The Nuclear Science and Technology Division

SEMINAR ANNOUNCEMENT

Title: **Covariance Methodology for Nuclear Data Evaluation**

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Low-fidelity covariance project: a large set of neutron cross section covariances in the fast energy region - 5 keV-20 MeV - has been produced. The set of data on 57 structural materials and 31 heavy nuclei follows the earlier work on 219 fission product materials and completes an extensive contribution to the low-fidelity covariance project (307 materials). This project aims to provide initial, low-fidelity yet consistent estimates of covariance data for nuclear criticality safety applications. The evaluation methodology combines the nuclear reaction model code EMPIRE which calculates sensitivity to nuclear reaction model parameters, and the Bayesian code KALMAN that propagates uncertainties of the model parameters to cross sections. Taking into account the large scale of the project, only marginal reference to experimental data was made. The covariances were derived from the perturbation of several key model parameters selected by the sensitivity analysis. These parameters refer to the optical model potential, the level densities and the strength of the pre-equilibrium emission. This work represents the first attempt ever to generate nuclear data covariances on such a large scale.

Covariance analysis applications: the determination of cross section uncertainties for capture measurements with C_6D_6 detectors at CERN has been developed. Namely, the present section aims at a complete description of a method to determine the uncertainties and associated covariance matrix for the ^{151}Sm(n,γ) and ^{232}Th(n,γ) experiments performed at the n_TOF facility at CERN. It should be considered as an example for the report required by the evaluator to fully include all available information about the experiment into the evaluation procedure. Especially, the method leads to disentangle the various contributions and clarify the statistical and/or systematical nature. An important goal is also the generation of an EXFOR file which includes the covariance information.