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Performance and physics measurements at protoDUNE-SP

The protoDUNE Single Phase (protoDUNE-SP) TPC is a prototype for the DUNE far detector and it is currently under construction at CERN. It will not only serve as a test-bed for the engineering design and construction techniques but will also provide a set of key measurements for the future DUNE far detector.

The new H4 extension beam-line at CERN will provide electron, muon and hadron beams with energies in the range of sub-GeV to a few GeV. The data collected during the test beams will be analysed to assess the performance of a state-of-the-art LAr TPC. For such detectors the event reconstruction is challenging and test beam data will allow the performance of the different reconstruction algorithms, which also involve machine-learning techniques, to be benchmarked and improved. Furthermore, important physics measurements are foreseen with protoDUNE-SP. For example, the study of pion interactions in argon using test beams is fundamental to understand some of the processes that will be seen as part of the primary neutrino interactions and which would modify the event signature in the DUNE detectors. ProtoDUNE-SP will provide new measurements of the pion-Ar cross-section, for both positive and negative charges, which will make a vital contribution to improve the current, very limited knowledge of such interactions.

Experimental Collaboration

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