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Expanding the Neutron Program for DUNE

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The Deep Underground Neutrino Experiment (DUNE) is a long-baseline, neutrino oscillation experiment designed to measure Charge Parity Violation in the neutrino sector using liquid argon as the primary detector medium. DUNE's main physics program is centered around measuring the flavor profile of beams in neutrino and anti-neutrino modes, as a function of energy, both at the near and the far detector, and will rely on accurate event reconstruction to do so. Understanding the detector response to neutrons will be critical for performing neutrino oscillation analyses in DUNE because they can elude detection resulting in missing energy. In addition to the primary neutrons produced in neutrino interactions, subsequent interactions of any charged hadrons produced can result in secondary neutrons. ProtoDUNE Single-Phase sits in a testbeam and is a 770-ton prototype of the DUNE far detector designed to validate technology and measure charged hadron cross sections at the relevant energies for DUNE; therefore, it is ideal for studying the secondary neutron component.

This talk presents the status of a neutron analysis using ProtoDUNE 1GeV/c pion data and prospects for two dedicated neutron-Argon total and capture cross section measurement experiments, namely, ARTIE-II at Los Alamos National Lab with sensitivity between 20-200 keV and the MArEx initiative at CERN aimed at measuring neutron cross sections up to a few tens of MeV.

Poster prize

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