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WPEC sub-group proposal

P. Schillebeeeckx, EC-JRC-IRMM – JEFF Project

Title

Reporting and usage of experimental data for evaluation in the resolved resonance region

Justification for a Subgroup

Covariance data are required to correctly assess uncertainties in design parameters and construction margins of new generation nuclear reactors, such as GEN-IV and other emerging application of nuclear technology. Therefore, the nuclear data community has recognized the growing need for covariance information to accompany evaluated cross section data libraries.

The main objective of the proposed subgroup is to improve the quality of the covariance data in the resolved resonance region (RRR). Despite the effort made by other subgroups, the quality of uncertainties on cross section data, deduced from resonance parameters recommended in evaluated data files, is not satisfactory. Evaluations in the resolved resonance region produce uncertainties, which are mostly unrealistically small. Apparently not all systematic effects and uncertainty components are taken into account.

Since no theory is capable of predicting parameters of individual resonance, reliable covariance matrices of parameterized cross sections can only be obtained starting from the full covariance information of the experimental data. Therefore an assessment of the covariance matrix of experimental data is of primary importance. The main activities of this subgroup will concentrate on:

(1) the identification and quantification of the uncertainty components and experimental details required to produce accurate cross section data with reliable covariance data in the RRR

(2) the definition of a format for reporting the required experimental details and covariance information in EXFOR

Subgroup Monitor

M. Herman, BNL , ENDF

Subgroup Coordinator

P. Schillebeeckx, EC-JRC-IRMM, JEFF

Subgroup Participants

The subgroup will be supported by experts in nuclear data measurements, data base (EXFOR) and evaluations:

Measurement experts
- Y. Danon, RPI
- K. Guber, ORNL
- F. Gunsing, CEA-Saclay
- S. Kopecky, EC-JRC-IRMM
- C. Massimi, INFN, Bologna
- P. Schillebeeckx, EC-JRC-IRMM

EXFOR experts
- E. Dupont, OECD-NEA
- N. Otuka, IAEA

Evaluation experts
- G. Arabanas, ORNL
- M. Herman, BNL
- L. Leal, ORNL
- C.M. Mattoon, BNL
- S. Mughabghab, (BNL)
- G. Noguere, CEA-Cadarache
- D. Rochman, NRG
- Young-Sik Cho, (KAERI)
- I. Sirakov, INRNE Sofia

Definition of the project and proposed activities

The subgroup will address issues concerning data uncertainty for experimental data and their propagation in the data evaluation process. The main task is to identify and quantify the metrological parameters involved in each step of the evaluation process, starting from the production of experimental data. The project will be divided in the following parts:

1. Identify the uncertainty components affecting experimental data in the resonance region
2. Identify methods for evaluating uncertainties in the resonance region using experimental covariance information
3. Define and analyse case studies
4. Provide recommendations for reporting and usage of experimental details and uncertainty components

1. Identify uncertainty components

Evaluated cross section data in the resonance region result from adjustments of experimental data sets using cross sections obtained from nuclear reaction theory. Hence,

the final uncertainty and covariance of evaluated cross section data depend on various components entering this process:
- experimental observables and their covariance information
- a nuclear reaction theory and modelling of the experiment
- adjustment procedure.
The above require the expertise of both experimentalists and evaluators.

2. Identify methods to evaluate uncertainties
Evaluation experts will summarize the current methods to evaluated uncertainties and covariance data of cross section data in the resonance region. The summary will include the experimental information needed for the evaluation.

3. Define and analyze case studies
Example cases will be identified. In the examples the full evaluation process starting from the experimental data will be described. They will be analyzed by different evaluation groups using the methods presented in activity 2.

4. Recommendations
Based on the results of the case studies recommendations will be provided. These recommendations will cover:
- list of uncertainty components of importance for cross section data in the resolved resonance region
- reporting of experimental data with full covariance information in EXFOR
- comparison of methods of uncertainty evaluation with recommendation for treating experimental covariances.

Relevance to Evaluated Data Files

Improvement of quality of evaluated data files, in particular production of more reliable uncertainties on cross section data in the resonance region.

Time-Schedule and Deliverables:

- *2010*

Review of SG proposal by WPEC
Agreement on activities, time-schedule and deliverables

- *2011*

Report on evaluation methods and experimental input requirements
Report on uncertainty components of experimental data in the resolved resonance region

- *2012*

Selection and analysis of example case(s)

- *2013*

Report with recommendations for reporting of experimental data and processing of covariance data in the resonance region