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The Characteristic of Neutron Spectroscopy with Silicon-based Photo-sensors

Most detection systems for radiation detection are basically made up of scintillator and photo-sensor, and the most popular instrument for collecting a light from a scintillator in the field of the nuclear experiments is PMT(Photomultiplier Tube). However, silicon-based photo-sensors as like Photodiode and APD(Avalanche photodiode) have been developed so as to replace it. One of promising replacements in a spectroscopy is SiPM(Silicon photomultiplier). For measurements of the characteristics of neutron spectrometer, a scintillator for the neutron detection was chosen among commercially available scintillators.

In this study, a Stilbene and a BC501A are selected as neutron detecting material because they have a good performance of pulse-shape discrimination under PMT-based measurements.

The performance of decay time is measured against neutrons using SiPM. Not only we tested the performance of pulse-shape discrimination of the neutron and gamma-ray with SiPM using a ^{252}Cf neutron source at a room temperature, but also we measured the characteristics of it at sub-zero temperatures. Gain, decay time and pulse shape discrimination of SiPM are compared with that of PMTs or APDs. This study is supported by Ministry of Knowledge Economy through KEIT(10030104).

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