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Hadron Production in Neutrino Beams Through the Looking-Glass

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At upcoming neutrino oscillation experiments, a precise understanding of the neutrino flux is imperative for oscillation studies with sub-percent precision, even with a near detector. Current uncertainties on the neutrino flux are dominated by hadron production uncertainties, making their precise determination crucial. We propose a novel approach to investigate hadron production using near detectors.

Our approach leverages the angular distributions of mesons with different masses - lighter pions will remain along the beam axis compared to heavier kaons. This property creates a distinct off-axis angle dependence in the resulting neutrino flux which, when measured at multiple off-axis positions, can reveal valuable information about the underlying hadron flux composition.

As a case-study we focus on DUNE-PRISM, the movable near detector complex of DUNE, and demonstrate that this approach can enhance the precision of the standard oscillation parameter measurements.

Mini Symposia (Invited Talks Only)

Plenary (Invited talks only)

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