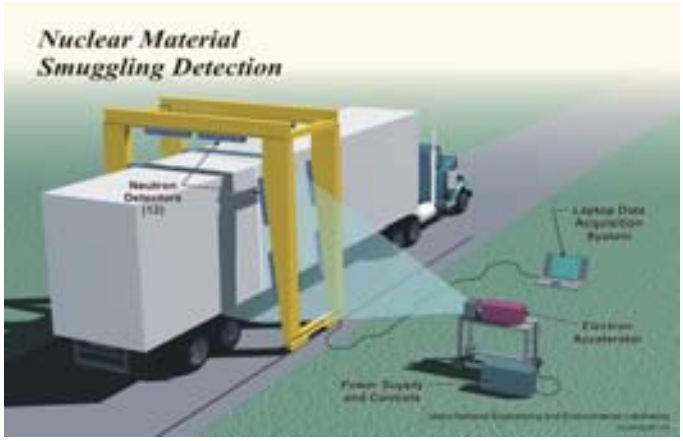
Pulsed Photonuclear Assessment Technology

Project Description

The Pulsed Photonuclear Assessment Technology (PPAT) is a broad application, nondestructive evaluation (NDE) technique that uses energetic photons as low as 1.8 MeV, to induce selective photonuclear reactions within an inspected object. The induced photonuclear emissions are measured between accelerator pulses with specialized neutron and/or gamma-ray detectors to enable characterization of the inspected object. These energetic photons are produced using a portable, transportable, or fixed-site electron accelerator. Any resulting short-lived radioactivation of the inspected object is either immeasurable or, due to the very short induced residual activation times, has no detrimental consequences for any practical deployment. While not application limited, PPAT as been designed to address three major focus areas: treaty verification, nuclear smuggling, and contraband and explosives detection.

Nuclear Smuggling

Bremsstrahlung photons, produced with electron beam energies greater than 6-MeV,can be used directly to detect nuclear materials within trucks and large cargo containers even in shielded configurations. This method uses delayed neutron detection from induced photofission events. Energy inspection from a second electron beam inspection permits nuclear material type identification. When used with a photonuclear conversion source, electron beam energies of less than 6 MeV can help differentiate shielded fissile and fissionable materials.



Treaty Applications

Using selective interrogations with electron beam energies in the range of 2 to 8 MeV, PPAT is capable of non-intrusively, verifying the classification and type of a unknown nuclear weapon system when inspectors have agreed upon defined treaty-limited items. In addition, the system is easily capable of differentiating nuclear and non-nuclear packages resulting from any nuclear weapon dismantlement process.

Aracor, Inc. mobile system

Contraband and Explosives Detection

By using ~6.5 to 10 Mev electron beams to produce bremsstrahlung radiation and a colocated photonuclear conversion source, PPAT is capable of performing spectroscopy using photoneutron-induced, element-characteristic gamma-rays acquired between each accelerator pulse.

R&D Status

Los Alamos National Laboratory and a commercial partner, (Aracor, Inc.) are partnering with the INEEL to incorporate the nuclear material detection capability of the PPAT into a U.S. Customs Service mobile inspection system capable of imaging sea cargo containers.

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