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The PANDORA Project: Investigating Photonuclear Reactions in Light Nuclei.

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The PANDORA (Photo-Absorption of Nuclei and Decay Observation for Reactions in Astrophysics) project focuses on the experimental and theoretical analysis of photo-nuclear reactions involving light nuclei with a mass below $A = 60$. This is of particular importance in the scope of ultra-high-energy cosmic ray research where the main mode of energy attenuation as it travels through the cosmos is determined by the electromagnetic interaction of the nucleus with the cosmic microwave background through the isovector giant dipole resonance. Currently, propagation calculations and reaction models are plagued by a shortage of reliable experimental data sets for important nuclei. By utilizing virtual photon experiments conducted at iThemba LABS (South Africa) and RCNP (Japan), as well as real photon experiments carried out at ELI-NP (Romania), it becomes feasible to extract crucial information such as the isovector giant dipole resonance (IVGDR) E1 strength and the branching ratios for particle decay for light nuclei.

This study will focus on the virtual photon absorption method employed at iThemba LABS and RCNP using high energy inelastic proton scattering at 0° scattering angle using a magnetic spectrometer, combined with silicon particle coincidence and LaBr₃ gamma coincidence measurements. An initial extraction of the photoabsorption cross section of a dataset of Mg^{24} will be shown along with preliminary results from a recent experiment at RCNP.

Attendance Type

In-person

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