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Effect of deformation on the fine-structure energy scales of the neodymium isotope chain

High energy-resolution proton inelastic scattering experiments with E_p = 200 MeV were performed on ^{142, 144, 146, 148, 150}Nd and ¹⁵²Sm in the excitation-energy region of the Isovector Giant Dipole Resonance (IVGDR) using the zero-degree mode of the K600 magnetic spectrometer of iThemba LABS. The effect of deformation on both the broad and the fine structure of the IVGDR in the rare-earth region was investigated. A goal of the present study was to extend, for the first time, the IVGDR measurements on these isotopes to high energy-resolution and confirm the K-splitting observed in previous photo-absorption measurements. The applicability of the photo-absorption data to the present study, owing to the low energy-resolution, is limited to broad structure comparisons only with the focus on the evolution of the shape of the IVGDR in the transition from spherical to deformed nuclei. Techniques based on the continuous wavelet transform have been implemented in order to perform a fine structure analysis on the high energy-resolution data obtained in the present study. Characteristic energy scales have been extracted from the experimental data and compared to those extracted from state-of-the-art theoretical predictions of the corresponding B(E1) strength functions. The conclusions of these comparisons will be presented.

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