OCTUPOLE CORRELATIONS IN A FULL SYMMETRY-CONSERVING FRAMEWORK

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The study of both dynamic and static octupole correlations in atomic nuclei is receiving renewed attention lately given the impact of those correlations on many properties of nuclear ground and excited states [1]. Static correlations are treated using intrinsic mean field wave functions breaking, in addition to rotational invariance and particle number, the symmetry under spatial reflection. Its presence in a given nucleus requires both proton and neutron numbers to be equal or close to the values 56, 88, 134, 190, etc. For those numbers of particles intruder Nilsson orbitals are close to the Fermi level and strongly interact with the surrounding normal parity states differing in three units of angular momentum. Only a few nuclei in the rare earth and actinide region show sizable static octupole correlations [2]. However, most of the even-even nuclei in the periodic table show some kind of dynamical octupole correlations when beyond mean field effects like parity symmetry restoration and/or octupole fluctuations are considered [2,3] In addition, the properties of collective negative parity states can be described [2,3,4] in the same framework. The role played by the additional restoration of angular momentum and particle number quantum numbers has been the subject of very recent studies both with relativistic [5] and non-relativistic [6] energy density functionals. The framework includes, in addition to the restoration of the above mentioned symmetries, quadrupole and octupole shape mixing handled using the Generator Coordinate method. These calculations permit to study excitation energies and transition strengths (mostly E1 and E3) in different scenarios, including vibrational (with low lying 3^- states) and rotational (with low-lying 1^- states) cases. The relevant details of the method as well as some relevant results (obtained with the Gogny family of functionals), and its comparison with experimental data will be addressed in the presentation.

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