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Development of the COREA detector system for the measurement of the $^{12}\text{C}(\alpha, \gamma)^{16}\text{O}$ reactions

There is still a significant lack of experimental data on the alpha-capture process starting from ^4He near the Gamow window, prompting numerous attempts worldwide to address this gap. Among them, we are conducting the COREA (Carbon Oxygen Reaction Experiment with Active-target TPC) experiment to measure the cross-section of the $^{12}\text{C}(\alpha, \gamma)^{16}\text{O}$ reaction using an low pressure active-target TPC, a $\text{LaBr}_3(\text{Ce})$ detector array, and a 3-T superconducting magnet. The TPC features an active volume of $10 \times 10 \text{ cm}^2$ with readout using $3 \times 3 \text{ mm}^2$ square pads, gate operation and amplification via GEM layers. The gamma-ray detector array consists of 16 cylindrical $\text{LaBr}_3(\text{Ce})$ detectors, each with a 50 mm diameter and a 75 mm long crystal, connected to SiPM. The detector system has been tested with radioactive sources and ion beams from the KIST tandem accelerator facility in Korea. This presentation will cover the current status of the COREA experiment and the performance of the detector system.

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