

Plan for the ProtoDUNE performance paper

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Two separate “companion papers” (i.e. two consecutive articles on the same journal Issue):

- 1st Article on Detector Design, Construction and basic Performance from Commissioning and Operation (*ie the protoDUNE-SP “Technical Paper”*)
- 2nd Article on more advanced Performance from off-line data reconstruction and analysis of LArTPC on the test beam (*ie the first “Performance of protoDUNE-SP detector...” paper*)
 - From Flavio’s talk at the last collaboration meeting.
 - Gina Rameika will be the editor of the “Technical Paper”.
 - I will be the editor of the “Performance Paper”.
 - This talk discusses the plan for the “Performance Paper”.

Strategy of the performance paper

- The performance paper will have a brief description of detector, beamline and data taking. The details will be in the technical paper.
- The performance paper will focus on the detector performance characterization aspects of both TPC and photon detectors.
- For each topic, we will identify one or a few persons to coordinate the effort and write the corresponding section.
 - Many people have agreed to contribute to the paper.
 - More discussions are needed for the detector summary and photon detector sections.
- People should start writing the details of the analysis methods and results using MCC11 data/MC samples while we continue to validate MCC12. The final results will be based on the MCC12 production.

First results on ProtoDUNE-SP LArTPC performance from a test beam run at the CERN Neutrino Platform

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Milestones

- We will identify people for the remaining sections (recommendations and volunteers are welcome).
- We aim to have the first draft on July 18 using MCC11 results.
- We aim to have the second draft on Aug 18 using MCC12 results.
- If Flavio, George and myself are satisfied with the second draft, we will start the review process as documented in DUNE-doc-1115:
 - WG review
 - ARC (Analysis Review Committee) review
 - Collaboration review

Contents

1 Introduction

2 Detector component

- 2.1 Inner Detector: TPC
 - 2.1.1 Cathode Plane Assembly (CPA)
 - 2.1.2 Field Cage (FC)
 - 2.1.3 Beam Plug (BP)
 - 2.1.4 High-voltage (HV) system and Ground Planes (GP)
 - 2.1.5 Anode Plane Assemblies (APA)
 - 2.1.6 TPC Front-end cold electronics (CE)
- 2.2 Inner Detector: Photon Detection System (PDS)
 - 2.2.1 PhotoCollectors: ARAPUCA Cells, Dip-Coated Bars, Double-shift Bars
 - 2.2.2 PhotoSensors: SiPM and MPPC
 - 2.2.3 PDS read-out electronics
- 2.3 CryoInstrumentation
 - 2.3.1 Purity Monitor
 - 2.3.2 T probes and Vertical T-profiler

3 Detector Assembly

- 3.1 The Neutrino Platform facility at CERN
- 3.2 Membrane Cryostat and FeedThroughs
- 3.3 Cryogenics, Cooling and Purification System
- 3.4 ColdBox tests
- 3.5 Ship-in-a-Bottle Assembly
- 3.6 Detector Grounding and shielding

4 External Trigger detectors

- 4.1 H4-VLE Beam Line, Beam Instrumentation (BI) and Beam Trigger
- 4.2 Muon Tagger (CRT) and Cosmic Trigger

5 Detector Commissioning and data taking

- 5.1 Detector Control System (DCS)
- 5.2 Cooling and LAr Filling
- 5.3 Data Acquisition System (DAQ)
- 5.4 Data Quality Monitor (DQM)
- 5.5 Data processing and Computing
- 5.6 Working conditions and detector stability
- 5.7 HV stability

6 LAr characterization

- 6.1 LAr Purity level (from PurMon) and e-Lifetime monitoring
- 6.2 LAr T gradient (from T vertical probes)

7 TPC characterization

- 7.1 Non-responsive wires/channels
- 7.2 TPC/CE Noise level, Noise sources, Noise Filtering
- 7.3 Cold ADC issues (sticky code) and mitigation
- 7.4 Test Pulse calibration: Channel-to-channel variation (gain) and stability
- 7.5 Signal shape and signal deconvolution
- 7.6 Hit reconstruction
- 7.7 Imaging: event display gallery (2D and 3D)

8 PDS characterization

- 8.1 Non-responsive sensors/channels
- 8.2 Test pulse (flasher): Single PE calibration and stability
- 8.3 PhDetector(s) Efficiency (PE/Ph)

9 Conclusions