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Total Neutron cross section measurement with a 3D projection scintillator tracker for long-baseline neutrino experiments

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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. 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. In order to demonstrate the capability of the neutron detection, a total neutron-scintillator cross section is measured with one of the prototypes and compared to external measurements. In this presentation, the details of the cross section measurement and the systematic uncertainty handling will be presented.

Working group

WG2

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