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On Solving the Problem of Heavy Ion Collisions in an Optical Model

We present algorithm implements the solution of the inverse problem, i.e., calculates the unknown coupling constant $g(E)$ and scattering matrix $S(g(E), E)$ from condition $|S(g(E), E)|^2 = 1-|T(E)|^2$ by means of the secant method. The required amplitudes of transmission $T(E)$ and reflection $R(E)$ subject also to the condition $|R(E)|^2 = 1-|T(E)|^2$ of the model with incoming wave boundary conditions (IWBCs) are previously calculated by the standard MAPLE implemented KANTBP 4M
program.The algorithm provides a one-to-one correspondence between the OM with a complex-valued potential and the model of IWBCs with a real-valued potential.

The efficiency of the proposed approach is shown by solving numerically the scattering problem and calculating the reference fusion cross section for a pair of heavy ions ^{16}O+^{144}Sm in the single-channel approximation of the close-coupling method.

A.A. Gusev, O. Chuluunbaatar, V.L. Derbov, R.G. Nazmitdinov, S.I. Vinitsky, P.W. Wen, C.J. Lin, H. M. Jia, L. L. Hai, Symbolic-numerical algorithm for solving the problem of heavy ion collisions in an optical model with a complex potential, Lecture Notes in Computer Science 14139, pp. 128–140 (2023).

Section

Nuclear structure: theory and experiment

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