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Analysis of the regular part of the total scattering amplitude in the generalized theory of finite fermi systems

In the sequential microscopic theory of the nucleus, using the formalism of Green's functions (GF), it is necessary to consider the full amplitude of the interaction (scattering amplitude) Γ [1,2], which contains the regular part of Γ^r. First of all, this is due to the inclusion of two-phonon configurations in addition to the 1p1h+phonon configurations [2], i.e. we are talking about the sequential consideration (in the language of GF) of two-phonon configurations.
The equation for the regular part of Γ^r was obtained by A.B. Migdal [1] and, as far as we know, has never been studied quantitatively. To solve it, it is necessary to find the second free term F_1 containing the square of the phonon creation amplitude g (the first free term is the well-known interaction F in the theory of finite Fermi systems [1])
We transformed both these equations for g and Γ^r in the approximation for the interaction of F in the form of separable forces, see [3], with the parameters of these forces found by us for ^{208}Pb for $E2$ transitions, used the corresponding experimental data for g and solved the equation for Γ^r. Calculations showed a rather unexpected result: the ratio of two free terms F_1/F = -6.0, and the ratio Γ^r/F=-31.2. Apparently, these estimates mean that the microscopic theory of two-phonon nuclear excitations must be substantially refined.

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Section

Nuclear structure: theory and experiment

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