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Electron Diffusion in the ProtoDUNE-SP LArTPC

The Deep Underground Neutrino Experiment (DUNE) is a neutrino oscillation experiment which will utilize Liquid Argon Time Projection Chamber (LArTPC) technology to perform a wide array of neutrino physics, astrophysical phenomena, proton decay, and BSM studies. The accurate and precise detection and reconstruction of electrons are essential to achieve these goals. One important systematic uncertainty associated with electron detection comes from the effects of electron diffusion. This uncertainty is quantified by longitudinal and transverse diffusion constants. Though previous experiments have measured the longitudinal electron diffusion constant in liquid argon, the first study of electron diffusion in LArTPCs on the scale of the DUNE detectors is currently being performed using data from ProtoDUNE-SP, a 1 kt-scale LArTPC prototype for the DUNE far detectors. The latest constraints on the longitudinal diffusion constant from ProtoDUNE-SP are presented here.

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