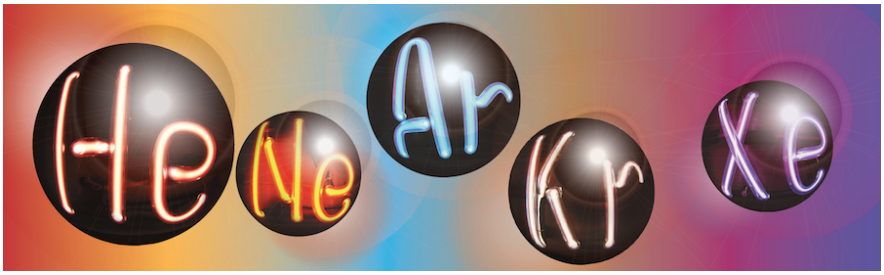

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Data driven Photon Detection Efficiency measurements in DUNE's Near Detector Demonstrators

The Deep Underground Neutrino Experiment (DUNE) Near Detector will be exposed to an extremely intense neutrino flux (over 100 beam-related interactions per spill). To cope with the very high event pile-up, the Near Detector uses a modular array of Liquid Argon time projection chambers (ND-LAr), which incorporates several innovations. Most importantly, a pixelated charge readout system with native 3D reconstruction, a high-coverage Light Readout System (LRS), and a segmented design. The latter is what enables the correct matching between charge and light signals, allowing energy depositions to be properly associated with their interactions.

The LRS employs Wavelength Shifter (WLS) based light traps, which absorb the VUV photons produced by LAr scintillation, shift them into visible wavelengths and guide them to Silicon Photomultipliers (SiPM). The Photon Detection Efficiency (PDE) quantifies how efficiently the light traps convert the absorbed scintillation photons into a detectable SiPM signal. A higher PDE improves the detected light yield, timing reconstruction, charge-light matching and generally improves the LRS performance across all key metrics. Therefore, an accurate determination of the PDE is essential not only for reconstruction, but also for QA/QC and detector performance validation. This contribution outlines a data-driven approach to determine the PDE of the light traps in the 2×2 and Full-Scale Demonstrator (FSD) using muon-track data.

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