Selfconsistent multiphonon calculation of E1 response in ^{132}Sn

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Detailed theoretical description of collective excitations is still very appealing problem in the nuclear structure physics. In spite of the success in calculation of gross properties of collective modes within standard methods, like selfconsistent HF+RPA approaches, it is obvious that for the detailed understanding of strength distributions one has to adopt many-body methods which go beyond simple harmonic approximation (RPA). For example, it is known that the coupling to complex configurations is responsible for spreading widths of giant resonances.

Recently, we have developed approach based on equation of motion phonon method (EMPM) [1] which extends standard TDA or RPA, and is able account for 2-phonon configurations. The method was recently applied for calculation of E1 strength in ^{208}Pb [2].

Interesting question arising in these kind of studies is, whether realistic nucleon-nucleon potentials could give reasonable results for strength distributions. For this purpose we used V_{lowk} potential in the framework of selfconsistent HF+TDA and EMPM approach.

We will present calculation of isosclalar and isovector E1 distributions in ^{132}Sn. Attention will be focused on the low-energy peaks corresponding to the pygmy resonance. The effect of 2-phonon states on E2 strength will be demonstrated for ^{40}Ca. We will show that inclusion of phenomenological density dependent interaction, simulating 3-body force, is essential for reasonable single particle spectra, whereas coupling to 2-phonon sector affects strongly the fine structure of the giant dipole resonance, which results to be severely damped and fragmented. The role of correlations in the ground state and problems with description of positive parity states will be also discussed.

1. D. Bianco, F. Knapp, N. Lo Iudice, F. Andreozzi, and A. Porrino, Phys. Rev. C **85**, 014313 (2012).
2. D. Bianco, F. Knapp, N. Lo Iudice, F. Andreozzi, A. Porrino and P. Veselý, Phys. Rev. C **86**, 044327 (2012).