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Theoretical description of the photon strength function and nuclear level densities

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Reliable theoretical predictions of nuclear dipole excitations and level densities in the whole nuclear chart are of great interest for different applications, including in particular nuclear astrophysics. We present here recent and original calculations of the de-excitation E1 and M1 photon strength functions obtained in the framework of the axially-symmetric deformed quasiparticle random phase approximation (QRPA) based on the finite-range D1M Gogny force. These calculations are compared with photoabsorption strength function as well as available experimental data (including those obtained within the Oslo method). Predictions of the dipole strength function for spherical and deformed nuclei within the valley of beta-stability as well as in the neutron-rich region are discussed.

Similarly, based on the same QRPA framework but complemented by the boson expansion method, the nuclear level densities are extracted systematically for all nuclei for which experimental s-wave spacings have been measured. This new method to determine energy-, spin- and parity-dependent level densities and its capacity to reproduce experimental data will be presented. A comparison with standard nuclear level densities will also be discussed. The impact on radiative neutron capture cross sections will also be presented.

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