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Optimization of PSD technique on charge integration ratio to improve neutron/gamma discrimination for EJ-276 plastic scintillation detector

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Charge integration ratio (Qratio), method in the Pulse Shape Discrimination (PSD) technique has been widely used to discriminate between fast neutron and gamma in organic scintillation detectors. Here Qratio is defined as the ratio of tail integration to total integration of digitized pulses. In this method, tail integration window is depends much on the decay components in fluorescence of organic scintillation material and PMT time response.

In this work, we carry out optimizing the tail integration window, based on decay components of organic scintillation material and PMT time response to improve the Figure of Merit (FOM), a quantity characterizing for neutron/gamma separation. We study for an EJ-276 plastic scintillator of (14x40x14)mm³, a commercial product of ELJEN technology, which is known for its good performance of separating gamma and fast neutron signals on the basis of their timing characteristics. PMT pulse shape recorded by a DRS-4 digitizer with sampling rate of 2 GSPS is employed. We conduct an experiment on Cf-252 radioisotope source which emits fast neutron and gamma. A comparison of charge integration ratio is carried out in energy thresholds from 100keVee to 1000keVee to evaluate the neutron/gamma discrimination.

Minioral

Yes

IEEE Member

Yes

Are you a student?

No

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