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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 explores photo-nuclear reactions in light nuclei ($A < 60$) through both experimental and theoretical studies. This research is particularly relevant to ultra-high-energy cosmic rays (UHECRs), where energy and mass loss primarily occur via electromagnetic interactions between nuclei and the cosmic microwave background, driven by the isovector giant dipole resonance (IVGDR) and it also has profound significance for nuclear physics for reaction calculations, theoretical models and nuclear data benchmarks. A key limitation in current UHECR propagation models is the scarcity of reliable experimental data for critical nuclei. To address this, PANDORA will utilize virtual photon experiments at iThemba LABS and RCNP, as well as real photon experiments at ELI-NP, to extract essential nuclear parameters, including IVGDR cross-sections, E1 strength distributions, and branching ratios for particle decay. The project's first experiment was conducted at RCNP in late 2023, focusing on photo-absorption and charged particle decay in ^{12}C and ^{13}C. This study utilized the Grand Raiden spectrometer, SAKRA (a backward-angle silicon detector array), and SCYLLA (a $LaBr_3$ detector array). This presentation will discuss the analysis of these measurements and their implications for UHECR propagation, particularly in refining loss length calculations.

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