

Neutron Physics in the DUNE-ND 2x2 Demonstrator

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The Deep Underground Neutrino Experiment (DUNE) is a cutting-edge long-baseline experiment under construction in the United States. DUNE will use a far detector (FD) and a near detector (ND) to sample a high-intensity neutrino beam produced at Fermilab. This experiment aims to conduct precise studies of neutrino oscillations, establish the ordering of neutrino masses, and investigate potential CP symmetry violation in the lepton sector. To achieve its goals, DUNE will require precise reconstruction of the neutrino energy. In this context, neutrons produced in neutrino-argon interactions become a major challenge since neutron-induced activity is difficult to identify for reconstruction algorithms. In this talk, I will introduce the efforts to perform neutron identification using neutron-induced protons in the 2x2 Demonstrator. The 2x2 is a prototype of the liquid argon detector of the DUNE ND which features a modular design and novel charge and light detectors. This analysis leverages the modular design of the 2x2 using a deep learning-based reconstruction to identify neutron activity. Furthermore, I will present the prospects of identifying neutrons via low-energy photon activity and neutron capture on argon and using them as a calibration source for the 2x2.

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