Low-energy E1 strength: interplay of pygmy and vortical toroidal flows

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During the last decade we observe an increasing interest in the E1 low-energy strength, often denoted as the "pygmy dipole resonance" (PDR) [1]. The PDR can be related to the neutron skin in nuclei and density dependence of the nuclear symmetry energy, which in turn may be important for the isospin-dependent part of the nuclear equation of state (EOS) and various astrophysical applications.

Despite a great number of publications on the PDR, its properties (e.g. collectivity) and nature (e.g. the actual velocity flow) are not yet well established and may be disputed [2,3]. In the present study [2], we critically inspect the familiar view of the PDR as an oscillation of the neutron excess against the nuclear core. Moreover, the general overview of the interplay between the vortical and irrotational E1 flows is done. The study is performed within RPA using Skyrme forces in the fully self-consistent manner [4]. The strength functions, transition densities, and velocity fields are scrutinized. The possible contributions of the toroidal (vortical) and compression (irrotational) modes [5] to the PDR region are inspected. Perspectives of different reactions, first of all (e,e'), in exploration of the PDR origin are discussed.

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