MEMO CP-C/81

Date: February 3, 1981

From: Victoria McLane VM

Subject: Error Specifications

Correlation Factors

In coding sample entries using the new error specification format, we have come across some cases in which the correlations between sub-components at different energies are not 0. or 1.0, but are constant for a given sub-component. We think these should be included in the system. See, for example, G. Winkler, et al., Nuc. Sci. Eng. 76, 30 (1980).

Therefore, we propose adding the correlation factor to the code given under ERR-ANALYS, as follows:

ERR-ANALYS (ERR-1,0.5)

Headings for Error Specification

We are neutral in the matter of which headings to use, but will use the agreed upon headings until a new agreement is reached.

The draft proposal to be sent to evaluators and experimentalists is attached.

Sol Pearlstein

cc. Cullen
Day Day
Hendrichson
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VML:SP:hl
encl.

Proposal
for
Inclusion of Detailed Error Information
in the International Data Exchange Files (EXFOR)

Formulated at the Fifth Nuclear Reaction Data Centers Meeting
Brookhaven National Laboratory

December 1980

Following is a proposal for the inclusion of detailed information on errors in the international data exchange file (EXFOR). The proposal was formulated as a result of a topical discussion held at the Fifth Meeting of the Nuclear Reaction Data Centers based on talks with measurers and evaluators at the Workshop on Evaluation Methods and Procedures held at Brookhaven, September 22 - 25, 1980.

General Comments

1. First priority should be given to the compilation of detailed information on statistical and systematic errors for experimental data on neutron cross sections of standards and dosimetry reactions, in new entries and for retransmitted data sets.

2. When the required information is not given in the publication, every effort should be made to obtain the information from the authors.

3. Errors should be broken down into statistical and systematic errors.

4. Errors will be given as one standard deviation or the equivalent for systematic errors.

5. Systematic errors should be broken down into individual independent components and these components should be given as a function of energy. They should not be combined into a final variance-covariance matrix (V-C matrix) as this represents a significant loss of information.

6. The breakdown of systematic errors into major components by source should be "fine" enough so that the correlations between sub-components at different energies within a given major component may be reasonably set equal to a constant lying between +1.0 and -1.0.

7. In the case of systematic errors where the preceding is not satisfied, e.g., background determination in a time-of-flight experiment with black filters, the quantitative information on the energy dependence of the correlations should be given in "comments" which include the appropriate algebraic expressions.

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* Errors referred to here are an expression of the uncertainty of the measured data and are not mistakes or blunders.

8. The preceding two proposals avoid the problem of having to give a gigantic V-C matrix in the files and allow the evaluator construct the V-C matrix of the data from the information given. They also allow for the inclusion of new information on any major error component obtained at a later date.

9. Measured ratios should <u>always</u> be given when they are available.

10. Data measured in different experimental runs with changes in experimental parameters, e.g., sample, flux monitor, etc., should be given as separate sets.

<u>Specific Proposal</u>

1. Error fields will be identified as statistical or systematic (or total, if that is all that is given). The definition of the different systematic errors will be given in free text comments.

2. Only errors which are one standard deviation or the equivalent will be entered using this format.

3. Constant errors, such as in sample thickness, etc., will be entered in the common data section, others will be given as a function of energy.

4. The data will be tabulated as follows:

ERR-1	ERR-2
ϵ_1	ϵ_2

ENERGY	EN-ERR	EN-RSL	DATA	ERR-S	ERR-3	ERR-4	...
E_1	ΔE_1	$E_R(E_1)$	$B(E_1)$	$\Delta_{stat}(E_1)$	$\epsilon_3(E_1)$	$\epsilon_r(E_1)$	...
E_2	ΔE_2	$E_R(E_2)$	$B(E_2)$	$\Delta_{stat}(E_2)$	$\epsilon_3(E_2)$	$\epsilon_4(E_2)$	...
.	.	.	.	.	.	.	...
.	.	.	.	.	.	.	
E_i	ΔE_i	$E_R(E_i)$	$B(E_i)$	$\Delta_{stat}(E_i)$	$\epsilon_3(E_i)$	$\epsilon_4(E_i)$	...
.	.	.	.	.	.	.	...
.	.	.	.	.	.	.	
E_n	ΔE_n	$E_R(E_n)$	$B(E_n)$	$\Delta_{stat}(E_n)$	$\epsilon_3(E_n)$	$\epsilon_4(E_n)$	...

where ENERGY = Lab energy of incident particle
EN-ERR = energy uncertainty
EN-RSL = resolution
(a Gaussian distribution is assumed; (EN-RSL) defines the variance of the distribution.)
DATA = the measured data (B)
ERR-S = statistical error (Δ_{stat})
ERR-1 = <u>constant</u> 1st major component of systematic error (ϵ_1)
ERR-2 = <u>constant</u> 2nd major component of systematic error (ϵ_2)
ERR-3 = 3rd major component of systematic error (ϵ_3)
ERR-4 = 4th major component " " " (ϵ_4), etc.

The following are assumed:

$$\langle \Delta_{stat}(E_i)\,\Delta_{stat}(E_j)\rangle \equiv 0 \quad \text{if } i \neq j$$

$$\langle \Delta_{stat}(E_i)\,\varepsilon_\ell(E_j)\rangle \equiv 0$$

$$\langle \varepsilon_\ell(E_i)\,\varepsilon_m(E_j)\rangle \equiv 0 \text{ if } \ell \neq m.$$

$$\langle \varepsilon_\ell(E_i)\,\varepsilon_\ell(E_j)\rangle \equiv \varepsilon_\ell(E_i)\,\varepsilon_\ell(E_j)\,\rho_{ij}$$

where ρ_{ij} is a constant between -1.0 and +1.0

See General Comment 7, when ρ_{ij} is energy dependent.