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Isoscalar electric giant resonances: Compression modes and nuclear incompressibility

A rich spectrum of giant resonances of different multipolarities and spin and isospin structure was expected on theoretical grounds. In the nineteen seventies, the isoscalar giant quadrupole resonance (ISGQR) was discovered in electron scattering followed by the isoscalar giant monopole resonance (ISGMR) in inelastic α scattering. In the last five decades, the compression modes the ISGMR and isoscalar giant dipole resonance (ISGDR) were extensively studied because of their importance for the determination of the nuclear-matter incompressibility and consequently their implications for the equation of state (EOS) of nuclear matter. Though the nuclear matter incompressibility (K_∞) has been reasonably well determined (~ 240 $\pm$ 20 MeV) through comparison of experimental results on several spherical nuclei with microscopic calculations, the asymmetry term was determined with larger uncertainty. This has been addressed in measurements on a series of stable Sn and Cd isotopes, which resulted in a value of K_τ = - 550 $\pm$ 100 MeV for the asymmetry term in the nuclear incompressibility. The nuclear matter incompressibility and the asymmetry term are key parameters of the equation of state (EOS) of nuclear matter.

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