Contribution ID: **13** Type: **not specified**

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 (ISGQR) 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 ≈ 150 and neutron number N ≈ 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_x ≤ 15 MeV), since they extend from the semi-magic N = 82 nucleus (¹⁴²Nd) 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.

Primary author: Mr KUREBA, Chamunorwa Oscar (School of Physics, University of the Witwatersrand, Johannesburg 2050, South Africa)

Co-authors: Prof. RICHTER, Achim (Institut für Kernphysik, Technische Universität Darmstadt, D-64829, Darmstadt, Germany); Mr KRUGMANN, Andreas (Institut für Kernphysik, Technische Universität Darmstadt, D-64829, Darmstadt, Germany); Ms HEILMAN, Anna-maria (Institut für Kernphysik, Technische Universität Darmstadt, D-64829, Darmstadt, Germany); Prof. TAMII, Atsushi (Research Center for Nuclear Physics, Osaka University, Ibaraki, Osaka 560-0047, Japan); Dr STEYN, Deon (iThemba Laboratory for Accelerator Based Sciences, Somerset West 7129, South Africa); Dr FOURIE, Dirk (iThemba Laboratory for Accelerator Based Sciences, Somerset West 7129, South Africa); Prof. SIDERAS-HADDAD, Elias (School of Physics, University of the Witwatersrand, Johannesburg 2050, South Africa); Dr SMIT, Frederick (iThemba Laboratory for Accelerator Based Sciences, Somerset West 7129, South Africa); Prof. COOPER, Gordon R. J (School of Geosciences, University of the Witwatersrand, Johannesburg 2050, South Africa); Dr USMAN, Iyabo (School of Physics, University of the Witwatersrand, Johannesburg 2050, South Africa); Mr SWARTZ, Jacobus (Department of Physics, University of Stellenbosch, Matieland 7602, South Africa); Mr MIRA, Joele (iThemba Laboratory for Accelerator Based Sciences, Somerset West 7129, South Africa, Department of Physics, University of Stellenbosch, Matieland 7602, South Africa); Prof. CARTER, John (School of Physics, University of the Witwatersrand, Johannesburg 2050, South Africa); Dr MABIALA, Justin (Department of Physics, University of Stellenbosch, Matieland 7602, South Africa); Dr CONRADIE, Lowry (iThemba Laboratory for Accelerator Based Sciences, Somerset West 7129, South Africa); Mr JINGO, Maxwell (School of Physics, University of the Witwatersrand, Johannesburg 2050, South Africa); Dr PAPKA, Paul (iThemba Laboratory for Accelerator Based Sciences, Somerset West 7129, South Africa, Department of Physics, University of Stellenbosch, Matieland 7602, South Africa); Prof. VON NEUMANN-COSEL, Peter (Institut für Kernphysik, Technische Universität Darmstadt, D-64829, Darmstadt, Germany); Dr NEVELING, Retief (iThemba Laboratory for Accelerator Based Sciences, Somerset West 7129, South Africa); Dr NEWMAN, Richard (Department of Physics, University of Stellenbosch, Matieland 7602, South Africa); Prof. FEARICK, Rodger (Physics Department, University of Cape Town, Rondebosch 7700, South Africa); Mr MURRAY, Sean (iThemba Laboratory for Accelerator Based Sciences, Somerset West 7129, South Africa); Dr FÖRTSCH, Siegfried (iThemba Laboratory for Accelerator Based Sciences, Somerset West 7129, South Africa); Dr BUTHELEZI, Zinhle. B (iThemba Laboratory for Accelerator Based Sciences, Somerset West 7129, South Africa)

Presenter: Mr KUREBA, Chamunorwa Oscar (School of Physics, University of the Witwatersrand, Johannesburg 2050, South Africa)