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Scintillation light detection in the 6-m drift length ProtoDUNE Dual Phase liquid argon TPC

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The Deep Underground Neutrino Experiment (DUNE) is a leading-edge experiment for long-baseline neutrino oscillation studies, neutrino astrophysics and nucleon decay searches. ProtoDUNE-Dual Phase (DP) is a 6x6x6 m³ liquid argon time-projection-chamber (LArTPC) operated at the CERN Neutrino Platform in 2019-2020 as a prototype of the DUNE Far Detector. In ProtoDUNE-DP, the scintillation and electroluminescence light produced by cosmic muons in the LArTPC is collected by photomultiplier tubes placed up to 7 m away from the ionizing track. In this talk, we will present the performance of the ProtoDUNE-DP photon detection system, comparing different wavelength-shifting techniques and the use of xenon-doped LAr as a promising option for future large LArTPCs. The scintillation light production and propagation processes are analyzed and compared to simulations, improving understanding of the liquid argon properties.

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