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Pygmy resonance above excited states

Content

Possible existence of a pygmy resonance above excited states in 80Ge is studied within the quasi-particle version of equation of motion phonon method (EMPM) [1]. In EMPM, a set of iterative equations of motion is constructed and solved to yield the states composed of (n = 2, 3, ..) Tamm Dancoff (TD) phonons. These states, added to an HFB (n=0) and TD (n=1) solutions,form the multiphonon basis (n = 0, 1, 2, ...) in which the eigen-value problem of nuclear Hamiltonian is solved by a diagonalization of the Hamiltonan matrix. Two effective n-n potentials, chiral NNLOopt [2] and Daejeon16 derived from the chiral NNNLO interaction [3], were usedin our calculations.

The neutron-rich 80Ge was recently studied also experimentally. Very preliminary data from beta-decay of 80Ga indicate the existence of negative parity states (2−, 3−) with energy 7.5-8 MeV connected to the first 2+ state by E1 transitions [4,5,6]. We analyzed a distribution of one- and two-TD phonon components in the excitation spectrum and our EMPM calculations confirmed the dominance of 2-phonon components of the 1−, 2−, 3− eigen-states in this energy region. If the preliminary experimental results are correct our EMPM calculations indicate that the excited 1−, 2−, 3− states of 80Ge in the energy region 7.5-8 MeV can be interpreted as the pygmy resonance built on the first 2+ excited state.

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