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DUNE-PRISM: An innovative technique for neutrino oscillation analysis

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The Deep Underground Neutrino Experiment (DUNE) is a next generation experiment designed to measure the neutrino and anti-neutrino oscillation probabilities, using a high-intensity neutrino beam (1.2-2.4 MW) produced at Fermilab. With a baseline of 1300 km and large (kton-scale) LArTPC detectors, DUNE will provide an unprecedented precision in measuring the oscillation parameters. Neutrinos interaction cross sections represent the main source of systematics which enters the analysis and limits the sensitivity of measuring the CP violating phase and other oscillation parameters . The Precision Reaction Independent Spectrum Measurement (PRISM) represents an innovative technique for neutrino oscillation analysis, which has the potential to significantly reduce the interaction model dependency. The DUNE Near Detector (ND) complex is designed to move to different positions along the neutrino beam axis, sampling thus several neutrino fluxes with different peak energies as a function of the off-axis position. The PRISM concept linearly combines these off-axis neutrino measurements to produce data-driven predictions of the oscillated neutrino spectrum at the Far Detector (FD). An oscillated FD prediction obtained directly from data has a minimum modeling dependency, any cross section effects being naturally incorporated in the analysis. This poster will give an overview of the PRISM concept and how it is used within DUNE. A case-study showing how PRISM can avoid potential biases resulting from the wrong interaction modeling will also be presented.

Poster prize

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