

IV.B. IMPLEMENTATION OF BAYES' EQUATIONS

Each of the three forms of Bayes' equations has its own strengths and weaknesses.

In the original version of SAMMY (circa 1978), only the N+V method was available. This method requires inversion of a symmetric square matrix whose size is the number of experimental data points – a prohibitive requirement, in the case where off-diagonal data covariance matrix elements exist. The I+Q method requires inversion of a non-symmetric square matrix whose size is the number of varied parameters; in its original form, however, I+Q also required that the data covariance matrix be diagonal. The M+W method also requires inversion of a matrix whose size is the number of varied parameters; in this case, the matrix is symmetric.

SAMMY's method of solution of Bayes' equations for N+V inversion scheme is described in Section IV.B.1, and the solution for the I+Q scheme in Section IV.B.2. The M+W solution method is discussed in Section IV.B.3.

By default, analyses in the resolved resonance region (RRR) use either the N+V or the I+Q method, and SAMMY will choose the method requiring the least amount of computer memory. In general, this means that analyses involving a large number of parameters and/or an off-diagonal data covariance matrix will use N+V, and analyses involving relatively few parameters and a diagonal data covariance matrix will use I+Q.

Under certain circumstances, it is possible for the user to override SAMMY's default choice of which method to use. (This is accomplished by inserting the command "NPV" or "IPQ" in the INPut file; see Table VI A1.2.) When both N+V and I+Q are possible, they give the same results but consume different amounts of computer resources (memory and time).

Analyses in the unresolved resonance region use only the M+W method.

For truly simultaneous fitting of a number of data sets in the RRR, the M+W is used and can be made to behave as a least-squares process. The retroactive covariance matrix generation scheme also uses M+W. See Section IV.E for discussions of these topics.

Certain types of off-diagonal data covariance matrices can be accommodated by any of the three forms of Bayes' equations. See Section IV.D for a discussion of the implicit data covariance (IDC) techniques and propagated uncertainty parameters (PUPs).