

# ProtoDUNE-VD PDS kickoff meeting summary

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# Introduction

- A new group has been formed to coordinate efforts towards successful protoDUNE-VD PDS construction, installation and operation
- We expect to have a functional group by the collaboration meeting in two weeks
- We are currently collecting information and will contact people as needed.
- Aim is to have a clear picture of the current status and identify the critical items ASAP
- Contact e-mails available on previous slide
- We will probably have a dedicated mailing list


# Things to care about

- Design choices and critical down-selects
- Procurement of components
- Exchange of components between different labs
- Assembly of different subsystems
- Shipment to CERN
- Fiber/cable routing, cable trays
- Cryostat ports and flanges
- Simulation, DAQ, Slow control, DQM, offline analysis code preparation
- Coordination with CERN and top-level installation team
- Coordination with cold boxes
- Interfaces with other groups (HV, DSS, CRP, Elec., CALCI, DAQ, TC, ...)

# Meetings

- Biweekly (initially) but will certainly increase frequency at some point

## protoDUNE-VD PDS (kick-off Meeting)

 Friday Aug 26, 2022, 9:00 AM → 10:00 AM US/Central

**9:00 AM** → 9:15 AM **Introduction**

**Speakers:** Anselmo Cervera, Franciole Marinho

 15m

**9:15 AM** → 9:35 AM **Current timeline for R&D, construction and installation.**

**Speaker:** Peter Shanahan (Fermilab)

 20m

**9:35 AM** → 9:50 AM **Simulation and plans for data**

**Speaker:** Franciole Marinho

 15m

**9:50 AM** → 10:00 AM **AOB**

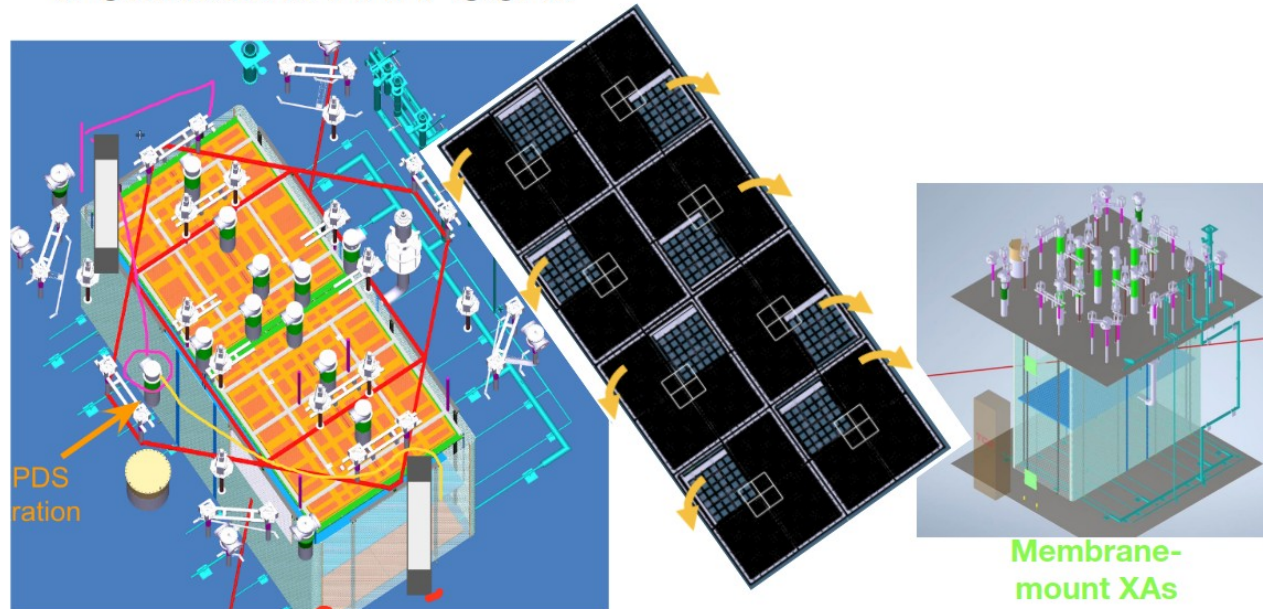
 10m

<https://indico.fnal.gov/event/56016/>

# PDS preparation for ProtoDUNE-VD

*P. Shanahan, F. Cavanna and R. Rivera*

- Module overview
  - R&D work and timeline
  - Fabrication timeline
  - Installation
- 8 Membrane-mount X-ARAPUCAS
    - 1 column of 4 XAs on each end
  - 8 Cathode X-ARAPUCAS



# PDS preparation for ProtoDUNE-VD

*P. Shanahan, F. Cavanna and R. Rivera*

- Warm electronics
  - DAQ integration details
  - Digitizers (simple & DAPHNE) and POF fiber transmitter units
- Cables (anode), fibers (cathode) and flanges
- Response monitoring system
- Ongoing R&D
  - Analog readout
  - SIPMs bias generation and distribution
  - XArapuca mechanical design
  - Cables, fibers and flanges

# PDS preparation for ProtoDUNE-VD

*P. Shanahan, F. Cavanna and R. Rivera*

- Components delivery schedule
- Integration plans
  - Milestones schedule
  - Details in Module-0 integration meetings
  - PDS installation in *early December 2022*
- Part tracking production & delivery of components for Module-0
  - DUNE parts DB expert needed (or interest person)

# ProtoDUNE-VD PDS simulation and analysis

- Ongoing efforts
  - Software for simulation and data analysis
  - Aim: LArSoft full chain implementation
- Tests, coldboxes and previous pDUNE-SP&DP data results to validate pDUNE-VD simulation
- Identify needs to organize effort:
  - Analysis software tools, simulation, measurements of interest,...

- Geometry description in LArSoft
- Light production and propagation description
- Digitization and reconstruction

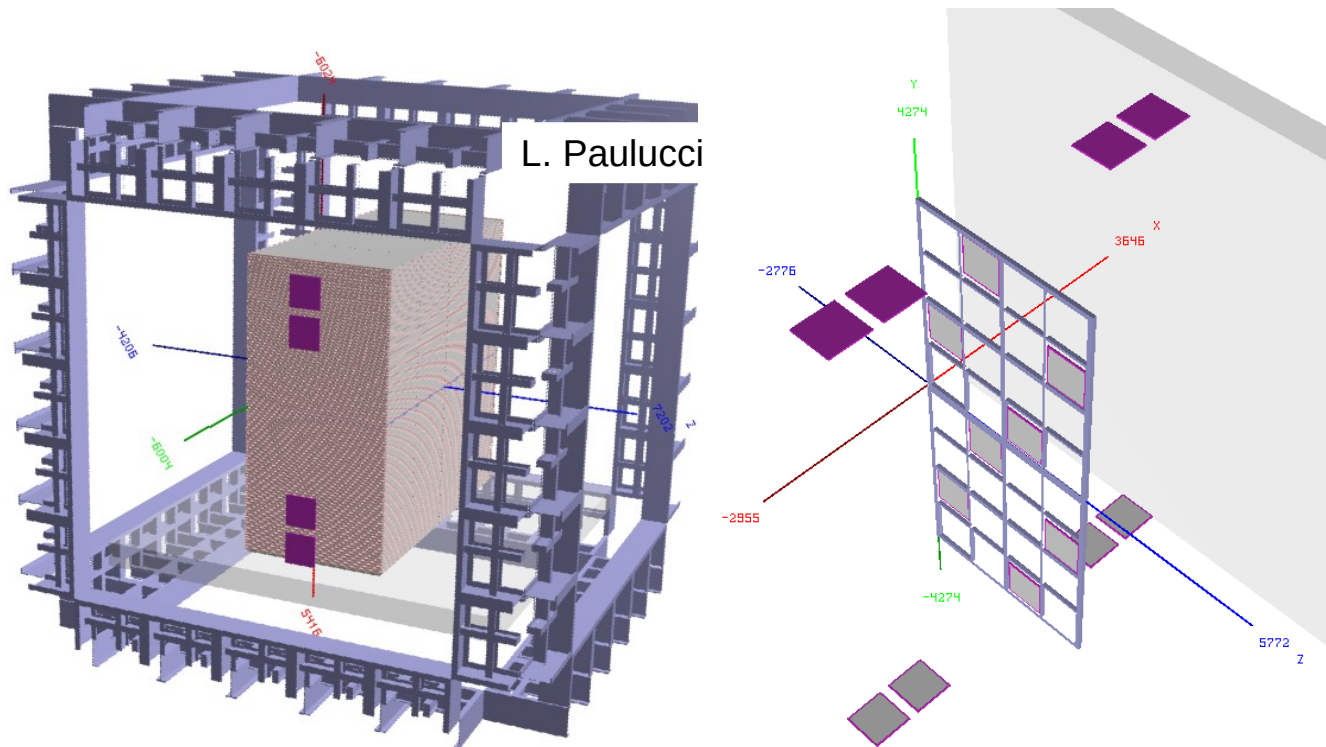
- Validation
  - Strong development on the X-Arapuca ongoing
    - Optical components, Si sensors, electronics
    - Tiles efficiency, signal characteristics
  - Geometry and optical properties for protoDUNE materials
    - Cage field, grid, cathode, anode, LAr, etc.
    - Reflectivity, transmission, refractive index, Rayleigh, absorption length.



# ProtoDUNE-VD PDS simulation and analysis

- Initial geometry adapted from the ProtoDUNE-DP geometry
- Includes PDS and field cage
- Under evaluation by PD-VD software coordination
- Drift in the X direction as in FD2-VD geo due to reconstruction issues

Fast optical simulation



# ProtoDune-VD PD performance

- Calibration and monitoring
  - Multiple PEs plot, charge and max amplitude
  - Gain vs applied bias voltage, SNR, calibration factor
  - Crosstalk & afterpulses
  - Time resolution
  - Response stability overtime
- Cosmics
  - Signal characteristics:
  - Baseline, noise
  - SPE: amplitude, rise, fall, etc
  - Sensor efficiency (track, MC light estimate)
  - Time resolution (distance, track)
- Beam
  - Beam characteristics, particle types
  - Sensor efficiency (MC light estimate)
  - Time resolution (distance, track)
  - Energy related measurements?

# Tentative tasks list

- Software development
  - Simulation implementation & studies
    - Geometry, optical properties, primary gen.
    - Light production and propagation
    - Full X-Arapuca tiles response
  - Calibration, monitoring, reconstruction tools
- Activities
  - Establish schedule for main items
  - People/groups involvement

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