

Integral Research Reactor Experiments for Testing Differential Evaluations

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The United States Nuclear Data Library ENDF/B-VII was recently released for use in diverse applications in the nuclear data field. This data base is a collection of nuclear data evaluations performed in the United States and abroad, in the energy range from thermal up to several million electron volts. The data evaluation process is generally based on analysis and evaluation of energy- and angle-differential measurements performed by neutron time-of-flight techniques using linear accelerators as pulsed neutron sources, as for instance the Oak Ridge Electron Linear Accelerator (ORELA) located at the Oak Ridge National Laboratory (ORNL). Sophisticated computer codes such as SAMMY or EMPIRE are used for the evaluations to determine the best fit of theoretical cross section to experimental data.

Prior to the data being accepted as part of the ENDF library, they are tested by comparison to integral measurements (e.g., thermal capture cross sections and resonance integrals). The data evaluator's final task is to ensure that the differential evaluations are in agreement with the integral measurements. Research reactors like the IEA-R1 research reactor at Instituto de Pesquisas Energéticas e Nucleares (IPEN) play an important role in generating these integral data for testing nuclear data evaluations.

Many resonance evaluations done at ORNL have been included in the ENDF library following the procedure outline above. Examples are the ^{235}U , ^{238}U , and ^{232}Th resonance evaluations. The presentation will describe (1) the methodology used at ORNL to evaluate differential nuclear data in both the resolved and the unresolved resonance energy regions and (2) the role of the integral data for validating the evaluation.

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