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Purity monitoring for ProtoDUNE-SP

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The Deep Underground Neutrino Experiment (DUNE) is a next-generation long-baseline neutrino oscillation experiment based on liquid argon TPC (LArTPC) technology. DUNE's single-phase prototype ProtoDUNE-SP at CERN finished its 2-year Phase-1 running in July 2020, which successfully collected test beam data and cosmic ray data. The DUNE collaboration is preparing ProtoDUNE-SP Phase-2 run which is expected to start in late 2022. A key component of calibration for LArTPCs is the lifetime of drift electrons, which corrects the charge attenuation caused by drift electrons being captured by impurities. A purity monitor is a miniature TPC that measures the lifetime of electrons generated from the photocathode via the photoelectric effect. The purity monitoring system in ProtoDUNE-SP Phase-1 continuously monitored liquid argon purity throughout the entire lifetime of ProtoDUNE-SP Phase-1, which was critical to the experiment's successful commissioning, operation, and data taking. I will discuss the design, implementation and results of purity monitors in ProtoDUNE-SP Phase-1, as well as the development of purity monitors for ProtoDUNE-SP Phase-2.

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