

Benchmark results with a new evaluation of ^{155}Gd and ^{157}Gd

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Evaluations of gadolinium isotopes ^{155}Gd and ^{157}Gd in the resolved resonance region were performed with the code SAMMY. The main objective for revising the resonance evaluations of these isotopes was to address issues related to critical benchmark results. For the thermal benchmark system, trends of k_{eff} as a function of gadolinium concentration indicated an issue with existing evaluations. A combination of the code SAMMY and the code SAMINT, which permit incorporation of differential and integral data in the evaluation process, was used to observe which resonance parameters are sensitive to changes in the benchmark k_{eff} . Benchmark sensitivity calculations were performed based on the TSUNAMI code. The observed trend on k_{eff} results as a function of gadolinium concentration indicates a strong correlation to the neutron capture cross section, the Westcott factor and the capture resonance integral. Isotopes ^{155}Gd and ^{157}Gd have capture cross sections of approximately 60,000 b and 250,000 b, respectively. The differential data used in the evaluation were transmission and capture cross-section data, which were available in EXFOR. Critical benchmark models from the International Criticality Safety Benchmark Evaluation Project and the critical reactor benchmark ZED-2 (Zero Energy Deuterium)—a critical facility at Chalk River Laboratories owned by Atomic Energy of Canada Limited—were included in the analysis and evaluations. In addition to the resonance parameter evaluation, resonance parameter covariances were also derived.