

F. Fröhner MF=32 Proposal (circa 1994)

- Difficulties of Present MF=32 format
 - No provision for uncertainties of effective radii for s-, p-, and d-wave potential scattering
 - Variances and covariance data are not only needed for partial widths but also total widths
 - No spot for second fission or other residual width (e.g., inelastic) needed for 3-channel RM format (used by U-235, Pu-239, etc)
- Attempts to find easy fixes within existing formats proved frustrating, consider alternative approach.....
- Introduce more general, user-friendly format
- Instead of providing covariances provide standard deviations and correlations

Covariances vs Standard Deviations and Correlations

- Covariance matrix C with elements C_{jk} represented by the standard deviations and correlations as follows:

$$C_{jk} = \sigma_j \rho_{jk} \sigma_k$$

- Explicitly:

$$\begin{pmatrix} C_{11} & C_{12} & C_{13} & \dots \\ C_{12} & C_{22} & C_{23} & \dots \\ C_{13} & C_{23} & C_{33} & \dots \\ \vdots & \vdots & \vdots & \ddots \end{pmatrix} = \begin{pmatrix} \sigma_1 & 0 & 0 & \dots \\ 0 & \sigma_2 & 0 & \dots \\ 0 & 0 & \sigma_3 & \dots \\ \vdots & \vdots & \vdots & \ddots \end{pmatrix} \begin{pmatrix} 1 & \rho_{12} & \rho_{13} & \dots \\ \rho_{12} & 1 & \rho_{23} & \dots \\ \rho_{13} & \rho_{23} & 1 & \dots \\ \vdots & \vdots & \vdots & \ddots \end{pmatrix} \begin{pmatrix} \sigma_1 & 0 & 0 & \dots \\ 0 & \sigma_2 & 0 & \dots \\ 0 & 0 & \sigma_3 & \dots \\ \vdots & \vdots & \vdots & \ddots \end{pmatrix}$$

- Technical literature point data (x_i, y_j) and uncertainties Δy_j :

$$\begin{array}{ll} x_1 & y_1 \pm \sigma_1 \\ x_2 & y_2 \pm \sigma_2 \\ x_3 & y_3 \pm \sigma_3 \\ \vdots & \vdots \end{array}$$

- Supplemented with correlations:

$$\begin{array}{llll} & 1 & & \\ \rho_{12} & & 1 & \\ \rho_{13} & \rho_{23} & & 1 \\ \vdots & \vdots & \vdots & \ddots \end{array}$$

Fröhner Proposal for MF=32

- Switch from variances and covariances for all resonance parameters to standard deviations and correlation coefficients—present the data in two tables:
 - Provided for energies, partial widths of resonances, effective radii, and other distant-level parameters for potential scattering
- Propose to represent standard deviations in File 2 format:
 - Put in standard deviations of all resonance parameters in the same sequence and same format as the File 2 parameters
 - Practical implementation: evaluator would be able to copy their resonance parameter tables from File 2 to File 32 and replace the parameters with the standard deviations
 - Evaluator must also be permitted to enter relative standard deviations
- Correlation tables in new general format (if correlations are available):
 - Because of symmetry and unit values on diagonal, only need to store values above diagonal
 - Correlation matrices can be sparse—only need to store nonzero values
 - Fröhner postulated compression schemes in original proposal—not sure this still makes sense and we now have the Compact Resonance Format from Nancy Larson