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Neutrino and Beyond Standard Model Physics Searches at the CERN ProtoDUNE Detectors

Tuesday, September 30, 2025 3:30 PM (20 minutes)

Neutrino beams directed at liquid argon time projection chamber (LArTPC) detectors is a promising means of searching for beyond Standard Model (BSM) physics, such as heavy neutral leptons. The CERN Neutrino Platform hosts two full-scale LArTPC prototypes (the ProtoDUNE detectors) that are proving the technology to be deployed by the Deep Underground Neutrino Experiment (DUNE). Recent studies indicate that these prototypes could also have the potential to detect long-lived BSM particles from one of the targets (T2) in CERN's north area that is exposed to the 400 GeV SPS beam. In addition, the prototypes are expected to observe a substantial flux of neutrinos from the SPS beam, which would be a source of background in any BSM search. Detecting these neutrinos is therefore a key demonstration of the feasibility of any future BSM program. A sample of high-energy neutrino events may also be of broader use to the DUNE collaboration. For example, by testing the performance of reconstruction algorithms on highly energetic neutrino interactions. This talk will highlight the status of our analysis and prospects for establishing a BSM physics program at the CERN Neutrino Platform.

Neutrino Properties

The talk will cover the status of the search and analysis of neutrino interaction within ProtoDUNE, in addition to searches for BSM models such as heavy neutral leptons that are produced by the CERN SPS beam.

Neutrino Telescopes & Multi-messenger

The talk has a focus on prospects for establishing a BSM physics program at the CERN ProtoDUNE detectors. Such BSM physics models may include light dark matter and heavy neutral lepton models.

Neutrino Theory & Cosmology

N/A

Data Science and Detector R&D

One component of this talk will be the potential use of samples of high-energy neutrino interactions at the ProtoDUNE detectors to test LArTPC reconstruction algorithms in preparation for the construction of the DUNE far detectors.

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