Contribution ID: **98** Type: **Poster**

Electron Shower Energy Reconstruction for the ProtoDUNE experiment

Tuesday, 18 June 2024 17:30 (2 hours)

The ProtoDUNE experiment is a full engineering prototype of the DUNE far detector, and took test beam data at CERN. ProtoDUNE-SP is the largest Liquid Argon Time Projection Chamber (LArTPC), which contains about 770 tons of liquid argon, with 420 tons in the active volume. The beam of the tertiary particles was designed to cover the expected spectrum of particles from neutrino interactions in the DUNE detectors. A key aspect of understanding these interactions is the accurate energy reconstruction of electron showers. This work focuses on improving the energy reconstruction for electron showers in the ProtoDUNE-SP detector. We apply an electron lifetime correction and a simulation-based evaluation of missing energy to improve our energy measurements. We study the correlation between reconstructed shower energy and beam momentum, as well as the resolution of the beam momentum itself. A relationship between the energy resolution of electron showers and beam momentum was studied. Our ongoing work involves developing the analysis for two ProtoDUNE technologies, i.e. horizontal(ProtoDUNE-HD) and vertical(ProtoDUNE-VD) drifts TPCs. Comparing the performance of energy reconstruction between these two detectors will provide valuable insights. This analysis contributes to improvements in understanding energy reconstruction techniques in the ProtoDUNE experiment, paving the way for more accurate neutrino interaction measurements.

Poster prize

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Session Classification: Poster session and reception 1

Track Classification: Neutrino oscillations