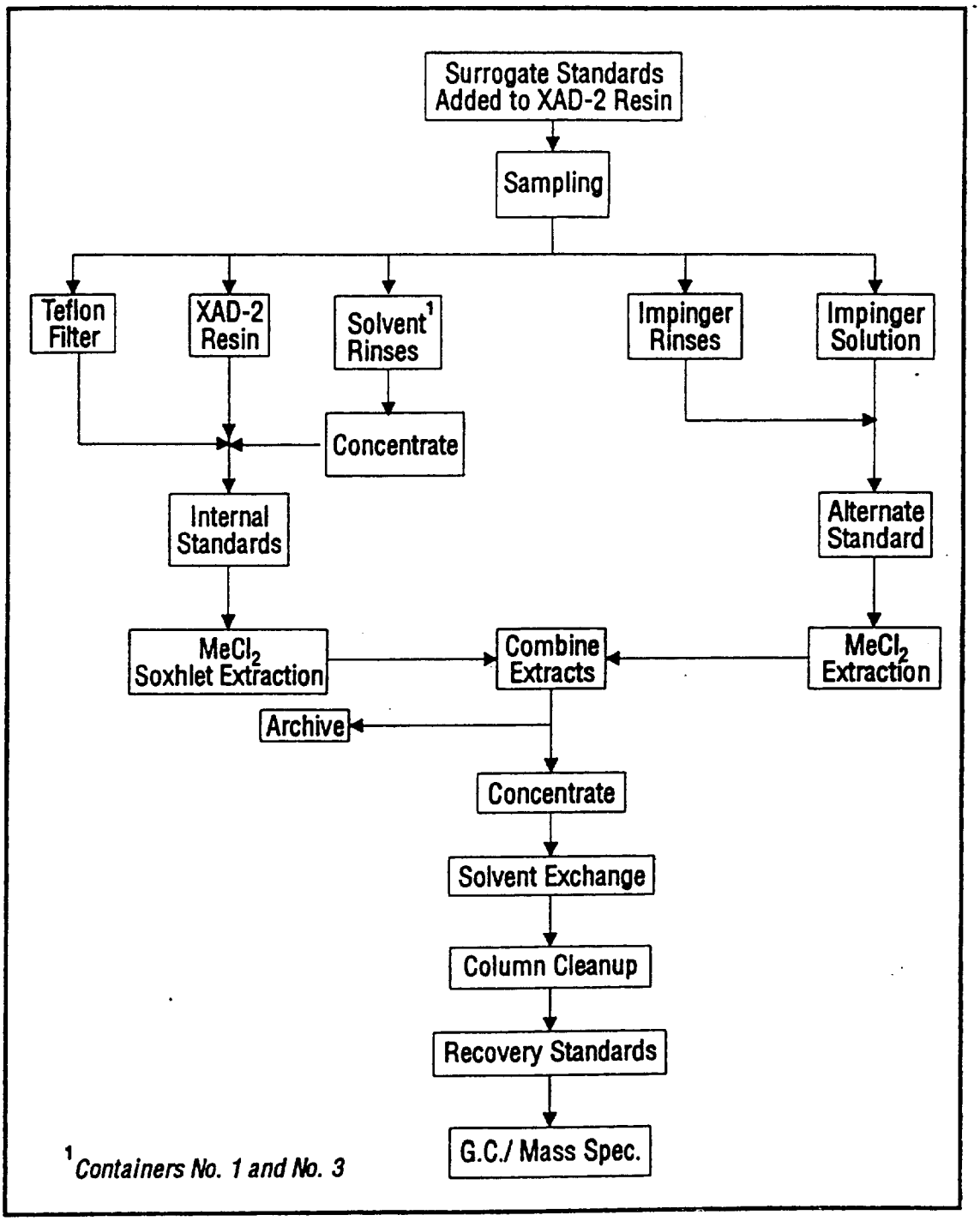


FIGURE 9

EXAMPLE OF PRE-TEST CALCULATIONS FOR PAH EMISSIONS TEST

					PST = 6 hours PSV = 180 dscf	
	PQL (ng/sample)	STC (ng/dscm)	MSV (dscf)	MST (hours)	F	SRL (ng/dscm)
Naphthalene	2400	<1500	>56.5	>1.89	NA	471
2-Methylnaphthalene	330	NA	NA	NA	NA	64.7
Acenaphthylene	5.0	180	0.98	0.03	183	0.98
Acenaphthene	5.0	6	29.4	0.98	6	0.98
Fluorene[1]	83	<6	>489	>16.3	NA	16.3
Phenanthrene	110	120	32.4	1.08	6	21.6
Anthracene	5.0	<6	>29.4	>0.98	NA	0.98
Fluoranthene	5.0	46	3.8	0.13	47	0.98
Pyrene	5.0	46	3.8	0.13	47	0.98
Benzo(a)anthracene	5.0	<6	>29.4	>0.98	NA	0.98
Chrysene	5.0	42	4.2	0.14	43	0.98
Benzo(b)fluoranthene	5.0	50	3.5	0.12	51	0.98
Benzo(k)fluoranthene	5.0	50	3.5	0.12	51	0.98
Benzo(e)pyrene	5.0	NA	NA	NA	NA	0.98
Benzo(a)pyrene	5.0	<6	>29.4	>0.98	NA	0.98
Perylene	5.0	NA	NA	NA	NA	0.98
Indeno(1,2,3-c,d)pyrene	5.0	<6	>29.4	>0.98	NA	0.98
Dibenzo(a,h)anthracene	5.0	<6	>29.4	>0.98	NA	0.98
Benzo(g,h,i)perylene	5.0	<6	>29.4	>0.98	NA	0.98
Average Volumetric Sampling Rate (VSR) = 0.5 dscfm = 30 dscf/hr						

PQL = Practical quantitation limit for analyte (based on pre-test analysis of XAD-2 resin)
STC = Source target concentration for analyte. (From previous emissions test. Samples were analyzed by HRGC/LRMS).
MSV = Minimum sample volume required to collect detectable levels of target analyte. (MSV = PQL ÷ STC) *Equation 429-1*
MST = Minimum sample time required to collect detectable levels of target analyte at VSR. (MST = MSV ÷ VSR) *Equation 429-2*
PST = Planned sampling time (6 hours chosen as the longest practical sampling time for the planned emissions test)
PSV = Planned sample volume (PSV = PST × VSR) *Equation 429-4*
F = Safety factor (>1) that allows for deviation from ideal sampling and analytical conditions. (F = PSV ÷ MSV) *Equation 429-5*
SRL = Source reporting limit if the target analyte cannot be detected with the planned test parameters. (SRL = PQL ÷ PSV) *Equation 429-7*
NA This calculation is not applicable either because there is no STC value available or the STC is a detection limit.

[1] PSV is lower than the MSV. Therefore, the analyte is not expected to be detected if it is present at the target concentrations. It will only be detected if the actual concentration is lower than the indicated SRL.

FIGURE 10

CARB METHOD 429 (PAHs) SAMPLING TRAIN SET-UP RECORD

RUN NO.	_____	PROJECT NO.	_____
PLANT NAME	_____	PLANT LOCATION	_____
SET-UP DATE	_____	SET-UP BY	_____
RECEIVED BY	_____	DATE/TIME	_____

	COMPONENTS	COMPONENT ID	OTHER INFORMATION	
1.	NOZZLE	_____	Material	_____
			Diameter	_____
2.	PROBE	_____	Liner material	_____
			Length	_____
3.	FILTER HOLDER	_____	Before set-up, all openings sealed with	_____
			Filter support type	_____
4.	FILTER	Lot # _____	Filter Type	_____
			Size	_____
			Contamination check?	_____
5.	TRANSFER LINE AND CONDENSER	_____	Transfer line material	_____
	Fittings	_____		_____
6.	XAD-2 RESIN CARTRIDGE	_____	Both ends sealed in lab prior to set-up	_____
			Fittings	_____
			Contamination check?	_____
			Spiked?	_____
7.	IMPINGERS: No. 1	_____	Charge with 100 mL impinger solution and weigh	_____ g
	U-Connector	_____		
	No. 2	_____	Charge with 100 mL impinger solution and weigh	_____ g
	U-Connector	_____		
	No. 3	_____	Weigh empty	_____ g
	U-Connector	_____		
8.	SILCA GEL CARTRIDGE	_____	Tare weight	_____ g
			Appearance	_____

FIGURE 11

CARB METHOD 429 (PAHs) SAMPLING TRAIN RECOVERY RECORD

RUN NO. _____ PROJECT NO. _____
PLANT NAME _____ PLANT LOCATION _____
RECOVERY DATE _____ RECOVERED BY _____

1. **CHECK whether openings were covered.** **RINSE 3x each with Acetone, $MeCl_2$, Hexane.**
MARK liquid level and STORE containers at temp. <4°C away from light.

Component	Openings covered?	Rinse volume (mL) Acetone	$MeCl_2$	Hexane	Storage Container(s) IDs
Nozzle					
Probe liner					
Filter holder front					

2. **STORE filter(s) at temp. <4°C away from light.** **RECORD ALL sample storage information.**

Component	Appearance after sampling	Storage (Temperature & light)	Storage Container(s) ID
Filter			
Filter			
Filter			

3. **CHECK whether openings were covered.** **RINSE 3x each with Acetone, $MeCl_2$, Hexane.**
MARK liquid level and STORE containers at temp. <4°C away from light.

Component	Openings covered?	Rinse volume (mL) Acetone	$MeCl_2$	Hexane	Storage Temp. & light	Storage Container ID
Filter support and filter holder back						
Transfer line						
Condenser						

4. **STORE Resin cartridges at temp. <4°C away from light.** **RECORD ALL storage information.**

ID	Appearance after sampling	Storage temperature & light conditions

5. **WEIGH impinger contents and silica gel cartridge.**
MARK liquid level and STORE impinger contents at temp. <4°C away from light.

Weight	No. 1	No. 2	No. 3	Additional impingers No. 4	No. 5	Silica gel cartridge
Final (g)						
Before sampling (g)						
Gain (g)	(A)	(B)	(C)	(D)	(E)	(F)

Total condensate (A) + (B) + (C) + (D) + (E) + (F) _____ (g)

STORAGE CONTAINER ID(s) _____ _____ _____ _____

6. **RINSE impingers 3x each with Acetone, $MeCl_2$, Hexane.**
MARK liquid level and STORE impinger rinses at temp. <4°C away from light.

Rinse volumes (mL)					
Acetone					
$MeCl_2$					
Hexane					
STORAGE CONTAINER ID(s)					

FIGURE 12

CHAIN OF CUSTODY SAMPLE RECORD

Project # _____ Date: _____ Start: _____
Stop: _____
Source name: _____ Sample/Run # : _____
Sampling location: _____ Sample type: _____
Chain of Custody Log Record # (s) _____ Operator: _____

SAMPLE STORAGE INFORMATION

SAMPLE PRESERVATION	Comments
Ice/Dry ice?	

CHAIN OF CUSTODY

ACTION	DATE	TIME	GIVEN BY	TAKEN BY

RELATED IDs	DESCRIPTION/COMMENTS	Log #s
FR	Front rinse (nozzle, probe,filter holder front)	
F	Filter in sealed storage container	
BR	Back rinse (filter support, filter holder, sample line & condenser	
C	Resin cartridge	
I	Impinger contents	
IR	Impinger rinses	

FIGURE 13

CHAIN OF CUSTODY LOG RECORD

PROJECT NO. _____ Page _____ of _____

Log #	Sample ID	Date	Time	Comments	Given by	Taken by

Sample Identifier	Sample Description
FR	Rinses of probe and front half of filter holder
F	Filter in sealed storage container
BR	Rinses of filter support, back half of filter holder, sample transfer line and condenser
C	Aluminum foil wrapped, capped resin cartridge
I	Impinger contents
IR	Impinger rinses

FIGURE 14A

EXAMPLE GC/MS SUMMARY REPORT (HRMS) FOR INITIAL CALIBRATION SOLUTION #1
CALIFORNIA AIR RESOURCES BOARD METHOD 429 POLYCYCLIC AROMATIC HYDROCARBONS

ICAL ID: ST1120A1 ACQUIRED: 12/3/94 16:23:24 INSTRUMENT: W
RUN #: PAHCS1 PROCESSED: 12/3/94 OPERATOR: MPA

	RT	RRT	Area	RRF
Naphthalene	8:20	1.006	6.66 E+07	0.75
2-Methylnaphthalene	9:42	1.007	1.44 E+07	1.30
Acenaphthylene	11:04	1.003	1.57 E+07	1.44
Acenaphthene	11:20	1.004	1.05 E+07	0.94
Fluorene	12:06	1.003	8.15 E+06	1.05
Phenanthrene	13:20	1.003	1.99 E+07	1.15
Anthracene	13:23	1.001	7.07 E+06	1.02
Fluoranthene	14:38	1.001	3.18 E+07	1.26
Pyrene	14:55	1.001	3.31 E+07	1.31
Benzo(a)anthracene	16:34	1.002	2.08 E+07	1.13
Chrysene	16:39	1.003	2.26 E+07	1.13
Benzo(b)fluoranthene	18:54	1.004	2.35 E+07	1.69
Benzo(k)fluoranthene	18:58	1.004	2.50 E+07	1.24
Benzo(e)pyrene	19:42	1.004	2.41 E+07	1.20
Benzo(a)pyrene	19:51	1.003	2.11 E+07	1.07
Perylene	20:06	1.004	1.38 E+07	0.70
Indeno(1,2,3-c,d)pyrene	23:60	1.006	2.07 E+07	2.19
Dibenzo(a,h)anthracene	24:01	1.006	1.49 E+07	1.66
Benzo(g,h,i)perylene	25:15	1.005	1.84 E+07	2.23
d_8-Naphthalene	8:17	1.000	3.54 E+08	4.22
d_8-Acenaphthylene	11:02	1.000	1.09 E+08	1.29
d_{10}-Acenaphthene	11:17	1.000	1.11 E+08	1.32
d_{10}-Fluorene	12:04	1.000	7.78 E+07	0.93
d_{10}-Phenanthrene	13:18	1.000	6.92 E+07	0.82
d_{10}-Fluoranthene	14:37	1.000	2.53 E+08	1.03
d_{12}-Benzo(a)anthracene	16:32	1.000	1.83 E+08	0.75
d_{12}-Chrysene	16:36	1.000	2.00 E+08	0.82
d_{12}-Benzo(b)fluoranthene	18:50	1.000	2.77 E+08	1.35
d_{12}-Benzo(k)fluoranthene	18:54	1.000	4.03 E+08	1.95
d_{12}-Benzo(a)pyrene	19:47	1.000	3.93 E+08	1.91
d_{12}-Indeno(1,2,3-c,d)pyrene	23:52	1.000	1.89 E+08	0.92
d_{14}-Dibenzo(a,h)anthracene	23:52	1.000	1.80 E+08	0.87
d_{12}-Benzo(g,h,i)perylene	25:07	1.000	1.65 E+08	0.80
d_{14}-Terphenyl	14:59		2.65 E+08	0.52
d_{12}-Benzo(e)pyrene	19:37	1.000	1.44 E+08	0.37
d_{10}-Anthracene	13:22	1.000	5.82 E+07	0.69
d_{10}-2-Methylnaphthalene	9:38	1.000	8.40 E+07	---
d_{10}-Pyrene	14:54	1.000	2.45 E+08	---
d_{12}-Perylene	20:01	1.000	1.03 E+08	---

FIGURE 14B

EXAMPLE OF INITIAL CALIBRATION (ICAL) RRF SUMMARY
CALIFORNIA AIR RESOURCES BOARD METHOD 429 POLYCYCLIC AROMATIC HYDROCARBONS

ICAL ID: ST1120 ACQUIRED: 3-DEC-94 INSTRUMENT: W
RUN #: NA PROCESSED: 3-DEC-94 OPERATOR: MPA

	RRF #1	RRF #2	RRF #3	RRF #4	RRF #5	Mean RRF	SD	%RSD
Naphthalene	0.75	0.66	0.61	0.64	0.71	0.67	0.056	8.29%
2-Methylnaphthalene	1.30	1.15	1.10	1.12	1.26	1.19	0.089	7.47%
Acenaphthylene	1.44	1.27	1.24	1.28	1.43	1.33	0.096	7.19%
Acenaphthene	0.94	0.84	0.80	0.83	0.94	0.87	0.067	7.72%
Fluorene	1.05	0.94	0.88	0.92	1.07	0.97	0.082	8.43%
Phenanthrene	1.15	1.06	1.01	1.05	1.23	1.10	0.088	8.00%
Anthracene	1.02	1.00	0.98	0.95	1.14	1.02	0.074	7.25%
Fluoranthene	1.26	1.15	1.08	1.13	1.28	1.18	0.085	7.21%
Pyrene	1.31	1.27	1.13	1.15	1.41	1.25	0.115	9.22%
Benzo(a)anthracene	1.13	1.05	1.05	1.04	1.23	1.10	0.082	7.43%
Chrysene	1.13	1.02	0.97	0.98	1.11	1.04	0.073	7.00%
Benzo(b)fluoranthene	1.69	1.45	1.46	1.42	1.86	1.58	0.194	12.33%
Benzo(k)fluoranthene	1.24	1.25	1.14	1.18	1.26	1.21	0.052	4.32%
Benzo(e)pyrene	1.20	1.12	1.06	1.06	1.19	1.12	0.066	5.89%
Benzo(a)pyrene	1.07	0.99	0.96	0.96	1.14	1.02	0.080	7.81%
Perylene	0.70	0.63	0.58	0.60	0.70	0.64	0.059	9.12%
Indeno(1,2,3-c,d)pyrene	2.19	2.01	1.92	1.99	2.26	2.07	0.143	6.90%
Dibenzo(a,h)anthracene	1.66	1.60	1.56	1.61	1.87	1.66	0.122	7.35%
Benzo(g,h,i)perylene	2.23	2.05	1.96	2.00	2.32	2.11	0.154	7.28%
d_8-Naphthalene	4.22	4.15	4.16	4.18	4.10	4.16	0.044	1.05%
d_8-Acenaphthylene	1.29	1.29	1.28	1.27	1.30	1.29	0.012	0.91%
d_{10}-Acenaphthene	1.32	1.34	1.32	1.30	1.32	1.32	0.013	1.00%
d_{10}-Fluorene	0.93	0.95	0.94	0.95	0.95	0.94	0.011	1.21%
d_{10}-Phenanthrene	0.82	0.82	0.82	0.86	0.88	0.81	0.026	3.09%
d_{10}-Fluoranthene	1.03	1.00	1.07	1.07	0.99	1.03	0.038	3.71%
d_{12}-Benzo(a)anthracene	0.75	0.70	0.70	0.72	0.70	0.71	0.022	3.09%
d_{12}-Chrysene	0.82	0.79	0.81	0.83	0.84	0.82	0.021	2.56%
d_{12}-Benzo(b)fluoranthene	1.35	1.39	1.46	1.27	1.32	1.36	0.072	5.32%
d_{12}-Benzo(k)fluoranthene	1.95	1.95	2.14	1.84	2.11	2.00	0.124	6.23%
d_{12}-Benzo(a)pyrene	1.91	1.96	2.11	1.82	1.99	1.96	0.107	5.46%
d_{12}-Indeno(1,2,3-c,d)pyrene	0.92	0.88	0.98	0.85	0.98	0.92	0.059	6.40%
d_{14}-Dibenzo(a,h)anthracene	0.87	0.84	0.91	0.78	0.89	0.86	0.049	5.71%
d_{12}-Benzo(g,h,i)perylene	0.80	0.76	0.83	0.73	0.80	0.78	0.042	5.36%
d_{14}-Terphenyl	0.52	0.52	0.49	0.48	0.51	0.51	0.018	3.59%
d_{12}-Benzo(e)pyrene	0.37	0.37	0.37	0.36	0.36	0.36	0.005	1.50%
d_{10}-Anthracene	0.69	0.73	0.74	0.80	0.90	0.77	0.080	10.40%
d_{10}-2-Methylnaphthalene	---	---	---	---	---	---	---	---
d_{10}-Pyrene	---	---	---	---	---	---	---	---
d_{12}-Perylene	---	---	---	---	---	---	---	---

FIGURE 14C

EXAMPLE OF CONTINUING CALIBRATION (CONCAL) SUMMARY
CALIFORNIA AIR RESOURCES BOARD METHOD 429 POLYCYCLIC AROMATIC HYDROCARBONS

CONCAL ID: CC1202
CONCAL DATE: 12/3/94

ICAL ID: ST1120
ICAL DATE: 3-DEC-94

INSTRUMENT: W
OPERATOR: MPA

	RRF	ICAL RRF	ΔRRF	RPD %
Naphthalene	0.68	0.67	0.01	1.5
2-Methylnaphthalene	1.42	1.19	0.23	17.6
Acenaphthylene	1.42	1.33	0.09	6.6
Acenaphthene	0.91	0.87	0.04	4.5
Fluorene	0.98	0.97	0.01	1.0
Phenanthrene	1.10	1.10	0.00	0.0
Anthracene	0.98	1.02	-0.04	4.0
Fluoranthene	1.12	1.18	-0.06	5.2
Pyrene	1.18	1.25	-0.07	5.8
Benzo(a)anthracene	1.08	1.10	-0.02	1.8
Chrysene	1.04	1.04	0.00	0.0
Benzo(b)fluoranthene	1.46	1.58	-0.12	7.9
Benzo(k)fluoranthene	1.12	1.21	-0.09	7.7
Benzo(e)pyrene	1.04	1.12	-0.08	7.4
Benzo(a)pyrene	0.95	1.02	-0.07	7.1
Perylene	0.62	0.64	-0.02	3.2
Indeno(1,2,3-c,d)pyrene	2.04	2.07	-0.03	1.5
Dibenzo(a,h)anthracene	1.61	1.66	-0.05	3.1
Benzo(g,h,i)perylene	2.11	2.11	0.00	0.0
d_8-Naphthalene	4.78	1.16	0.68	15.3
d_8-Acenaphthylene	1.20	1.29	-0.09	7.2
d_{10}-Acenaphthene	1.25	1.32	-0.07	5.5
d_{10}-Fluorene	0.85	0.94	-0.09	10.1
d_{10}-Phenanthrene	0.79	0.81	-0.02	2.5
d_{10}-Fluoranthene	1.05	1.03	0.02	1.9
d_{12}-Benzo(a)anthracene	0.69	0.71	-0.02	2.9
d_{12}-Chrysene	0.82	0.82	0.00	0.0
d_{12}-Benzo(b)fluoranthene	1.24	1.36	-0.12	9.2
d_{12}-Benzo(k)fluoranthene	1.91	2.00	-0.09	4.6
d_{12}-Benzo(a)pyrene	1.87	1.96	-0.09	4.7
d_{12}-Indeno(1,2,3-c,d)pyrene	0.84	0.92	-0.08	9.1
d_{14}-Dibenzo(a,h)anthracene	0.80	0.86	-0.06	7.2
d_{12}-Benzo(g,h,i)perylene	0.76	0.78	-0.02	2.6
d_{14}-Terphenyl	0.50	0.51	-0.01	2.0
d_{12}-Benzo(e)pyrene	0.37	0.36	0.01	2.7
d_{10}-Anthracene	0.71	0.77	-0.06	8.1
d_{10}-2-Methylnaphthalene	---	---		
d_{10}-Pyrene	---	1.000		
d_{12}-Perylene	---	1.000		

FIGURE 15A.

EXAMPLE OF SUMMARY REPORT OF LCS RESULTS
CALIFORNIA AIR RESOURCES BOARD METHOD 429 POLYCYCLIC AROMATIC HYDROCARBONS

Client ID CARB
Lab ID: 14129/LCS1/LCS2
Instrument: W
Operator: MPA
Reviewer: JCM

Sample Matrix: XAD-2
Date Received: NA
Date Extracted: 11/30/94
Date Analyzed: 12/3/94
Sample amount: Sample

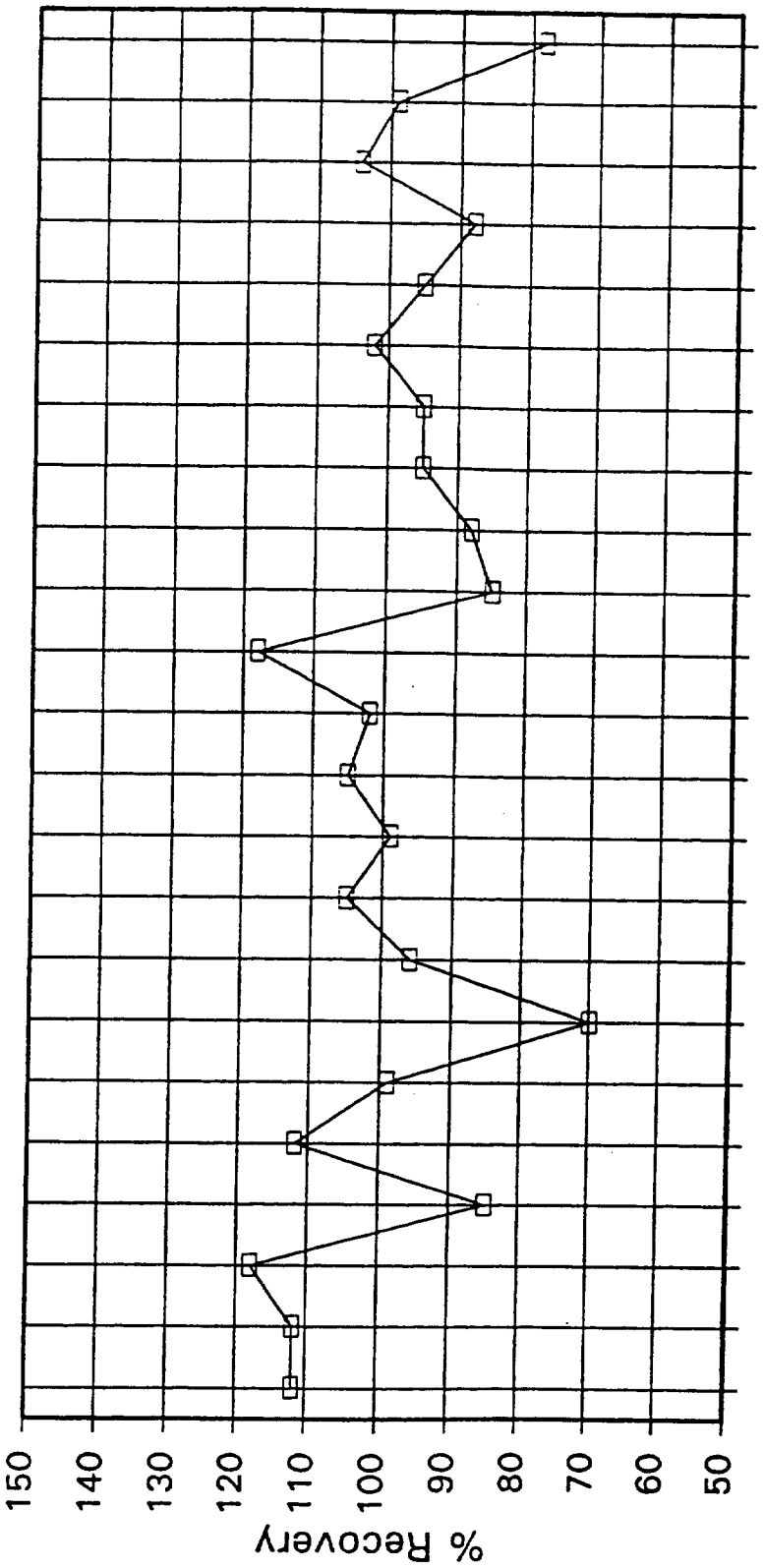
ICAL ID: ST1120
ICAL DATE: 12/3/94
CONCAL ID: NA
CONCAL DATE: NA
Units: NA

Resin Lot #: LC1130M
LCS IDs: NA
LCS DATE: NA

COMPOUND:	LCS1 %R	LCS2 %R	RPD %
Naphthalene	100	103	3.0
2-Methylnaphthalene	96	95	1.0
Acenaphthylene	95	97	2.1
Acenaphthene	92	94	2.2
Fluorene	94	96	2.1
Phenanthrene	93	94	1.1
Anthracene	91	89	2.2
Fluoranthene	90	92	2.2
Pyrene	87	89	2.3
Benzo(a)anthracene	87	86	1.2
Chrysene	83	89	7.0
Benzo(b)fluoranthene	92	93	1.1
Benzo(k)fluoranthene	92	95	3.2
Benzo(e)pyrene	97	99	2.0
Benzo(a)pyrene	89	92	3.3
Perylene	89	89	0.0
Indeno(1,2,3-c,d)pyrene	87	90	3.4
Dibenzo(a,h)anthracene	88	90	2.2
Benzo(g,h,i)perylene	89	91	1.2
Internal Standards (%R)			
d_8-Naphthalene	67	64	
d_8-Acenaphthylene	73	70	
d_{10}-Acenaphthene	76	75	
d_{10}-Fluorene	79	81	
d_{10}-Phenanthrene	88	93	
d_{10}-Fluoranthene	84	80	
d_{12}-Benzo(a)anthracene	96	98	
d_{12}-Chrysene	96	91	
d_{12}-Benzo(b)fluoranthene	88	85	
d_{12}-Benzo(k)fluoranthene	85	84	
d_{12}-Benzo(a)pyrene	92	90	
d_{12}-Indeno(1,2,3-c,d)pyrene	104	105	
d_{14}-Dibenzo(a,h)anthracene	96	96	
d_{12}-Benzo(g,h,i)perylene	102	103	
Alternate Standard (%R)			
d_{10}-Anthracene	83	85	

FIGURE 15B

LCS RECOVERIES FOR BENZO(a)PYRENE



8/18/92 - 5/21/93

FIGURE 16A

EXAMPLE GC/MS SUMMARY REPORT (HRMS) FOR SAMPLE RUN #32
CALIFORNIA AIR RESOURCES BOARD METHOD 429 POLYCYCLIC AROMATIC HYDROCARBONS

Lab ID: 14129-02
Acquired: 12/3/94 16:23:40
Client ID: M429-32

ICAL ID: 12/3/94 16:23:40
ICAL DATE: 12/3/94

Instrument: W
Operator: MPA
Reviewer: JCM

	RT	RRT	Area	RRF	Amt. (ng)	% REC
Naphthalene	8:21		1.053 E+10	0.67	10,478.37	
2-Methylnaphthalene	9:41		1.790 E+08	1.19	140.98	
Acenaphthylene	11:03		9.371 E+08	1.33	712.59	
Acenaphthene	11:19		7.649 E+06	0.87	8.21	
Fluorene	12:05		2.417 E+07	0.97	30.02	
Phenanthrene	13:17		8.402 E+08	1.10	925.53	
Anthracene	13:21		2.905 E+07	1.02	34.54	
Fluoranthene	14:36		5.932 E+08	1.18	254.36	
Pyrene	14:52		7.611 E+08	1.25	307.62	
Benzo(a)anthracene	16:32		3.120 E+06	1.10	1.9	
Chrysene	16:32		9.620 E+06	1.04	6.2	
Benzo(b)fluoranthene	18:49		1.030 E+06	1.58	7.6	
Benzo(k)fluoranthene	Not found		0.0	1.21		
Benzo(e)pyrene	19:36		1.646 E+07	1.12	13.61	
Benzo(a)pyrene	19:46		4.936 E+06	1.02	3.95	
Perylene	20:01		1.823 E+06	0.64	2.32	
Indeno(1,2,3-c,d)pyrene	23:54		5.728 E+06	2.07	4.37	
Dibenzo(a,h)anthracene	23:56		5.875 E+05	1.66	0.59	
Benzo(g,h,i)perylene	25:09		1.584 E+07	2.11	14.95	
d_8-Naphthalene	8:18	1.000	4.794 E+08	1.16	124.92	62.5
d_8-Acenaphthylene	11:01	1.000	1.972 E+08	1.29	166.07	83.0
d_{10}-Acenaphthene	11:16	1.000	2.142 E+08	1.32	176.19	88.1
d_{10}-Fluorene	12:02	1.000	1.658 E+08	0.94	190.71	95.4
d_{10}-Phenanthrene	13:16	1.000	1.652 E+07	0.81	213.39	106.7
d_{10}-Fluoranthene	14:34	1.000	3.955 E+08	1.03	116.22	58.1
d_{12}-Benzo(a)anthracene	16:28	1.000	2.835 E+08	0.71	121.18	60.6
d_{12}-Chrysene	16:31	1.000	2.987 E+08	0.82	111.08	55.5
d_{12}-Benzo(b)fluoranthene	18:45	1.000	3.439 E+08	1.36	165.79	41.4
d_{12}-Benzo(k)fluoranthene	18:50	1.000	4.304 E+08	2.00	141.02	35.3
d_{12}-Benzo(a)pyrene	19:41	1.000	4.895 E+08	1.96	163.67	40.9
d_{12}-Indeno(1,2,3-c,d)pyrene	23:46	1.000	2.529 E+08	0.92	179.71	44.9
d_{14}-Dibenzo(a,h)anthracene	23:45	1.000	2.400 E+08	0.86	182.65	45.7
d_{12}-Benzo(g,h,i)perylene	24:60	1.000	2.006 E+08	0.78	167.24	41.8
d_{14}-Terphenyl	14:55		7.988 E+08	0.51	523	105
d_{12}-Benzo(e)pyrene	19:32	1.000	3.011 E+08	0.36	676.33	135.3
d_{10}-Anthracene	13:20	1.000	6.795 E+07	0.77	95.29	47.6
d_{10}-2-Methylnaphthalene	9:38	1.000	1.844 E+07	---	100	
d_{10}-Pyrene	14:51	1.000	6.576 E+08	---	100	
d_{12}-Perylene	19:56	1.000	3.057 E+08	---	100	

FIGURE 16B

EXAMPLE LABORATORY REPORT OF PAH RESULTS FOR SAMPLE RUN #32
CALIFORNIA AIR RESOURCES BOARD METHOD 429 POLYCYCLIC AROMATIC HYDROCARBONS

Client ID M429-32	Sample Matrix: M429	ICAL ID: ST1120	Resin Lot #: LC1130M
Lab ID: 14129-02	Date Received: 11/18/94	ICAL DATE: 12/3/94	LCS IDs: 14129-LCS1/LCS2
Instrument: W	Date Extracted: 11/30/94	CONCAL ID: NA	LCS DATE: 12/3/94
Operator: MPA	Date Analyzed: 12/3/94	CONCAL DATE: NA	
Reviewer: JCM	Sample amount: Sample	Units: ng/sample	

COMPOUND:	Conc.	R.L.	Flags
Naphthalene	10478	1600	
2-Methylnaphthalene	141	94	
Acenaphthylene	712	5.0	
Acenaphthene	8.2	5.0	
Fluorene	30	27	
Phenanthrene	930	80	
Anthracene	35	5.0	
Fluoranthene	254	5.0	
Pyrene	307	5.0	
Benzo(a)anthracene	ND	5.0	
Chrysene	6.2	5.0	
Benzo(b)fluoranthene	7.6	5.0	
Benzo(k)fluoranthene	ND	5.0	
Benzo(e)pyrene	14	5.0	
Benzo(a)pyrene	ND	5.0	
Perylene	ND	5.0	
Indeno(1,2,3-c,d)pyrene	ND	5.0	
Dibenzo(a,h)anthracene	ND	5.0	
Benzo(g,h,i)perylene	15	5.0	
Internal Standards (%R)			
d_8-Naphthalene	62		
d_8-Acenaphthylene	83		
d_{10}-Acenaphthene	88		
d_{10}-Fluorene	95		
d_{10}-Phenanthrene	107		
d_{10}-Fluoranthene	58		
d_{12}-Benzo(a)anthracene	61		
d_{12}-Chrysene	56		
d_{12}-Benzo(b)fluoranthene	41		H
d_{12}-Benzo(k)fluoranthene	35		H
d_{12}-Benzo(a)pyrene	41		H
d_{12}-Indeno(1,2,3-c,d)pyrene	45		H
d_{14}-Dibenzo(a,h)anthracene	46		H
d_{12}-Benzo(g,h,i)perylene	42		H
Alternate Standard (%R)			
d_{10}-Anthracene	48		
Surrogate Standard (%R)			
d_{14}-Terphenyl	105		
d_{12}-Benzo(e)pyrene	135		

FIGURE 17A
EXAMPLE OF TESTER'S SUMMARY OF LABORATORY REPORTS

Run #:	31	32	33	Field Blank	Method Blank	LCS #1	LCS #2
	ng/sample					percent recovery	
Naphthalene	4300	10000	460000 *	<1600	<1700	100	103
2-Methylnaphthalene	< 94	140	6400 *	< 94	<78	96	95
Acenaphthylene	140	710	85000 *	9.1	< 5.0	95	97
Acenaphthene	9.2	8.2	500	< 5.0	< 5.0	92	94
Fluorene	27	30	180	< 27	< 27	94	96
Phenanthrene	310	930	43000 *	< 80	< 74	93	94
Anthracene	26	35	2400	5.3	< 5.0	91	89
Fluoranthene	83	250	16000 *	16	< 5.0	90	92
Pyrene	110	310	20000 *	19	< 5.0	87	89
Benzo(a)anthracene	< 5.0	< 5.0	170	< 5.0	< 5.0	87	86
Chrysene	< 5.0	6.2	300	< 5.0	< 5.0	83	89
Benzo(b)fluoranthene	< 5.0	7.6	340	< 5.0	< 5.0	92	93
Benzo(k)fluoranthene	< 5.0	< 5.0	89	< 5.0	< 5.0	92	95
Benzo(e)pyrene	35	< 35	530	6.9	< 5.0	97	99
Benzo(a)pyrene	< 5.0	< 5.0	240	< 5.0	< 5.0	89	92
Perylene	< 5.0	< 5.0	110	< 5.0	< 5.0	89	89
Indeno(1,2,3-c,d)pyrene	< 5.0	< 5.0	100	< 5.0	< 5.0	87	90
Dibenzo(a,h)anthracene	< 5.0	< 5.0	6.4	< 5.0	< 5.0	88	90
Benzo(g,h,i)perylene	< 85	< 85	440	17.0	< 5.0	89	91
Internal Standards (%R)							
d_8-Naphthalene	66	62	57 *	53	55	67	64
d_8-Acenaphthylene	82	83	85 *	73	69	73	70
d_{10}-Acenaphthene	85	88	80 *	81	75	76	75
d_{10}-Fluorene	91	95	102	90	82	79	81
d_{10}-Phenanthrene	106	107	79 *	107	93	88	93
d_{10}-Fluoranthene	79	58	75 *	83	80	84	80
d_{12}-Benzo(a)anthracene	100	61	108	114	93	96	98
d_{12}-Chrysene	91	56	99	102	88	96	91
d_{12}-Benzo(b)fluoranthene	69	41 H	60	85	84	88	85
d_{12}-Benzo(k)fluoranthene	62	35 H	50	78	84	85	84
d_{12}-Benzo(a)pyrene	70	41 H	58	86	89	92	90
d_{12}-Indeno(1,2,3-c,d)pyrene	82	45 H	58	106	106	104	105
d_{14}-Dibenzo(a,h)anthracene	72	42 H	58	92	92	96	96
d_{12}-Benzo(g,h,i)perylene	84	46 H	58	107	104	102	103
Surrogate Standards (%R)							
d_{14}-Terphenyl	125	105	90	123	130		
d_{12}-Benzo(e)pyrene	72	135	112	103	112		
Alternate Standard (%R)							
d_{10}-Anthracene	67	48 H	115	116	101	83	85
Test Date	11/15/94	11/16/94	11/17/94	11/16/94	NA	NA	NA
Date received by lab.	11/18/94	11/18/94	11/18/94	11/18/94	NA	NA	NA
Date extracted	11/30/94	11/30/94	11/30/94	11/30/94	11/30/94	11/30/94	11/30/94
Date analyzed	12/3/94	12/3/94	12/3/94	12/3/94	12/3/94	12/3/94	12/3/94

"<" denotes that the compound was not detected at levels above the indicated reporting limit.
"H" indicates internal Standard Recovery Results below 50%, but signal-to-noise greater than 10:1.
"*" indicates compounds reanalyzed at 1:50 dilution due to saturation.

FIGURE 17B
FIELD DATA SUMMARY FOR PAH EMISSIONS TEST

	RUN ID	31	32	33	
	DATE	11-15-95	11-16-95	11-17-95	
	START/STOP TIME	1015/1435	1020/1645	0855/1525	
	LOCATION	STACK	STACK	STACK	
	STACK DIAMETER	35.5 in.	35.5 in.	35.5 in.	
	NOZZLE DIAMETER	0.3105	0.313 in.	0.3125 in.	
	METER BOX ID	5419	5419	5419	
STANDARD DRY GAS VOLUME	$V_{m(std)}$	145.19	235.57	250.76	DSCF(68° F)
	V_m	132.65	213.67	228.10	cubic ft
	P_{bar}	29.78	29.98	29.88	inches Hg
	ΔH_{avg}	1.15	1.35	1.56	inches H_2O
	T_m	60.0	60.0	60.0	° F
	K_1	17.64	17.64	17.64	
	Y	1.08	1.08	1.08	
PERCENT MOISTURE	B_{ws}	12.9	15.0	18.4	percent
	Impinger + tare	2183.3	2092.3	2063	grams
	Final wt.	2609.8	2934.9	3210.2	grams
	Net imp. catch	426.5	842.6	1147.2	grams
	Silica gel tare	1561.8	1788.8	1585.7	grams
	Post sampling wt.	1590.0	1826.9	1536.2	grams
	Moisture gain	28.2	38.1	49.5	grams
	Total moisture (V_{1c})	454.7	880.7	1196.7	grams
	$V_{w(std)}$	21.43	41.50	56.39	DSCF(68° F)
	$V_{m(std)}$	145.19	235.57	250.76	DSCF(68° F)
	K_2	0.0471	0.0471	0.0471	
MOLECULAR WEIGHT	M_d	29.93	29.95	30.08	lb/lbmole
	M_s	28.40	28.16	27.86	lb/lbmole
	O_2	11.25	10.75	10.00	percent
	CO	0.00	0.00	0.00	percent
	CO_2	9.25	9.50	10.50	percent
	N_2	79.50	79.75	79.50	percent
	B_{ws}	12.86	14.98	18.36	percent
GAS VELOCITY	v_s	38.4	40.88	43.2	feet/second
	Δp	0.530	0.56	0.59	inches H_2O
	T_s	420	428	427	° F
	P_g	-0.27	-0.27	-0.27	inches H_2O
	P_s	29.76	29.96	29.86	inches Hg
	M_s	28.40	28.16	27.86	lb/lbmole
	K_p	85.49	85.49	85.49	
	C_p	0.83	0.83	0.83	
VOLUMETRIC FLOW RATE	Q_{std}	8241	8531	8641	DSCF(68° F)
	B_{ws}	12.86	14.98	18.36	percent
	v_s	38.38	40.88	43.23	feet/second
	A	6.8736	6.8736	6.8736	sq. feet
	sec/min	60	60	60	
	K_1	17.64	17.64	17.64	
ISOKINETIC RATIO	I	96	99	104	percent
	T_s	420	428	427	° F
	$V_{m(std)}$	145.19	235.57	250.76	DSCFM(68° F)
	P_s	29.76	29.96	29.86	inches Hg
	v_s	38.38	40.88	43.23	feet/second
	θ	240	360	360	minutes
	B_{ws}	12.86	14.98	18.36	percent
	A_n	0.00053	0.00053	0.00053	sq. feet
	K_4	0.09450	0.09450	0.09450	

FIGURE 17C

EXAMPLE OF EMISSIONS TEST REPORT

	Run #31	Run #32	Run #33
(ng/dscm)			
Naphthalene	1046	1499	64782
2-Methylnaphthalene	<23	21.0	901
Acenaphthylene	34	106	11971
Acenaphthene	2.2	1.2	70
Fluorene	6.6	4.5	25
Phenanthrene	75	139	6056
Anthracene	<6.3	5.3	338
Fluoranthene	20	38	2253
Pyrene	27	47	2817
Benzo(a)anthracene	<1.2	<0.75	24
Chrysene	<1.2	0.92	42
Benzo(b)fluoranthene	<1.2	1.1	48
Benzo(k)fluoranthene	<1.2	<0.75	13
Benzo(e)pyrene	<8.5	<5.3	75
Benzo(a)pyrene	<1.2	<0.75	34
Perylene	<1.2	<0.75	16
Indeno(1,2,3-c,d)pyrene	<1.2	<0.75	14
Dibenzo(a,h)anthracene	<1.2	<0.75	0.90
Benzo(g,h,i)perylene	<21	<13	62
(ng/sec)			
Naphthalene	4068	6036	264180
2-Methylnaphthalene	<89	85	3676
Acenaphthylene	132	429	48816
Acenaphthene	8.7	5.0	287
Fluorene	26	18	103
Phenanthrene	293	561	24695
Anthracene	<25	21	1378
Fluoranthene	79	151	9189
Pyrene	104	187	11486
Benzo(a)anthracene	<4.7	<3.0	99
Chrysene	<4.7	3.7	172
Benzo(b)fluoranthene	<4.7	4.6	195
Benzo(k)fluoranthene	<4.7	<3.0	51
Benzo(e)pyrene	<33	<21	304
Benzo(a)pyrene	<4.7	<3.0	138
Perylene	<4.7	<3.0	63
Indeno(1,2,3-c,d)pyrene	<4.7	<3.0	57
Dibenzo(a,h)anthracene	<4.7	<3.0	3.7
Benzo(g,h,i)perylene	<80	<51	253

Standard Conditions: 68 deg.F (20 deg.C) & 29.92 in. Hg. (760 mm Hg)
"<" indicates that the compound was not detected above the reporting limit.

METHOD 429 - APPENDIX A

DETERMINATION OF THE METHOD DETECTION LIMIT

This procedure is based on the approach adopted by the EPA and included as Appendix B to Title 40, Part 136 of the Code of Federal Regulations (40 CFR 136). The samples shall be subjected to the same extraction, concentration, cleanup, and analytical procedures as those required for the field samples.

A1 Procedure

A1.1 Make an estimate of the detection limit (MDL) of each target compound using one of the following:

(a) The concentration value that corresponds to an instrument signal/noise ratio in the range of 2.5 to 5.

(b) The concentration equivalent of three times the standard deviation of replicate instrumental measurements of the analyte in reagent methylene chloride.

(c) That region of the standard curve where there is a significant change in sensitivity, i.e., a break in the slope of the standard curve.

(d) Instrumental limitations.

(e) The concentration equivalent to five times the theoretical quantitation limit (Section 8.3.1 of the test method)

The experience of the analyst is important to this process, but one of the above considerations must be included in the initial estimate of the detection limit.

A1.2 Prepare according to the procedures described in Sections 4.2.2.1 to 4.2.2.4 enough XAD-2 resin to provide, at a minimum, eight aliquots each with mass equal to that required to pack a Method 429 sorbent cartridge. A contamination check must be conducted to identify those PAH for which a MDL cannot be determined by this method.

A1.3 To each of seven (7) aliquots of the clean resin, add an amount of each target analyte equal to the estimated detection limit. The mass of each resin aliquot must be known, and should be approximately 40 grams, the amount required to pack a Method 429 sorbent cartridge. The eighth aliquot shall be a blank.

A1.4 Process each of the eight samples through the entire PAH analytical method. All quality criteria requirements of the analytical method must be satisfied.

A1.5 Report the analytical results. The laboratory report must satisfy all of the reporting requirements of Section 10 of the test method.

A1.6 It may be economically and technically desirable to evaluate the estimated method detection limit before proceeding with step A1.3. This will: (1) prevent repeating this entire procedure and (2) insure that the procedure is being conducted at the correct concentration. It is quite possible that an inflated MDL will be calculated from data obtained at many times the real MDL even though the level of analyte is less than five times the calculated method detection limit. To insure a good estimate of the method detection, it is necessary to determine that a lower concentration of analyte will not result in a significantly lower method detection limit. Take two aliquots of the sample to be used to calculate the method detection limit and process each through the entire method, including blank measurements as described above in step A1.3. Evaluate these data:

(1) If the sample levels are in a desirable range for determination of the MDL, take five additional aliquots and proceed. Use all seven measurements for calculation of the MDL according to Section A2.

(2) If these measurements indicate the selected analyte level is not in correct range, reestimate the MDL with a new sample as in A1.2 and repeat steps A1.3 to A1.5.

A2 Calculation

A2.1 Calculate the variance (S^2) and standard deviation (S) of the replicate measurements, as follows:

$$S^2 = \frac{1}{n-1}\left[\sum_{i=1}^{n} x_i^2 - \frac{\left(\sum_{i=1}^{n} x_i^2\right)}{n}\right] \qquad \text{429-(A)-(34)}$$

$$S = \sqrt[2]{S^2}$$

Where:

X_i, i = 1 to n, are the analytical results in the final method reporting units obtained from the n sample aliqouts and Σ refers to the sum of the X values from i = 1 to n.

A2.2 (a) Compute the MDL as follows:

$$MDL = t_{(n-1,\ 1-\alpha = 0.99)} \times (S) \qquad 429(A)\text{-}(35)$$

Where:

MDL = the method detection limit

$t_{(n-1,\ 1-\alpha = 0.99)}$ = Students' t-value appropriate for a 99% confidence level and a standard deviation estimate with n-1 degrees of freedom. See Table 429(A)-1.

S = standard deviation of the replicate analyses.

(b) The 95% confidence interval estimates for the MDL derived in A2.2(a) are computed according to the following equations derived from percentiles of the chi square over degrees of freedom distribution (χ^2/df).

LCL = 0.64 MDL
UCL = 2.20 MDL

where: LCL and UCL are the lower and upper 95% confidence limits respectively based on seven aliquots.

A3 Optional Iterative Procedure

A3.1 This is to verify the reasonableness of the estimate of the MDL and subsequent MDL determinations.

(a) If this is the initial attempt to compute MDL based on the estimate of MDL formulated in Step A1.1, take the MDL as calculated in Step A2.2, spike the matrix at this calculated MDL and repeat the procedure starting with Step A1.3.

(b) If this is the second or later iteration of the MDL calculation, use S^2 from the current MDL calculation and S^2 from the previous MDL calculation to compute the F-ratio. The F-ratio is calculated by substituting the larger S^2 into the numerator S^2_A and the other into the denominator S^2_B. The computed F-ratio is then compared with the F-ratio found in the table which is 3.05 as follows: if $S^2_A/S^2_B < 3.05$, then compute the pooled standard deviation by the following equation:

$$S_{pooled} = \left[\frac{6S_A^2 + 6S_B^2}{12}\right] \qquad 429(A)\text{-}(36)$$

if $S^2_A/S^2_B > 3.05$, respike at the most recent calculated MDL and process the samples through the procedure starting with Step A1.3. If the most recent calculated MDL does not permit qualitative identification when samples are spiked at that level, report the MDL as a concentration between the current and previous MDL which permits qualitative identification.

(c) Use the S_{pooled} as calculated in Equation 429(A)-3 to compute the final MDL according to the following equation:

$$MDL = 2.681\,(S_{pooled}) \qquad 429(A)\text{-}(37)$$

Where: 2.681 is equal to $t_{(12,\ 1-\alpha\ =\ .99)}$.

(d) The 95% confidence limits for MDL calculated using Equation 429(A)-4 are computed according to the following equations derived from percentiles of the chi squared over degrees of freedom distribution.

$$LCL = 0.72\ MDL$$
$$UCL = 1.65\ MDL$$

where LCL and UCL are the lower and upper 95% confidence limits respectively based on 14 aliquots.

TABLE 429(A)-1

SELECTED STUDENT'S t VALUES AT THE 99 PERCENT CONFIDENCE LEVEL

Number of Replicates	Degrees of Freedom (n-1)	$t_{(n-1,\ .99)}$
7	6	3.143
8	7	2.998
9	8	2.896
10	9	2.821
11	10	2.764
16	15	2.602
21	20	2.528
26	25	2.485
31	30	2.457
61	60	2.390

FORMULA: Table 1

M.W.: Table 1

POLYNUCLEAR AROMATIC HYDROCARBONS

METHOD: 5506
ISSUED: 5/15/85

OSHA: proposed for B[a]P: 0.2 µg/m³
ACGIH: suspect carcinogen (B[a]P)

PROPERTIES: Table 1

COMPOUNDS:			
	acenaphthene	benzo[ghi]perylene	fluorene
	acenaphthylene	benzo[a]pyrene	indeno[1,2,3-cd]pyrene
	anthracene	benzo[e]pyrene	naphthalene
	benz[a]anthracene	chrysene	phenanthrene
	benzo[b]fluoranthene	dibenz[a,h]anthracene	pyrene
	benzo[k]fluoranthene	fluoranthene	

SYNONYMS: PAH; PNA; also see Table 2.

SAMPLING

SAMPLER: FILTER + SORBENT
(2-µm, 37-mm PTFE + washed XAD-2, 100 mg/50 mg)

FLOW RATE: 2 L/min

VOL-MIN: 200 L
-MAX: 1000 L

SHIPMENT: transfer filters to culture tubes; wrap sorbent and culture tubes in Al foil; ship @ 0 °C

SAMPLE STABILITY: unknown; protect from heat and UV radiation

FIELD BLANKS: 10% (≥3) of samples
MEDIA BLANKS: 6 to 10

AREA SAMPLES: 8 replicates on preweighed filters for solvent selection

ACCURACY

RANGE STUDIED, BIAS, AND OVERALL PRECISION (s_r): not measured

MEASUREMENT

METHOD: HPLC, FLUORESCENCE/UV DETECTION

ANALYTE: compounds above

EXTRACTION: 5 mL organic solvent appropriate to sample matrix (step 7)

COLUMN: 15 cm x 4.6 mm, reverse phase, 5-µm C_{18}

INJECTION VOLUME: 10 to 50 µL

MOBILE PHASE: H_2O/CH_3CN gradient @ ambient temperature

FLOW RATE: 1.0 mL/min

DETECTORS: UV @ 254 nm; fluorescence @ 340 nm (excitation), 425 nm (emission)

CALIBRATION: external standards in CH_3CN

RANGE, LOD AND PRECISION (s_r): EVALUATION OF METHOD

APPLICABILITY: The working range for B[a]P is 1 to 50 µg/m³ for a 400-L air sample. Specific sample sets may require modification in filter extraction solvent, choice of measurement method, and measurement conditions (see EVALUATION OF METHOD).

INTERFERENCES: Any compound which elutes at the same HPLC retention time may interfere. Heat, ozone, NO_2, or UV light may cause sample degradation.

OTHER METHODS: This revises P&CAM 206 and 251 [1]. The spectrophotometric methods, P&CAM 184 and 186 [1], have not been revised. Also see Method 5515 (GC).

REAGENTS:

1. Filter extraction solvent: benzene,* cyclohexane, methylene chloride, or other appropriate solvents, pesticide grade grade (step 7).
2. Water, distilled, deionized, degassed.
3. Acetonitrile, HPLC grade, degassed.
4. PAH reference standards,* appropriate to the PAH-containing matrix sampled.
5. Calibration stock solution, 0.25 mg/mL.* Check purity of each PAH reference standard by GC/FID, HPLC/fluorescence and/or melting point. Purify, if necessary, by recrystallization. Weigh 25 mg of each PAH into a 100-mL volumetric flask; dilute to volume with acetonitrile. Stable six months if refrigerated and protected from light.

*See SPECIAL PRECAUTIONS.

EQUIPMENT:

1. Sampler:
   a. Filter. PTFE-laminated membrane filter, 2-µm pore size, 37-mm diameter (ZEFLOUR, Membrana, Pleasanton, CA or equivalent), backed by a gasket (37-mm OD, 32-mm ID) cut from a cellulose support pad, in cassette filter holder.
      NOTE 1: If sampling is to be done in bright sunlight, use opaque or foil-wrapped cassettes to prevent sample degradation.
      NOTE 2: Take filters to be preweighed from the filter package and allow to equilibrate 24 hrs with laboratory atmosphere before taring.
   b. Sorbent tube, connected to filter with minimum length PVC tubing. Plastic caps are required after sampling. Washed XAD-2 resin (front = 100 mg; back = 50 mg) (Supelco ORBO 43 or equivalent). Pressure drop at 2 L/min airflow 1.6 to 2 kPa (15 to 20 cm H_2O).
2. Personal sampling pump capable of operating for 8 hrs at 2 L/min, with flexible connecting tubing.
3. Aluminum foil.
4. Vial, scintillation, 20-mL, glass, PTFE-lined cap.
5. Refrigerant, bagged.
6. Culture tubes, PTFE-lined screw cap, 13-mm x 100-mm.
7. Forceps.
8. Filters, 0.45-µm, PTFE or nylon (for filtering sample solutions).
9. Pipet, 5-mL.
10. Syringe or micropipets, 1- to 100-µL.
11. Ultrasonic bath.
12. HPLC, with gradient capability, fluorescence (excitation @ 240 nm, emission @ 425 nm) and UV (254 nm) detectors in series, electronic integrator, and column [HC-ODS-SILX (Perkin-Elmer Corp.), Vydac 201TP (The Separations Group) or equivalent; see page 5506-1].
13. Volumetric flasks, 10- and 100-mL.
14. Lighting in laboratory: incandescent or UV-shielded fluorescent.
15. Kuderna-Danish extractor.

SPECIAL PRECAUTIONS: Treat benzene and all polynuclear aromatic hydrocarbons as carcinogens. Neat compounds should be weighed in a glove box. Spent samples and unused standards are toxic waste. Regularly check counter tops and equipment with "black light" for fluorescence as an indicator of contamination by PAH.

SAMPLING:

1. Calibrate each personal sampling pump with a representative sampler in line.
2. Take personal samples at 2 L/min for a total sample size of 200 to 1000 L. Take a concurrent set of eight replicate area samples at 2 to 4 L/min on preweighed, 2-µm PTFE filters in an area of highest expected PAH concentration.
   NOTE: The area samples are needed for solvent selection (step 7).
3. Immediately after sampling, transfer the filter carefully with forceps to a scintillation vial. Hold filter at edge to avoid disturbing the deposit. Cap the scintillation vial and wrap it in aluminum foil.
   NOTE: This step is necessary to avoid loss of analytes due to sublimation and degradation by light.
4. Cap the sorbent tube and wrap it in aluminum foil.
5. Ship to laboratory in insulated container with bagged refrigerant.

SAMPLE PREPARATION:

NOTE: UV light may degrade PAH. Use yellow, UV-absorbing shields for fluorescent lights or use incandescent lighting.

6. Refrigerate samples upon receipt at laboratory.
7. Determine optimum extraction solvent.
   a. Allow the preweighed area filter samples to equilibrate 24 hrs with the laboratory atmosphere.
   b. Weigh the area filters. Determine total weight collected on each.
   c. Extract the first pair of area filters with acetonitrile, the second with benzene, the third with cyclohexane, and the fourth with methylene chloride, according to step 8.
      NOTE: Use alternate solvents, if appropriate. PAH of interest may be entrained within, and adsorbed by, particulate matter collected on the filter. It is necessary to determine the solvent which maximizes recovery of the PAH from each sample matrix. For example, methylene chloride [2,3] and benzene:ethanol (4:1 v/v) [4] have been recommended for extraction of PAH from diesel exhaust particulate.
   d. Analyze the extracts for the PAH of interest (steps 10 through 18). Normalize the total mass of PAH found to the mass of sample collected.
   e. Choose the solvent which gives the highest recovery of PAH of interest. Use the solvent chosen to extract the personal filter samples.
8. Extract filters.
   a. Add 5.0 mL of the solvent chosen in step 7 to each scintillation vial containing a filter. Start media and reagent blanks at this step.
   b. Cap and let sit 15 to 20 min in an ultrasonic bath.
      NOTE 1: Soxhlet extraction may be required when large amounts of highly adsorptive particulate matter (e.g., fly ash or diesel soot) are present.
      NOTE 2: The sample must be dissolved in acetonitrile for chromatography. If needed, perform solvent exchange as follows:
      CAUTION: To avoid loss of volatile components, do not allow the sample to go to dryness at any time.
      (1) After filtration (step 10), take the sample to near dryness in a Kuderna-Danish extractor.
      (2) Add ca. 1 mL acetonitrile, take to near dryness, and adjust final volume to 1.0 mL with acetonitrile and filter again.
9. Desorb PAH from sorbent.
   a. Score each sorbent tube with a file in front of the front (larger) sorbent section. Break tube at score line.

b. Transfer glass wool plug and front sorbent section to a culture tube. Discard the foam plug. Transfer back sorbent section to a second culture tube.
c. Add 5.0 mL acetonitrile to each culture tube. Cap the culture tubes.
d. Allow samples to sit for 30 min. Swirl occasionally.

10. Filter all sample extracts through an 0.45-µm membrane filter.

CALIBRATION AND QUALITY CONTROL:

11. Calibrate daily with at least five working standards.
    a. Dilute aliquots of calibration stock solution with acetonitrile in 10-mL volumetric flasks (e.g., to 2.5, 0.5, 0.1, 0.02, and 0.002 µg/mL).
    b. Intersperse working standards and samples in the measurements.
    c. Prepare calibration graphs (peak area vs. µg of each PAH per sample).
12. Recovery and desorption efficiency.
    a. Determine recovery (R) from filters and desorption efficiency (DE) from sorbent tubes at least once for each lot of filters and sorbent tubes used in the range of interest.
       (1) Filters. Using a microliter syringe or micropipette, spike four filters at each of five concentration levels with a mixture of the analytes. Allow the filters to dry in the dark overnight. Analyze the filters (steps 8, 10, and 14 through 16. Prepare graphs of R vs. amounts found.
       NOTE: This step may not be used for some highly adsorptive particulate matrices for which calibration by the method of standard additions may be more accurate.
       (2) Sorbent tubes. Transfer an unused front sorbent section to a culture tube. Prepare a total of 24 culture tubes in order to measure DE at five concentration levels plus blanks in quadruplicate. Using a microliter syringe or micropipette, add calibration stock solution directly to sorbent. Cap culture tubes and allow to stand overnight. Analyze (steps 9, 10, and 14 through 16). Prepare graphs of DE vs. amounts found.
    b. Check R and DE at two levels for each sample set, in duplicate. Repeat determination of R and DE graphs if checks do not agree to within ±5% of DE graph.
13. Analyze at least three field blanks for each sample medium.

MEASUREMENT:

14. Set HPLC according to manufacturer's recommendations and to conditions on page 5506-1. Equilibrate column at 60% CH_3CN/40% H_2O at 1.0 mL/min for 15 min before injecting first sample.
15. Inject sample aliquot. Start mobile phase gradient:
    a. Linear gradient 60% CH_3CN to 100% CH_3CN, 20 min.
    b. Hold at 100% CH_3CN for 20 min.
       NOTE: Hold longer if necessary to prevent carryover of background, e.g., from coal dust.
    c. Linear gradient to initial condition, 5 min.
16. Measure peak areas.
    NOTE 1: Approximate retention times appear in Table 3.
    NOTE 2: If peak area is above the calibration range, dilute with appropriate solvent, reanalyze, and apply dilution factor in calculations.
    NOTE 3: If sample has many interferences, additional sample cleanup may be necessary. Many cleanup procedures have been published. Liquid-liquid partitioning between cyclohexane and nitromethane [5,6] is widely used, but other techniques may be more appropriate for specific samples.

CALCULATIONS:

17. Read the mass, µg (corrected for R or DE) of each analyte found on the filter (W) and front sorbent (W_f) and back sorbent (W_b) sections, and on the average media blank filter (B) and front sorbent (B_f) and back sorbent (B_b) sections from the calibration graphs.
18. Calculate concentration, C (µg/m³), in air as the sum of the particulate concentration and the vapor concentration using the actual air volume sampled, V (L).

$$C = \frac{(W - B + W_f + W_b - B_f - B_b) \cdot 10^3}{V}, \ \mu g/m^3.$$

NOTE: W_f and W_b include analyte originally collected on the filter as particulate, then volatilized during sampling. This can be a significant fraction for many PAH (e.g., fluoranthane, naphthalene, fluorene, anthracene, phenanthrene).

EVALUATION OF METHOD:

The fluorescence detector used in this method is both sensitive and selective. The detector can "see" as little as 50 pg of many PAH injected on the column. LODs for the 17 analytes range from 50 to 350 ng per sample. It does not respond to non-fluorescent molecules such as aliphatics. The method is, therefore, most amenable to determination of trace amounts of PAH in mixtures of aliphatic compounds. Successful applications include: aluminum reduction facilities, asphalt fume, coal gasification plants, coal liquefaction plants, coal tar pitch, coke oven emissions, creosote treatment facilities, diesel exhaust, graphite electrode manufacturing, petroleum pitch, and roofing tearoff operations.

This method has been evaluated by analyzing spiked filters, spiked sorbent tubes, and complete spiked sampling trains through which were drawn 500 L of air [7]. Each of the three groups was spiked with each analyte at two concentration levels in sextuplicate. Particular note should be made that the effect of particulate matter has not been evaluated, and every sampling matrix is unique. The data on the following page were obtained on spiked samplers stored refrigerated in the dark for three months followed by measurement with HPLC.

COMPOUND	CALIBRATION RANGE (µg per sample)	LOD (µg per sample)	MEASUREMENT PRECISION SPIKED[a]	SPIKED + AIR[b]
1. ACENAPHTHENE	2.0 - 13	0.8	.058 S	.093 (50)
2. ACENAPHTHYLENE	1.0 - 100	0.35	.032 S	.075 (100)
3. ANTHRACENE	0.4 - 13	0.05	.039 S	.037 (5)
4. BENZ[a]ANTHRACENE	0.4 - 13	0.15	.032 F	.084 (5)
5. BENZO[b]FLUORANTHENE	0.4 - 12	0.1	.027 F	.028 (10)
6. BENZO[k]FLUORANTHENE	0.4 - 13	0.15	.025 F	.027 (1)
7. BENZO[ghi]PERYLENE	0.5 - 25	0.2	.031 F	.029 (10)
8. BENZO[a]PYRENE	0.4 - 14	0.2	.027 F	.029 (5)
9. BENZO[e]PYRENE	0.5 - 13	0.2	(c)	(c)
10. CHRYSENE	0.4 - 12	0.15	.039 F	.024 (5)
11. DIBENZ[a,h]ANTHRACENE	0.5 - 25	0.2	.026 F	.029 (10)
12. FLUORANTHENE	0.4 - 13	0.15	.026 S	.050 (10)
13. FLUORENE	0.7 - 13	0.25	.031 S	.090 (10)
14. INDENO[1,2,3-cd]PYRENE	0.5 - 12	0.2	.044 F	.032 (10)
15. NAPHTHALENE	0.6 - 13	0.25	.041 S	.125 (50)
16. PHENANTHRENE	0.4 - 13	0.1	.036 S	.070 (2)
17. PYRENE	0.5 - 13	0.2	(c)	(c)

[a]RSD for filter (F) where volatilization is nil or for sorbent (S) where substantial volatilization may occur during sampling.

[b]RSD determined at the µg level shown in parenthesis for a spiked filter followed by a sorbent tube. After spiking, laboratory air was drawn through the sampling train at 2 L/min for 4 hrs.

[c]Not determined.

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METHOD REVISED BY: B. R. Belinky and E. J. Slick, NIOSH/DPSE.

Table 1. Formulae and physical properties.

COMPOUND (by M.W.)	EMPIRICAL FORMULA	MOLECULAR WEIGHT	DETECTOR	MELTING POINT (°C)	BOILING POINT (°C)*	REF.
1. NAPHTHALENE	$C_{10}H_8$	128.17	UV	80	218	[9]
2. ACENAPHTHYLENE	$C_{12}H_8$	152.20	UV	92-93	265-275	[10]
3. ACENAPHTHENE	$C_{12}H_{10}$	154.21	UV	96.2	279	[10]
4. FLUORENE	$C_{13}H_{10}$	166.22	UV	116	293-295	[9]
5. ANTHRACENE	$C_{14}H_{10}$	178.23	UV	218	340	[9]
6. PHENANTHRENE	$C_{14}H_{10}$	178.23	UV	100	340	[9]
7. FLUORANTHENE	$C_{16}H_{10}$	202.26	FL	110	—	[9]
8. PYRENE	$C_{16}H_{10}$	202.26	FL	156	399	[9]
9. BENZ[a]ANTHRACENE	$C_{18}H_{12}$	228.29	FL	158-159	—	[9]
10. CHRYSENE	$C_{18}H_{12}$	228.29	UV	255-256	—	[9]
11. BENZO[b]FLUORANTHENE	$C_{20}H_{12}$	252.32	FL	168	—	[9]
12. BENZO[k]FLUORANTHENE	$C_{20}H_{12}$	252.32	FL	217	480	[10]
13. BENZO[a]PYRENE	$C_{20}H_{12}$	252.32	FL	177	—	[9]
14. BENZO[e]PYRENE	$C_{20}H_{12}$	252.32	FL	178-179	—	[9]
15. BENZO[ghi]PERYLENE	$C_{22}H_{12}$	276.34	FL	273	—	[9]
16. INDENO[1,2,3-cd]PYRENE	$C_{22}H_{12}$	276.34	FL	161.5-163	—	[8]
17. DIBENZ[a,h]ANTHRACENE	$C_{22}H_{14}$	278.35	FL	262	—	[9]

*Many of these compounds will sublime.

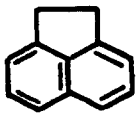
Table 2. Synonyms.

COMPOUND (alphabetically)	SYNONYMS
1. ACENAPHTHENE	CAS# 83-32-9
2. ACENAPHTHYLENE	CAS# 208-96-8
3. ANTHRACENE	CAS# 120-12-7
4. BENZ[a]ANTHRACENE	1,2-benzanthracene; benzo[b]phenanthrene; 2,3-benzophenanthrene; tetraphene; CAS# 56-55-3
5. BENZO[b]FLUORANTHENE	3,4-benzofluoranthene; 2,3-benzofluoranthene; benz[e]acephenanthrylene; B[b]F; CAS# 205-99-2
6. BENZO[k]FLUORANTHENE	11,12-benzofluoranthene; CAS# 207-08-9
7. BENZO[ghi]PERYLENE	1,12-benzoperylene; CAS# 191-24-2
8. BENZO[a]PYRENE	3,4-benzopyrene; 6,7-benzopyrene; B[a]P; BP; CAS# 50-32-8
9. BENZO[e]PYRENE	1,2-benzopyrene; 4,5-benzopyrene; B[e]P; CAS# 192-97-2
10. CHRYSENE	1,2-benzophenanthrene; benzo[a]phenanthrene; CAS# 218-01-9
11. DIBENZ[a,h]ANTHRACENE	1,2,5,6-dibenzanthracene; CAS# 53-70-3
12. FLUORANTHENE	benzo[jk]fluorene; CAS# 206-44-0
13. FLUORENE	CAS# 86-73-7
14. INDENO[1,2,3-cd]PYRENE	2,3-phenylenepyrene; CAS# 193-39-5
15. NAPHTHALENE	naphthene; CAS# 91-20-3
16. PHENANTHRENE	CAS# 85-01-8
17. PYRENE	benzo[def]phenanthrene; CAS#129-00-0

Table 3. Approximate PAH retention times.

COMPOUND	RETENTION TIME (min)*
1. NAPHTHALENE	2.4
2. ACENAPHTHALENE	2.8
3. ACENAPHTHENE	3.6
4. FLUORENE	3.9
5. PHENANTHRENE	4.7
6. ANTHRACENE	5.8
7. FLUORANTHENE	6.8
8. PYRENE	7.7
9. BENZ[a]ANTHRACENE	11.2
10. CHRYSENE	12.1
11. BENZO[e]PYRENE	14.0
12. BENZO[b]FLUORANTHENE	14.8
13. BENZO[k]FLUORANTHENE	16.5
14. BENZO[a]PYRENE	17.3
15. DIBENZ[a,h]ANTHRACENE	20.0
16. BENZO[ghi]PERYLENE	20.0
17. INDENO[1,2,3-cd]PYRENE	21.2

*NOTE: Determined with a Perkin-Elmer HC-ODS-SILX column. Actual retention times will vary with individual columns and column age.



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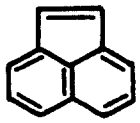

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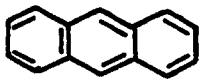

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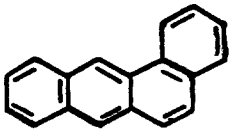

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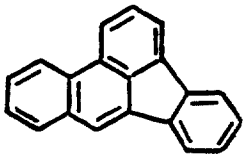

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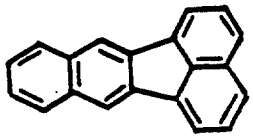

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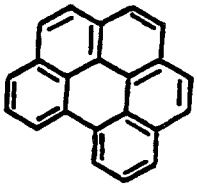
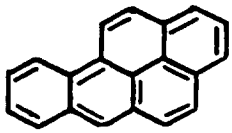


BENZO(g h i)PERYLENE



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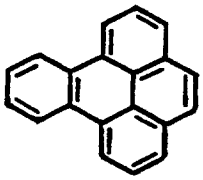

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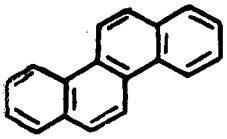

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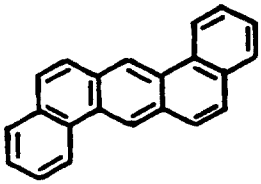

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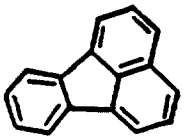
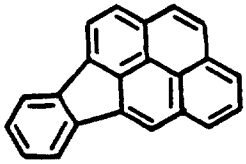
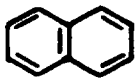


FLUORANTHENE

FLUORENE



INDENO(1,2,3-c d)PYRENE



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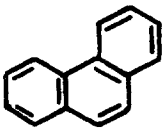

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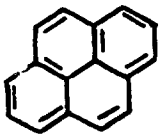

PYRENE

Figure 1. Structures of PAH.

TECHNICAL REPORT DATA

Please read instructions on the reverse before completing

1. REPORT NO. EPA-454/R-99-002c	2.	3. RECIPIENT'S ACCESSION NO.
4. TITLE AND SUBTITLE Final Report - Emissions Testing of Combustion Stack and Pushing Operations at Coke Battery No. 5/6 at ABC Coke in Birmingham, Alabama Volume III of III		5. REPORT DATE February 1999 6. PERFORMING ORGANIZATION CODE
7. AUTHOR(S) Franklin Meadows Daniel F. Scheffel		8. PERFORMING ORGANIZATION REPORT NO.
9. PERFORMING ORGANIZATION NAME AND ADDRESS Pacific Environmental Services, Inc. Post Office Box 12077 Research Triangle Park, North Carolina 27709-2077		10. PROGRAM ELEMENT NO. 11. CONTRACT/GRANT NO. 68-D-98-004
12. SPONSORING AGENCY NAME AND ADDRESS U.S. Environmental Protection Agency Office of Air Quality Planning and Standards Emissions, Monitoring and Analysis Division Research Triangle Park, North Carolina 27711		13. TYPE OF REPORT AND PERIOD COVERED Final 14. SPONSORING AGENCY CODE
15. SUPPLEMENTARY NOTES		

16. ABSTRACT

The United States Environmental Protection Agency (EPA) is investigating the coke making industry to characterize hazardous air pollutants (HAPs) emitted from coke pushing operations and combustion (underfire) stacks. This test report addresses pushing emissions from a coke oven, and emissions from the combustion (underfire) stack that serves Coke Battery No. 5/6 at ABC Coke in Birmingham, Alabama. The purpose of this test program was to quantify emissions from the inlet and outlet of the baghouse controlling emissions from the coke pushing operation and to quantify emissions from the combustion outlet stack. The data may be used by the EPA in the future to support a residual risk assessment for coke oven facilities.

The testing was performed to quantify uncontrolled and controlled air emissions of filterable particulate matter (PM), methylene chloride extractable matter (MCEM) and 19 polycyclic aromatic hydrocarbons (PAHs) including acenaphthene, acenaphthylene, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(e)pyrene, benzo(k)fluoranthene, benzo(ghi)perylene, chrysene, dibenzo(a,h)anthracene, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, 2-methylnapthalene, napthalene, perylene, phenanthrene, and pyrene. In addition, following the PM and MCEM analyses, the samples were analyzed to screen for the presence of 17 trace metals. Baghouse dust samples were also collected and analyzed for 16 trace metals. Simultaneous testing was performed at the inlet and outlet of the baghouse controlling emissions from the coke pushing operation. Sampling was also performed on the combustion outlet stack. In addition to pollutant testing, oxygen (O_2) and carbon dioxide (CO_2) were measured at each location. During the sampling program, Research Triangle Institute (RTI), another EPA contractor, monitored and recorded process and emission control system operating parameters.

This volume (Volume III) is comprised of 379 pages and consists of Appendices: E (Calculations), F (QA/QC Data), G (Participants), and H (Sampling and Analytical Procedures).

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTIONS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COASTI Field/Group
Baghouse Coke Ovens Emission Measurements Hazardous Air Pollutants Metals Methylene Chloride Extractable Matter Particulate Matter Polycyclic Aromatic Hydrocarbons		
18. DISTRIBUTION STATEMENT Unlimited	19. SECURITY CLASS *(This Report)* Unclassified 20. SECURITY CLASS *(This page)* Unclassified	21. NO. OF PAGES 1647 22. PRICE