

Precise liquid argon drift electron lifetime measurement and calibration with purity monitors for ProtoDUNE-SP LArTPC

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DUNE is a next-generation long-baseline neutrino oscillation experiment based on liquid argon TPC (LArTPC) technology. A key component of calibration for LArTPC is the drift electron lifetime in LAr, which corrects the charge attenuation caused by drift electrons captured by impurities. A purity monitor is a miniature TPC that measures the drifting electron lifetime. I will discuss new techniques to significantly improve the charge and electron lifetime measurement of purity monitors at DUNE's prototype detector ProtoDUNE-SP at CERN. The improved charge measurement uncertainty reaches below 1%, which is promising to fulfill the requirement of calibration at DUNE. The purity monitor based electron lifetime measurement has unique importance for DUNE's deep-underground far detector calibration, where the cosmic-ray-based calibration is very challenging due to the low cosmic statistics.

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