TOWARDS THE SELF-CONSISTENT AND RELATIVISTIC STUDY OF SPIN-ISOSPIN EXCITATIONS IN DEFORMED NUCLEI

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Nuclear density functional theory (DFT) with a minimal number of parameters allows a very successful description of ground-state and excited-state properties of nuclei all over the nuclear chart. In particular, its covariant version takes the Lorentzian symmetry into account. This covariant framework puts stringent restrictions on the number of parameters, achieving a consistent treatment of the spin degrees of freedom as well as the unification of the time-even and time-odd components.

The self-consistent relativistic study of nuclear spin-isospin resonances does not have a long history. A fully self-consistent description of both Gamow-Teller resonances (GTR) and spin-dipole resonances (SDR) has been achieved with the explicit inclusion of the Fock terms [1, 2], i.e., the self-consistent RPA based on the relativistic Hartree-Fock theory. The effect of the Fock terms also plays important roles in nuclear β decays and *r*-process nucleosynthesis [3].

In the present talk, recent developments towards the self-consistent and relativistic study of spin-isospin excitations in deformed nuclei will be introduced. By combining the relativistic RPA and finite-amplitude method, it is found that the effects of Dirac Sea can be taken into account implicitly in the coordinate-space representation, and the rearrangement terms due to the density-dependent couplings can be treated practically without extra computational costs [4]. Furthermore, by using the inverse Hamiltonian method and higher-order Wilson terms to overcome the problems of Dirac Sea and Fermion doubling. The self-consistent 3D relativistic mean-field code for atomic nuclei has been built in the three-dimensional coordinate space [5].

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