DoNuTS Technical Meeting

Time: 1600 Wednesday, 13 May 2009

Place: NE Conference Room, 1106 Etcheverry

Speaker: James McFarland, UC Berkeley Nuclear Engineering

Subject: Another Technological Step Towards Threat Reduction: Nuclear Resonance Fluorescence

Nuclear resonance fluorescence (NRF) is a promising technique for identification of special nuclear material (SNM) in nonproliferation, safeguards, and arms control applications. An experiment exploring the NRF properties of $^{239}\text{Pu}$ was conducted at the University of California Santa Barbara Center for Terahertz Science and Technology. A 4.0 MeV bremsstrahlung photon source was used to irradiate $\sim 4$ g Pu which was 93% enriched in $^{239}\text{Pu}$. The limit of detection was calculated to be $2 \pm 1$ eV barn, and two $^{239}\text{Pu}$ NRF peaks were identified at 2143 keV $[4 \pm 2$ eV barn] and 2423 keV $[10 \pm 3$ eV barn]. A high background is attributed to the interaction of neutrons and is supported by the identification of seven neutron capture peaks, five neutron scattering peaks, and two beta delayed gamma-decay peaks in the spectrum. Despite the high background, some NRF lines in $^{239}\text{Pu}$ could be seen, and NRF remains a viable technique for SNM identification requiring further study.