Contribution ID: **180** Type: **Poster**

Imaging systems for the liquid Argon target of SAND at the DUNE Near Detector Complex

Thursday, 30 May 2024 08:35 (1 minute)

The Deep Underground Neutrino Experiment (DUNE) has among its primary goals the determination of the neutrino mass ordering and the possible CP-violating phase in the neutrino mixing matrix.
The System for On-Axis Neutrino Detection (SAND) is one of the three components of the DUNE Near Detector complex, permanently located on-axis to monitor the neutrino beam stability and measure its flux. SAND includes a novel liquid Argon detector - GRAIN - designed to image neutrino interactions using scintillation light produced in Ar by charged particles, eliminating the dependence on slow charge collection of LAr TPCs.
Two optical systems are currently being developed for GRAIN, both based on Silicon Multiplier (SiPM) matrices, coupled either to UV cryogenic lenses or Coded Aperture masks.
This contribution will discuss the preliminary design of both GRAIN optical systems, with a particular focus on the Coded Aperture system and its reconstruction algorithm. This algorithm is based on an iterative approach of Maximum Likelihood Expectation Maximization and has been optimized for GPU usage in order to achieve the necessary performance.
A preliminary analysis of the anticipated performance of charged particle tracks reconstruction in GRAIN with the Coded Aperture mask system will be presented, with a comparison with the lens-based system

Collaboration

on behalf of the DUNE collaboration

Role of Submitter

I am the presenter

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Session Classification: Detector Techniques for Cosmology and Astroparticle Physics - Poster session

Track Classification: T1 - Detector Techniques for Cosmology and Astroparticle Physics