

Development and Characterization of the Photon Detection System for DUNE

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DUNE is an international long baseline neutrino experiment and will be the largest of its kind. It will determine the neutrino mass ordering, search for CP violation in the lepton sector, and perform precision tests of the neutrino oscillation paradigm. DUNE will use an intense muon neutrino beam produced, together with a Near Detector located on the Fermilab site and a Far Detector installed 1,300 km away at the Sanford Underground Research Facility.

The DUNE Far Detector will employ liquid argon time projection chamber (LArTPC) technology for charge readout and a Photon Detection System (PDS) based on X-ARAPUCA technology to detect the 128 nm scintillation light produced in liquid argon. PDS is a key component of the DUNE, providing precise timing information and scintillation light measurements for event reconstruction, triggering, and low energy physics. This contribution will present the design and implementation of the X-ARAPUCA PDS for the DUNE Far Detector module. The operating principles, detector characterization, and performance validation will be discussed with respect to the general and physical requirements of DUNE.