

R-MATRIX ANALYSIS CODE (RAC)

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A comprehensive R-matrix analysis code has been developed. It is based on the multichannel and multilevel R-matrix theory^[1] and runs in VAX computer with FORTRAN-77.

This code is an automatically fitting one. All the R-matrix parameters are adjustable, which include channel radii, boundary condition numbers, positions and reduced width amplitudes of all energy levels considered.

With the code many kinds of experimental data for one nuclear system can be fitted simultaneously. Those data may have different reaction channel. Usually they include total cross section, elastic scattering cross section, reaction cross section and polarization.

A new technology for developing code named The Optimize Method for Design Optimization Code^[2] was used. So the CPU time can be reduced significantly.

We have made detailed comparison between our code RAC and code EDA of LANL^[3]. With one set of R-matrix parameters, both codes produced the same calculation results (Table 1 and Table 2).

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Table 1 The differential cross section of $^{10}\text{B}(n,\alpha)^7\text{Li}^*$ for $E_n = 0.4$ MeV

Angle (degree)	RAC (China)(mb / sr.)	EDA(USA)(mb / sr.)
0.00	14.624	14.621
20.00	14.161	14.160
40.00	12.841	12.840
60.00	10.950	10.951
80.00	8.759	8.757
100.00	6.607	6.606
120.00	4.753	4.753
140.00	3.363	3.362
160.00	2.154	2.513
180.00	2.230	2.230

Table 2 The polarization of $^{16}\text{O}(n,n)^{16}\text{O}$ for $E_n = 2.56$ MeV

Angle (degree)	RAC (China)	EDA(USA)
26.55	0.2771	0.2764
47.50	3.3694	0.3694
68.20	0.3468	0.3472
93.60	0.2356	0.2355
118.20	0.0332	0.0332
137.50	-0.1125	-0.1126
156.50	-0.1083	-0.1073

REFERENCES

- [1] A. M. Lane et al., Rev. Mod. Phys. 30, 257(1958).
- [2] Z. P. Chen, Qi Huiquan, J. of Tsinghua University, IV, 1984.
- [3] D. C. Dodder et al., EDA, An Energy Dependence Analysis Code for Nuclear Reaction, Unpublished.