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Investigating the Evolution of the Pygmy Dipole Resonance with deformation in Samarium isotopes

Investigating the low-lying electric dipole *(E1)* response referred to as the Pygmy Dipole Resonance (PDR) has garnered a lot of attention in recent years, with both experimental and theoretical studies dedicated to this topic. Within the hydrodynamic model, the PDR has been interpreted as an oscillation of excess neutrons against a proton-neutron saturated core [1,2]. The PDR is of particular interest due to the link between its strength and the neutron skin thickness associated with the density dependence of the symmetry energy at saturation, which has implications for the way in which we can constrain the nuclear equation of state.

The role that deformation plays on the PDR is yet to be established. In a preliminary 154Sm(p,p') study performed at RCNP, evidence for a splitting in the PDR response similar to that of the Giant Dipole Resonance with deformation was observed [3]. A tentative interpretation suggested that this splitting could be connected to the splitting of the resonance structure with respect to the K quantum number.

Since the PDR has a mixed isospin nature, it can be investigated using both isoscalar and isovector probes. An investigation using liquid drop model calculations to compare the ratio between the transition probability of K=0 and K=1 contributions for the isovector and isoscalar components of the PDR respectively showed that the isoscalar part varies more dramatically with deformation [4].

As such, an investigation using the (α,α'γ) inelastic scattering reaction at 120 MeV on the deformed 154Sm nucleus was performed at the iThemba LABS in Faure, making use of the K600 magnetic spectrometer in 0° mode in co-incidence for the first time with BaGeL (Ball of Germanium and LaBr detectors). In this talk, we will present recent results of this study.

References

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Primary authors: Ms JIVAN, Harshna (University of the Witwatersrand and iThemba LABS); PELLEGRI, Luna (University of the Witwatersrand and iThemba LABS)

Co-authors: ADSLEY, P. (Stellenbosch University and iThemba LABS); BRUMMER, W. (Stellenbosch University and iThemba LABS); CARTER, J. (University of the Witwatersrand); GORGEN, A. (University of Oslo); JONES, P. (iThemba LABS); LI, K.C.W. (Stellenbosch University and iThemba LABS); MARIN-LAMBARRI, D.J. (University of the Western Cape and iThemba LABS); MIHAI, C. (IFIN-HH, Romania); MOLEMA, P.T. (University of the Witwatersrand and iThemba LABS); NEGRET, A. (IFIN-HH, Romania); NEVELLING, R. (iThemba LABS); PAPKA, P. (Stellenbosch University and iThemba LABS); PESUDO, V. (University of the Western Cape and iThemba LABS); SIDERAS-HADDAD, E (University of the Witwatersrand); SMIT, F.D. (iThemba LABS); STEYN, G.F. (iThemba LABS); SIEM, S. (University of Oslo); TRIAMBAK, S. (University of the Western Cape); USMAN, I. (University of the Witwatersrand); VON NEUMAN-COSEL, P. (Institut fuer Kernphysik, Technische Universitaet Darmstadt); WIEDEKING, M. (iThemba LABS)

Presenter: Ms JIVAN, Harshna (University of the Witwatersrand and iThemba LABS)

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