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Performance evaluation of an EJ-276 plastic scintillator using 252Cf neutron source/252Cf 中性子線源を用いた EJ-276 プラスチックシンチレータの性能評価

Thursday, 16 November 2023 15:00 (2 hours)

Fast neutron measurements are indispensable technique in the field of experimental nuclear physics and nuclear data measurement. In order to discriminate gamma rays generated by the production of fast neutrons, it is necessary to use a detector capable of discriminating between gamma rays and fast neutrons. As a typical detector for fast neutrons, organic liquid scintillators are widely used. Although liquid scintillators are used in metal containers, there is a problem that the volume decreases over time. Furthermore, import and export procedures are complicated because they are toxic and flammable liquids. On the other hand, plastic scintillators are convenient due to their physical hardness, non-toxicity, and lower flammability. One of the latest pulse-shape discriminating plastic scintillators is EJ-276, but there are few measurements of detector characteristics. This study aims to evaluate the capability to discriminate between neutrons and gamma rays and derive the neutron response function.
In the experiment, the time of flight of neutrons from ^{252}Cf neutron sources was measured. A Φ5 inch x 2 inch EJ-276 coupled to a photomultiplier tube (PMT) Hamamatsu photonics R1250 and two Φ2 inch x 2 inch EJ-301s coupled to a PMT Hamamatsu photonics R7724 were used. Signals from the PMTs were fed to a digitizer, CAEN-V1730SB, to convert the analog waveforms into digital data. The discrimination capability of EJ-276 and EJ-301 was compared. The response functions obtained from the experimental data were compared with PHITS SCINFUL calculations [1]. The comparison results will be reported in the presentation.

References

[1] D. Satoh, T. Sato, "Improvements in the particle and heavy-ion transport code system (PHITS) for simulating neutron-response functions and detection efficiencies of a liquid organic scintillator"J. Nucl. Sci. Technol. 59(8), (2022), pp. 1047-1060

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