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Fine Structure of the Isovector Giant Dipole Resonance using the (p,p′) reaction at zero degrees: Effects of strong nuclear deformation

The decay of giant resonances in nuclei is a prime example of how a well-ordered collective excitation dissolves into a disordered motion of internal degrees of freedom in fermionic quantum many-body systems. Fine structure of the Isovector Giant Dipole Resonance (IVGDR) for the neodymium isotope chain, ^{142,144,146,148,150}Nd, has been observed in high energy-resolution inelastic proton scattering experiments. The state-of-the-art K600 magnetic spectrometer of iThemba LABS was used to perform these experiments at zero-degrees scattering angle with an incident proton energy of 200 MeV. The analysis of the measured (p,p′) energy spectra will yield insight into the transition from spherical (¹⁴²Nd) to highly deformed (¹⁵⁰Nd) nuclei and provide information about the dominant damping mechanisms. A comparison can be made to (γ,xn) data which clearly show a broadening and splitting of the IVGDR as deformation increases. Preliminary results will be discussed.

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