Development and Performance of a Si-CsI-GAGG detector Array for Coincidence Measurements

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Rare Isotope (RI) beams provide a unique opportunity to investigate nuclear structure and reaction dynamics of exotic nuclei far from the β-stability line. Worldwide, many RI-beam facilities have been constructed to conduct such studies, and in Korea, the RAON (Rare isotope Accelerator complex for ON-line experiments) facility, initiated in 2011, recently began providing domestic beam time for nuclear physics experiments. To enable efficient measurements under low-intensity RI-beam conditions, we are developing a compact detector array, referred to as SCIGA (Si-CsI-GAGG detector Array), composed of silicon detectors and CsI and GAGG scintillator detectors.

The Si-CsI telescopes are used for charged-particle detection, and the GAGG array is employed for γ-ray measurement in coincidence with charged particles. The detector system provides a large solid-angle coverage, which compensates for the low intensity of RI beams and allows efficient detection of widely distributed reaction products in inverse-kinematics experiments. Coincidence measurements of charged particles and γ rays enable the identification of excited states in nuclei with high level densities. In particular, the fast scintillation rise time of GAGG scintillators provides an important advantage for coincidence measurements, while their non-hygroscopic nature allows flexible placement inside a vacuum chamber together with other detector systems.

In the presentation, we will introduce the current status of the SCIGA and the performance of the CsI and GAGG scintillators. In addition, recent commissioning results obtained using RI beams at the RAON facility will be discussed.