Study of the K quantum number of pygmy states in ^{154}Sm

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Abstract

This study aims to understand the Pygmy Dipole Resonance (PDR) in the deformed ^{154}Sm nucleus. Despite previous efforts, the interpretation of the behavior and nature of this low-energy resonance remains unclear with respect to the effects of neutron excess and deformation in nuclei. This further limits the predictive power of exotic nuclei properties. The current study uses the (γ, γ') technique to explore dipole states from 3.5 MeV to the neutron separation threshold (8 MeV). The experiment was performed with the improved γ^3 setup available at the HIγS facility of the Triangle Universities Nuclear Laboratory. The setup allows for measurements by the asymmetry method of the character of the populated transitions in order to distinguish between the contribution of 1^- and 1^+ states which in particular is important in the study of a deformed nucleus. The high beam resolution mode ($< 2\%$) available at HIγS allows for the measurement of the decay branching ratio to the first 2^+ state. This will help to identify the K quantum number of different excited states and the PDR as a function of excitation energy. The motivation for the study along with experimental details will be provided. The initial data analysis will be discussed and an overview of future comparisons will be given.