

Technical Meeting on the Compilation of Nuclear Data Experiments for Radiation Characterization

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Pulsed Neutron Die-Away Experiments at LLNL

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Pulsed-neutron die-away (PNDA) experiments can be useful benchmarks to validate neutron thermal scattering laws (TSLs). The experiment uses a neutron generator to impinge a short ($\sim 10^{-4}$ s), mono-energetic neutron pulse on a target sample. After the pulse, the neutron population within the sample moderates and reaches thermal equilibrium with a fundamental spatial mode and characteristic decay-time eigenvalue. The eigenvalue can be extracted from the experimental measurements of the neutron flux and used as an integral parameter in validation. For certain materials and geometric configurations, the eigenvalue is heavily influenced by thermal neutron scattering of only the target material. For that reason, a PNDA experiment can have a higher sensitivity to TSLs than is commonly available in critical experiments. Herein, we present results for a series of new PNDA experiments conducted at Lawrence Livermore National Laboratory with plastic materials (high-density polyethylene and Lucite) and for light water. We compare the experimental integral parameters to simulated results and report trends in the biases.

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