

Neutron detection using Li-loaded scintillators coupled to a custom-designed silicon photomultiplier array

Tuesday 19 September 2017 10:12 (1 minute)

Scintillators that are capable of detecting both neutron and gamma-ray have received much attention in recent years. Of particular interest is the use of silicon photomultipliers (SiPMs) as the photosensor for such scintillators in low-power and compact-geometry applications. Three types of Li-loaded scintillators, CLYC, CLLB, and NaIL, have been tested with a custom-designed SiPM array for temperatures between -20 and 50 degrees C. The array consists of four 6x6 mm² SiPMs arranged in a 2x2 configuration. Pulse-shape discrimination is used for neutron and gamma identification. Because the pulse shape changes with temperature, the quality of neutron-gamma identification varies with temperature. Furthermore, the larger dark current in SiPMs at high temperatures results in poorer energy resolution and neutron-gamma separation. Comparisons of the energy resolution and the neutron-gamma pulse-shape discrimination for the three scintillators coupled the SiPM array will be discussed.

Has accepted

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Session Classification: Poster Session 1

Track Classification: P1_applications