

Miniature Integrated Nuclear Detection System

Increasing the Value of Detection

Introductory Brief

Miniature Integrated Nuclear Detection System

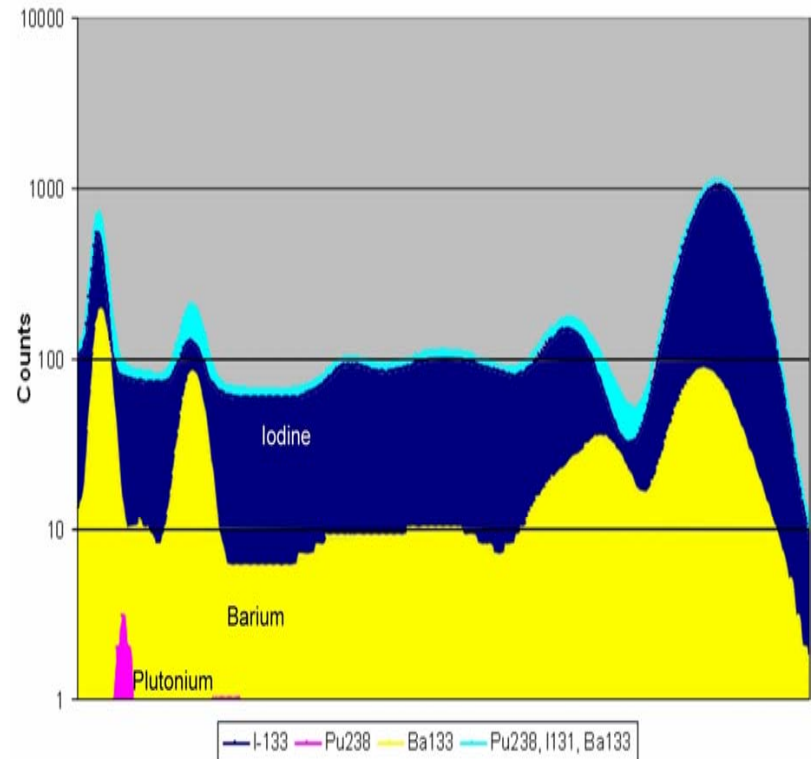
Increasing the Value of Detection

- ⊕ Radiation detection and identification system
- ⊕ Satisfies many of the needs of DHS/DNDO
- ⊕ Developed by Princeton Plasma Physics Lab (“PPPL”) in 2002, a DoE FFRDC laboratory
- ⊕ Refined and incubated by PPPL and the Army’s ARDEC command at Picatinny Arsenal
- ⊕ Thallium-activated sodium iodide NaI(Tl) gamma detector(s)
- ⊕ Patented identification algorithms use peak fitting and “AI” algorithms
- ⊕ Prototype and manufacturing at Picatinny Arsenal, N.J.
- ⊕ Four years testing
 - ⊕ 210 million data points
 - ⊕ 1 million simulated data files.

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- Low level detection capabilities
 - **one-billionth of the material to create a dirty bomb**
- Sensor agnostic
- Differentiates between threat-inducing and acceptable industrial or medical spectra
- Library based on ANSI N42.38 requirements (expanding)
- Identifies mixed or embedded spectra not typically recognized by curve or peak fitting based algorithms



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Flexible support:

- ⊕ X-Ray equipment to scan luggage and parcels
- ⊕ Stanchion mounts to scan trucks, cargo or ships
- ⊕ Portal systems used to detect chemical, biological and explosives on individuals
- ⊕ Scan choke points in tunnels, bridges, toll booths
- ⊕ Stationary or man-portable
- ⊕ Mobile applications
- ⊕ Legacy or new sensor systems

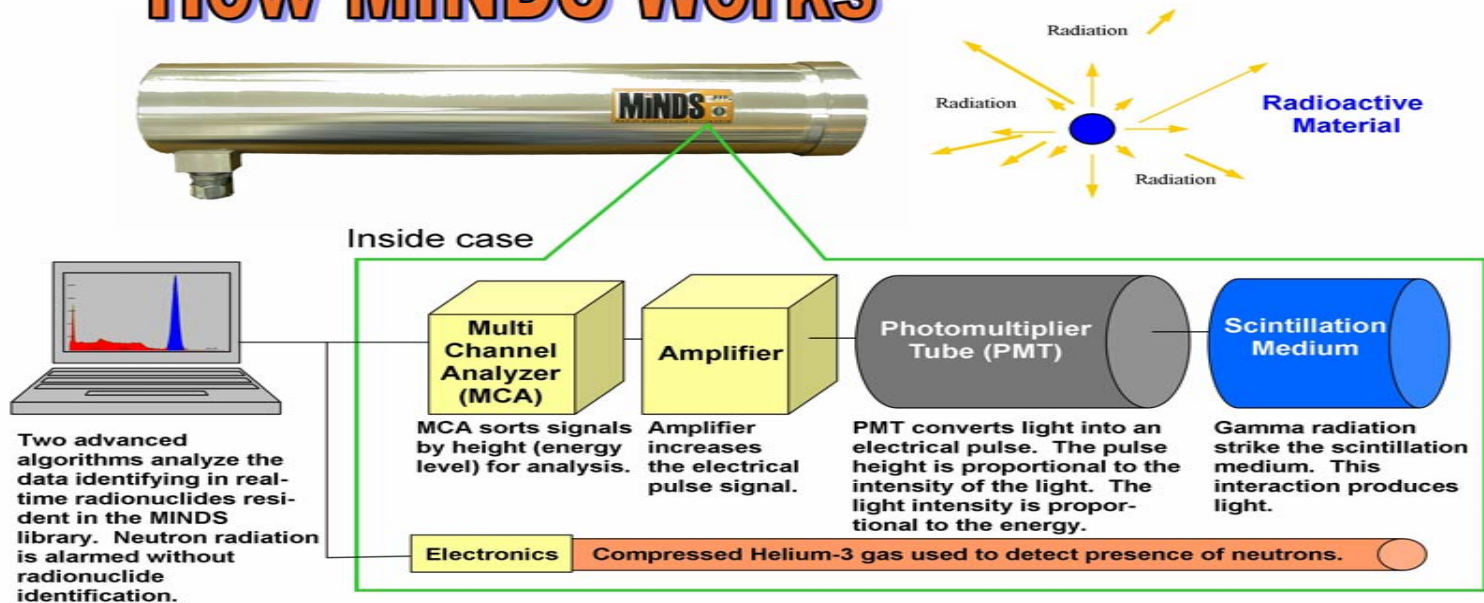
Advantages for national surveillance/detection:

- ⊕ Immediate detection and identification (1/2 sec)
- ⊕ Eliminates the “car alarm” syndrome
- ⊕ Identify spectra, even in high noise-to-signal ratio
- ⊕ No interruption to commerce or traffic
- ⊕ No emission of dangerous radiation
- ⊕ No legacy disposal issues

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How MINDS Works



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The “Heart” of MINDS, Advanced Algorithms

- ⊕ Background levels are continuously measured and archived
- ⊕ Gross counts, a peak-finding algorithm and Artificial Intelligence algorithm are used for the gamma counts
- ⊕ Statistical parameters for each isotope include relative peak height/width ratios, known energy ranges, and detailed information about each isotope’s common uses and relative threat
- ⊕ Peak-finding algorithm accounts for detector variations, filters noise, subtracts a background, and uses a gradient-expansion algorithm to compute a non-linear least-squares fit to a Gaussian curve with additional terms included for Compton Scattering effects.
- ⊕ Artificial Intelligence algorithm estimates a larger number of free parameters through machine learning protocol utilizing known spectra