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Status and Recent Progress towards the second DUNE Far Detector Module

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The Deep Underground Neutrino Experiment (DUNE) is part of the next generation of neutrino oscillation experiments that seek to definitively answer key questions in the field. It will utilize four 17-kt modules of Liquid Argon Time Projection Chambers (LArTPCs) enabling mm spatial resolutions for unprecedented sensitivity to neutrino oscillation paramters as well as for studies related to proton decay and supernova neutrinos. For this purpose, a newly proposed Vertical Drift (VD) configuration is being planned for the second DUNE module, in contrast to a Horizontal Drift (HD) configuration for the first module. The VD detector involves a suspended cathode dividing the TPC into two drift volumes oriented vertically above and below the cathode and is situated in an electric field of 500 V/cm. Unlike in the HD design where a multi-wire plane readout was employed, the anodes here consist of a grid of double-sided perforated PCBs. As electrons pass through the perforations, charge is induced and collected at parallel strips etched on different layers of the PCBs and oriented in multiple configurations for each layer. As part of prototyping designs for such a detector, a coldbox demonstrator housed in the NP04 platform at CERN is collecting cosmic data. The prototypes will seek to ensure favorable readout conditions as well as test different designs for the PCBs and strip orientations. In parallel, simulation studies are underway for the Far Detector module to assess various performance metrics related to selection and reconstruction efficiency. In this talk, I shall provide an overview of these efforts with a emphasis on the analysis of cosmic data from the coldbox demonstrators and its comparison with the simulation as well as the development of a deep learning-based neutrino flavor tagger in order to maximize sensitivity towards the oscillation measurements and help DUNE achieve its primary physics goals.

In-person participation

No

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