

Characterization of Cs₂LiLaBr₆:Ce (CLLB) Scintillator with Silicon Photomultiplier Arrays

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A Cs₂LiLaBr₆:Ce (CLLB) crystal has been characterised in terms of gamma energy resolution and neutron /gamma pulse shape discriminating (PSD) abilities, across the temperature range -20°C to 50°C. Performance was assessed through measurements taken with the crystal close coupled to a variety of SiPM devices and array configurations. One of these devices is a new Silicon Photomultiplier developed by Kromek. The SiPM devices have two outputs; a standard output that utilizes the full amplification potential of the device, ideal for making energy resolution measurements; a second output has low capacitance to provide a fast response signal, comparable to a PMT and is ideal for performing PSD. The PSD investigation examined two variants of the Charge Integration method; a 'prompt integration' method, that includes more of the prompt scintillation signal in the calculation; and a 'delayed integration' method, whose results are more dependent on the late portion of the scintillation signal. The measurements made with the Kromek-developed SiPM array yield a comparable energy resolution to that achieved with a super-bialkali PMT at 662 keV. The obtained figure-of-merit values as a function of temperature are presented, demonstrating the ability of the detector system to perform PSD.

Has accepted

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