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Performance evaluation of GAGG/LFS scintillator+MPPC array readout with ASIC

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In the soft gamma ray region (100 keV-10 MeV), Compton scattering is the dominant physical process, and It is an unexplored region where observation has not progressed because the background is rather high compared to the signal from celestial sources. In this region, the direction and energy of incident gamma rays can be determined by using Compton camera technique where photons are Compton scattered by a scatterer and then fully absorbed by an absorber. Recently, semiconductor detectors with excellent energy and position resolution are used in the Compton camera, but when observing higher energy than 1 MeV, it is required to develop an array-type detector in which scintillators with excellent gamma ray stopping power are assembled in the form of pixels as an absorber. So we constructed a gamma ray detector by combining two types of scintillator array detectors with an MPPC array, and evaluated the performance by reading out the signals from the MPPC with a low-power integrated circuit (ASIC) manufactured by IDEAS in Norway. One of the two types of scintillators is a GAGG ($\text{Ga}_3\text{Al}_2\text{Gd}_3\text{O}_{12}$) scintillator, and the other is an LFS scintillator. The scintillator array is 2.5 cm x 2.5 cm in size and is coated with BaSO_4 -based white paint as a reflector except for the side optically coupled to the MPPC. The energy resolution of the GAGG array was about 7% at 662 keV at room temperature. This is almost equivalent to the typical energy resolution. In this presentation, we report on the performance evaluation of GAGG and LFS scintillator array.

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