Electric, Magnetic and Vorticity Strengths in Heavy Nuclei

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The separable RPA method [1,2] based on the Skyrme functional is applied to the analysis of E1 and M1 giant resonances (GR) in rare-earth, actinide and super-heavy spherical/deformed nuclei. A special attention is paid to time-odd currents in the Skyrme functional and their influence on the GR properties [1,2]. We discuss the influence of Skyrme parameterizations with different effective masses on the GR description and inspect main contributions to the resonance width (deformation splitting, Landau fragmentation, etc) [1-4].

The low-energy E1 strength near the particle emission thresholds is known to be important for astrophysical problems. We inspect influence of the deformation on this strength for particular isotopic chains [3]. The impact is shown negligible near and below the thresholds. At the same time, it increases the E1 strength near the E1 GR.

The nuclear vorticity and its relation to the dipole compressional and toroidal motions is analyzed in terms the strength function method [5]. A general and consistent formalism relating these kinds of nuclear motion is proposed. Both isoscalar and isovector branches are considered. The contributions of convection and magnetization currents are compared. The special attention is paid to the region of the pygmy mode.

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