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Towards a new 252 Cf(sf) PFNS evaluation: A multi-chapter story

Tuesday 28 January 2025 14:00 (2 hours)

The AIACHNE project presented on its method to pin-point physics root causes of systematic discrepancies between data sets, and new 252Cf PFNS evaluation, and a new 252Cf PFNS measurement. The new method to find physics root causes of systematic discrepancies between different experimental data sets uses a Bayes model to find biases tied to measurement features. It induces sparsity of systematic bias and features via a horseshoe prior. This method successfully identified known and previously unknown issues in data that prompted further analysis and improved the evaluation. We currently have a preliminary evaluation using a code that was able to reproduce Mannhart's evaluation within uncertainties (given that we don't know every detail of Mannhart's evaluation). This new evaluation shows less impact of the Li-6 peak seen in the detector response in some experiment and extends the energy range of the evaluation to lower and higher energies. Spectrum averaged cross sections (SACS) of IRDFF experiments calculated with our new evaluation are close to those calculated with Mannhart's spectrum except for the highest E-50% value if we use log-log interpolation. If we use lin-lin interpolation for the AIACHNE evaluation, we see a trend for too high calculated SACS compared to experimental SACS values stored in IRDFF. We are currently working on providing the data on a denser grid. At the same time, a new measurement of the 252Cf PFNS was undertaken using the CoGNAC array and several neutron-producing reactions to obtain a detector response. This new experiment will be included in the evaluation once the analysis is finalized and might help us to better understand the Li-6 response function of past measurements.
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