COMPLEX CONFIGURATION EFFECTS ON β-DECAY RATES

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One of the successful tools for nuclear structure studies is the quasiparticle random phase approximation (QRPA) with the self-consistent mean-field derived by making use of the Skyrme interaction. Many charge-exchange versions of it were developed during the last decade. Their common feature is that they allow to relate the properties of the ground states and excited states through the same energy density functional. On the other hand, it would be desirable to extend the description beyond the QRPA scheme in order to include damping effects observed experimentally. Making use of separable residual interaction one can perform the spin-isospin excitation calculations in large configuration spaces since there is an opportunity to avoid matrices whose dimensions grow with the size of configuration space. For the same reasons, we develop the finite rank separable approximation for the Skyrme interactions [1,2] that enables one to perform the charge-exchange calculations in the large configuration space [3,4].

In this talk we briefly describe our method for the charge-exchange excitations and present our studies of the coupling between one- and two-phonon terms in the wave functions and the tensor force effects on properties of Gamow-Teller (GT) states. We observe a redistribution of the GT strengths due to the tensor correlation influence on the $2p$-$2h$ fragmentation of GT states. The β^--decay half-lives is decreased by these effects [5]. As an application we present the evolution of the β-decay scheme of the neutron-rich N=50 isotones, in comparison to the doubly-magic nucleus ^{78}Ni that is also an important waiting point in the r-process.

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