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Influence of the proton core on the fine structure of the Isovector Giant Dipole Resonance as a function of nuclear deformation across the neodymium and samarium isotope chains

Abstract content
   (Max 300 words)

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 in the energy region of the Isovector Giant Dipole Resonance (IVGDR) from spherical to deformed neodymium isotopes (^{142,144,146,148,150}Nd) has been observed in high energy-resolution proton inelastic scattering experiments for E_p = 200 MeV at zero degrees using the K600 magnetic spectrometer of iThemba LABS. Data on the samarium isotope chain will be taken early in 2014. The analysis of the (p,p′) scattering data on both the neodymium and samarium isotope chains will yield insight into the transition from spherical to deformed nuclei and provide information about the dominant damping mechanisms. For nuclei with 88 < N < 92, a detailed study of the IVGDR is of specific interest since this is the nuclear region in which a transition from spherical to permanently deformed nuclei occurs. As such, comparisons between ¹⁴⁸₆₀Nd and ¹⁵⁰₆₂Sm as well as between ¹⁵⁰₆₀Nd and ¹⁵²₆₂Sm, which are isotones in the transitional region, will provide further insight into the nature of the transition region itself and will allow for an investigation into the change in characteristic energy scales in the region where the onset of deformation is seen. Studying the ¹⁵⁰Sm and ¹⁵²Sm isotopes in conjunction with the neodymium isotope chain will also allow for the influence of the proton number, Z, on the fine structure of the IVGDR as a function of nuclear deformation to be studied. It is important to note that because data for the samarium isotope chain will only be obtained in 2014, the preliminary results from the analysis of the data from the neodymium isotope chain will be presented along with a theoretical overview of the comparison between the two chains and existing photo-absorption data.

Apply to be
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Yes

Level for award
 (Hons, MSc,
   PhD)?

PhD

Main supervisor (name and email)
and his / her institution

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Would you like to <br> submit a short paper <br> for the Conference
 Proceedings (Yes / No)?

No

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