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Electromagnetic Transitions and Branching Ratios as a Tool for Investigating the Fine Structure of Nuclear Excitations

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Abstract

The electric multipole response of atomic nuclei at extreme isospin is investigated by energy-density functional (EDF) and three-phonon quasiparticle-phonon model (QPM) theory with special emphasis on electric and magnetic dipole and quadrupole excitations below the neutron threshold [1]. Additional dipole and quadrupole strength clusters associated with experimentally observed pygmy dipole and quadrupole resonances are found. The spectral distributions and transition densities of these excitations show special features being compatible with oscillations of a neutron skin against the isospin-symmetric nuclear core. Recently, two $(p,\ p'\gamma)$ Doppler-shift attenuation (DSA) coincidence experiments were performed at the SONIC@HORUS setup. Lifetimes and branching ratios of 2^+ states in ^{112,114}Sn were measured allowing for the determination of E2 transition strengths to the ground state. A stringent comparison of the new data to EDF+QPM theory hints at the occurrence of a low-energy quadrupole mode of unique character which could be interpreted as pygmy quadrupole resonance [2].

References

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[2] N. Tsoneva, M. Spieker, H. Lenske, and A. Zilges, *Nuclear Physics A* **990** (2019) 183-198 and refs. therein.