Development of a new module to process covariances in the IRSN nuclear data processing code GAIA

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Abstract:

It is crucial to account for uncertainties related to nuclear data when analysing and interpreting neutronics simulation results. The uncertainties associated with the nuclear data are available in the standard nuclear data libraries, usually in the form of covariance matrices [1]. However, using these matrices for uncertainties propagation in the neutronics simulations is not always straightforward and requires the data to be processed.

IRSN is working on the development of the nuclear data processing code GAIA [2]. GAIA has various modules to process cross sections, like the DOP module for reconstruction and Doppler broadening, TOP module for treating probability tables in the unresolved resonance region, and SAB for calculations related to the neutron thermal energy region. However, GAIA does not yet have a full capability to process covariances. To address this limitation, a new module named COP is under development, which will process covariance matrices and provide comprehensive capabilities for processing cross section (File 33), angular distribution (File 34), and resonance parameter (File 32). This paper presents the development carried out in the COP module. Also, preliminary results obtained using the COP module are presented, and are compared with those obtained using the ERRORR module of NJOY [1] and PUFF module of AMPX [3].

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[2] C.Jeannesson**.** Development of a methodology to exploit nuclear data in the unresolved resonance range and the impact on criticality safety and reactor applications. Phd thesis, École doctorale PHENIICS, Décembre 2020.
[3] Wiarda, Dorothea, Williams, Mark L, Celik, Cihangir, and Dunn, Michael E. *AMPX: A Modern Cross Section Processing System for Generating Nuclear Data Libraries*. United States: N. p., 2015. Web.