Monte Carlo Evaluation of the Improvements in Nuclear Materials Identification System (NMIS) Resulting From a DT Neutron Generator

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Nuclear Materials Identification System (NMIS) presently uses ^{252}Cf ionization chambers as a source for time-dependent coincidence distribution measurements. Since triggers from this source are associated with neutron emitted isotropically, adjacent materials such as floor and nearby containers affect the measurements and must be corrected for. The use of a DT neutron generator with an alpha particle detector defining a cone of neutrons that can be aimed at the item under verification removes the effects of nearby materials from the time-dependent coincidence distributions. Monte Carlo calculations using MCNP-POLIMI, a coupled gamma neutron transport theory code, that more correctly calculates the gamma production for detector-to-detector time-dependent coincidence measurements, was used to evaluate the enhancements to NMIS. These calculations quantified the sensitivity enhancements and removal of the effects of nearby materials.