

## Detection of SNM by Pulsed Neutron Interrogation

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A method for the detection of special nuclear materials (SNM) in shielded containers which is both sensitive and easily applicable under field conditions is presented. The method applies neutron induced fission in SNM by means of an external pulsed neutron source with subsequent detection of the fast prompt fission neutrons. Liquid scintillation detectors surrounding the container under investigation are able to discriminate gamma rays from fast neutrons by the so-called pulse shape discrimination technique (PSD).

The presentation explains laboratory tests performed with an array of eight detectors at the Pulsed Neutron Interrogation Test Assembly (PUNITA) for the purpose of investigating the method. Both single neutron detections, and coincident multiple neutron detections, from induced fission events are used as signatures for the presence of fissile materials. We discuss the sensitivity observed in both methods.

By proper time gating of the pulsed neutron source and the detection system, the interrogation can be done by either epi-thermal or thermal neutrons. Epi-thermal neutrons interrogation is particularly interesting as these neutrons are very penetrating and difficult to shield against. The results of such experimental investigations are demonstrated and discussed.

The experimental configuration in the PUNITA facility has been modeled with MCNP. Based on these simulations a scaled-up facility intended for inspection of air cargo containers (ULDs) has been modeled. This facility will fit a standard 20-foot ISO transport container, employ a single standard neutron generator, a large graphite moderator and a large array of liquid scintillation detectors. The objective is the detection of few hundred grams of <sup>235</sup>U embedded in a standard five cubic metre container. The results of these simulations are also discussed.