Reconstructing the Topology of Neutrinoless Double-Beta Decay Events Using Fast Timing

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Abstract

Experiments searching for neutrinoless double-beta decay ($0\nu\beta\beta$-decay) are required to have an increasingly large active detector mass. A kiloton-scale liquid-scintillator detector deep underground is an attractive option due to scalability and good energy resolution. In such a detector, neutrino interactions due to ^{8}B decays in the sun become the dominant background, which is usually considered as irreducible because of an overlap in deposited energy with the $0\nu\beta\beta$-decay signal. I will show that in a large liquid scintillator detector surrounded by fast photo-detectors, such as the Large-Area Picosecond Photo-Detectors (LAPPD™), it may be possible to reconstruct the event topology and separate the two-track $0\nu\beta\beta$-decay signal from the one-track ^{8}B background events. I will also discuss recent advances in the development of the LAPPD™.