DUNE Project Status

Jolie Macier

DUNE PMG Meeting

17 October 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

ESH

- Support meetings & discussions relating to installation activities relating to ProtoDUNE detector at CERN
- Production Readiness Review at Daresbury Laboratory 6-7 Nov
- Meetings & walkthrough of ProtoDUNE activities at CERN 8-9 Nov
- Sept. 1, CERN Hoist Incident (First aid)
  - Investigation has been completed and the safety measures have been put in place
  - New structure calculations have been validated and a consolidated structure certification was performed by CERN HSE
  - Awaiting CERN incident investigation report

ProtoDUNE Quality Assurance Update

- Reviewed and provided comments on the report documenting the review of the testing of the Cold Electronics ASIC Chips at Brookhaven National Lab (BNL).

- Production Readiness Reviews – follow-up for ProtoDUNE recommendations
  - Verified responses from Colorado State for the Photon Detectors Production Readiness Review.
  - Requested information from ANL for the recommendations resulting from the Photon Detector Readout review.
  - Scheduled follow-up for the Fermilab Photon Detector WSL Bars.

DUNE Milestones

	Sept 2017 P6 Update	August 2017 P6 Update	Variance	Comments
Completed In Sept				
T4 MS - Stakeholders Submit FINAL Requirements & Interfaces for FSCF	9/22/2017	9/22/2017	-	
Planned for Completion October-December				
T4 MS - ProtoDUNE SP 35ton HV Test (Phase 2) Complete	10/20/2017	10/6/2017	(14)	End date shifted to accommodate beam plug testing
T4 MS - ProtoDUNE SP Cold Integration Testing of APA#1 Complete	11/28/2017	11/17/2017	(11)	Additional time in cold box based on projected arrival of APA#2
T4 MS - ProtoDUNE PSL APA #2 Arrives @ CERN	11/30/2017	11/21/2017	(9)	Planning for arrival on 11/17; date shift based on predecessor activity
T4 MS - ProtoDUNE SP First APA Installed in Cryostat	12/4/2017	11/21/2017	(13)	Date shifted due to additional time in cold box

DUNE Stop Light Report – Current Month

DUNE - Sept 2017

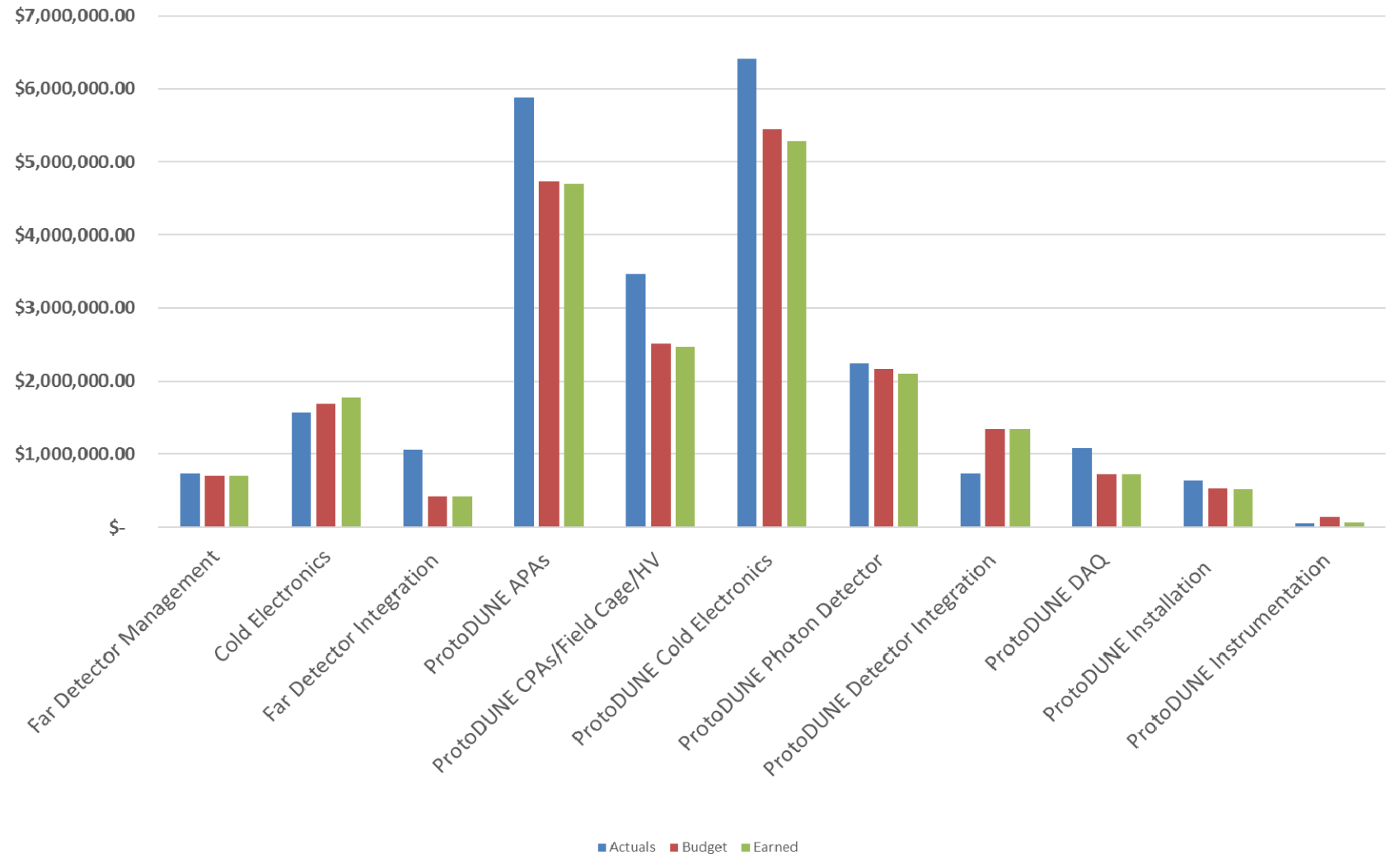
September 30, 2017

Currency in: $K	Current Period							Cumulative to Date	
Work Package.WBS (2), Work Package.WBS (3), Work Package.WBS (4)	**Budget**	**Earned**	**Actuals**	**SV ($)**	**SV (%)**	**CV ($)**	**CV (%)**	**SPI**	**CPI**
131.02 DUNE	1,187	1,283	1,577	96	8%	(294)	-23%	0.99	0.87
131.02.01 Project Office - DUNE	134	134	176	0	0%	(43)	-32%	1.00	0.95
131.02.02 Far Detector	1,054	1,150	1,401	96	9%	(251)	-22%	0.99	0.86
131.02.02.20 Far Detector - Detectors 1-4	93	102	(54)	10	11%	157	153%	1.03	0.92
131.02.02.30 ProtoDUNE Design and Construction	757	817	1,280	60	8%	(463)	-57%	0.98	0.84
131.02.02.40 ProtoDUNE Onsite	204	230	175	26	13%	55	24%	0.95	0.91
131.02.03 Near Detector	0	0	0	0	0%	0	0%	-	0.00
Total	**1,187**	**1,283**	**1,577**	**96**	**8%**	**(294)**	**-23%**	**0.99**	**0.87**

Last month: SPI = 0.98, CPI = 0.87

- September cost variance on ProtoDUNE Design and Construction impacted by
  - Shift of hours from FD Integration to PD HV (incorrect proj/task charges for 35t test)
  - Additional personnel costs associated with CE testing & installation
- Implementing closer review of monthly planned activities to minimize such variances

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



Project Management Highlights

- FY18 Budget & Schedule Review
  - FY18 SOWs in process; some FY18 FD activities will shift to FY19
    - Additional schedule changes to be implemented in October, after finishing work with new funding profile for FY19+
    - Most subcontracts shifted to FNAL
    - ProtoDUNE remains priority for FY18 Q1, Q2
- Interface meeting @ BNL, 3-4 October
  - Working session to finalize cryostat roof feedthroughs; Logistics discussion
- Visits to fabrication sites
  - UW-PSL, APA#2 & 3 Production, 22 September
  - CSU, Photon Detector Modules integration, 10 October
- LBNF/DUNE Project Office team to visit Daresbury Lab & CERN
  - UK APA Production Readiness Review, 6-7 November
  - CERN visit, 8-9 November
- Support for work at CERN
  - Six DUNE participants in FNAL ESH fall protection class, 5 October

Far Detector - Cryostat Interface Definition

1. Signal Penetration specification
Cable Routing –mock-up center APA tube done. Will now plan a realistic prototype. No cryostat changes foreseen. [no change]

2. Detector Support Structure
Additional Supports for the endwall are in the CERN model. Installation shuttle beam concept is being developed. Support feedthroughs accommodated in cryostat roof design.

3. Cleanroom-TCO interface
Waiting on resolution of interface issues from the cryostat.

4. HV feedthru Penetrations
Studying moving the HV feedthroughs off-axis to give space for the mechanical supports.

5. Cryogenic monitoring Interface
New consortia and taskforce formed. Meeting several times a week to converge on a proposed configuration

6. Calibration Feedthroughs
New consortia and taskforce formed. Meeting several times a week to converge on a proposed configuration

7. Rack Placement and Cable Trays
No progress

8. Infrastructure Floor load, Lights, HVAC, cable hooks
No Progress

Single Phase TPC Cold Electronics

- Plans for ADC
  - Recommendation from spokespeople / executive committee
  - Develop new ADC (BNL+LBL+FNAL), and also integrated ASIC (SLAC)
    - BNL+LBL+FNAL ADC will be pipeline ADC, development starting now
  - Investigate use of other ADCs (Columbia) [commercial ADCs investigated as part of SBND]
  - BCR in preparation will include funding for SLAC ($166k) and Columbia (18k$), will be compensated by delaying activities from FY18 to FY19
  - Plan includes testing in LAr (not a full scale APA: “LArIAT”) and cold box (@CERN), criteria for final choice of ADC to be developed in coming months
    - Neutrino Division considering new cryostat at PAB, with new APA to house large number of channels (O(1k)) for these tests

- Meeting with all institutions
  - Developing WBS and plan to get all institutions involved in the consortium activities

FD APA Consortium Structure

Consortium Leader: Stefan Söldner-Rembold
Technical Lead: Alberto Marchionni

APA Consortium Board
(24 Institutions)

APA Design

Detector and Hardware

Justin Evans
(ProtoDUNE)
Mitch Soderberg

Simulation and Software

Tingjun Yang
(FD simulation)
Chao Zhang

APA Production and Assembly

Automatisation and Tooling

Alan Grant
Robert Paulos

Testing, Installation, Integration

Roxanne Guenette
Peter Sutcliffe

Calibration

Kendall Mahn
(Calibration TF)

FD APA WBS

- A first version of the WBS structure is now available (~200 lines). Now being reviewed by the DUNE Project Office.

1	Single-phase APA
1.1	Management (Reviews, Milestones)
1.2	TPC simulation and software
1.3	APA design (Includes Interfaces with other systems)
1.4	APA Engineering (System engineering, production planning)
1.5	APA Tooling (Winder, tooling, cold box, shipping box)
1.6	APA Components Production Module 1
1.7	APA Assembly Module 1 (Factories and assembly lines)
1.8	APA Integration Module 1 (Integration with PD and CE)
1.9	APA Installation at SURF Module 1
1.10	TPC Calibration Module 1 (Calibration requirements and techniques)
1.11	Detector Support System (DSS) Module 1

FD APA activities

- Weekly APA consortium meetings since September 11
- Starting to assign institutional responsibilities for each WBS elements
- APA WGs just starting their activities (interfacing with PD and CE consortia, ProtoDUNE, DUNE Calibration TF, DUNE FD simulation group, DUNE FD installation group)
- Necessity of a central repository for technical drawings and definition of drawing standards & approval procedures
- Visits to PSL during the different production steps (frame assembly, winding, gluing of boards to the frame, mesh installation, CR boards production, shipping).
- Planning visit to ProtoDUNE and UK

SPPD Design & Construction – Subsystem Reports

APA

- US APA#2: u-plane winding, soldering & tension measurements complete last week; plan to ship 14 November
- US APA#3: frame assembly in process
- UK APA#1: v-plane winding in process

Photon Detector

- Production continues; assembly of bars for APA#2 underway

DSS

- Installation of runway & bridge beams complete
- First CPA trolleys shipping to CERN this week; bridge beam trolleys to ship 24 October

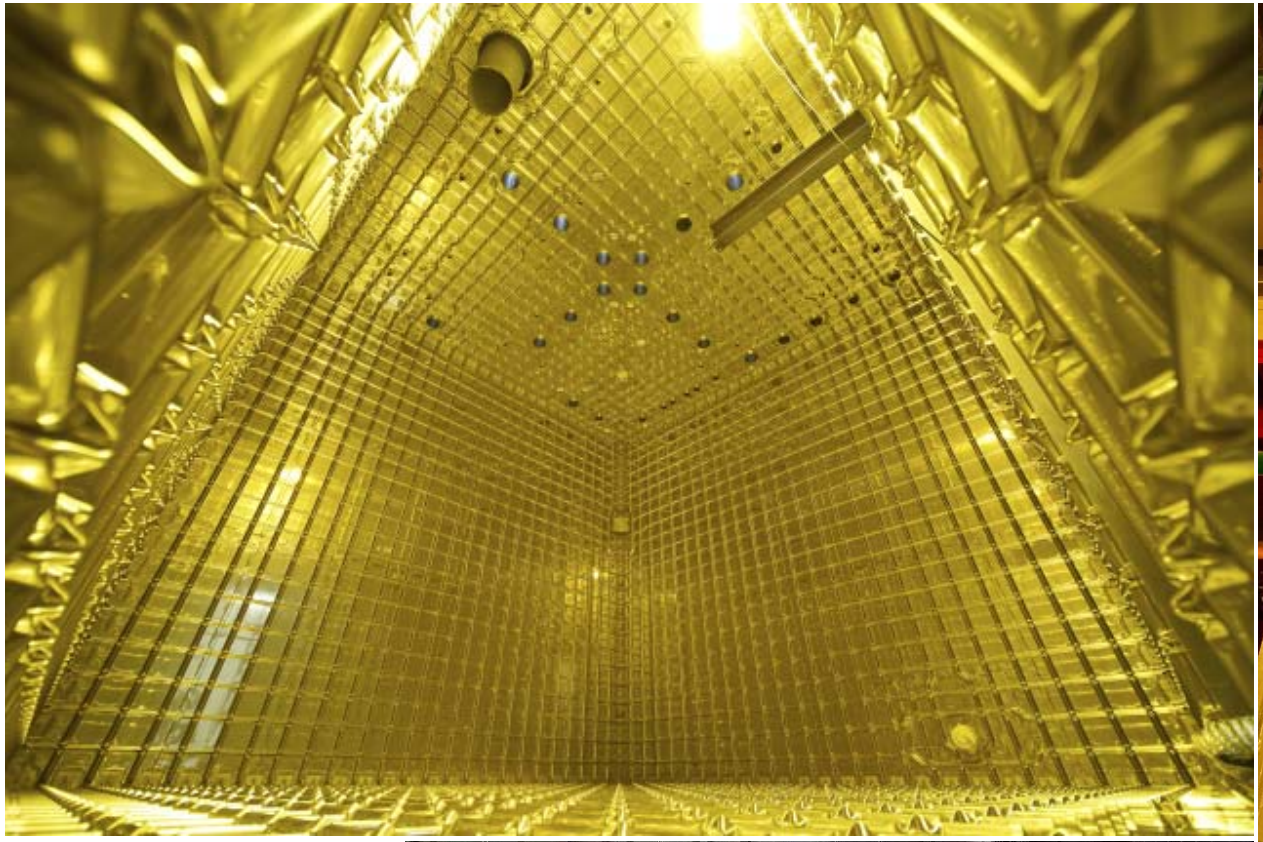
Cold Electronics

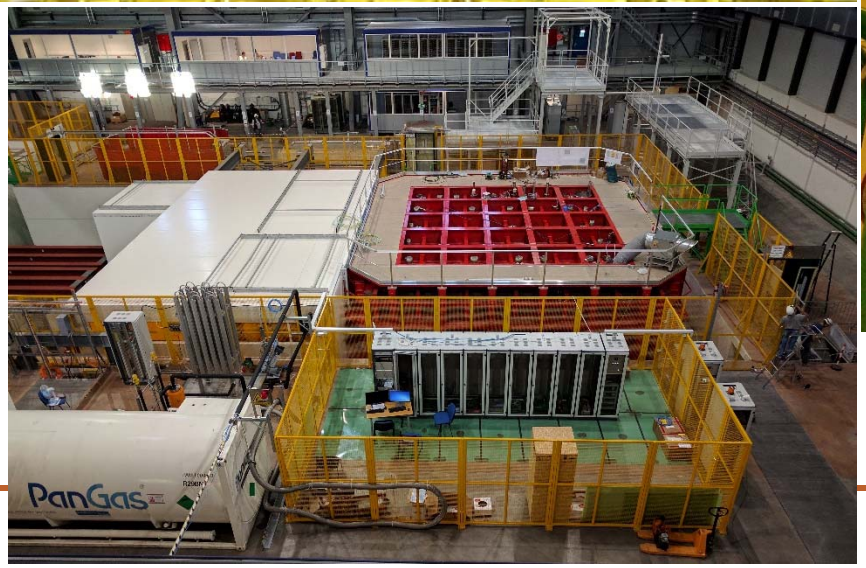
- Testing of production ASICs (FE & ADC); FEMB motherboard & WIB assembly for APA#2

CPA/FC/HV

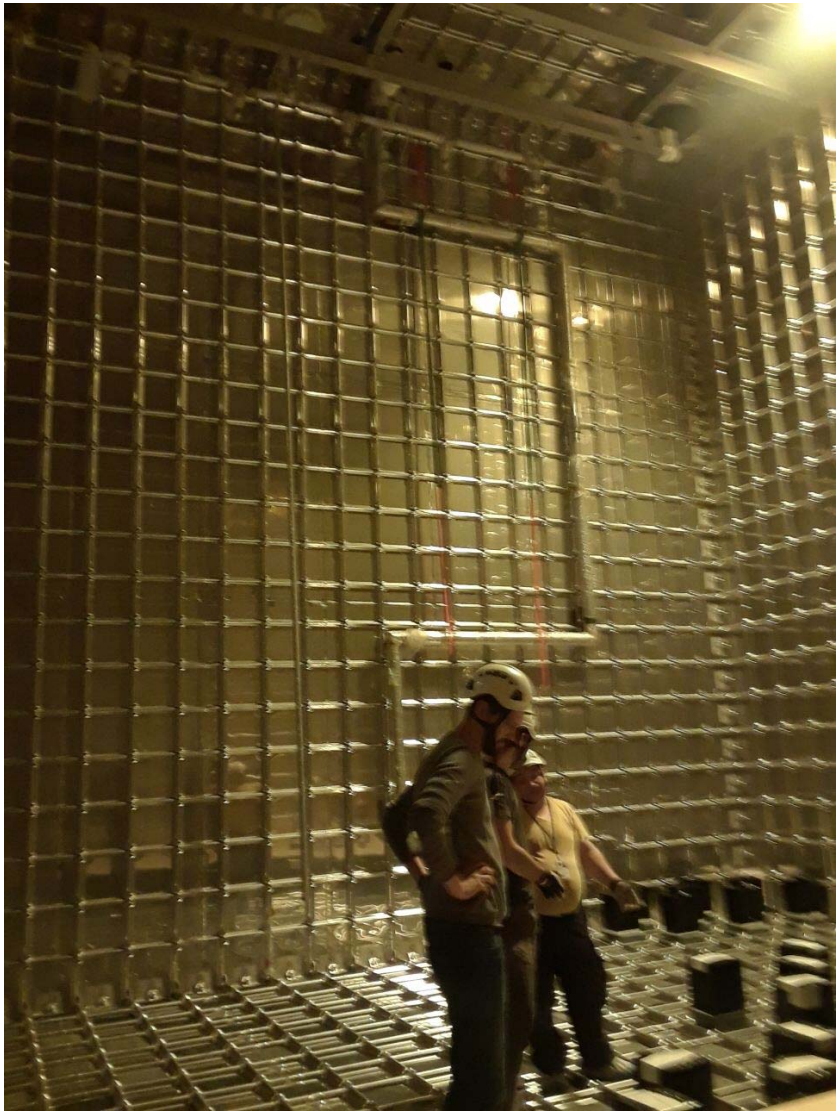
- Last of CPA modules to ship to CERN this week; DUNE installation testing at Ash River last week
- Field cage fabrication: all top/bottom modules completed & delivered to EHN1; endwall components at CERN. Assembly in process
- HV Phase 2 test at PC4 (with beam plug) now running

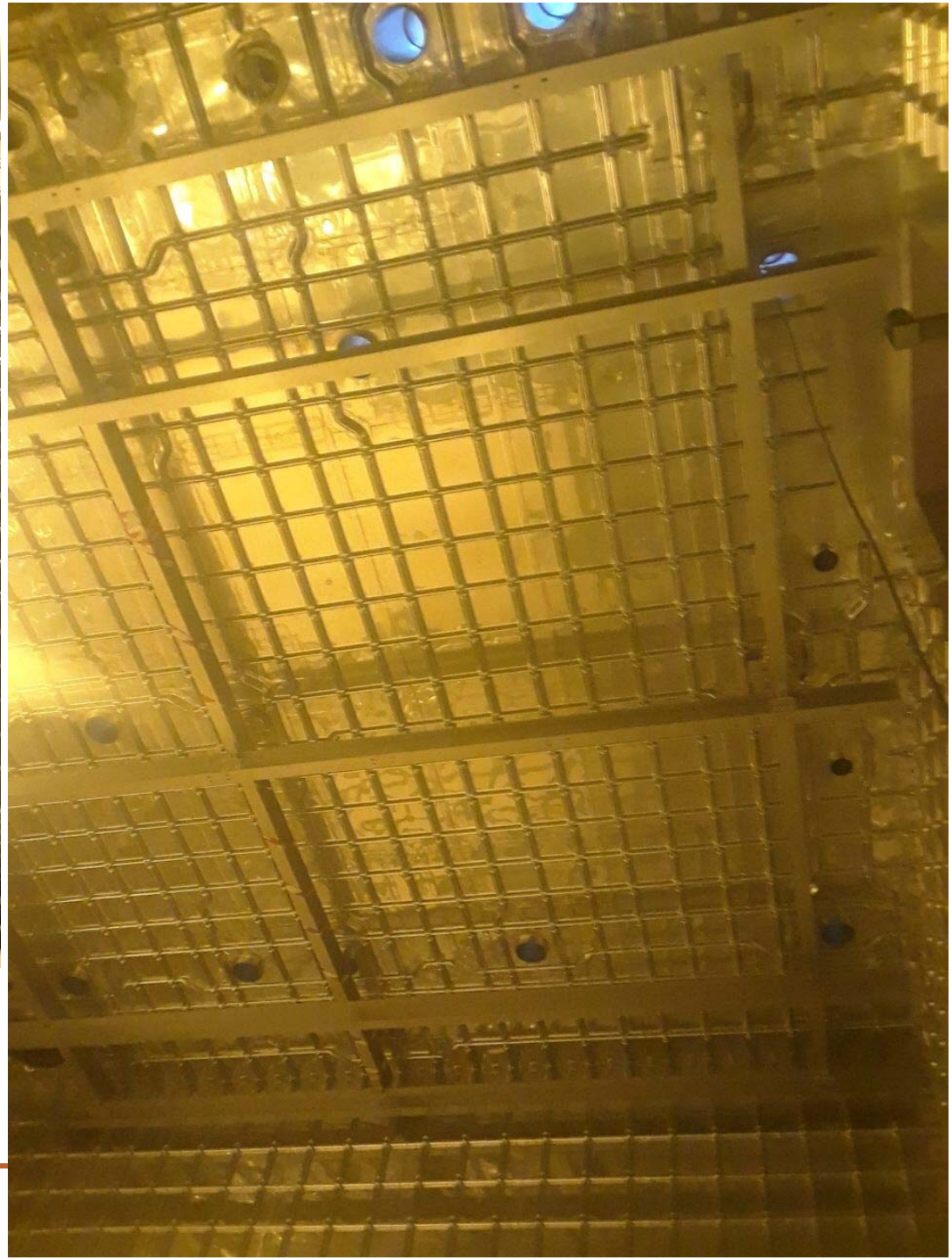
Clockwise from above: 12m CPA test at Ash River, PD assembly at CSU, APA#2 at PSL





Clockwise from bottom left: view of dewar, clean room & PDSP cryostat roof at EHN1; completed membrane at PDDP; APA#1 in the cold box





above: completed membrane, false floor & internal cryogenics piping at PDSP;
right: Detector support system beams at PDSP

OnSite - Installation and Instrumentation

- Cryostat completed; inner membrane welded and successfully leak-tested.
  - Wooden floor installed.
  - Final cleaning (power-wash) under way (completed by end of this week).
- Rail System inside Clean Room: extensive static and dynamic tests performed, qualified for use (CERN HSE).
  - Turntables and junctions/switches with manually operated hardware locks fully tested with APA mock-up (1.5 weight)
- Assembly of Top and Bottom Field Cage modules completed at CERN
  - Temporary storage at EHN1 dedicated area.
- Detector Support Structure (DSS) installation completed inside Cryostat
- APA#1 fully instrumented with CE boards (20 boards) and PD modules (10 bars) successfully moved into Cold Box on Oct. 12.
  - Cold Box is now sealed.
  - Cables connected to Cold Box Feedthrough.
  - First test (warm Temp) of CE noise in Cold Box started with local read-out
- DAQ Vertical Stand (including WIBs) ready for read-out data from Cold Box test

Dual-Phase - Technical Progress

- Dual phase 1x1x3 prototype continues operations
- 1x1x3 Review on 25 September
- Development of WBS as part of FD consortia effort

Upcoming Events

- SPSC Meeting, 19-20 October at CERN. Report on Run Plan for Summer 2018 and Beam Time Request
- Integration Facility Planning, 24-25 October at SDSMT
- LBNC Review, 26-28 October at SURF
- RRB Meeting, 2 November at Fermilab
- Signoff on SP cryostat feedthrus, 1st week of November by video
- Near Detector workshop, 6-7 November at CERN
- DUNE Collaboration Meeting, 29 Jan -1 Feb at CERN
- DOE IPR, TBD late February 2018 at Fermilab

Project Management Highlights

DUNE Review Recommendations, DOE IPR, 28 Feb-2 Mar

Define minimal, quantifiable requirements that ProtoDUNE must achieve so that DUNE will have successful LBNC, CD-2, and CD-3b reviews. Define a date for each of these sets of requirements to be achieved.	James, with Thomson	Complete 17 March 2017; docdb#2765
Use project management tools to manage the schedule, costs, and possible scope reductions so as to achieve the ProtoDUNE requirements. The planning should extend beyond integration.	Macier	Complete
Develop a plan and budget with clearly defined objectives for operating ProtoDUNE at CERN. Due Date: October 1, 2017.	James	Complete
Assemble a task force to address photon detection in preparation for CD-2. Due Date: May 1, 2017.	James	Complete
Establish and document, with the DUNE Collaboration, the detector performance requirements necessary to achieve the physics goals for CP violation, proton decay, and astrophysical neutrinos of the DUNE project for the TDR.	James	
Perform a comprehensive review of your bottom-up cost estimate (including CORE costs) prior to the next OPA review.	Macier	FY18 planning & Consortia Technical Proposals
DOE should work with LBNF/DUNE and international partners to better define CD2 requirements for non-DOE contributions.	Carolan	

Project Management Highlights

DUNE Review Recommendations, LBNC, 22-24 June

Recommendation	Responsible	
The ProtoDUNE-SP management team should prepare a table with the list of the CE components to be delivered by the BNL team, their status (e.g. “Prototype”, “procurement in progress”, “all components on hand”), expected or estimated delivery dates for APA1, 2,3,4,5,6). This table should also include details of any staged delivery plan. A prioritized plan for assignment of resources to these components should be prepared.	James	✓
The WIB is in a second iteration. 5 are needed for use in the cold box test of APA1 at CERN and only 1 board is available. The ProtoDUNE-SP management should work with the BNL team to identify sufficient WIBs to allow efficient operation of the cold box testing for APA1, presently scheduled for the first week in August, and to provide boards as needed to DAQ developers for system integration.	James	✓
The ProtoDUNE-SP CE System Manager should communicate with the Construction Coordinator on a weekly basis through this critical period (4-16 weeks).	James	✓
The LBNC points of contact for CE, Planning and Schedule should follow up with ProtoDUNE-SP management and the BNL team responsible for the cold and warm electronics deliverables in the next POC interaction, which should take place in approximately one month.	James	✓