

Current Status of the R-Matrix Code SAMMY, with Emphasis on the Relationship to ENDF Formats

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During the last decade, advances in evaluations of neutron-induced cross sections in the resolved resonance region surpassed the ability of the Evaluated Nuclear Data Files (ENDF) to make use of those evaluations. At the higher energies used in new evaluations, effects that in the past were deemed to be unimportant are now included. Among these are larger values of orbital angular momentum and the appearance of proton or alpha channels. The LRF = 3 ENDF format is unable to accommodate these effects or to treat more than one entrance channel; this so-called “Reich-Moore format” uses only a highly restricted form of the Reich-Moore formulation. A new ENDF format was therefore created and approved by the Cross Section Evaluation Working Group (CSEWG) in 2005; the new format, denoted by LRF = 7, is fully compatible with the R-Matrix formulation used in the SAMMY analysis code.

A concomitant development in the evaluation process is the enhanced use of uncertainty information. Techniques have been incorporated into SAMMY for easy and efficient treatment of measurement-related uncertainties (both statistical and systematic); the output resonance parameter covariance matrix (RPCM) reflects those uncertainties. When evaluations are prepared for submission to ENDF, the RPCM is written into File 32. For nuclides with a large number of resonance parameters (e.g., ^{235}U), the large size of the covariance matrix led to the development of a new “compact” format (also approved by CSEWG in 2005), capable of communicating the major features of the RPCM in an abbreviated space. For older evaluations lacking File 32 covariance information, schemes have been developed for retroactively generating approximate RPCMs.

In this paper, examples will be shown for both of the new ENDF formats. Other new features of the SAMMY code, available in the 2006 Revision 7 release, will also be described.