

Recent Developments in SAMMY

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Outline

- **SAMMY 8.0.0 released to RSICC**
 - **RSICC release date: December 1, 2008 (tentative)**
 - **Outline of new features**
- **Data Covariance Matrices (DCM)**
 - **A concise method for storing and communicating DCM**
 - **Unexpected consequences of using DCM**

SAMMY 8.0.0 new options summary

- **Energy dependent $\nu(E)$ for η computations**
- **Target thickness a piece-wise linear function of radius**
 - Only for transmission
- **Self-Shielding Multiple scattering module revised;**
 - new input options [NL08]
- **Tabulated values input for “double-plus” scattering corrections**
- **The Gaussian width in the “simple” resolution function may be a linear function of energy.**
- **Input Resonance parameters: $(E_\lambda, \Gamma_\lambda \equiv 2P\gamma_\lambda^2) \leftrightarrow (\sqrt{E_\lambda}, \gamma_\lambda)$**
useful for resonances very near threshold (numerical difficulties)

DCM: storage and communicating

- **Explicit off-diagonal DCM is very large $\sim(\# \text{ data points})^2$**
 - Large storage requirements
 - matrix operations, inversion, burdensome.
- **A solution: express DCM in terms of its three components:**
 - Diagonal CM of the measured quantity, e.g. counts (“v”)
 - Data Reduction Parameter (DRP) CM, small, (“m”)
 - DRP sensitivity matrix (“g”)

$$V = v + gm g^t$$

- **Benefits**
 - Matrix operations in terms of components much more efficient
 - Only DCM components need to be stored; much smaller.
- **N. Larson ORNL/TM-2008/104:**
 - http://www.ornl.gov/sci/nuclear_science_technology/nuclear_data/sammy/pdf/Concise_DCM.pdf
- **Also, Section IV.D.3 of SAMMY Manual**

DCM: unexpected consequences

- RPI team found that a conventional DCM yields bad fits
- ORNL team investigated the effects of various forms of DCM on fitting
- One of the conclusions:
 - DCM created from theoretical, rather than experimental cross sections, is advantageous:
 - Consistent with the derivation of Bayes' Eq.'s
 - Gives better fits than a respective conventional DCM
 - Conventional DCM may give unexpected results in Bayes Eq.'s
 - Although a legitimate DCM for many applications, the conventional DCM is not consistent with the derivation of Bayes' Eq.'s .
- N. Larson and G. Arbanas, “Unexpected Consequences of Fitting Resolved-Resonance Data Using an Off-Diagonal Data Covariance Matrix”, (available in draft form).
- Theory: Section IV.D.1 of SAMMY Manual

Γ_1 from Table 2 of the "Unexpected Consequences..." paper

