3.12 Anomalous Absorption of Deuteron Partial Waves by Nuclear Optical Potential

R.A.D.Piyadasa [1], M. Kawai [2] , J. Munasinghe [1]
1. Department of Mathematics, University of Kelaniya, Sri Lanka
2. 2-12-16, Matsuyama, Jonan-ku, Fukuoka 814-01, Japan

ABSTRACT

M.Kawai and Y. Iseri (2), (3) found an interesting phenomenon in nuclear physics, motivated by the work of (1), in case of nucleon-nucleus elastic scattering. In the following this phenomenon is discussed in case of neutron (n)-nucleus (A) elastic scattering.

In elastic scattering of neutron on (A), the elastic S − matrix element for a particular combination of j , l , E_{cm} , A becomes very small (almost zero), and they called this phenomenon anomalous absorption of neutron partial waves by nuclear optical potential, where j is the total angular momentum, l is the angular momentum, E_{cm} the centre of mass energy and A the mass of the nucleus. The striking feature of this phenomenon is systematic in various parameter (f, l, E_{cm}, A) planes. Among them, systematic in $\left(\dfrac{l}{k}, A^{1/3} \right)$ plane is actually remarkable, which consists of straight lines. All straight lines correspond to a definite node of wave functions associated with A , k E_{cm} , l , j .

It is quite interesting to examine whether this phenomenon occurs in case of composite projectiles such as d , He , etc.

Now, it has been shown (4) that this phenomenon is universal. The main purpose of this paper is to report results of the case $d − A$ after being rescrutinized by us. It is striking that the systematic in $\left(\dfrac{\eta + \sqrt{\eta^2 + l(l+1)}}{k}, A^{1/3} \right)$ plane is remarkably clearer than the case of neutron. Here, $\dfrac{\eta + \sqrt{\eta^2 + l(l+1)}}{k}$, the closest approach is physically meaningful in case of the presence of the Coulomb potential.

References.

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