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Constraining an Oscillation Analysis using Detector Systematics for the DUNE Liquid Argon Near Detector

Wednesday 9 April 2025 12:15 (15 minutes)

DUNE is a next generation long-baseline neutrino experiment which will make precision measurements of the neutrino oscillation parameters including δ_{CP}, and determine the neutrino mass hierarchy. DUNE will use a megawatt neutrino beam and two detector complexes, Near and Far, located at Fermilab and SURF, respectively. In contrast to the current generation of long baseline neutrino oscillation experiments, DUNE will not be statistically limited and therefore it is paramount to quantify the key sources of detector systematic uncertainty in both detector complexes. This talk will present a workflow representing the procedure DUNE will utilise to identify and parametrise a variety of detector systematics in ND-LAr, one of the near detectors in the Near Detector Complex, arising from acceptance studies, reconstruction, and calibration, using a data driven approach to contribute to the ultimate goal of accurately understanding the nature of neutrinos. The work begins on establishing a new particle gun production workflow, creating new samples that can be used to help identify these physical effects and how the uncertainties in the detector can be quantified.

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