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Electric dipole response of neutron-rich calcium isotopes in relativistic quasiparticle time blocking approximation

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New results for electric dipole strength in the chain of even-even Calcium isotopes with the mass numbers A = 40 −54 are presented. Starting from the covariant Lagrangian of Quantum Hadrodynamics, spectra of collective vibrations (phonons) and phonon-nucleon coupling vertices for $J \leq 6$ and normal parity were computed in a self-consistent relativistic quasiparticle random phase approximation (RQRPA). These vibrations coupled to Bogoliubov two-quasiparticle configurations (2q⊗phonon) form the model space for the calculations of the dipole response function in the relativistic quasiparticle time blocking approximation (RQTBA). The results for giant dipole resonance in the latter approach are compared to those obtained in RQRPA and to available data. Evolution of the dipole strength with neutron number is investigated for both high-frequency giant dipole resonance (GDR) and low-lying strength. Development of a pygmy resonant structure on the low-energy shoulder of GDR is traced and analyzed in terms of transition densities. A dependence of the pygmy dipole strength on the isospin asymmetry parameter is extracted.

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