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Neutron beam test with a scintillator tracker for long-baseline neutrino experiments

The long-baseline neutrino oscillation experiments rely on detailed models of neutrino interactions on nuclei. These models constitute an important source of systematic uncertainty, driven in part because detectors to date have been blind to final state neutrons. We are proposing a three-dimensional projection scintillator tracker as a near detector component in the next generation long-baseline neutrino experiments such as T2K upgrade and DUNE.

Such a detector consists of a large number of scintillator cubes with three orthogonal optical fibers crossing through each cube. Due to the good timing resolution and fine granularity, this technology is capable of measuring neutrons in neutrino interactions on an event-by-event basis and will provide valuable data for refining neutrino interaction models and ways to reconstruct neutrino energy. Two prototypes have been exposed to the neutron beamline in Los Alamos National Lab (LANL) in both 2019 and 2020 with neutron energy ranging from 0 to 800 MeV. These beam tests, aimed at characterizing our detectors response to neutrons, is a critical step in demonstrating the potential of this technology. In this presentation, the LANL beam test setup will be described and preliminary analysis results will be shown.

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