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Early Performance and Calibration of the SBND Photon Detection System

The Short-Baseline Near Detector (SBND) is a liquid-argon time-projection chamber (LArTPC) for detecting neutrinos from Fermilab's Booster Neutrino Beam. Located 110 m downstream of the beam target, SBND collects both ionization electrons and scintillation photons from particle interactions within the detector volume. With an active mass of 112 tons, it enables high-precision studies of neutrino-argon interactions. The detector has been collecting data since 2024. The primary photon detection system (PDS) consists of PMTs, which serve as the neutrino interaction trigger source within the LArTPC. The PDS of SBND is expanding with the addition of X-ARAPUCA modules located next to the PMTs and reflective wavelength-shifting panels in front of the PMTs and X-ARAPUCAs. Combined, these components enhance light collection, especially in regions furthest from the PDS, and provide high light yield, more uniform detection efficiency, excellent timing resolution, and scintillation-light-only 3D position reconstruction. This talk will cover the calibrated PMT system, including measurements of the light yield and timing resolution.

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