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## The study of the Pygmy Dipole Resonance at iThemba LABS

The Pygmy Dipole Resonance (PDR), the low energy part of the electric dipole response in nuclei, is particularly relevant to investigate the nuclear structure and for its connections with photodisintegration reaction rates in astrophysical scenarios. Studies on the PDR are currently almost exclusively focused on spherical nuclei. For deformed nuclei, several theoretical and experimental works have been performed to investigate the response of the Giant Dipole Resonance (GDR) while there are only a few on the PDR.

iThemba LABS, South Africa, is a suitable laboratory for the experimental study of the PDR. The use of the high-energy resolution magnetic spectrometer and an array of  $\gamma$ -ray detectors is a perfect combination to investigate the nature of the PDR. In particular, since very few measurements on the PDR have been performed in deformed nuclei up to now, a research activity was started in 2015 to provide such information. A support was developed to couple the  $\gamma$ -ray detectors (BaGeL – Ball of Germanium and LaBr detectors) with the K600 magnetic spectrometer. The structure was completed in October 2016 and the first K600+BaGeL experiment was performed to study the electric response of  $^{154}\text{Sm}$  via inelastic scattering of  $\alpha$  particles. The results of this experiment together with those performed using other reaction probes will provide new insights into the role of the deformation in the excitation of the PDR.

A project to increase the  $\gamma$ -ray detection efficiency of the iThemba LABS setup was recently funded by the South African National Research Foundation (NRF). This project consists in the extension of the  $\gamma$ -ray detector array AFRODITE, up to 17 HPGe clover detectors, and in the construction of the African LaBr<sub>3</sub>:Ce Array (ALBA), an array of 23 large volume LaBr<sub>3</sub>:Ce. These arrays can be coupled to the K600 spectrometer and silicon arrays for  $\gamma$ -particle coincidence measurements allowing for a new generation of experiments with a much-increased efficiency for detecting  $\gamma$  decay compared to arrays currently available worldwide.

An overview on the PDR in spherical and deformed nuclei will be given in connection with the recent results and future possibility for these studies at iThemba LABS.

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