

Pulse shape discrimination in the LUX-ZEPLIN experiment

The LUX-ZEPLIN (LZ) experiment, located at Sanford Underground Research Facility, is optimized to search for weakly interacting massive particles (WIMPs), one of the leading candidates for dark matter. WIMPs interactions in the detector produce nuclear-recoil (NR) events which are discriminated from electron-recoil (ER) background events using the ratio of collected charge to scintillation light which is different for NR and ER events. Pulse shape discrimination (PSD) provides an additional tool to distinguish NR events from ER events. To characterize the scintillation pulse shape, an analysis framework was developed to reconstruct the arrival times of individual scintillation photons. Using CH3T and DD neutron calibration data, the PSD parameters were optimized and the discrimination power of PSD was determined. The measured discrimination power of PSD was compared with predictions made with the Noble Element Simulation Technique (NEST).

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