Resonance Analysis Combined with Optical Model

T. Murata* and T. Nakagawa**
*former Toshiba, **JAEA

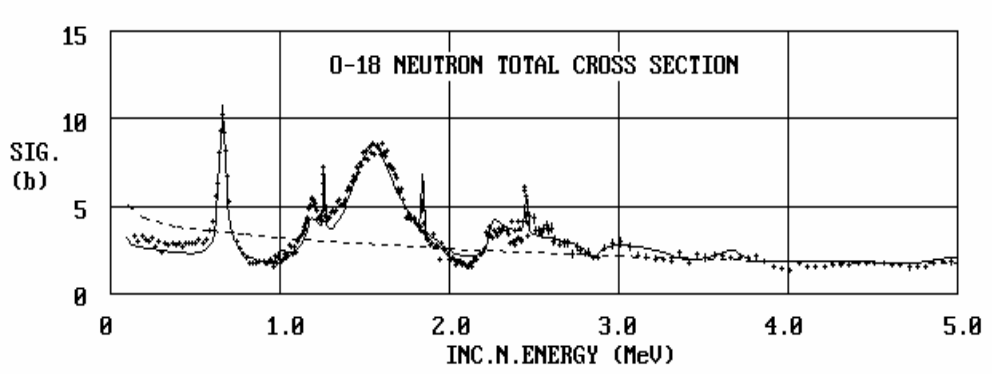
Cross sections of light nucleus show composite resonance structures in the incident energy range over 10 MeV. Ordinary method of resonance analysis requires frequently some wide resonances in the outside of the objective resonance region, which can not be explained physically. These wide resonances could be predicted by the optical model, as some dispersed single particle states, using adequate potential parameters. So, combination of resonance analysis and the optical model will be useful to analyze composite resonance region cross sections and effective to obtain continuation of nuclear data between resonance region and higher energy region that can be analyzed with the optical model.

In the present model, the collision matrix U which describes the neutron elastic channel is given by the sum of optical model U_{opt} and R-matrix U_R, for the same spin-parity state, such as

$$U^{J\Pi}=kU_{opt}{}^{J\Pi} + (1-k)U_R{}^{J\Pi},$$

where k is the optical model weight factor and resonance term weight was determined to hold U unitary.

The following figure shows an example of the present calculation (solid line); neutron total cross section of ^{18}O comparing with the experimental data[1),2)]. The dashed line shows the optical model calculation. The optical model U_{opt} was calculated with ELIESE-3 code[3)] using Wilmore-Hodgeson potential parameters[4)] and the resonance U_R was calculated with the approximated R-matrix code[5)] using 14 resonance levels and weight factor k=0.35.



References
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