

# DUNE Project Status

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DUNE PMG Meeting

21 November 2017

# Outline

- ES&H Update
- QA Update
- Schedule & Budget Status
- PM Update
- DUNE Update
  - FD Installation & Integration
  - FD TPC Electronics
  - FD APA
- ProtoDUNE-SP Report
  - Design & Construction – reports by subsystem
  - Onsite - installation & instrumentation
- ProtoDUNE-DP Report
- Upcoming Events

# ES&H Update

- Support meetings & discussions relating to installation activities for ProtoDUNE detector at CERN
- Production Readiness Review at Daresbury Laboratory Nov 6-7
  - Reviewed the ES&H requirements and processes for APA construction
    - Work planning & risk assessment documentation was in place and reviewed by the Daresbury SHE Group
  - Walkthrough of the construction and winder areas
    - Housekeeping & site organization excellent
    - Technicians had a good understand of the ES&H requirements
- Meetings & walkthrough of ProtoDUNE at CERN Nov 8-9
  - Met with CERN HSE representatives at EHN1
  - Walkthrough of the clean room & cryostats
  - Met with installation, cryogenic, mechanical & electrical representatives

# ProtoDUNE Quality Assurance Update

- Updated the Quality Assurance Requirements in the 4<sup>th</sup> Quarter Statement of Work for the University of Wisconsin Madison (PSL)
- Issued for comment a revision to the LBNF/DUNE Quality Assurance Plan which will incorporate responsibilities of the Consortia Leaders and the Technical Director for Quality Assurance
- Visited CERN EHN1, witnessed assembly of the CPA, observed the leak testing of the cryostat welds in the Dual Phase detector, met with various personnel to discuss quality issues
- Production Readiness Reviews
  - Performed a follow up on the status of production and recommendations from the Production Readiness Review of the Fermilab Photon Detector WLS Bars
  - Performed a Production Readiness Review at Daresbury Lab for the APAs being fabricated in the UK

# DUNE Milestones

Oct 2017    Sept 2017  
P6 Update    P6 Update    Variance    Comments

## Completed In October

### DUNE

T4 MS - ProtoDUNE SP 35ton HV Test (Phase 2) Complete	10/30/2017	10/20/2017	(10)	start of run delayed due to cryo operation approvals

## Planned for Completion November - January

### DUNE

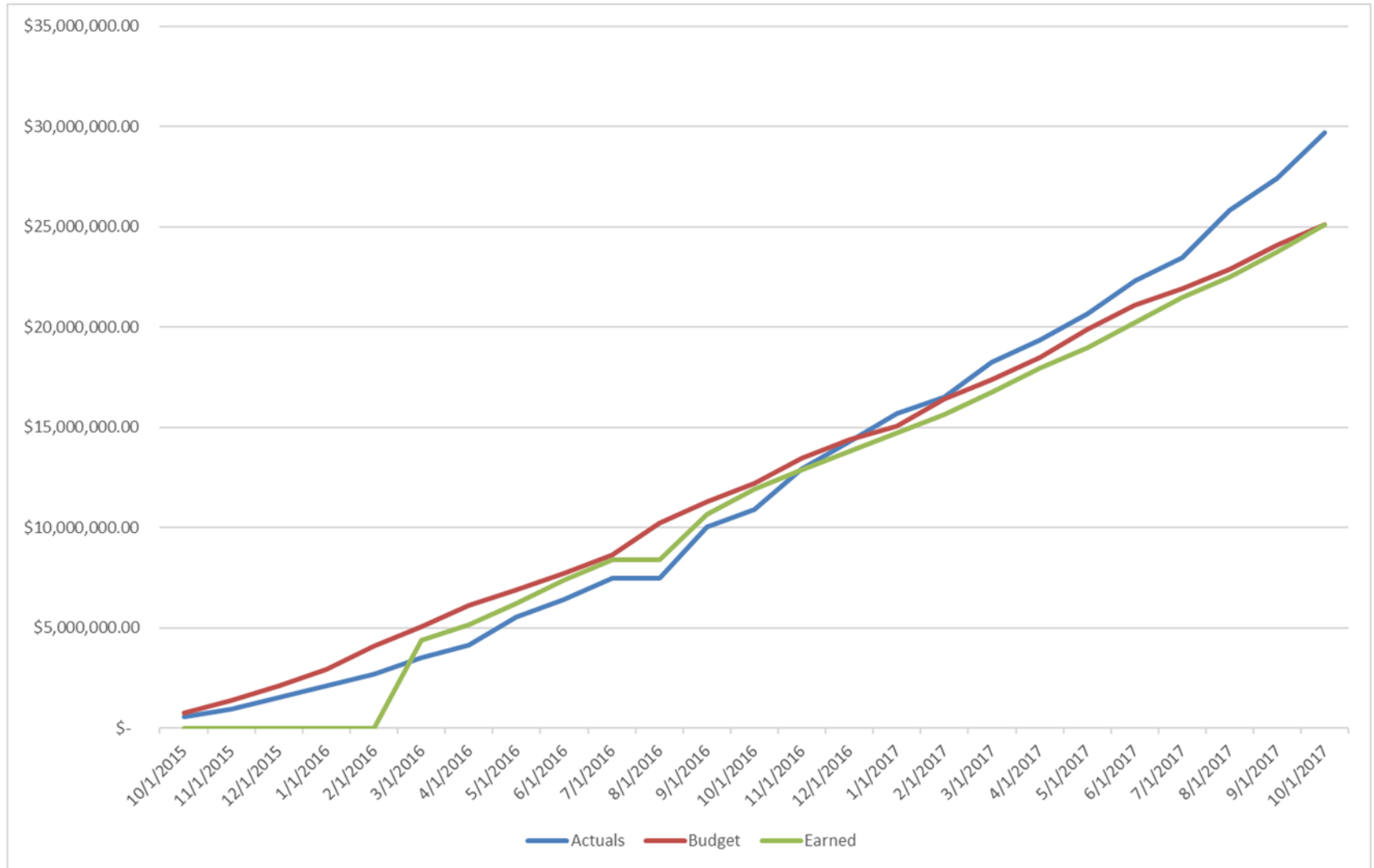
T4 MS - ProtoDUNE PSL APA #2 Arrives @ CERN	11/16/2017	11/30/2017	14	APA arrived ahead of schedule
T4 MS - ProtoDUNE SP Cold Integration Testing of APA#1 Complete	12/4/2017	11/28/2017	(6)	start of cold box testing delayed due to APA trolley rating for cold operation
T4 MS - ProtoDUNE SP First APA Installed in Cryostat	12/26/2017	12/4/2017	(22)	timeline for cold box testing changed
T4 MS - ProtoDUNE UK APA #1 Arrives @ CERN	1/17/2018	1/17/2018	-	
T4 MS - Stakeholders Written Approval of 30% FSCF Final Design Documents	1/18/2018	1/18/2018	-	
T4 MS - ProtoDUNE SP Decision on APA Configuration	1/31/2018	1/26/2018	(5)	decision timeline clarified

# DUNE Stop Light Report – Current Month

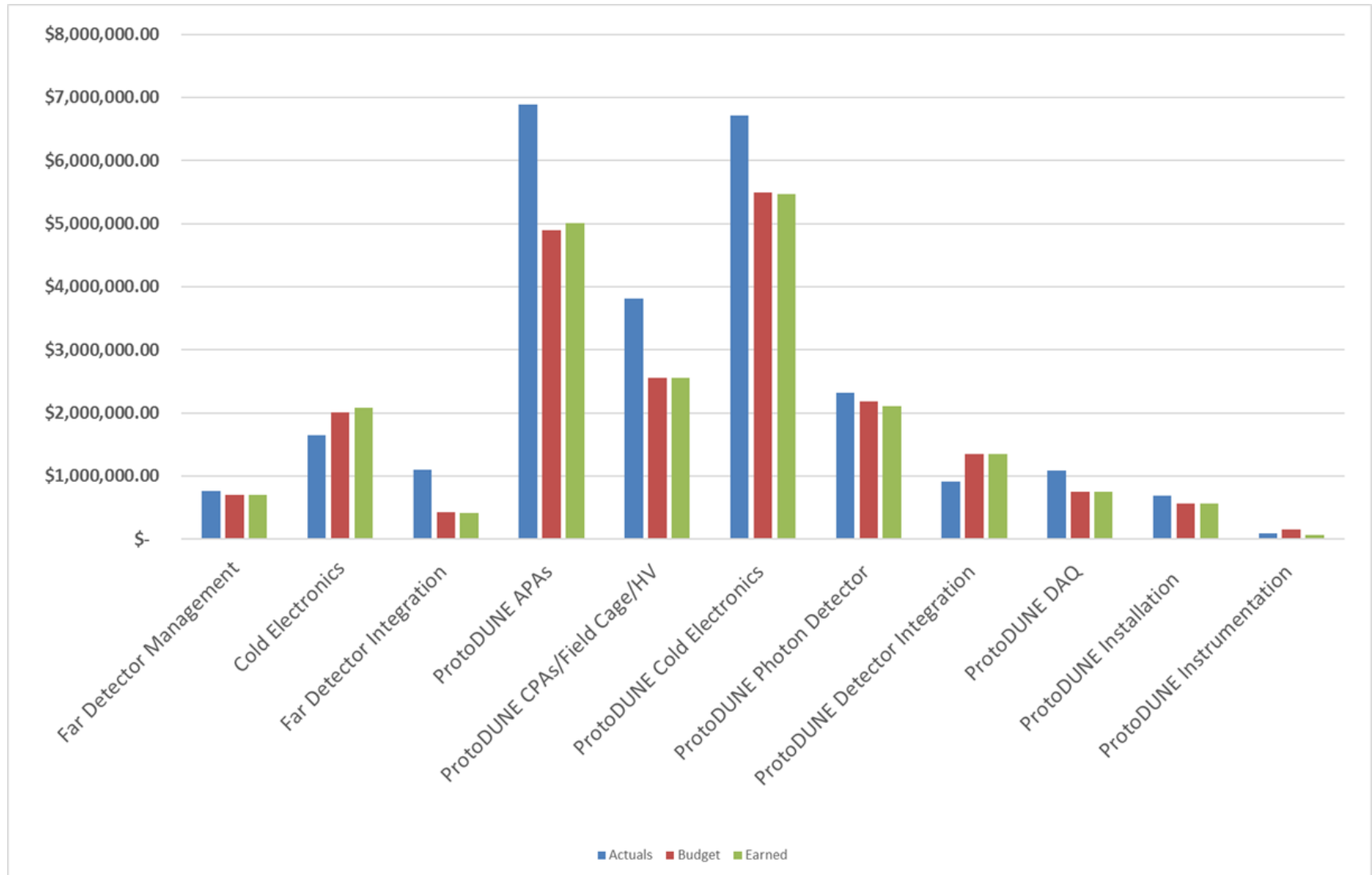
<b>DUNE - October 2017</b>							
<b>October 31, 2017</b>							
<b>Currency in: \$K</b>	<b>Current Period</b>						
<b>k Package.WBS (2), Work Package.WBS (3), Work Package.WB</b>	<b>Budget</b>	<b>Earned</b>	<b>Actuals</b>	<b>SV (\$)</b>	<b>SV (%)</b>	<b>CV (\$)</b>	<b>CV (%)</b>
131.02 DUNE	1,015	1,314	2,306	299	29%	(991)	-75%
131.02.01 Project Office - DUNE	216	216	104	0	0%	112	52%
131.02.02 Far Detector	799	1,098	2,202	299	37%	(1,104)	-101%
131.02.02.20 Far Detector - Detectors 1-4	441	421	151	(20)	-5%	270	64%
131.02.02.30 ProtoDUNE Design and Construction	285	600	1,949	315	111%	(1,349)	-225%
131.02.02.40 ProtoDUNE Onsite	73	78	102	4	6%	(24)	-31%
131.02.03 Near Detector	0	0	0	0	0%	0	0%
<b>Total</b>	<b>1,015</b>	<b>1,314</b>	<b>2,306</b>	<b>299</b>	<b>29%</b>	<b>(991)</b>	<b>-75%</b>

- ~\$1m of October cost variance on ProtoDUNE Design and Construction due to missing accrual for APA construction (over-budget)
- Implementing closer review of monthly planned activities to minimize such variances

# Far Detector/ProtoDUNE Budget, Earned, Actuals



# Far Detector/ProtoDUNE Actuals, Budget, EV at Level 4





# Project Management Highlights

- FY18 Budget & Schedule Review continues
  - FY18 Q2 SOWs in process; some FY18 FD activities will shift to FY19
    - Most subcontracts shifted to FNAL
    - ProtoDUNE remains priority for FY18 Q1, Q2
- LBNF/DUNE Project Office team visit to Daresbury Lab & CERN
  - UK APA Production Readiness Review, November 6-7
  - CERN visit, November 8-9
- Working on ProtoDUNE property transition from DOE to CERN
  - Developing an acceptance document with all components defined at a high level
  - Will include abandonment of double-shielded isolation transformers (purchased with incorrect secondary voltage; lessons learned in docdb#3863)

# FD – Installation & Integration

- The interface definition for the cryostat roof is near final.
  - All feedthrus except for the instrumentation feedthrus are fixed.
  - The requirements document for the initial design contract is available.
  - The information is available on the CERN cryostat WIKI and EDMS
- An initial list of common infrastructure items was generated
  - This is just starting but was needed for the RRB
- Vertical envelopes in the cryostat are being investigated.
  - Negotiating spaces for cryogenics and detector elements
- Effort to revise the DUNE space in the CUC is underway.
  - The CUC space includes the data room and some commissioning workstations along with general space to meet and eat.
- DUNE management met with the SDSM&T to discuss cooperation on the surface facilities needed off the SURF campus for logistics and possibly detector integration and testing.

# FD Single Phase TPC Cold Electronics

- Encouraging results from 40% test at BNL and cold box test of protoDUNE first APA
  - 40% LN<sub>2</sub> test: predict DUNE noise in the 500-600 e<sup>-</sup> range (collection/induction planes)
  - protoDUNE cold tests discussed by Flavio
- Work on adapting SLAC nEXO ASIC (called CRYO) for DUNE started
  - Schedule for submission (January 2018) appears very aggressive
- Common ADC development (LBNL+BNL+FNAL) started
  - Draft specification document available
  - Behavioral simulation of pipeline ADC in progress
  - In progress: pinout / interface to FE and COLDATA ASICs
- COLDATA ASIC
  - CPD1 received at Fermilab, all tests so far (warm + cold successful)

# FD APA activities

- Completed first pass of global DUNE WBS structure
- Started one-to-one meetings with all consortia groups
  - Will continue meetings over the next 1-2 weeks
- First assignment of institutional responsibilities (aspirations in some cases) to WBS elements
  - Presented at the RRB meeting on November 2nd
- Tim Bolton (KSU) agreed to serve as one of two primary editors for Technical Proposal & TDRs
- Work in progress to produce a schedule of activities for 2018 & 2019 with tracking milestones
  - E.g. Modifications of the APA frame to allow for 2-APA assembly & cabling as needed for DUNE FD

# SPPD Design & Construction – Subsystem Reports

## APA

- US APA#2: arrived at CERN 17 November
- US APA#3: mesh installation in process
- UK APA#1: u-plane winding finished (3/4 layers complete)

## Photon Detector

- Production continues; assembly of bars for APA#3 underway

## DSS

- All needed trolleys received at CERN

## Cold Electronics

- Testing of production ASICs (FE & ADC); FEMB motherboard & WIB assembly for APA#2

## CPA/FC/HV

- All CPA modules at CERN
- Field cage fabrication: all top/bottom modules completed & delivered to EHN1; endwall components at CERN. Assembly in process at Building 182.
- HV Phase 2 test at PC4 (with beam plug) complete







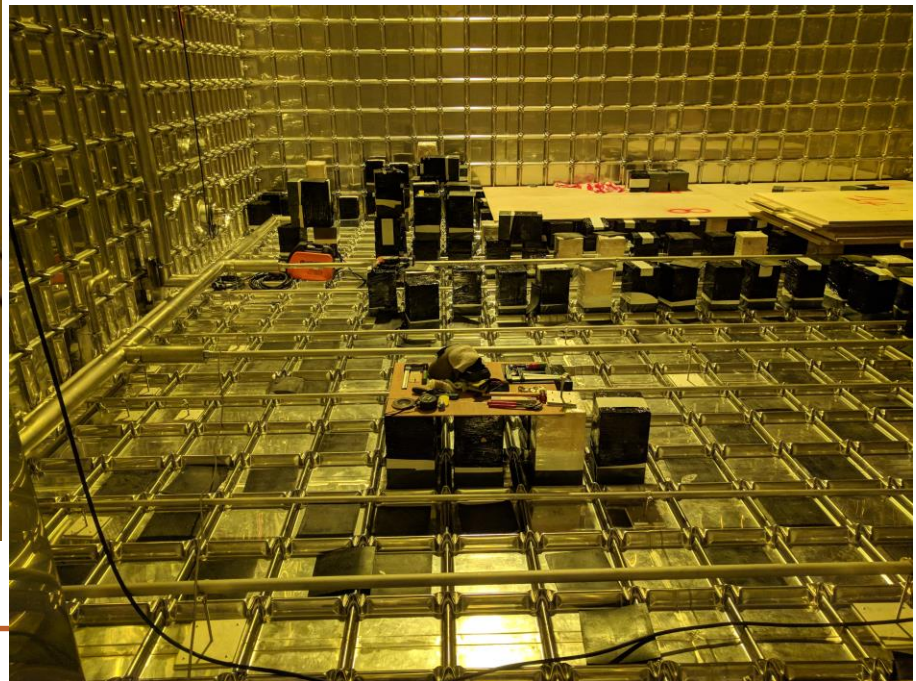
Clockwise from top: view of potential APA factory site at Daresbury; APA fabrication at Daresbury; exterior view of potential APA factory site at Daresbury





above: leak-checking in ProtoDUNE-DP; top right: top of cold box;  
Bottom right: Overview of ProtoDUNE-SP cryogenics to support  
the cold box



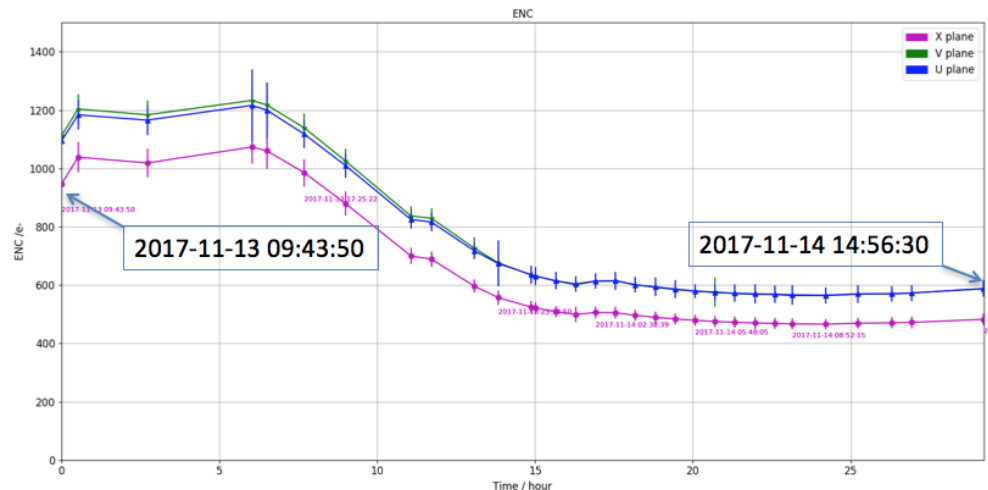


Clockwise from above: fully assembled CPA & field cage at EHN1, APA#3 mesh installation at PSL, internal cryogenic piping installation at EHN1



# SPPD OnSite - Installation and Instrumentation

- **Warm Test of Cold Electronics (APA#1 in Cold Box)**  
First measurement of pedestal fluctuation/ENC and noise frequency spectrum in line with expectation at room T.
- **Preparation for APA1 Cold Test**  
APA suspension system in Cold Box: trolley Static Load test at LAr T successfully performed and backup support bracket installed.  
Cold Box Cooldown test performed
- **CPA and FC module**  
First CPA (2 semi-modules) and FC Top and Bottom panels assembly completed (clean room)
- **DAQ Vertical Slice (ColdBox Read-out)**  
First CPA (2 semi-modules) all component in place - system under debugging
- **APA1 Cold Test in progress:**
  - A first plot of the CE noise level during the cooldown. The plot starts a couple of hours before the begin of cooldown procedures (room T), and ends with the temperature of the ASICs in the CE boxes at around -60C



Plot preliminary (analysis in progress)

# Dual-Phase - Technical Progress

- Full-day review was held at CERN on Friday, November 17th
- Dual phase 1x1x3 prototype operations are scheduled to end this week
- 1x1x3 cryostat will be ready to be opened around the beginning of next year (further diagnostics at that time)
- In the meantime, new ProtoDUNE LEMs for ProtoDUNE-DP have been tested at Saclay in France and shown to support higher voltages
- ProtoDUNE-DP schedule remains challenging

# Upcoming Events

- LBNF/DUNE-US Risk Workshop, December 4-5 at Fermilab
- LBNF/DUNE Interface Meeting, December 18-19 at Fermilab
- DUNE Collaboration Meeting, Jan 29 – Feb 1 at CERN
- LBNF/DUNE Interface Meetings, Jan 31 & Feb 2 at CERN
- DOE IPR, March 20-22 at Fermilab