Dictionary 23 (Analyses) – RFN

(N. Otsuka, 2017-05-09, Memo CP-D/931)

The R-function approximation is a special case of the Reich-Moore approximation of the R-matrix formalism. In the Reich-Moore approximation, all photon channels are removed by lumping them together into one parameter, the total radiation width, that goes in the imaginary part. If the target nuclide is non-fissile and only the elastic scattering channel remains, the R-matrix becomes a 1×1 matrix. This is just a function, and therefore it is called R-function.

Some compilers have wrongly understood "R-function" as a synonym of "R-matrix", and applied the analysis code RFN (R-function formalism) when the author explains that the compiled resonance parameters are derived by using the R-matrix formalism. This is not correct. Because the R-function approximation is a special case of the Reich-Moore approximation, <u>the resonance parameters derived with the R-function approximation must be coded with the modifier RM (Reich-Moore formalism) in REACTION SF8.</u>

If the author used the R-matrix formalism but without mentioning more details, we can leave REACTION SF8 blank but add some details (*e.g.*, code used for resonance analysis, like REFIT, SAMMY, FANAC, TACASI, etc.) in free text.

Dictionary 23 (Analyses)
RFN   (*Obsolete*)

Additional remarks
- The resonance analysis code REFIT implements only the Reich-Moore approximation while SAMMY implements several approximations.

- We have modifiers for the Vogt formalism (VGT, only one entry from an article published in 1960) and Adler-Adler formalism (AA, six entries from articles published in 1970, 1978, 1980, 1983). There could be resonance parameters derived by the single and multi Breit-Wigner approximations, and addition of new modifiers for them could be considered.

- I have quickly checked the numbers of EXFOR entries providing neutron resonance parameters coded with SLA, MLA, SHAPE, AREA and their combination under ANALYSIS. The parenthesized numbers give the number of entries:

	Approximation	SHAPE (190)	AREA (385)
SLA (94)	Single level Breit-Wigner	(14)	(7)
MLA (133)	Multilevel Breit-Wigner Reich-Moore, Adler-Adler Etc.	(7)	(1)

It is questionable if these analysis codes and their combinations have been applied in a consistent manner. For example, I would expect MLA is coded with SHAPE in many cases.

Frank Gunsing (CEA Saclay) has kindly provided me useful remarks on various approximations and their expressions in EXFOR.