

Report from Technical Meeting on Neutron Cross Section Covariances

(Extraction from the Summary Report on “Technical Meeting Neutron Cross Section Covariances, IAEA Headquarters Vienna, Austria 27-30 September 2010” to be published as INDC(NDS)-0582, Ed. R. Capote).

Discussion on resonance covariances that followed addressed several issues:

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- It was acknowledged by ORNL and IRMM that many experimental data sets were lost due to changes of computer platforms, hardware for reading magnetic media becoming obsolete, etc. This would not have happened if the data had been archived in some internationally maintained data base such as EXFOR. Unfortunately, adequate formats for archiving such information in EXFOR were not available. Recently the procedure was defined and a template was proposed by IRMM and IAEA, which allows the archival of sufficient information to repeat the resonance analysis with codes such as SAMMY or REFIT. Every effort should be made to insure that existing experimental data are entered into the EXFOR database. A consensus exists at ORNL and IRMM to archive the data from new measurements according to the new format. Part of the work of WPEC SG-36, which was recently formed, addresses the issue of archiving the uncertainty information in EXFOR. We encourage the SG-36 to co-ordinate their activities with the IAEA effort regarding enhancements to the EXFOR format for archival of time-of-flight experimental data. Unfortunately, no measured data were released so far from the n_TOF facility that would allow an independent resonance analysis to be carried out, and that could enable these data to be archived in this way. It now seems clear that simply reporting only resonance parameters and uncertainties that are obtained from analysis of experimental data, while ignoring the consideration and reporting of correlations, is inadequate for many applied purposes even though this has been the common practice for a long time.

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- It was discussed that in addition to the limited uncertainty information available in the EXFOR data base, the complete absence of information on correlations at all energies is a deficiency that is unlikely to be remedied in any reasonable way in the foreseeable future, if at all. It was concluded that some evaluator estimates of these correlations will certainly lead to more acceptable results than simply assuming them to be zero, but such estimates would unavoidably be *ad hoc*, introduced for practical reasons, and therefore very difficult to defend in any rigorous manner. In this regard, documentation of these assumptions by the evaluators is essential to insure traceability in the future.

Discussion on the application of covariances addressed the following:

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- The EXFOR formats should be flexible enough to accommodate information as provided by the experimenters. The EXFOR format should be extended to accommodate the full explicit covariance matrix, if provided by the authors or, alternatively, data required by a recipe for constructing covariance matrices based on providing partial error and correlation components.
- Authors of experimental data are urged to provide partial components of the uncertainties and as well as correlations that can enable generation of a full covariance matrix.
- Authors of experimental data are urged to provide the data that they actually measure as the primary data (e.g. ratios) in addition to the final quantity (e.g. cross section) and the monitor data numerical values (e.g. reference cross sections).
- The NRDC compilers should be instructed that it is mandatory to seek and compile uncertainty components and covariance information in computer-retrievable form.
- There is a need to search and assess systematic uncertainties for existing entries in the EXFOR database and enter them into the database in computer-retrievable form. The first step is to check the consistency of usage of keywords for partial components, second to code the information available in free text, third to scan the original literature for information that was provided but not coded, and fourth to take remedial action when sufficient information is not available.
- The present computational format (C4) should be extended to accommodate partial uncertainty information consistent with that available in EXFOR. In addition, a new format should be developed, capable of accommodating experimental covariance information.

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1. Summary of Recommendations

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3. Time-of-flight measurements should be archived in EXFOR according to the procedures proposed by IRMM and IAEA and reviewed by Organization for Economic Co-operation and Development WPEC SG-36.

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6. The IAEA should continue to support activities to correct errors and to complete uncertainty information in the EXFOR database, in the spirit of the work of Organization for Economic Co-operation and Development WPEC SG-30.

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9. The EXFOR formats should be flexible enough to accommodate information as provided by the experimenters. The EXFOR format should be extended to accommodate the full explicit covariance matrix, if provided by the authors or, alternatively, data required by a recipe for constructing covariance matrices based on providing partial error and correlation components.

10. Authors of experimental data are urged to provide partial components of the uncertainties and correlation information as needed to generate the full covariance matrix.

11. Authors of experimental data are urged to provide the data that they actually measure as the primary data (e.g. ratios) in addition to the final quantity (e.g. cross sections) and the monitor data numerical values (e.g. reference cross sections).

12. The NRDC compilers should be instructed that it is mandatory to seek and compile uncertainty components and covariance information in computer-retrievable form.

13. The activity to assess systematic uncertainties for existing entries in EXFOR database and enter them into the database in computer-retrievable form should continue.

14. The present computational format (C4) should be extended to accommodate partial uncertainty information consistent with that available in EXFOR. In addition, a new format should be developed, capable of accommodating experimental covariance information.

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