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Techniques Developed Calibrating ProtoDUNE-SP Using a Cosmic Ray Tagger

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ProtoDUNE Single-Phase (ProtoDUNE-SP) is a prototype of the first DUNE Far Detector module and was in operation at CERN from 2018-2020. As a liquid argon time projection chamber (TPC), ProtoDUNE-SP needs numerous calibration methods to measure the location of argon ionization and the precise number of electrons ionized. To aid in calibration, an array of scintillator strips covering the front and back TPC faces, known as a Cosmic Ray Tagger (CRT), was installed to externally tag cosmics, a major background for on-the-surface liquid argon TPC detectors. This talk will discuss the techniques ProtoDUNE-SP employs to calibrate the detector using the CRT and how the results of these studies inform the eventual performance of the DUNE Far Detector modules. Specifically, it will describe how ProtoDUNE-SP uniquely utilizes the CRT to measure offsets in the reconstructed track position and to quantify the attenuation of TPC signals due to liquid argon impurities.

Collaboration name

DUNE

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