Contribution ID: **39** Type: **not specified**

Laser calibration system at ProtoDUNE-HD

Wednesday, 16 October 2024 16:52 (1 minute)

The Deep Underground Neutrino Experiment (DUNE) is a full experiment consisting of multiple detectors separated by a near and far site. DUNE will study long-baseline neutrino oscillations, which will provide insight into CP-violation, neutrino mass ordering, and the matter/antimatter asymmetry. Additionally, DUNE will search for nucleon decay and observe neutrinos from supernovae. DUNE relies on liquid argon time projection chambers (LAr TPCs), an excellent technology for tracking particles and reconstructing their interactions with high precision. To achieve its goals, DUNE is supported by the ProtoDUNE experiments at CERN, which serve as large-scale prototypes to validate detector technologies and calibration systems. The precise calibration of the electric field within the detector is vital for accurate 3D reconstruction of particle tracks, particularly in maintaining the consistency of charge measurements along the drift path. This work presents the development and implementation of a laser calibration system designed for ProtoDUNE-II. This poster involved the physical installation and commissioning of the laser system. The commissioning process included extensive testing to ensure alignment and operational efficiency, such as rotating the laser to observe behavior of tracks. The groundwork established during these steps is crucial for future data analysis, aiming to measure the electron lifetime (in the active volume) and map the electric field inside the detector with high precision.

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Session Classification: Poster Session