III.E.3. Data-Reduction Parameters

Analysis of experimental data requires, first of all, a reduction of raw data to cross section (or transmission). Values of the parameters for the data-reduction process may not be perfectly known, and the effects of these uncertainties should be incorporated into the data analysis. Within SAMMY there are several methods of doing this:

1. The uncertainties can be carefully propagated through the data-reduction process, so that the full off-diagonal covariance matrix of the reduced data is generated. This covariance matrix is then explicitly input to SAMMY; see Section VI.C.2 for input details.

2. The user-supplied implicit data covariance (IDC) matrix may be used. See Section IV.D.3 for a description of the IDC method and Section VI.C.3.b for input for this option.

3. Another method of incorporating data-reduction parameters into the SAMMY analysis is to perform the background subtraction and/or normalization process explicitly, analytically, within SAMMY. In this case the operations are applied to the theoretical calculations, not to the experimental data. Section III.E.3.a discusses this option in detail.

4. The PUP (Propagated Uncertainty Parameter) method is perhaps the easiest method for the analyst to use for incorporating measurement-related uncertainties into the analysis process. See Sections IV.D.1 for derivation of the PUP method, Section IV.D.2 for a summary and description of its use in SAMMY, and Section VI.C.3.a for input information. The PUP method is applicable only for parameters for which SAMMY has derivatives internally available; therefore, it is more restrictive than # 1 or # 2 (but more general than # 3).

5. Partial derivatives of the (reduced) data with respect to the data-reduction parameters can be generated externally, and these derivatives read into SAMMY, which will then generate the explicit data covariance matrix. Details are given in Section III.E.3.b. (The code ALEX [NL84] can be used to generate the needed partial derivatives.) While this method requires similar input to # 2 above (though in different format), it is an older formulation and has not been extensively tested. Probably this option will be eliminated in the near future.

The computer code ALEX was designed to generate the data covariance matrix for ORELA data and can therefore be used to prepare input for options # 1, 2, or 5. For a description of ALEX and a detailed discussion on the role of uncertainties in the data-reduction process, see [DL83] and [NL84]. An update of this code, to be more directly applicable for option # 2, is planned.

See test case tr140 for equivalent examples of many of these options.