MCNP-POLIMI EVALUATION OF TIME DEPENDENT COINCIDENCE BETWEEN DETECTORS FOR FISSILE METAL VS. OXIDE DETERMINATION

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Monte Carlo neutron transport calculations are performed for both Pu metal and oxide. Previous passive Nuclear Materials Identification System (NMIS) measurements with Pu metal of different attenuation and multiplication properties: two shells of the same mass (~4 kg) with thickness of 30 and 6 mm have shown that the time-dependent coincidence distribution between a pair of detectors on opposite sides of the Pu have shown that the measured gamma-gamma coincidences are more for the thin shell and the time width of the gamma-neutron coincidence distribution was larger for the thicker shell (larger multiplication). These time-dependent coincidence distributions were calculated for gamma only, neutron only, and combined with MCNP-POLIMI, a coupled gamma-neutron transparent code that more correctly calculates quantities that depend on the second moment of the neutron and/or gamma distribution. MCNP-POLIMI calculates all the time-dependent coincidence distributions measured by NMIS. These calculations evaluate these time-dependent coincidence distributions between detectors for 2 and 4 kg samples of Pu in metal and oxide form and showed that the time-dependent coincidence distributions measured by NMIS can be used to distinguish metal from oxide.