

Development of low-energy event selection method for the NEON experiment

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NEON (Neutrino Elastic-scattering Observation with NaI) aims an observation of the coherent elastic neutrino-nucleus scattering (CEvNS) using reactor anti-electron neutrino with NaI(Tl) crystal detectors at Hanbit nuclear power plant in Yeonggwang, South Korea. For the observation of the CEvNS with the NEON detector, we need to achieve 0.2 keV energy corresponding to five photoelectrons threshold. Due to plenty of noise events induced by photomultipliers, we developed a multivariable event selection technique using the boosted decision tree (BDT) aiming to discriminate the scintillation events from the PMT-induced noise events. For training of the signal-like scintillation events, the waveform simulation was developed and tuned with the measured single photoelectron shape, NaI(Tl) scintillation decay time, and pedestal fluctuation. The same trigger condition and digitization were applied to the simulated waveforms stored in the same format as the NEON physics data. In this presentation, I will discuss the development of the waveform simulation of the NaI(Tl) crystal detectors and the progress of the event selection using the BDT with the simulated waveform of the scintillation events.

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