



**RADNET**

Tracking Environmental Radiation Nationwide

# National Radiation Air Monitoring Network

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# Overview

- ❑ Introduction to EPA's Radiation Monitoring Program
  - RadNet's mission and objectives
  - RadNet as an upgrade to the existing ERAMS system
    - Air, Milk, Precipitation, Drinking Water
  
- ❑ RadNet's Air Monitoring Functional Capabilities
  - Fixed and Deployable Monitors
    - Detection, Usage and Siting
  - Data Sharing
  
- ❑ Response to Fukushima Nuclear Incident



# RadNet's Mission

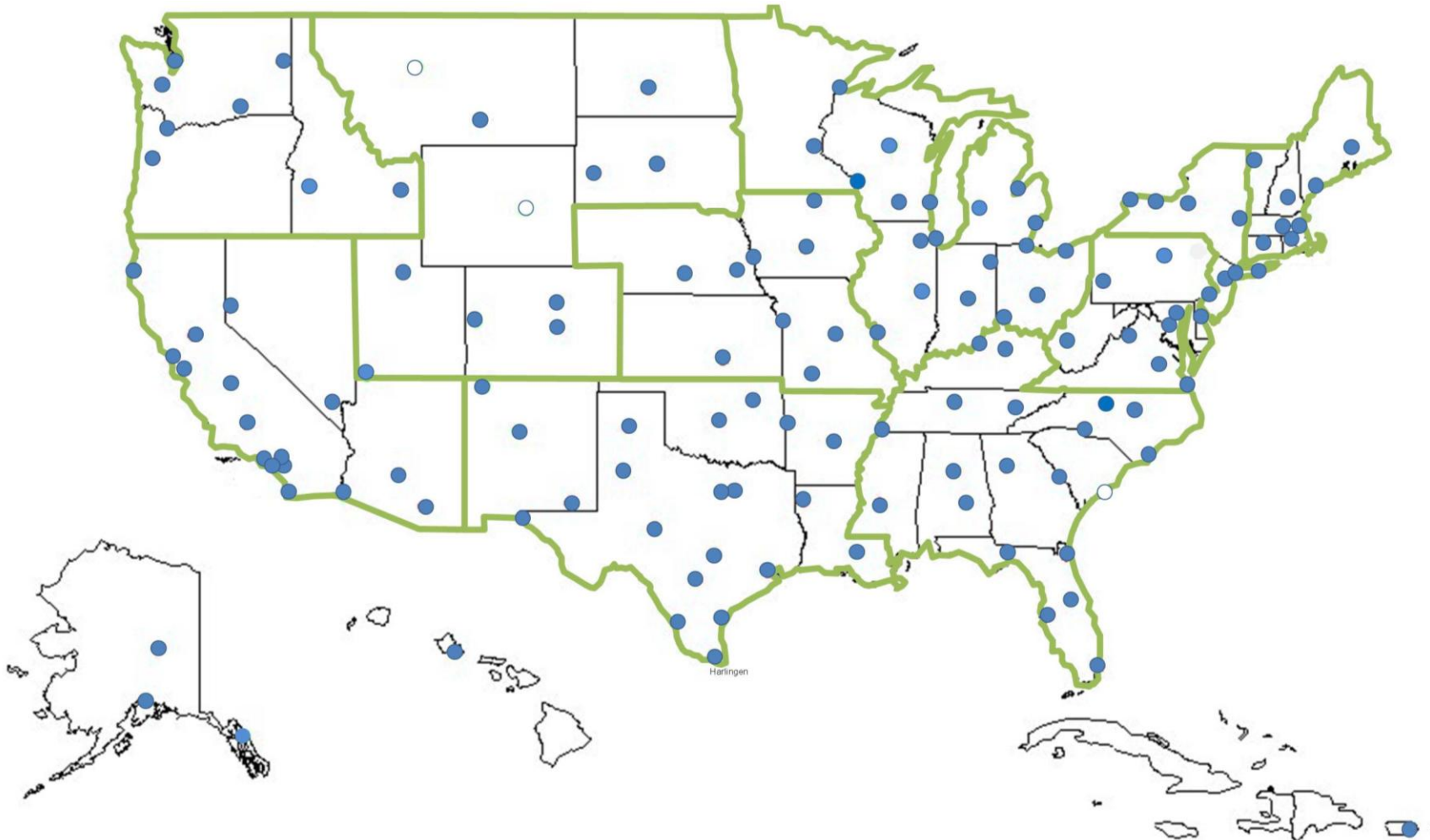
- ❑ EPA has developed a nationwide environmental radiation monitoring system known as RadNet
  - To track national / regional ambient radiation levels
  - To identify the degree and extent of contamination in the event of an emergency
  
- ❑ RadNet
  - supports EPA's role in incident assessment
  - focuses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

# Fixed Air Monitor 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 Objectives (continued)

- ❑ 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





# Monitoring of Other Media

Precipitation

Drinking Water

Milk

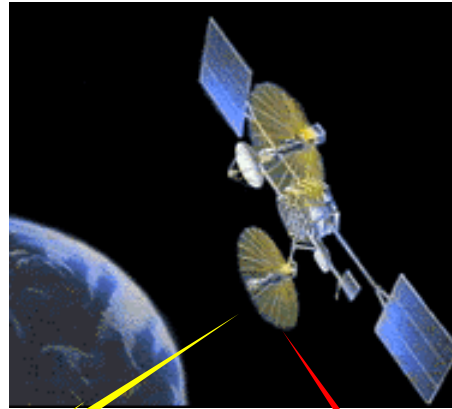
# Fixed Monitor Installations





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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.

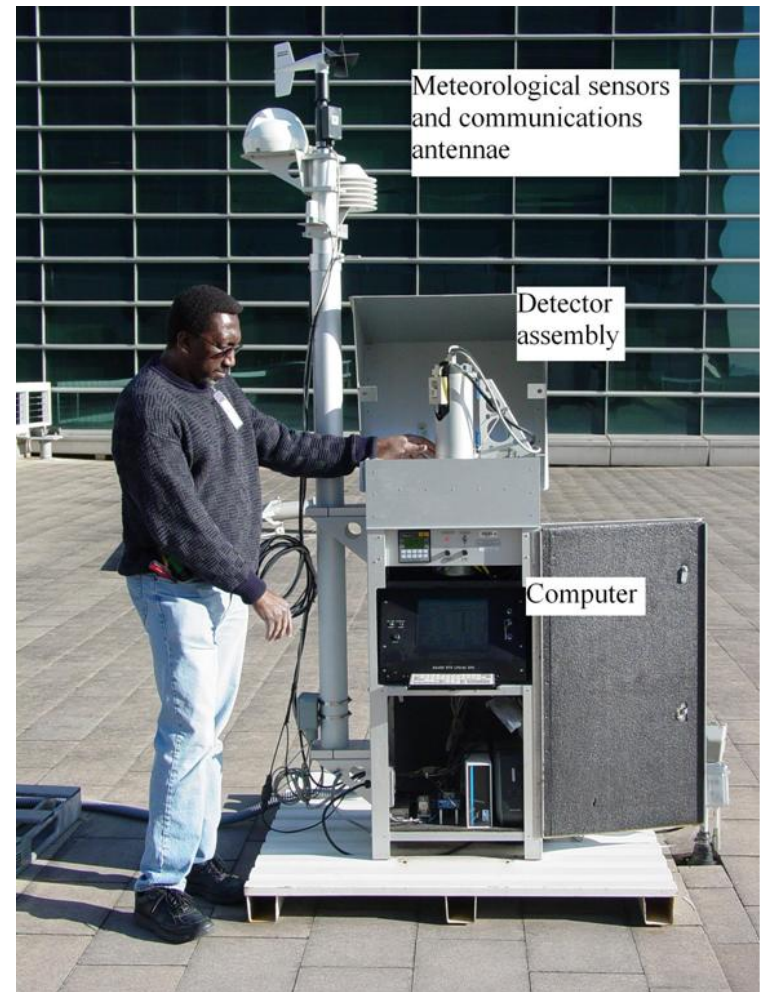


Data are transmitted by satellite telemetry, cell phone, telephone modem, and internet communications.



# Fixed Monitors

- ❑ First installation 2006
- ❑ 131 Installed
- ❑ Tested to withstand temperature extremes
- ❑ Tested to evaluated sampling efficiency
- ❑ Data publically available





# Wind Tunnel Testing



Wind into mast



Wind into front

# Wind Tunnel Testing



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 m<sup>3</sup>/hr.







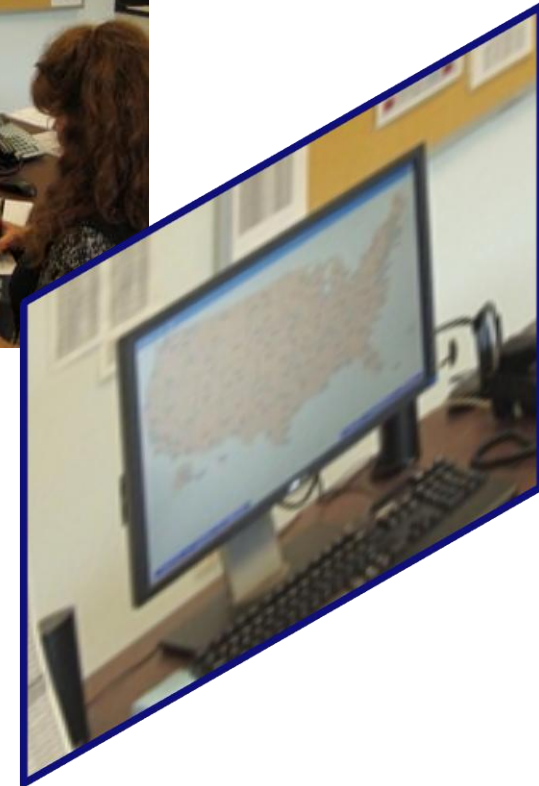
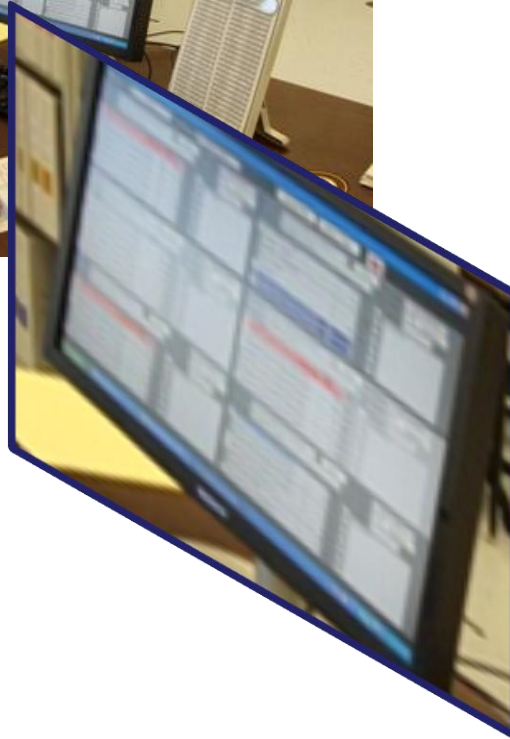
# Fixed Monitors Usage

- Collect air sample continuously
- Transmit gamma count rates to the National Analytical Radiation Environmental Laboratory (NAREL) in Montgomery, AL and store spectra locally
- Receive and store data at NAREL, assess incoming data for upper and lower limits, notifies staff with “alarm” for out of range
- Supplement real-time data with analysis on filter

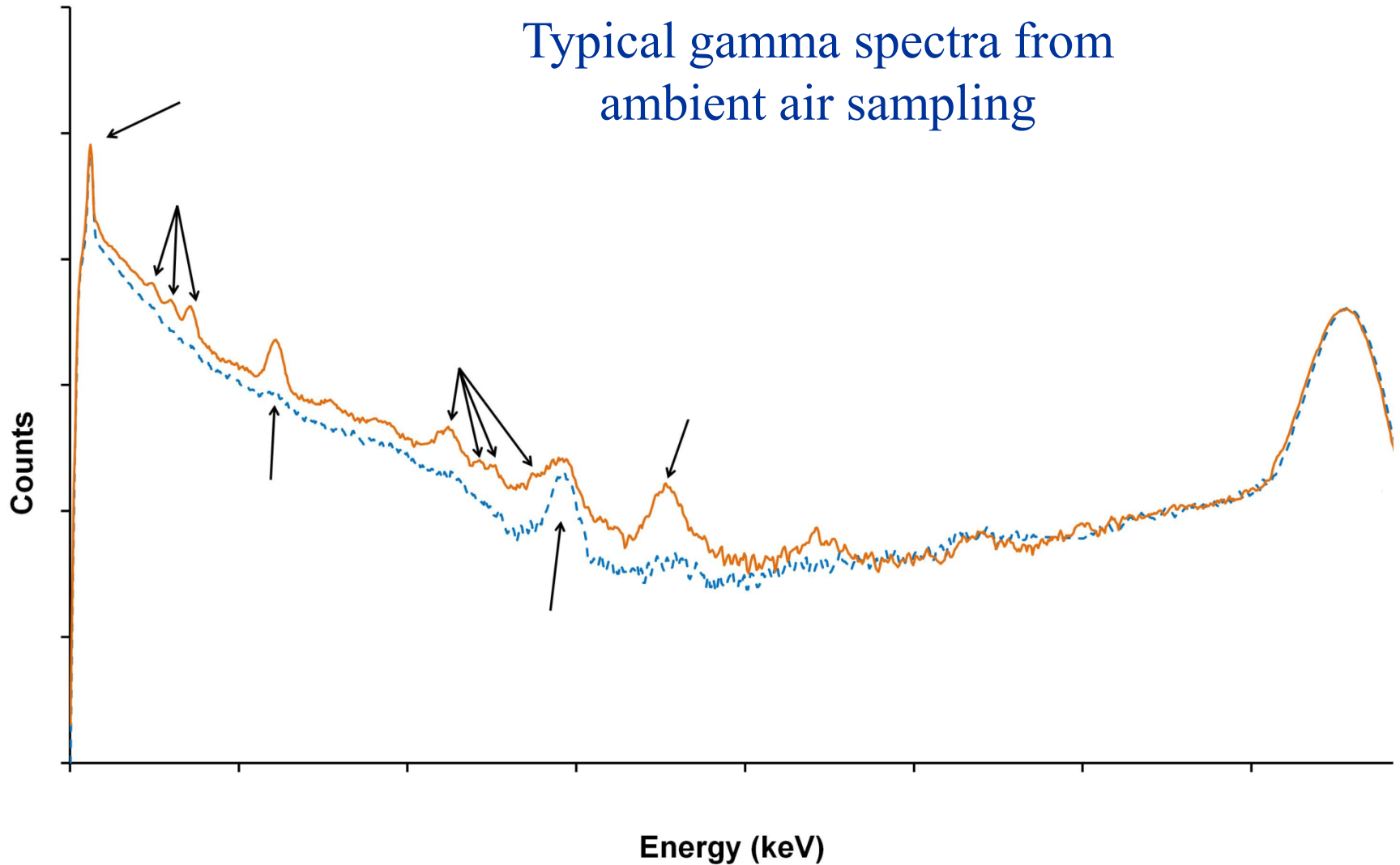


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# RadNet Control Room Operations


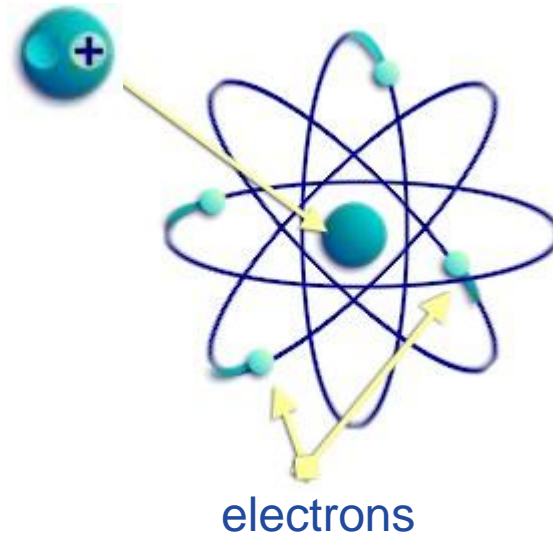


## Typical gamma spectra from ambient air sampling



# Radiation Detection

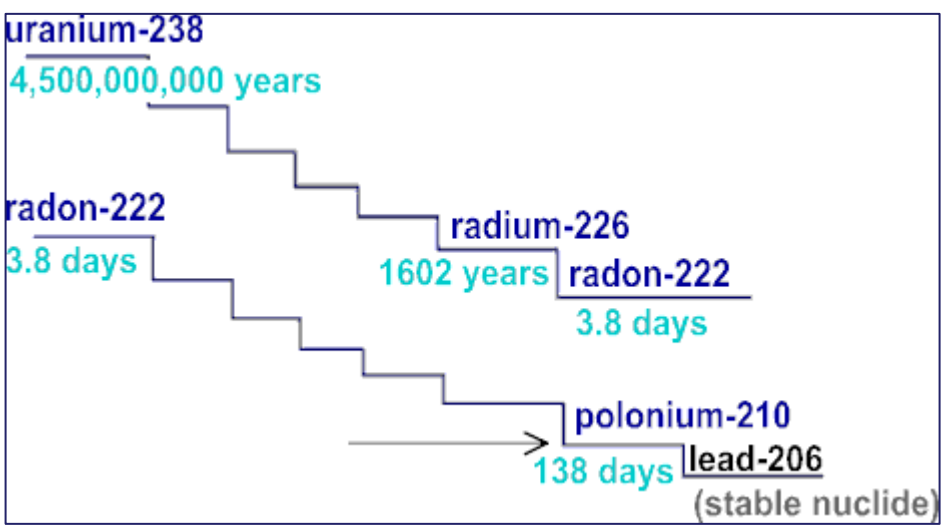
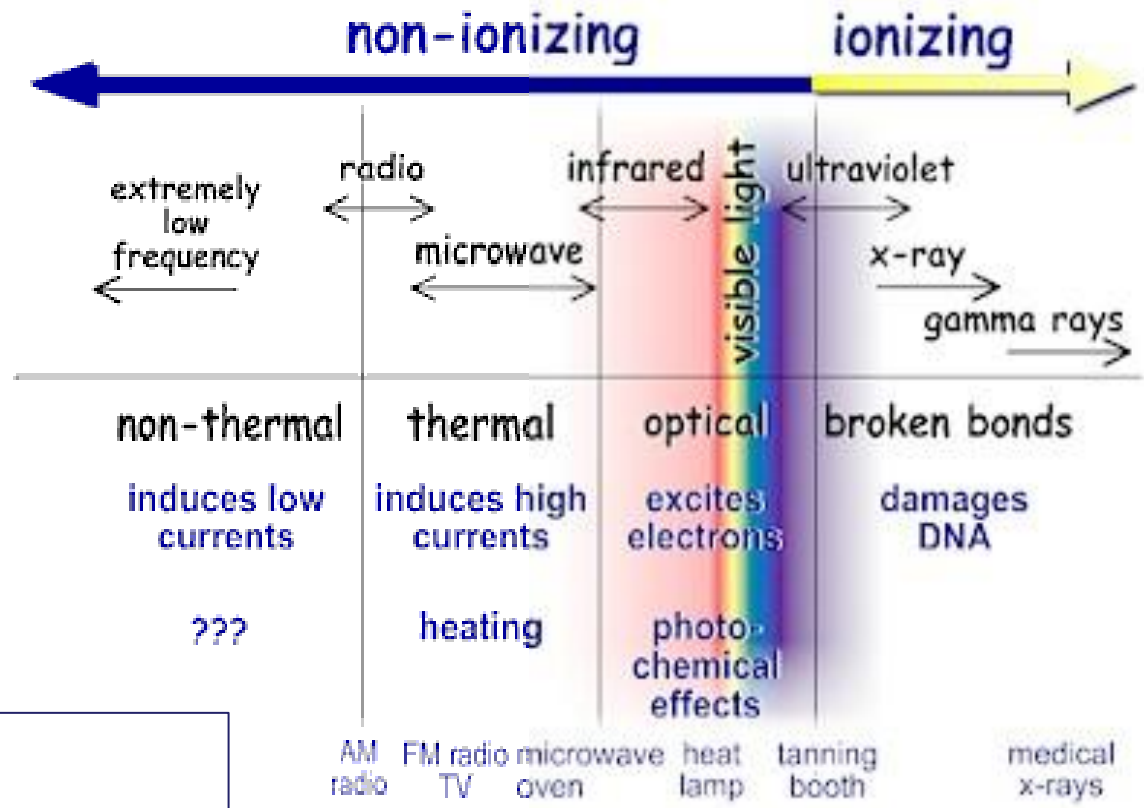
Nucleus  
contains protons  
and neutrons.



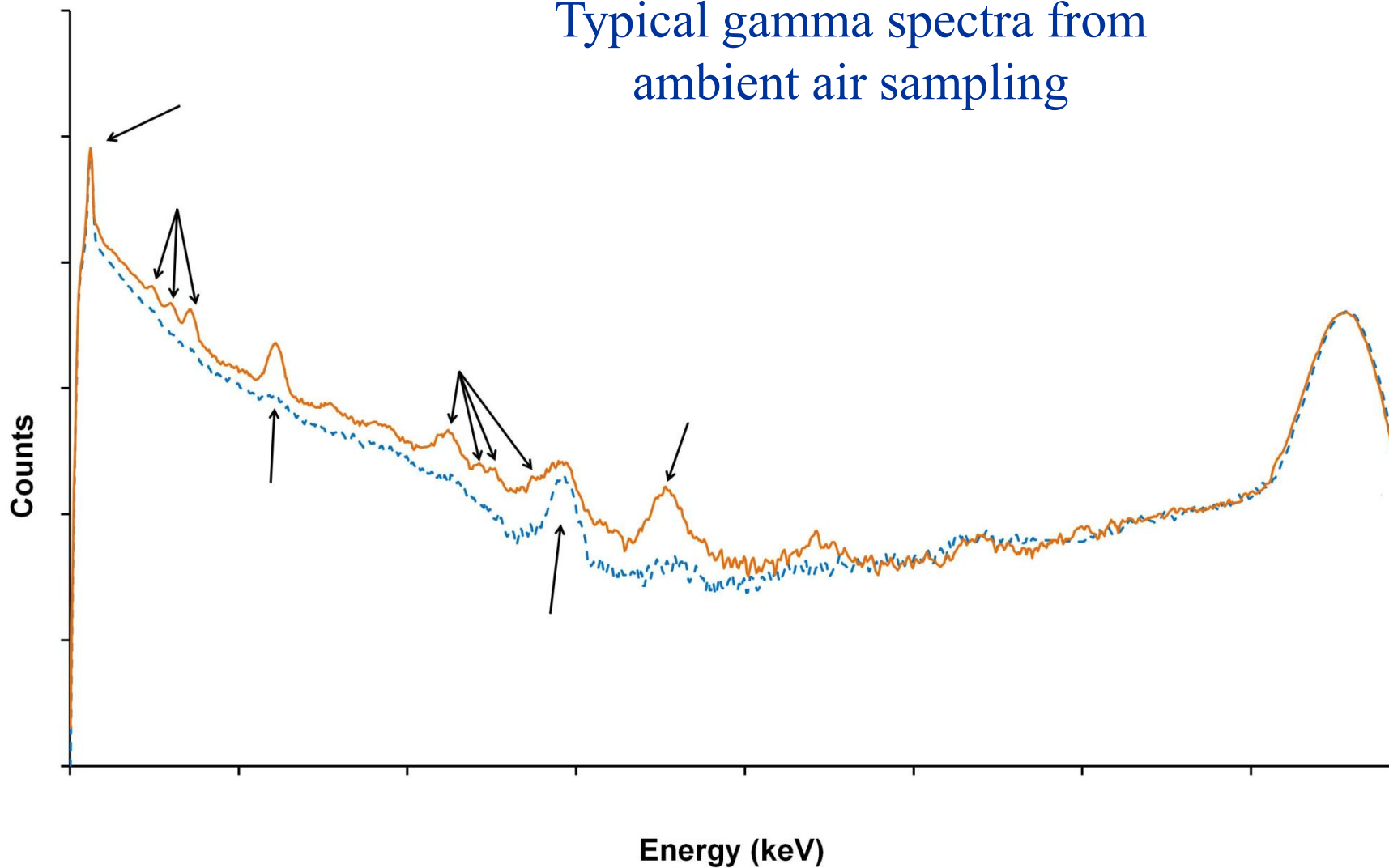
Neutrons  
have no electrical  
charge, and like  
protons, are about  
1800 times as  
heavy as an  
electron.



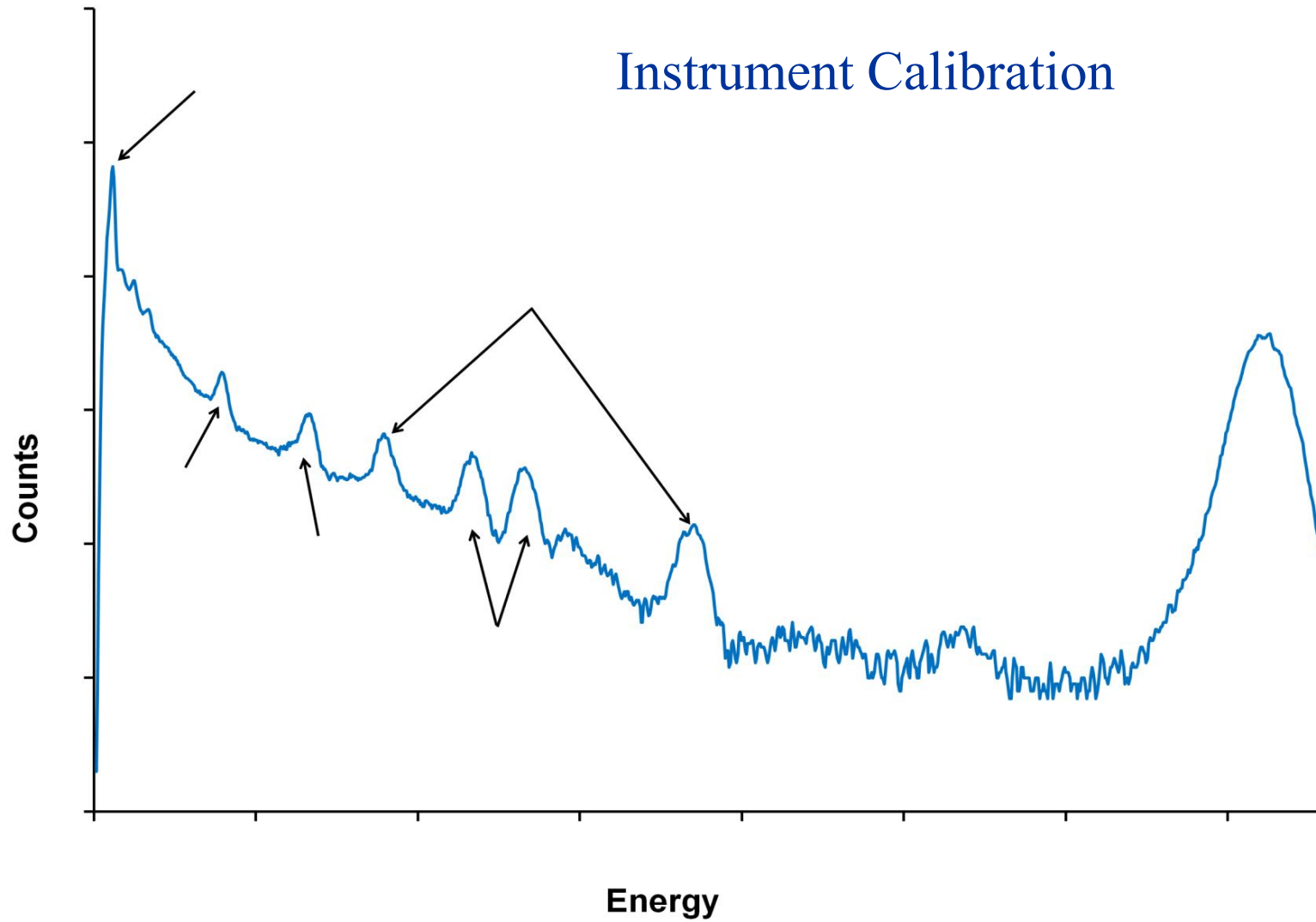
Protons  
are positively charged  
particles. All atoms of  
an element  
(radioactive and non-  
radioactive) have the  
same number of  
protons.



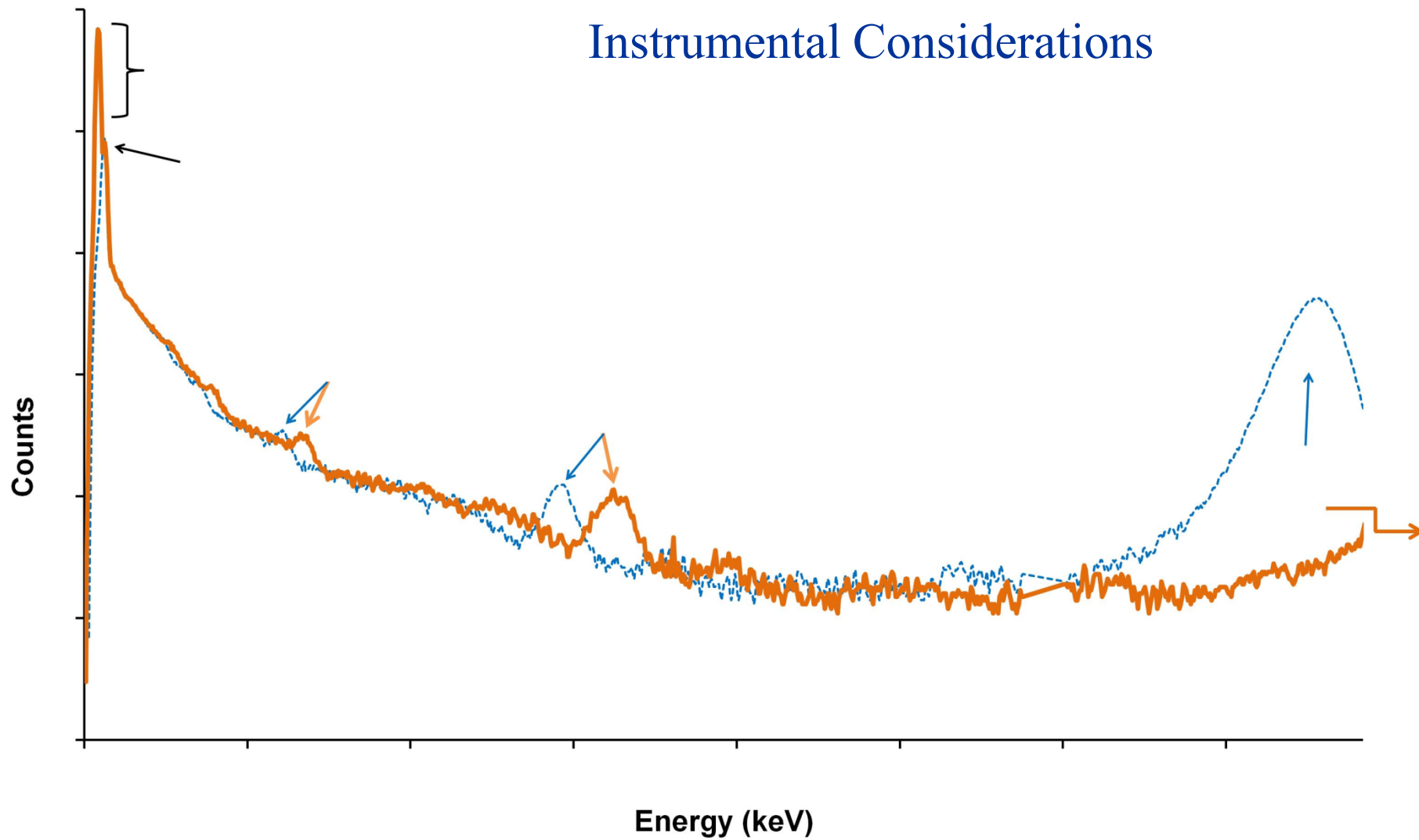
## Typical gamma spectra from ambient air sampling



## Instrument Calibration

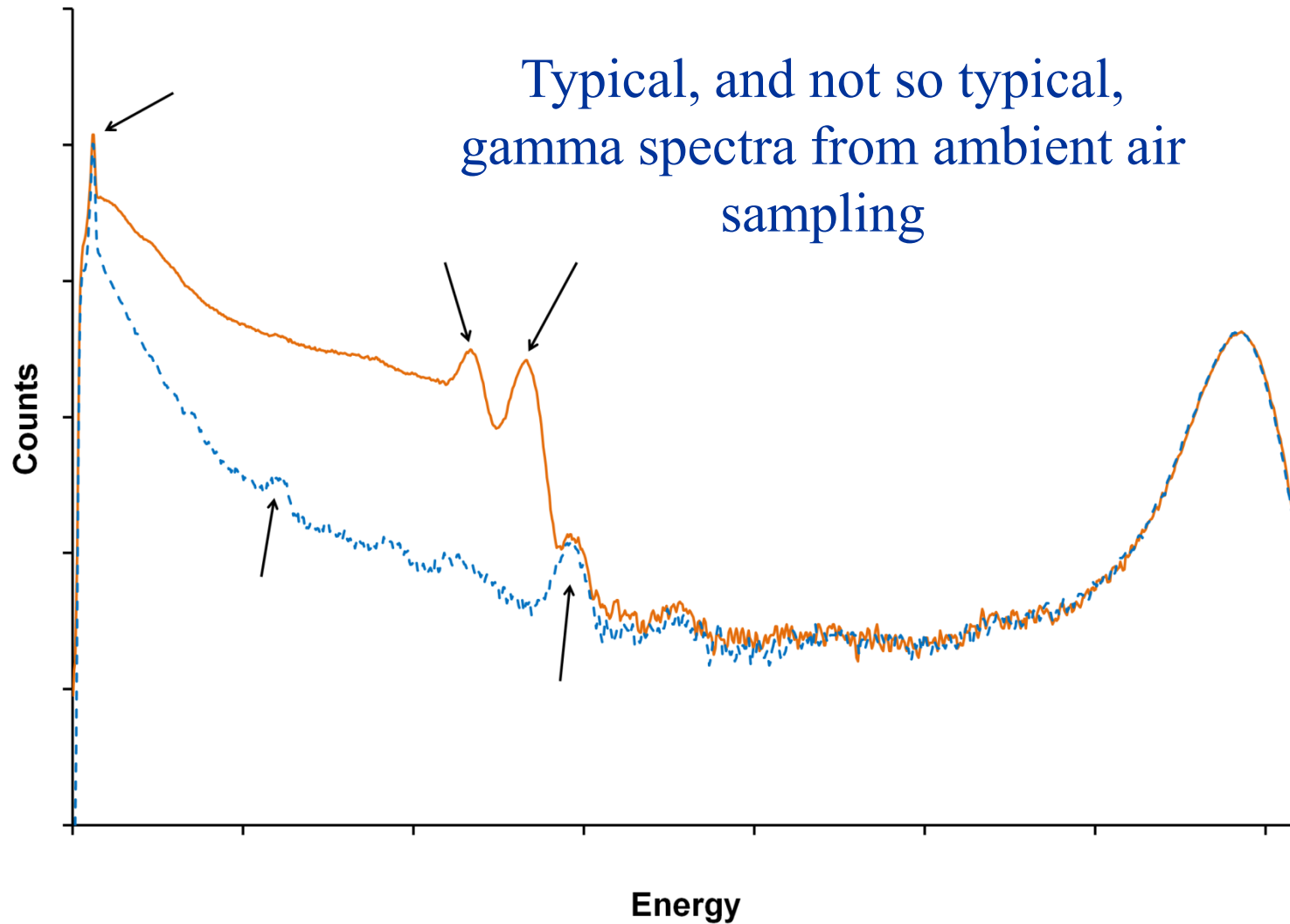


## Instrumental Considerations

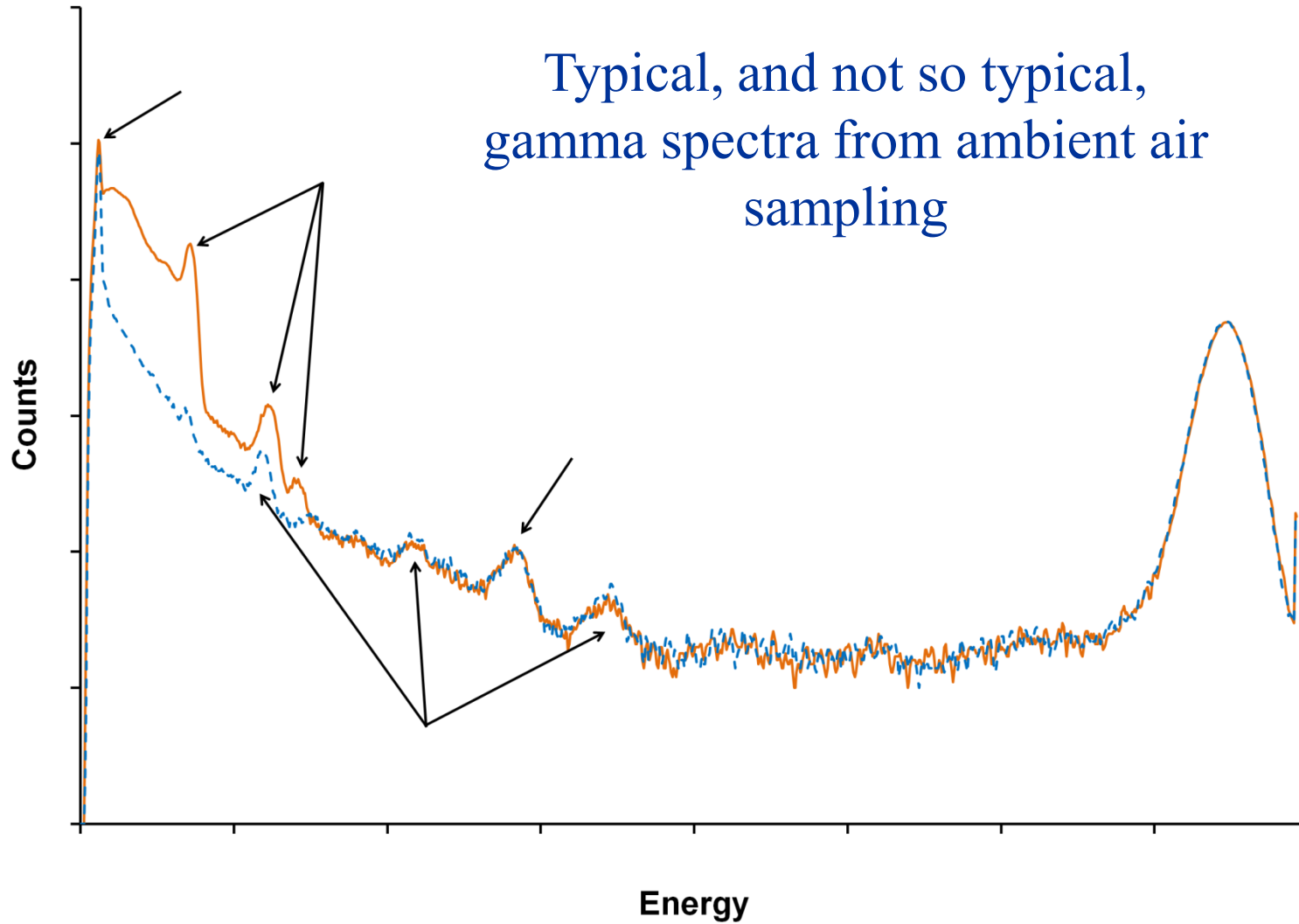




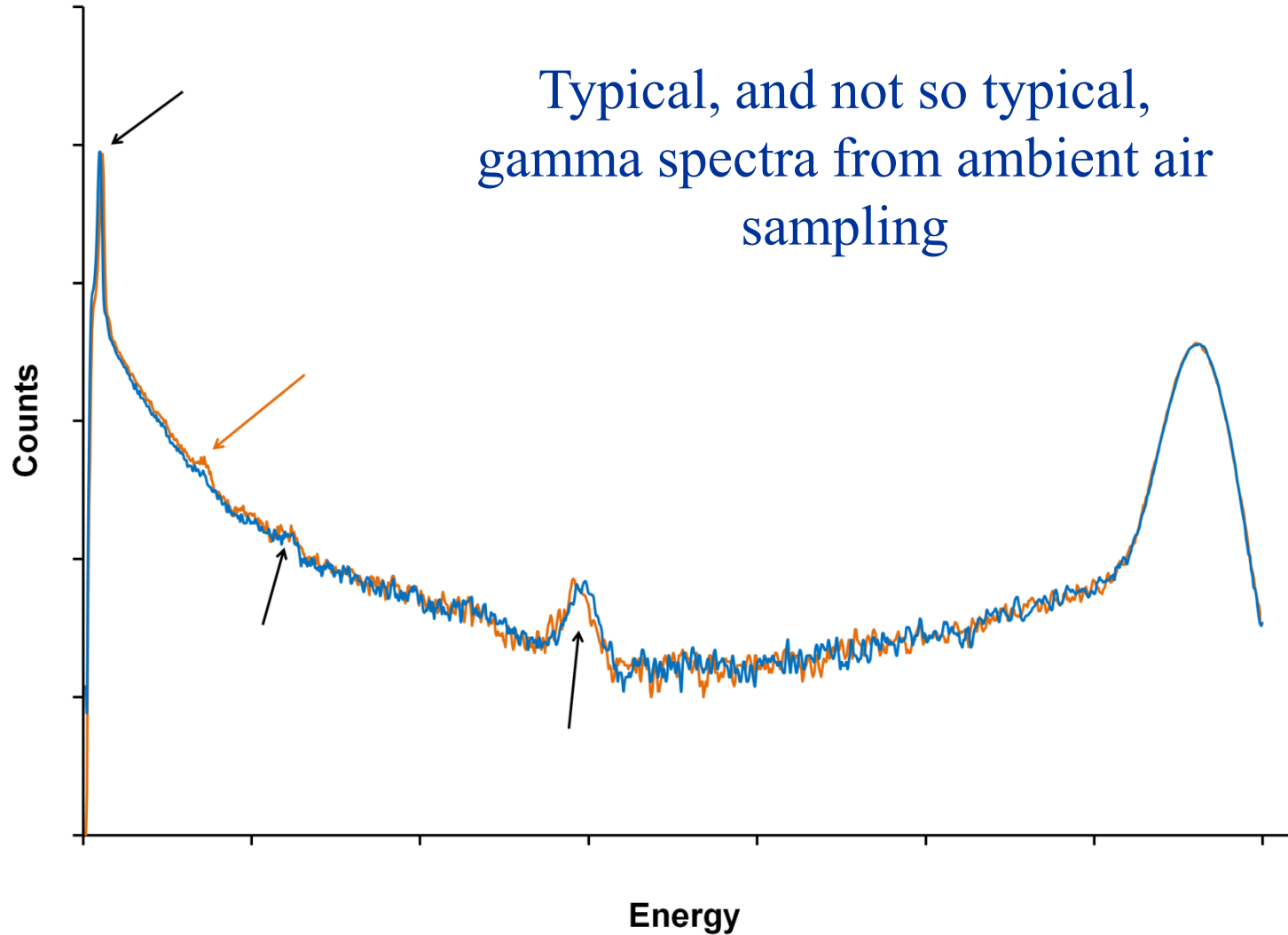
## Typical, and not so typical, gamma spectra from ambient air sampling



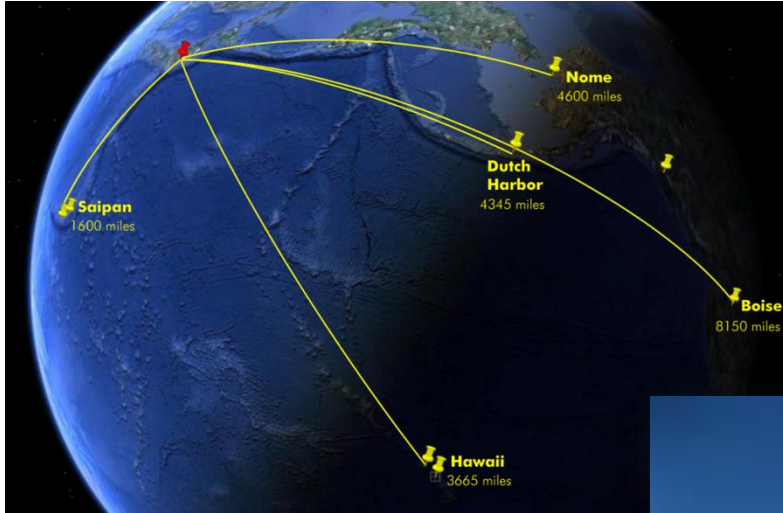
# Typical, and not so typical, gamma spectra from ambient air sampling



# Typical, and not so typical, gamma spectra from ambient air sampling



# 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 facilities and can be deployed to the scene of a radiological incident or pre-deployed to an event (e.g., Nationally Significant Security Event)

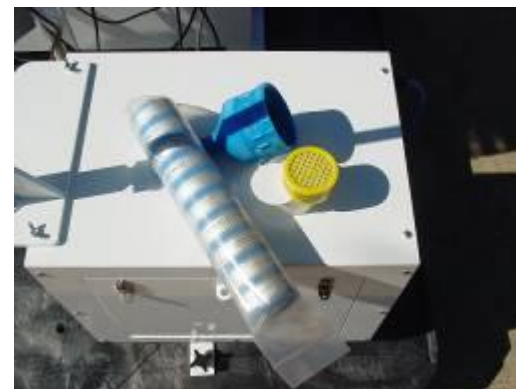
# Deployable Monitors



- High Volume Air Sampler
- Low Volume Air Sampler
- Gamma Exposure Instrument
- Power Distribution Panel
- Satellite Telemetry
- Data Logger
- PDA
- Platform

# 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.







# Deployable Monitor Usage

- ❑ Air sample operations
  - high volume and low volume air samples
  - 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





# 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



# 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