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Effects of nuclear deformation on the fine structure of the Isoscalar Giant Quadrupole Resonance of even-even neodymium isotopes using proton inelastic scattering

Fine structure has been observed in the region of the Isoscalar Giant Quadrupole Resonance (ISGOR) in ¹⁴²Nd, ¹⁴⁴Nd, ¹⁴⁶Nd, ¹⁴⁸Nd and ¹⁵⁰Nd target nuclei using high energy-resolution proton inelastic scattering. The 200 MeV proton beams were delivered by the Separated Sector Cyclotron (SSC) and measurements were made using the K600 Magnetic Spectrometer of iThemba Laboratory for Accelerator Based Sciences, a facility which is situated at Faure near Cape Town, South Africa. Nuclei with mass number A \approx 150 and neutron number N \approx 90 are of special interest since they occupy that region of the nuclide chart wherein the onset of permanent prolate deformation occurs. The stable neodymium (Z = 60) isotopes have been chosen in the present study, in order to investigate the effects accompanying the onset of deformation, on the excitation energy spectra in the ISGQR region (9 ≤ E < sub > x < /sub > 15 MeV), since they extend from the semi-magic N = 82 nucleus (< sup > 142 < /sup > Nd) to the permanently deformed N = 90 (¹⁵⁰Nd) nucleus. In order to enhance the ISGQR in the excitation energy spectra measured, a Discrete Wavelet Transform (DWT) background subtraction was carried out. The resonance width extracted shows a systematic broadening of the ISGQR, moving from spherical to highly deformed nuclei as has already been observed for the Isovector Giant Dipole Resonance (IVGDR) excited by γ-capture. Energy scales were extracted for the resonance region using the Continuous Wavelet Transform (CWT) technique. Experimental details, data extraction and analysis techniques, together with preliminary results will be presented.

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