



RADNET

Tracking Environmental Radiation Nationwide

RadNet Air Monitoring

for National Air Quality Conference
– Ambient Monitoring –
2012

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Briefing Overview

- Introduction to RadNet
 - RadNet’s mission and objectives
 - RadNet as an upgrade to the existing ERAMS system
 - Air, Milk, Precipitation, Drinking Water
- RadNet’s Functional Capabilities
 - Fixed and Deployable Monitors
 - Detection, Usage and Siting
 - Data Sharing
 - <http://www.epa.gov/radnet/radnet-data/index.html>
 - http://iaspub.epa.gov/enviro/erams_query_v2.simple_query
- Fukushima Response



RadNet's Mission

- EPA has developed a nationwide environmental radiation monitoring system known as RadNet
 - To track national / regional ambient radiation levels
 - To identify the degree and extent of contamination in the event of an emergency
- RadNet
 - supports EPA's role in incident assessment
 - focuses on monitoring potential impacts to population and public health



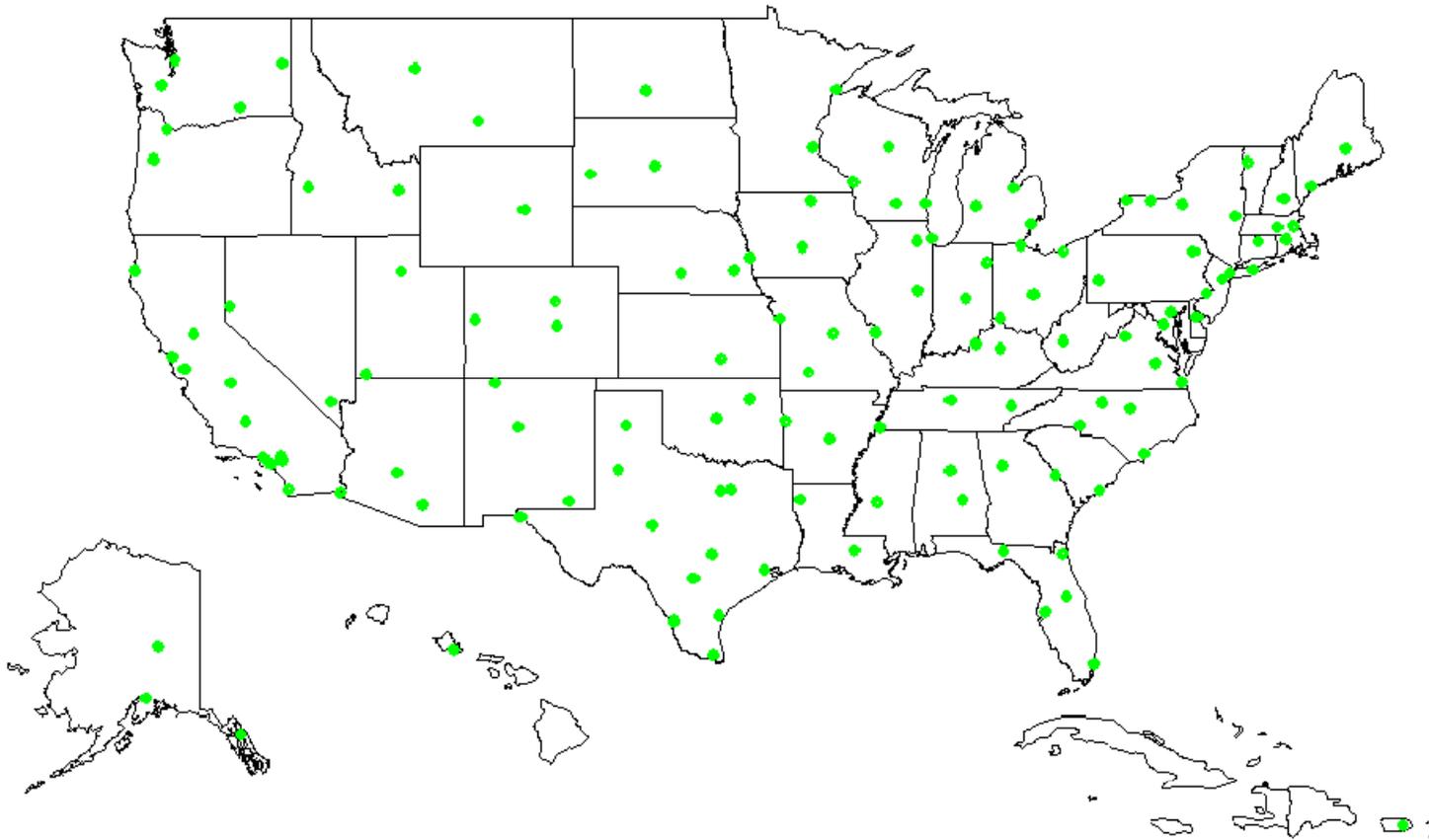
RadNet Objectives

- RadNet provides data quickly in the event of a radiation incident to
 - Decision makers for use concerning potential actions to protect public health
 - Dispersion modelers to assist in predicting/refining source term and dispersion characteristics
 - Nuclear/rad health experts to enable further assessment of national impact
- RadNet, for the most part, provides data related to a known radiological incident such as Fukushima
 - There may be instances where RadNet provides initial information (e.g., a foreign incident, pre-deployment)



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Fixed RadNet Sites





RadNet Objectives (continued)

- RadNet data helps
 - Determine large scale national impact of a radiological incident
 - Provide better and timely data to modelers for long distance transport estimates
 - Provide exposure data for large areas of population to assist in protective action recommendations, follow-up monitoring and assessment, and population dose reconstruction
- RadNet is not intended to
 - Be regulatory
 - Monitor nuclear facilities
 - Provide an early warning system for nuclear accidents
 - Provide a means to monitor in the immediate locality of the incident – this is addressed by other assets.



RadNet Builds Upon ERAMS

- RadNet built upon an existing ambient monitoring network known as Environmental Radiation Ambient Monitoring System (ERAMS)
- Like ERAMS, RadNet is multimedia:
 - air particulates, precipitation, drinking water and milk
- RadNet monitors and sampling efforts are operated by volunteers from EPA Regions, State and County programs
- Information collected by RadNet is publicly available
- Attributes of RadNet high-volume air samplers:
 - Hourly data from automated filter analysis sent to lab from 124 monitors
 - All hourly data reviewed by computer and/or scientist
 - Filters mailed to fixed lab for additional analyses



Monitoring of Other Media Continues Under RadNet

- Precipitation
 - Sampling as precipitation occurs at 34 locations
 - Analyses on monthly composites for gamma, tritium and gross beta
 - Each sample analyzed during Fukushima response
- Drinking Water
 - Sampling occurs quarterly at 77 locations
 - Started one week early and completed a second round during Fukushima response
 - Analyses focused on iodine and tritium with annual composites for gross alpha and beta, Strontium-90 and gamma
 - Additional analyses undertaken if values exceed certain pre-described levels (e.g., Ra-226 analysis undertaken if gross alpha exceeds $> 2\text{pCi/L}$)
- Milk
 - Sampling occurs quarterly at 36 locations
 - Started one week early and completed a second round during Fukushima response
 - Analyses focus on gamma for individual samples and summer readings of Strontium-90



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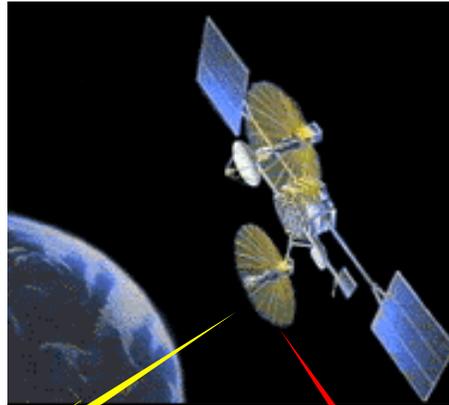
Fixed Monitor Installations





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Each fixed air monitor provides real-time capability and sends data directly to the NAREL facility automatically—a feature shared with RadNet’s deployable air monitors.

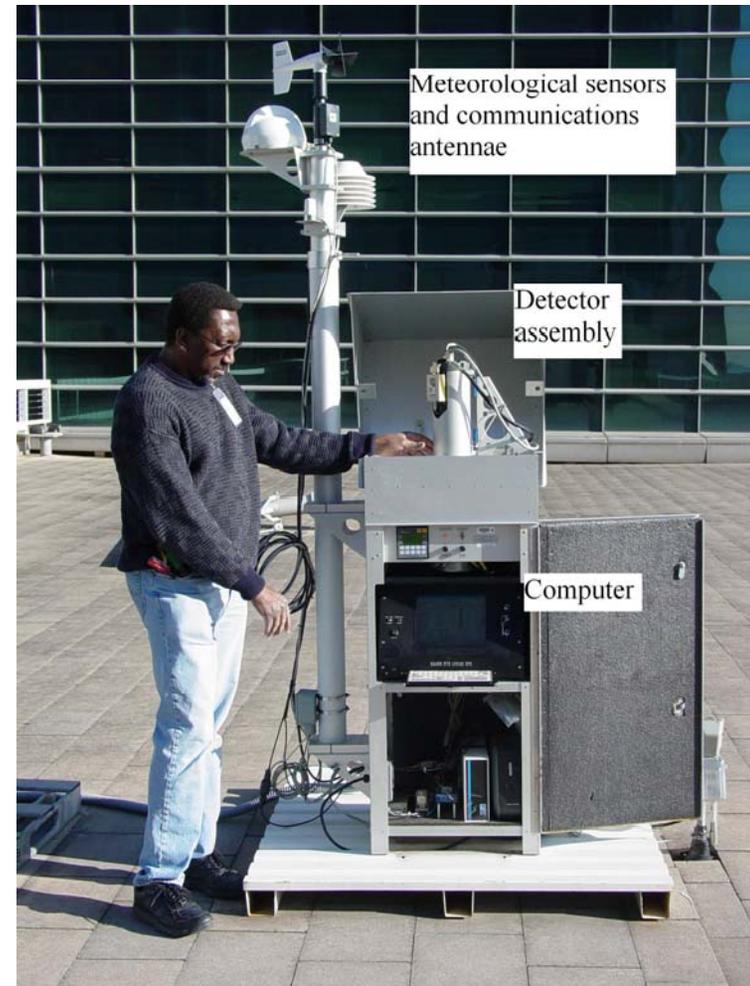


Data are transmitted by satellite telemetry, cell phone, telephone modem, and internet communications.



Fixed Monitors

- First installation 2006
- 124 Installed
- Tested to withstand temperature extremes
- Wind tunnel tested
- Data publically available





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Fixed radiation air monitoring stations have a high volume air sampler and a gamma spectrometry detector, allowing for continuous monitoring of radiation emanating from particles collected on the air filter.



In addition, the air filters are sent to the EPA's lab in Montgomery, AL (NAREL) for more sensitive analysis and further identification of radionuclides.





The fixed monitor's gamma (sodium iodide) detector is positioned above a 4" polyester filter, which samples at 60 m³/hr.





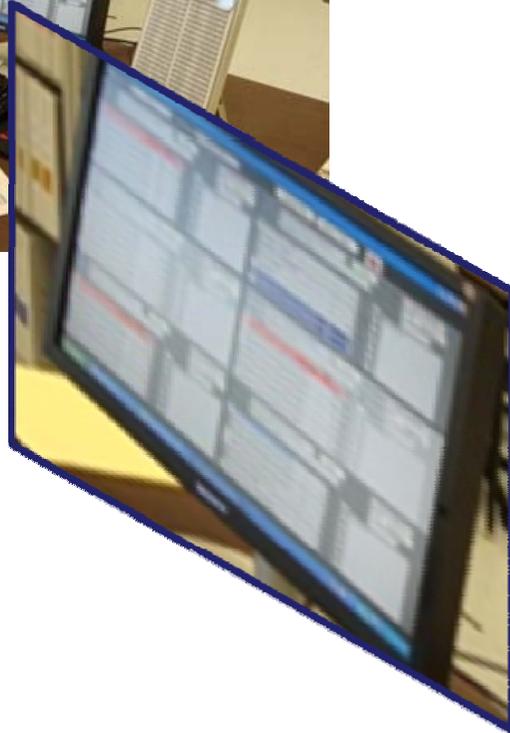
Fixed Monitors Usage

- Collect air sample continuously
 - Acquire gamma spectrum for 1 hour
- Transmit gamma count rates to the National Air and Radiation Environmental Laboratory (NAREL) in Montgomery, AL and store spectra locally
 - Encrypted telemetry system with redundant telecommunications capabilities:
- Receive and store data at NAREL, assess incoming data for upper and lower limits, notifies staff with “alarm” for out of range
 - Upload full spectrum, perform quantitative analysis at NAREL
- Supplement real-time data with analysis on filter
 - NAREL performs more gross and beta count, additional analysis if screening levels exceeded



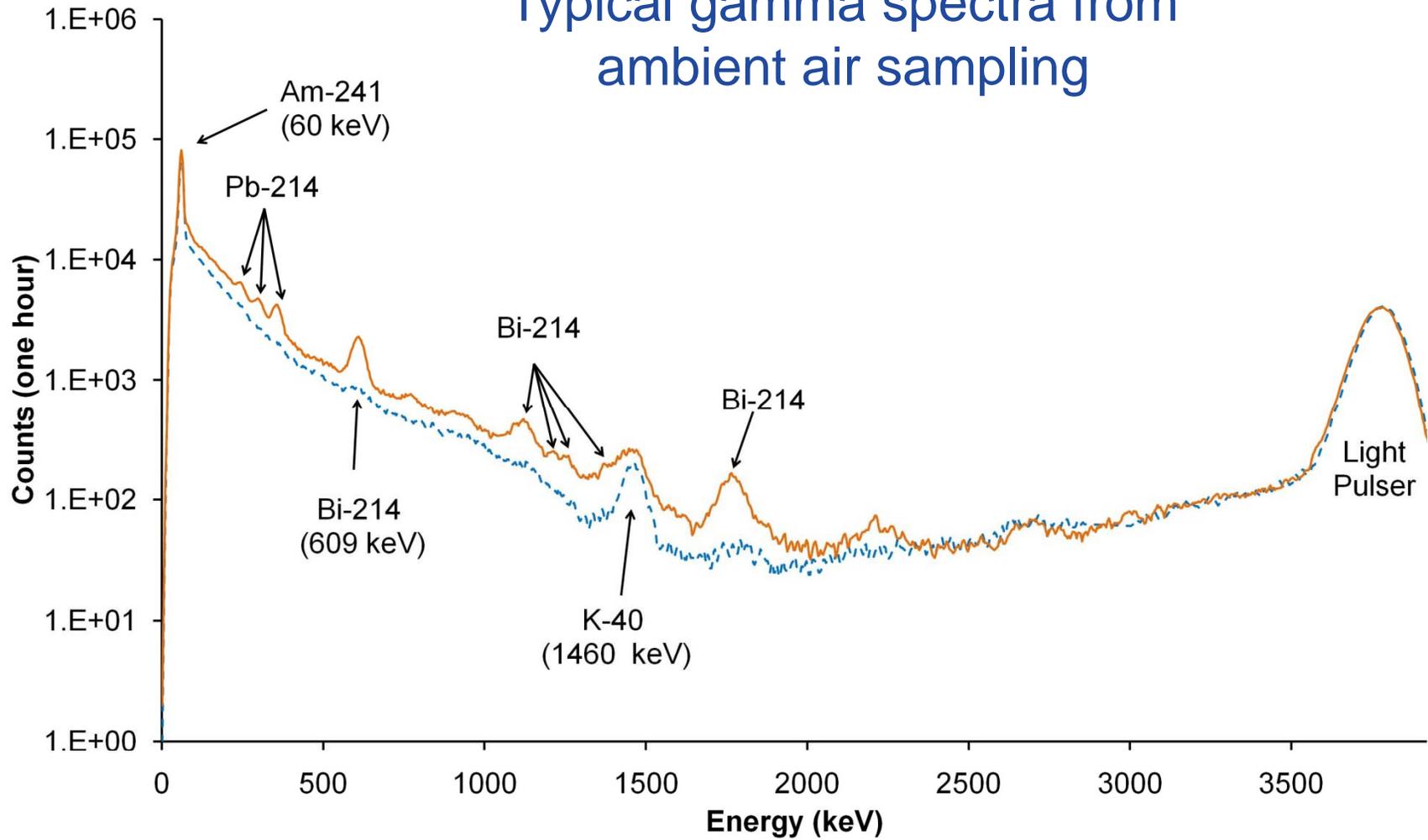
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RadNet Control Room Operations



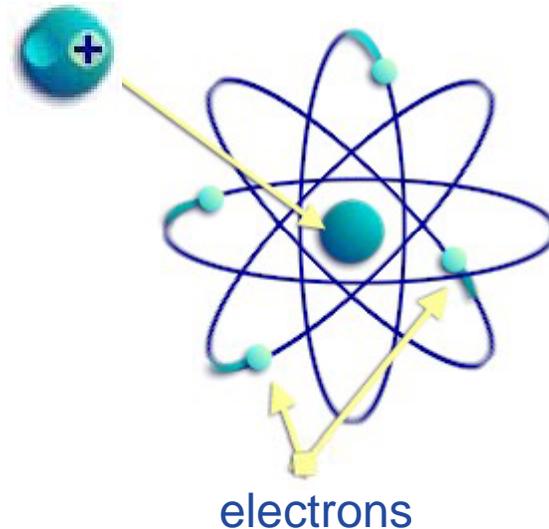


Typical gamma spectra from ambient air sampling

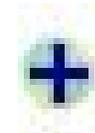


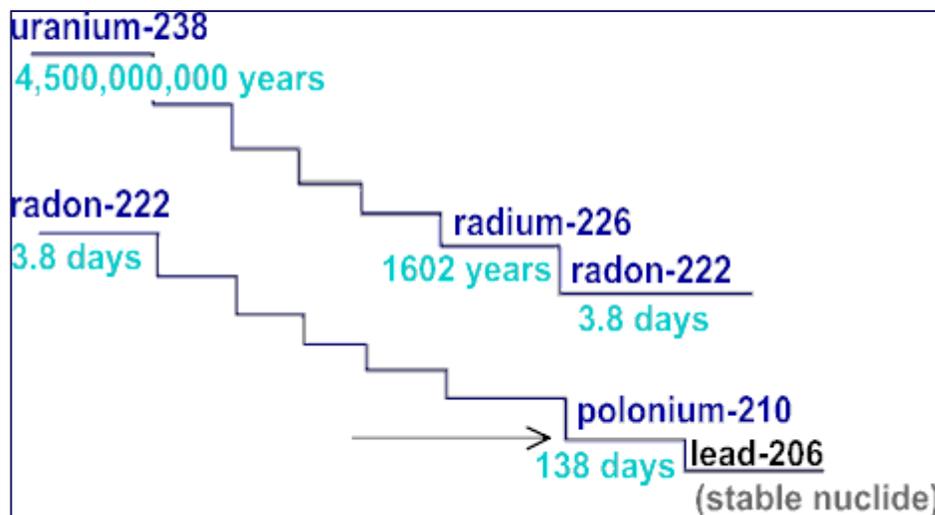
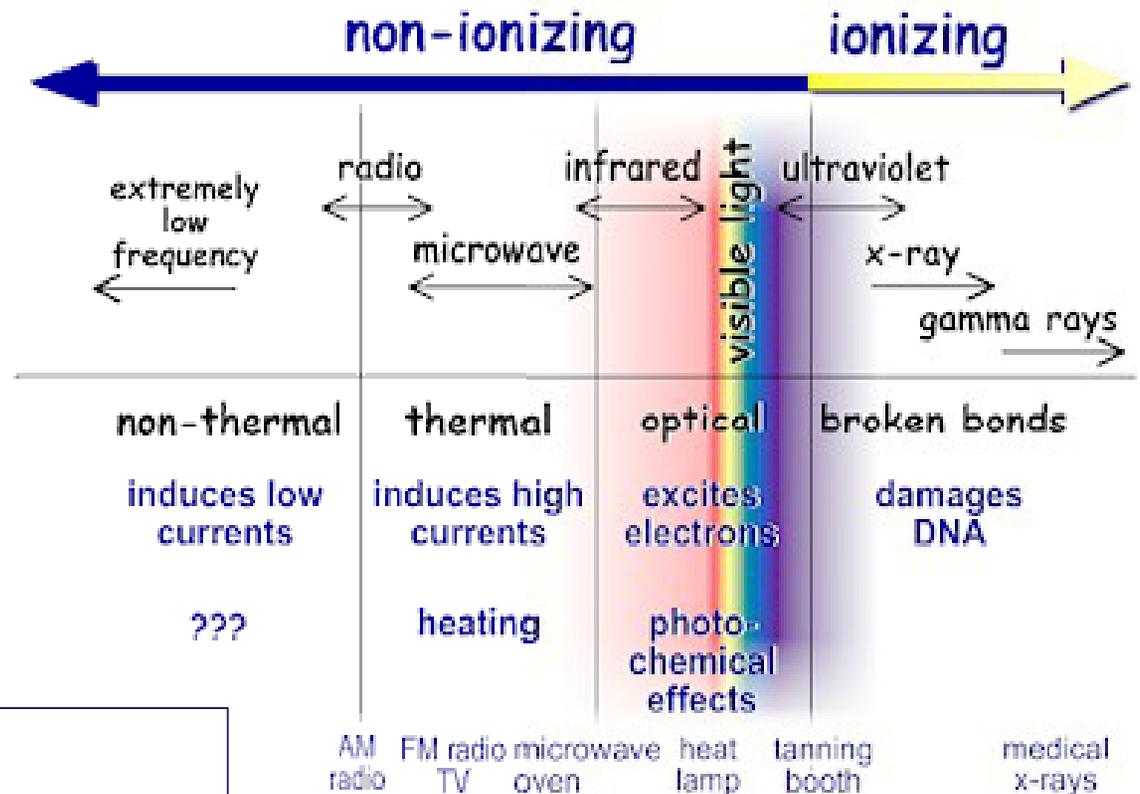
Radiation Detection

Nucleus
contains protons
and neutrons.



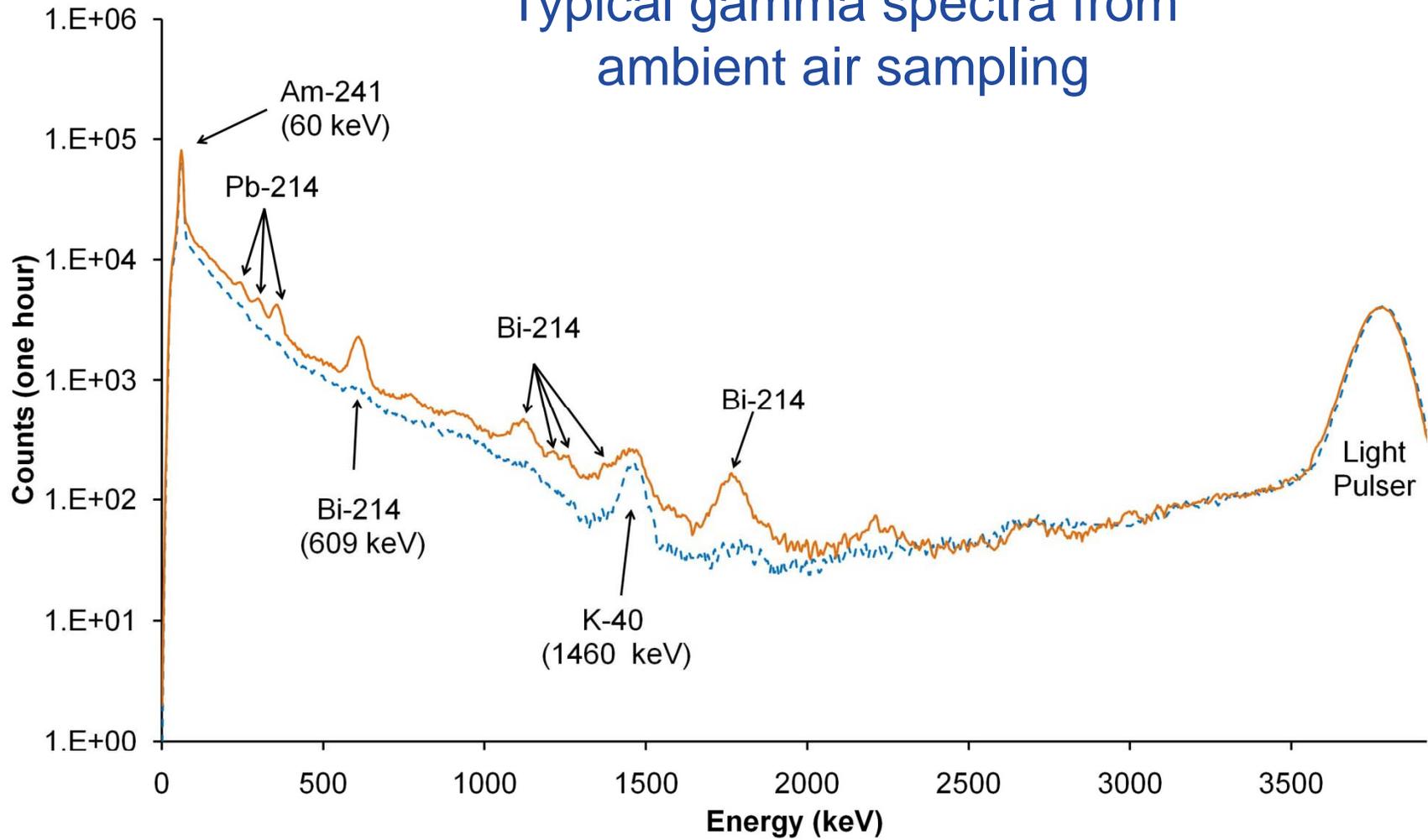
 Neutrons
have no electrical
charge, and like
protons, are about
1800 times as
heavy as an
electron.

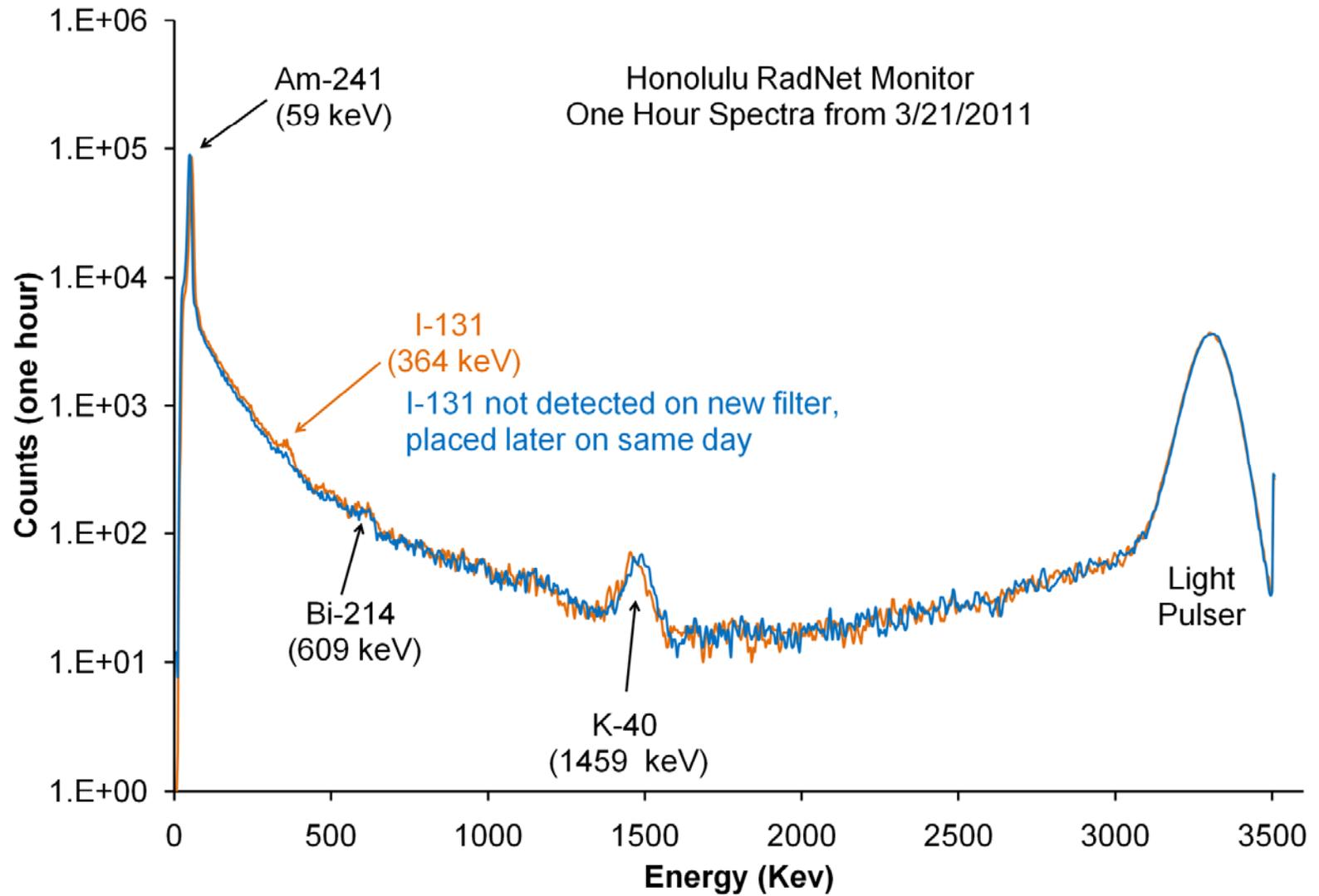
 Protons
are positively charged
particles. All atoms of
an element
(radioactive and non-
radioactive) have the
same number of
protons.





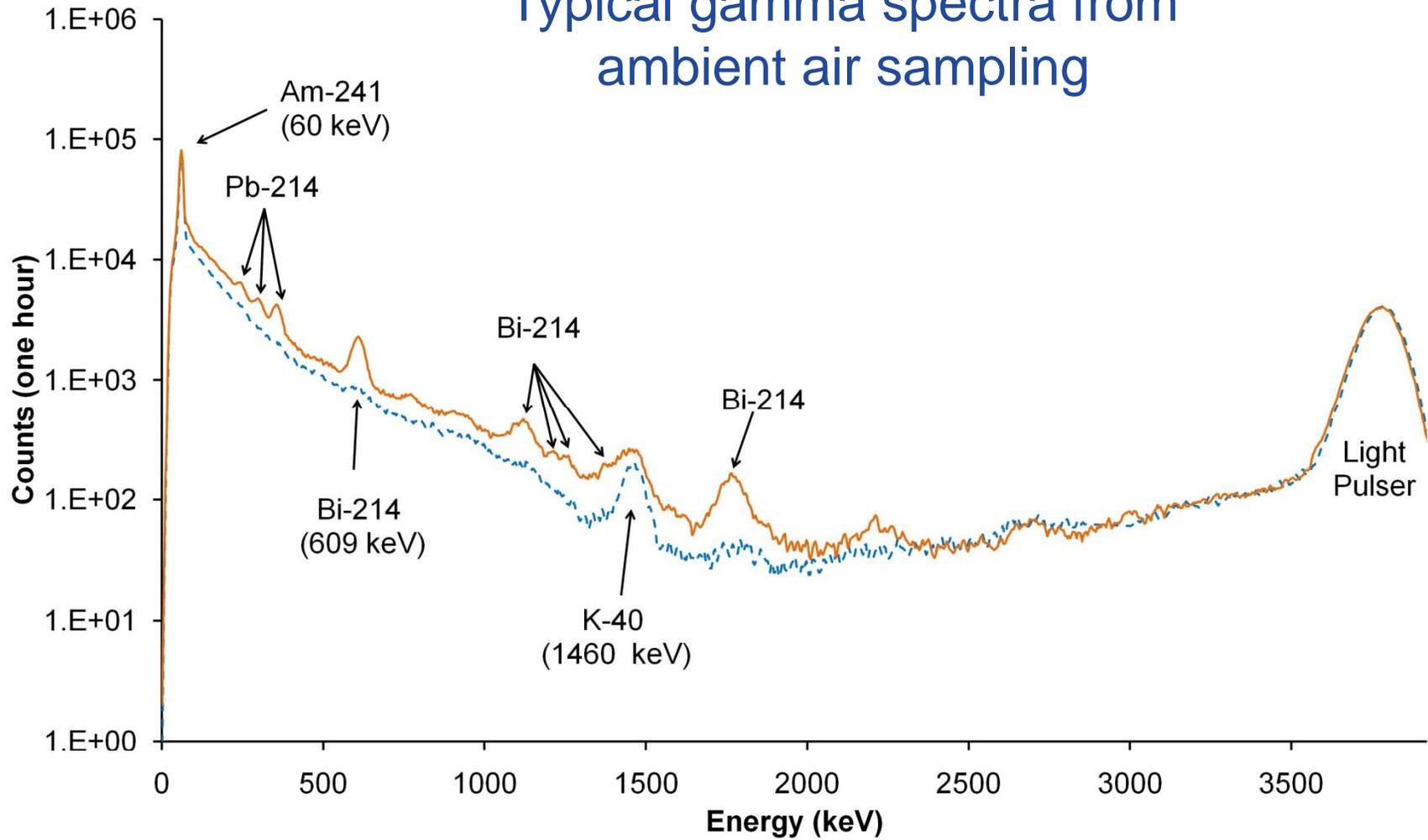
Typical gamma spectra from ambient air sampling





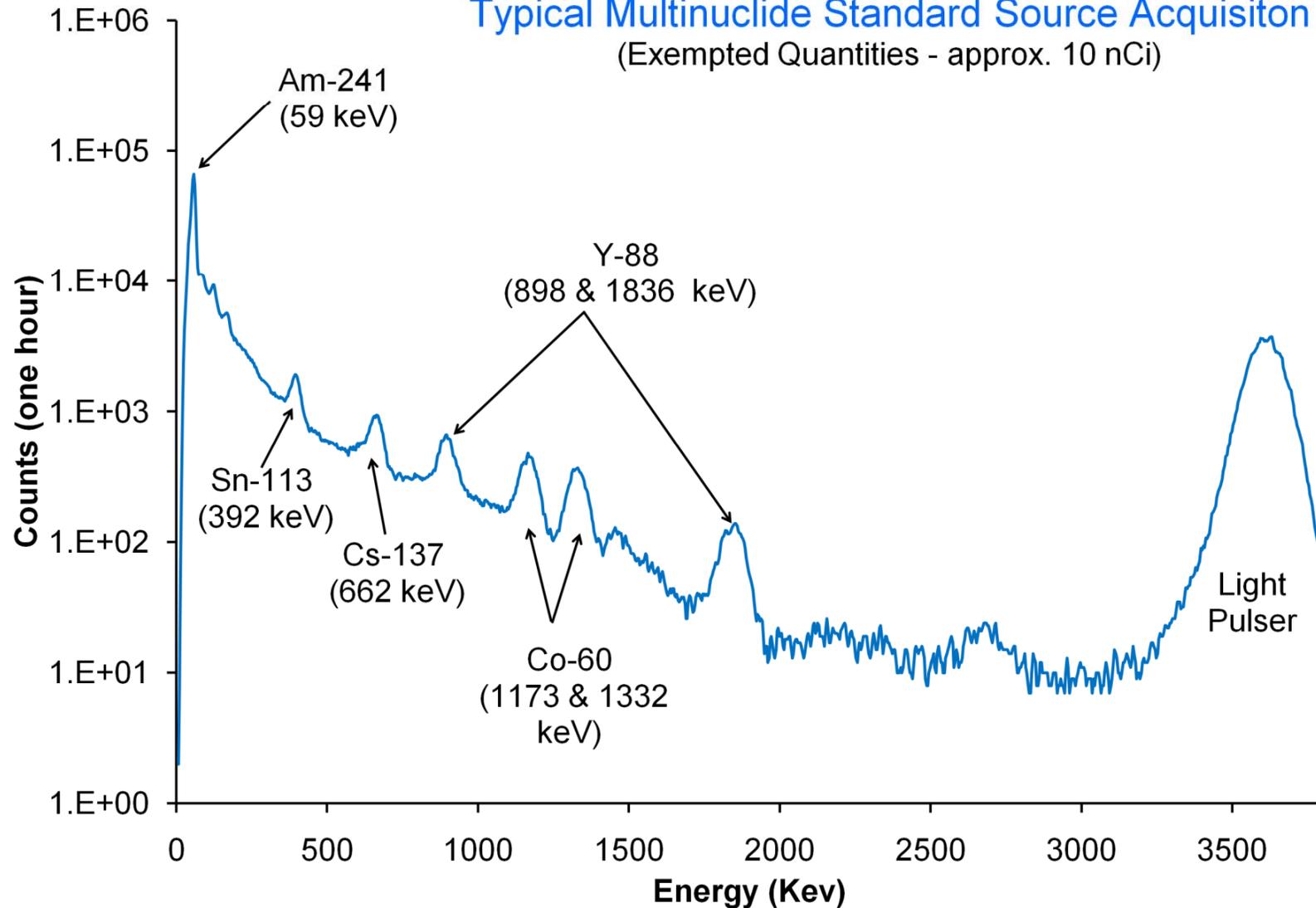


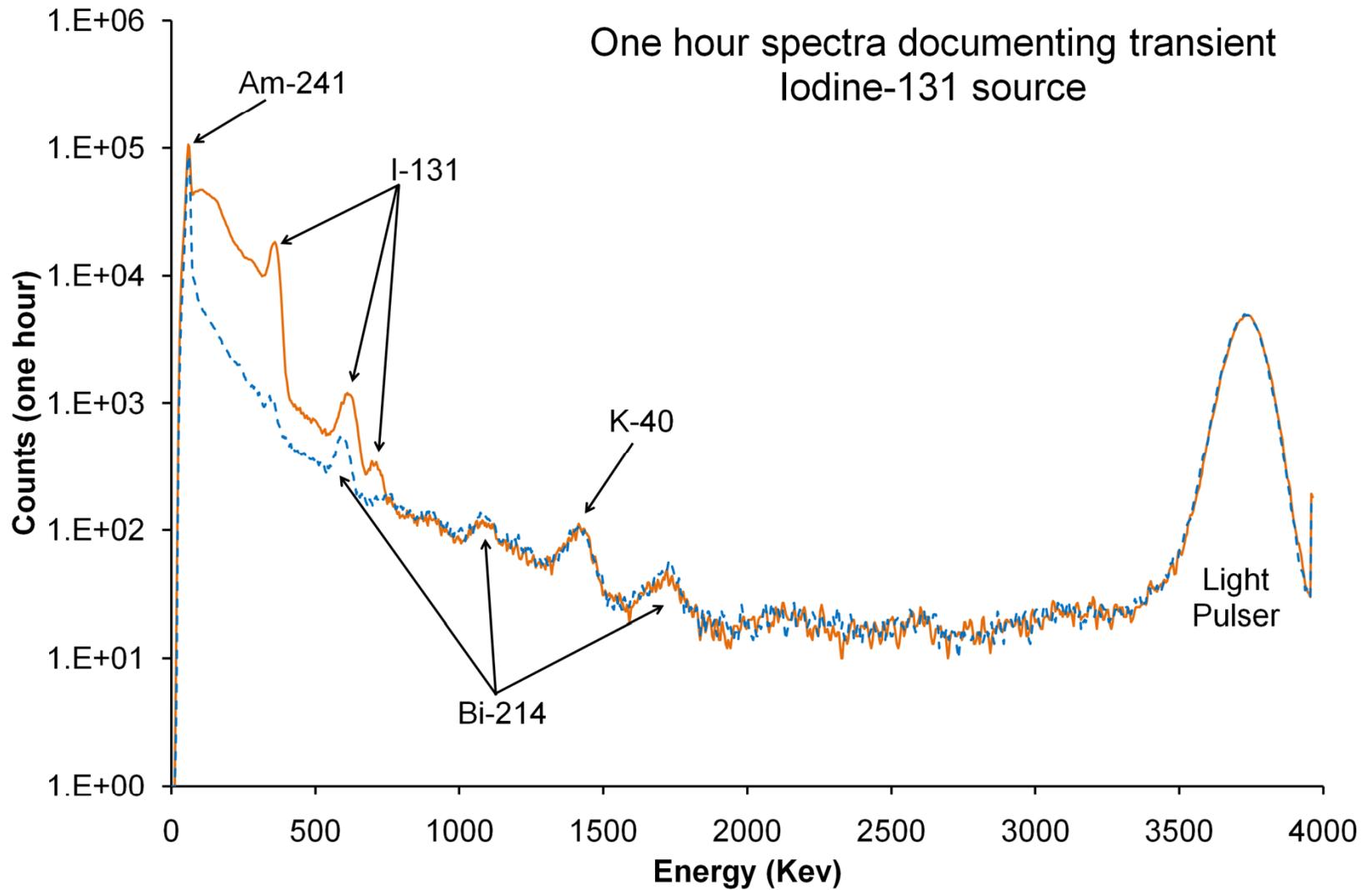
Typical gamma spectra from ambient air sampling

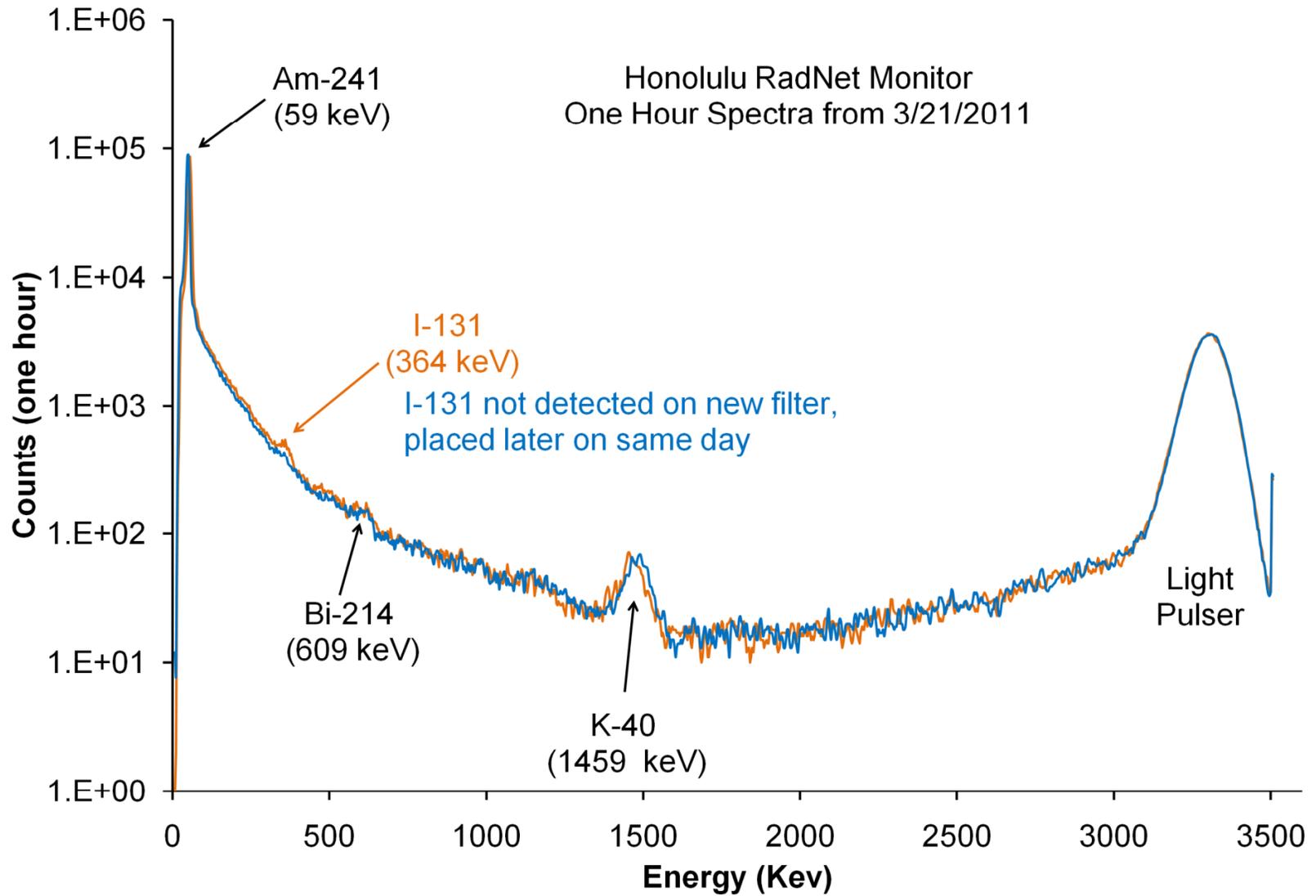




Typical Multinuclide Standard Source Acquisition (Exempted Quantities - approx. 10 nCi)

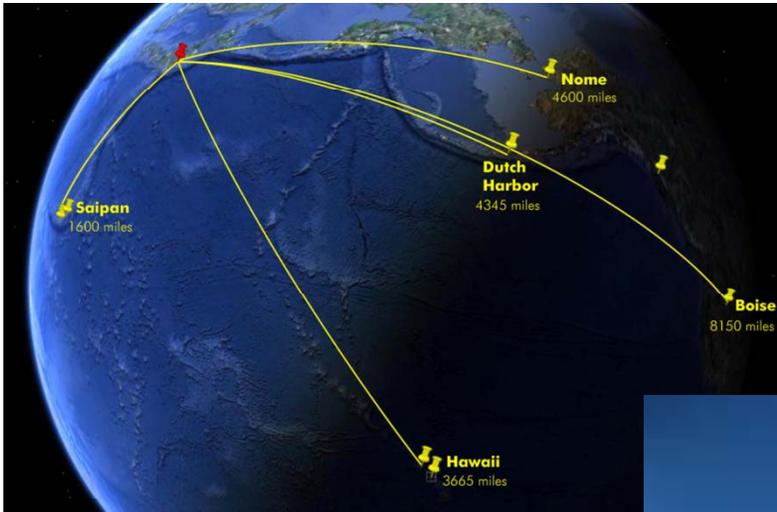








Deployable Monitor Sites





RadNet's Deployable Monitors

A Deployable monitor is a transportable unit that measures ambient gamma radiation levels in near real-time, and also collects airborne radioactivity with high and low-volume air samplers

The deployables are stored in a state of readiness at the Montgomery, Alabama and Las Vegas, Nevada laboratories and can be deployed to the scene of a radiological incident or pre-deployed to an event (e.g., Nationally Significant Security Event)



RadNet's Deployable Monitor



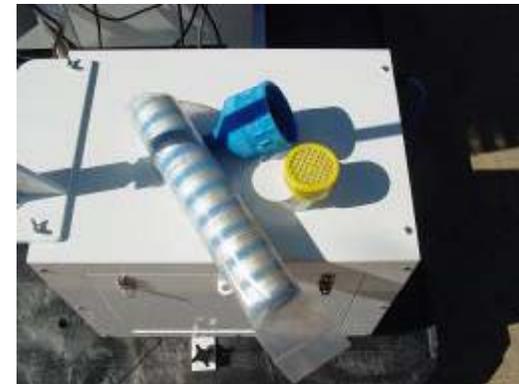
- **High Volume Air Sampler**
- **Low Volume Air Sampler**
- **Gamma Exposure Instrument**
- **Power Distribution Panel**
- **Satellite Telemetry**
- **Data Logger**
- **PDA**
- **Platform**
- **GPS and Weather Station**



Deployable Monitors



Deployable air monitors utilize a glass 4" filter and a glass 2" filter. Alternatively, 2" silver zeolite or charcoal cartridges may be substituted for sampling select nuclides.





RadNet's Deployable Monitor: Usage

- Air sample operations
 - Ability to collect both high volume and low volume air samples
 - Including charcoal or silver zeolite for iodine vapor capture
- Transmit stored information utilizing an encrypted telemetry system with redundant telecommunications capabilities:
 - Iridium Satellite modem
 - Analog modem
 - PDA download and storage
- Receive and store data at NAREL, assesses incoming data for upper limits, notifies staff with “alarm” for out of range
- Supplement near real-time data with analysis on filter
 - Filters delivered to mobile or fixed laboratory for analysis



RadNet Data Sharing

- EPA shares data through CDX & Envirofacts
 - Data are available to the responder community as a priority
 - Data are given sufficient context to be understood by its audience
 - Data sharing remains consistent with Federal policies and the overall Federal response
- EPA's approach to data sharing
 - Provided data and information on the internet with appropriate context and explanation
 - Public Affairs improved public access and messaging during Fukushima response



Fukushima Results

- Reviewed more than 250,000 sets of data
- Analyzed several hundred air, milk, rain, and drinking water samples
- Established deployable monitors in Alaska, Hawaii, Guam, and Saipan
- Real Time monitoring saw one indication for a few hours
- 1,000 to 3,000 minute laboratory counts to see other isotopes in sampled media
- Millions of hits per day on EPA RadNet data site



Summary

- EPA's RadNet radiation monitoring system
 - Tracks national / regional ambient radiation levels
 - Identifies the degree and extent of contamination in the event of an emergency
- The RadNet Program
 - Supports EPA's role in incident assessment
 - Focuses on monitoring potential impacts to population and public health