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FINDING PARAMETERS OF MULTI-CHANNEL RESONANCES FROM DISCRETIZED SPECTRA

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Recently we have suggested a new method for calculating resonance parameters in multi-channel and three-body systems, using the formalism of the spectral shift and spectral density functions [1]. The method is based on the possibility of reconstructing the spectral and integrated density of states from discretized spectra of the total and asymptotic Hamiltonians found within the variational method. The key point of the approach is combining many discretized spectra of the same dimension, obtained using bases with slightly changed parameters, into one common dense spectral set (union). Analysis of such a dense spectral set for the total Hamiltonian allows one to determine a position and a width of a multi-channel and three-body resonance.
The efficiency of the proposed approach is demonstrated by several multi-channel and three-body examples using a Gaussian basis. The convergence of results when expanding the basis dimension can be justified within the quasi-continuity concept [2] for the case of a multi-channel problem, while for the three-body case it is shown numerically. The developed approach allows one to avoid difficulties associated with the Coulomb interaction and to study problems with charged particles as well, for example, two-proton radioactivity. In particular, the width of the ground state of the 6Be nucleus was calculated within the framework of the three-cluster α-p-p model [1].

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Section

Nuclear structure: theory and experiment

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