

# DUNE Project Status

Jolie Macier

DUNE PMG Meeting

18 July 2018

# Outline

- ES&H Update
- QA Update
- Schedule & Budget Status
- PM Update
- DUNE Update
  - FD Engineering
  - FD Installation
  - FD TPC Electronics
  - FD APA
- ProtoDUNE Onsite Report
- Upcoming Events

# ES&H Update

- Continued development of LBNF/DUNE ESH Introduction video
  - Video development in progress
- Participated in the DUNE Risk Workshop
- Working with DUNE installation team to develop ESH requirements
  - Crane operations and rigging qualifications
  - Storage of installation materials
  - Emergency egress
- Supporting the development of the DUNE design review process

# Quality Assurance

- **LBNF/DUNE QA Plan**
  - Developed training presentation specific to the DUNE Consortia and presented summary to the DUNE Technical Board
- **LBNF/DUNE Risk Workshop**
  - Participated in the LBNF/DUNE Risk Workshop
- **Cold Electronics Workshop**
  - Participated in the Cold Electronics Workshop held at Brookhaven National Lab
- **QA Engineer Position**
  - Drafted a Position Description for a possible QA Engineer position on the DUNE project.

# DUNE Milestones

	June 2018 P6 Update	May 2018 P6 Update	Variance	Comments
<b>Completed In June</b>				
<b>DUNE</b>				
T4 MS - ProtoDUNE SP Detector Installation Complete	6/29/2018	6/29/2018	-	
<b>Planned for Completion July-Sept</b>				
<b>DUNE</b>				
T4 MS - Stakeholders Written Approval of 30% FSCF Final Design Documents	8/6/2018	8/10/2018	4	Due date 17 Aug
T4 MS - ProtoDUNE SP Manhole Closed	7/10/2018	7/11/2018	1	Closed 2 July
T4 MS - ProtoDUNE SP Testing Prior to Operations Completed	7/24/2018	7/25/2018	1	
T4 MS - ProtoDUNE SP Cryostat Purging Complete	8/14/2018	8/15/2018	1	
T4 MS - ProtoDUNE SP Approval for Filling Completed	8/15/2018	8/16/2018	1	
T4 MS - ProtoDUNE SP Cooldown and Filling Completed	9/24/2018	9/25/2018	1	
T4 MS - ProtoDUNE SP External Cryogenics Ready	7/1/2018	6/29/2018	(2)	

# DUNE Stop Light Report for Current Month

DUNE							
June 30, 2018							
Currency in: \$K	Current Period						
Work Package.WBS (2), Work Package.WBS (3), Work Package.WBS (4)	Budget	Earned	Actuals	SV (\$)	SV (%)	CV (\$)	CV (%)
131.02 DUNE	738	824	1,298	86	12%	(474)	-58%
131.02.01 Project Office - DUNE	201	201	241	0	0%	(39)	-20%
131.02.01 Project Office - DUNE	0	0	241	0	0%	(241)	-
131.02.01.01 Project Management Level of Effort	201	201	0	0	0%	201	100%
131.02.02 Far Detector	537	622	1,057	86	16%	(435)	-70%
131.02.02.20 Far Detector - Detectors 1-4	419	561	465	142	34%	96	17%
131.02.02.30 ProtoDUNE Design and Construction	24	6	296	(19)	-77%	(291)	-5272%
131.02.02.40 ProtoDUNE Onsite	94	56	296	(37)	-40%	(240)	-426%
131.02.03 Near Detector	0	0	0	0	0%	0	0%
131.02.03.01 Project Management	0	0	0	0	0%	0	0%
131.02.03.06 Installation	0	0	0	0	0%	0	0%
<b>Total</b>	<b>738</b>	<b>824</b>	<b>1,298</b>	<b>86</b>	<b>12%</b>	<b>(474)</b>	<b>-58%</b>

- We are working to correct CTCs since ProtoDUNE Design and Construction costs mistakenly include:
  - Far Detector Cold Electronics costs
  - Far Detector Installation costs

# DUNE Stop Light Report – Cumulative

DUNE																
June 30, 2018																
Currency in: \$K																
Package.WBS (2), Work Package.WBS (3), Work Package	Current Period							Cumulative to Date								
	Budget	Earned	Actuals	SV (\$)	SV (%)	CV (\$)	CV (%)	Budget	Earned	Actuals	SV (\$)	SV (%)	CV (\$)	CV (%)	SPI	CPI
131.02 DUNE	738	824	1,298	86	12%	(474)	-58%	33,620	33,792	40,357	172	1%	(6,565)	-19%	1.01	0.84
131.02.01 Project Office - DUNE	201	201	241	0	0%	(39)	-20%	5,045	5,045	4,863	0	0%	182	4%	1.00	1.04
131.02.01 Project Office - DUNE	0	0	241	0	0%	(241)	-	0	0	4,863	0	0%	(4,863)	-	-	0.00
131.02.01.01 Project Management Level of Effort	201	201	0	0	0%	201	100%	5,045	5,045	0	0	0%	5,045	100%	1.00	-
131.02.02 Far Detector	537	622	1,057	86	16%	(435)	-70%	28,575	28,747	35,494	172	1%	(6,747)	-23%	1.01	0.81
131.02.02.20 Far Detector - Detectors 1-4	419	561	465	142	34%	96	17%	7,188	7,313	6,276	124	2%	1,036	14%	1.02	1.17
131.02.02.30 ProtoDUNE Design and Construction	24	6	296	(19)	-77%	(291)	-5272%	18,482	18,482	25,881	(0)	0%	(7,399)	-40%	1.00	0.71
131.02.02.40 ProtoDUNE Onsite	94	56	296	(37)	-40%	(240)	-426%	2,905	2,953	3,336	47	2%	(384)	-13%	1.02	0.88
131.02.03 Near Detector	0	0	0	0	0%	0	0%	0	0	0	0	0%	(0)	-	-	0.00
<b>Total</b>	<b>738</b>	<b>824</b>	<b>1,298</b>	<b>86</b>	<b>12%</b>	<b>(474)</b>	<b>-58%</b>	<b>33,620</b>	<b>33,792</b>	<b>40,357</b>	<b>172</b>	<b>1%</b>	<b>(6,565)</b>	<b>-19%</b>	<b>1.01</b>	<b>0.84</b>

## Project Management Highlights

- Continue to develop the comprehensive bottoms-up cost/schedule estimate; DUNE-US L2 managers working concurrently on Neutrino Cost Group estimates
- BCR in process to accommodate TPC at FNAL; BCR forthcoming to support FY18 scientific labor (Program agreement with ND)
- LBNF/DUNE Interface Meeting scheduled to address crane requirements, work phases, 30% FSCF design report, use of EDMS and cryostat design status
- Working on FY19 SOWs; working with Procurement on transition to Cost Reimbursable subcontracts for universities.
  - Initiating FY19 technical coordination support agreements while FWP is in process
- Host Lab Working Group continues to make progress. SDSD head Patrick Weber has been added to the Project Support subteam with Elaine McCluskey & Jolie Macier
  - Also continue work with Business/Liability subteam on import / export issues (personnel and materials)

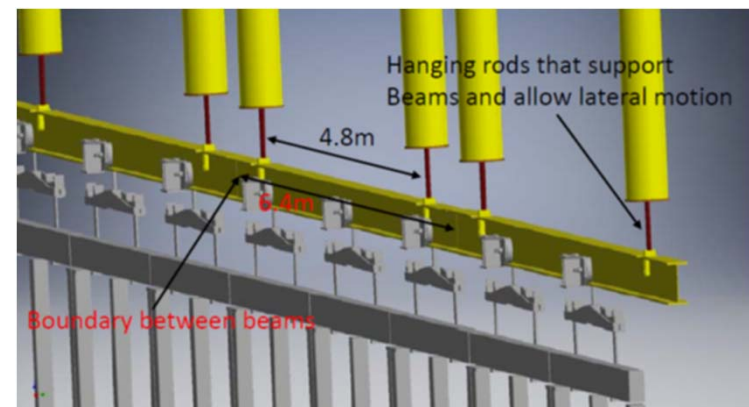


# Far Detector Engineering

- **Detector component integration and installation**
  - Finalized design review plan and presented to technical board
  - Developed design review schedule
  - Identified date for detector support structure 30% design review
  - Developed cost estimates for technical coordination engineering labor and infrastructure
  - Reviewed DUNE Far Detector engineering design risk analysis
- **DUNE Detector electronics and grounding**
  - Verified with Dave Newbold, DAQ Consortium, that CUC power budget allowed for DAQ instrumentation of at least two detectors; possibly all four. Adding more power has cooling implications which TC team is looking into
  - Detector Racks are to be air cooled. Possible Air Handling Unit (AHU) has been identified. Working with CF/ARUP to get attachment points for mounting brackets along the cavern walls
  - Working with CF/ARUP to define the cross-section of fiber cables running between detectors and CUC Underground Data Processing Room
  - Continue working with ARUP and the users of the CUC Underground Experimental Work Area to define requirements
  - Meetings scheduled with DAQ, SW&COMP, and CISC to go over interface documents and ensure that boundaries and responsibilities are well established

# FD Installation

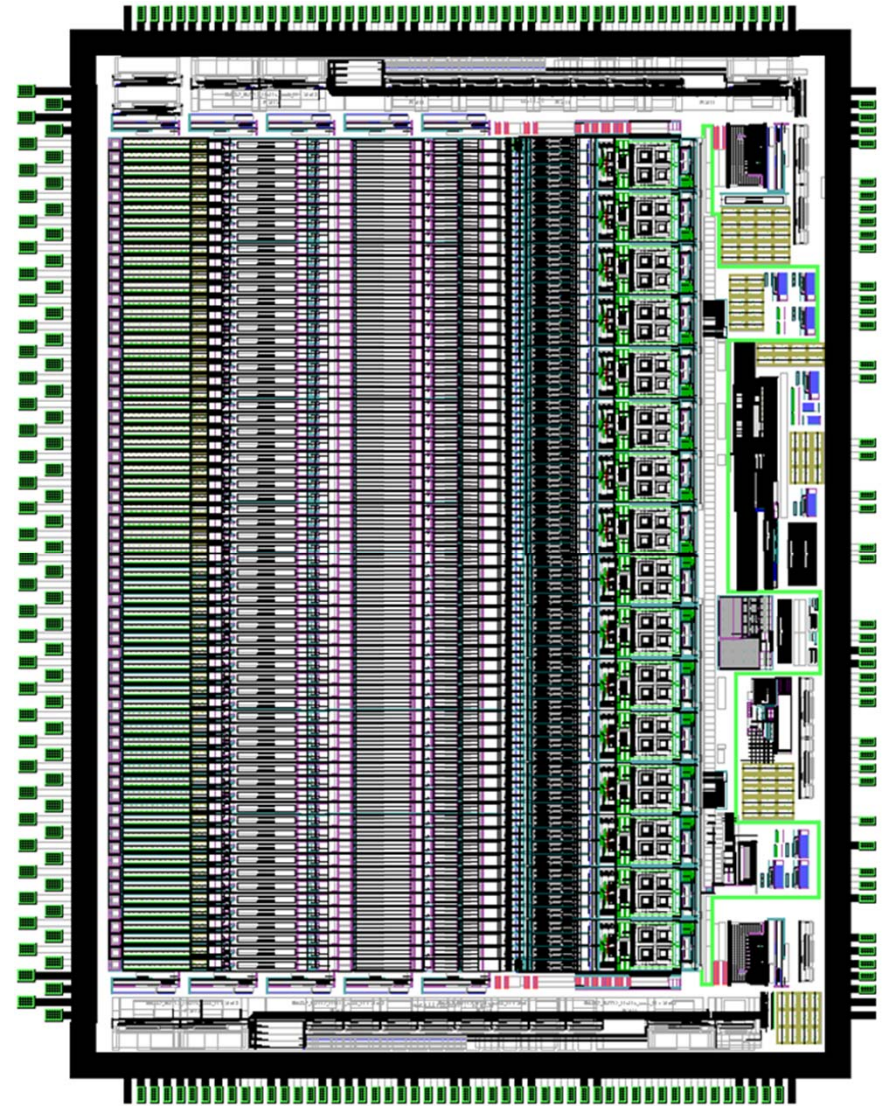
- Due to the final push to finish the detector installation plan, there was little effort available to progress the integration test facility design
  - Conversations continue with SDSM&T regarding the facility
- Significant effort to develop the cost estimates in preparation for the Neutrino Cost Group review
- Planning an internal cost review on July 30-31
- Work on the DSS is progressing and it is planned to have a 30% design review on August 20-21 at CERN



Beam and Feedthrough Layout

# FD TPC Electronics

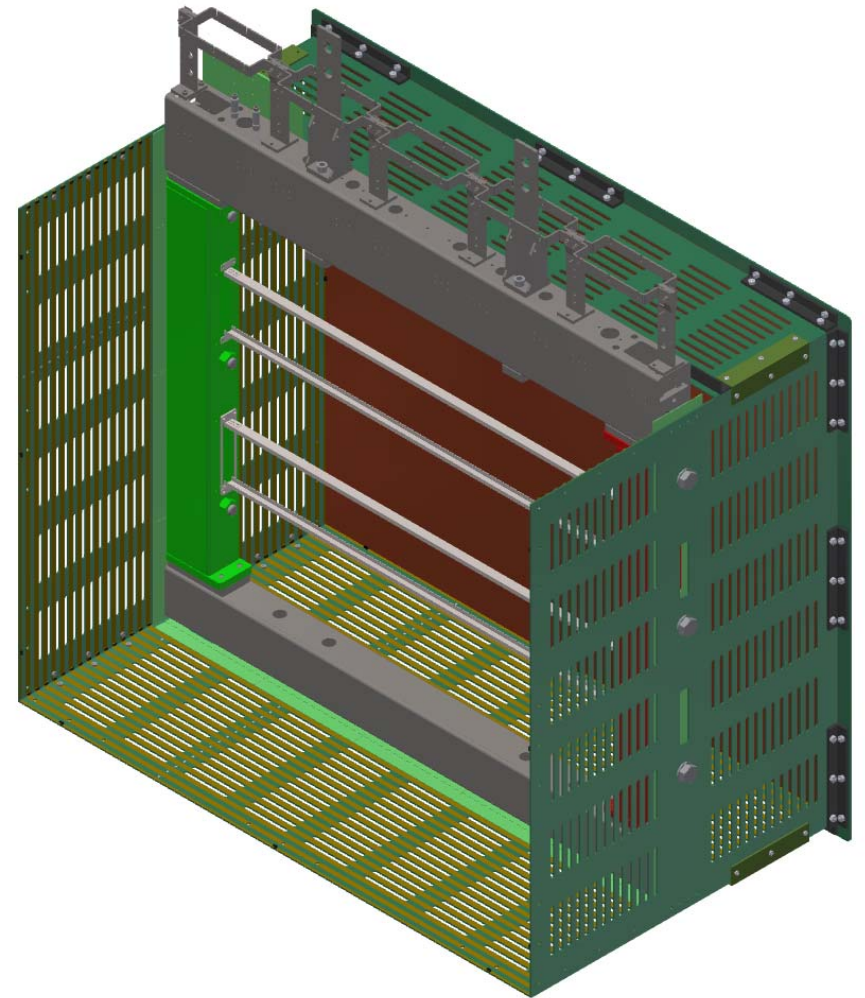
- Delays in ASICs submissions
  - SLAC CRYO will be submitted in August or (more likely) September
    - Design almost completed, but still investigating cross-talk issues, plus a few minor chip integration tasks to be completed
  - New LBNL-BNL-FNAL Cold ADC submission delayed until September
    - All blocks will be available in the ClioSoft repository at Fermilab this week
    - Start integration and simulation of complete chip
    - Delay with the new Cold ADC discussed in ASIC “PMG” on Monday 7/9 (this is now a monthly meeting)



**SLAC CRYO**

# FD TPC Electronics

- New small TPC and cryostat at PAB
  - Cryostat order placed, first design review yesterday at Ability Engineering
  - Construction of APA at PSL started
  - Design of cathode and field cage completed
  - Started set-up of readout system at PAB
- Plans for system testing
  - Construction of protoDUNE FEMBs (for this TPC and for 7th protoDUNE APA to be tested in cold box at CERN) progressing
  - Started design of FEMBs to test CRYO ASIC from SLAC, will soon start design of FEMBs using new cold ADC



**CAD design of new small TPC**



# FD TPC Electronics

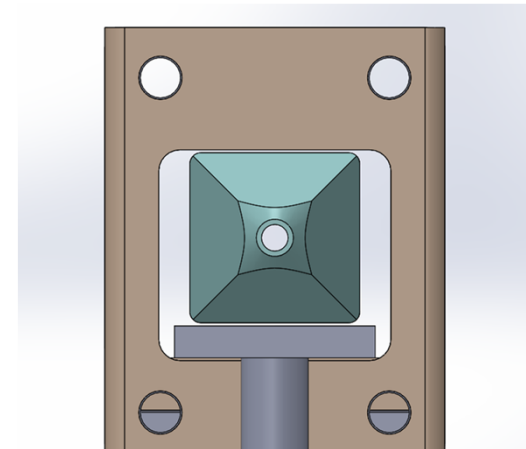
- Consequences of ASIC delays
  - We are trying to plan system tests well in advance and have all components ready ahead of the need-by date (SOWs for some new activities added in the system, proposal for BCR covering new activities under discussion)
  - However it is very likely that will not complete all the system tests prior to submission of TDR in April 2019
    - Will have results from standalone tests of ASICs, plus incomplete results from system tests
- Preparation for October director's review / January DOE IPR
  - Started implementing new schedule (mostly at the planning package level for the future) that reflects the current understanding of the project
  - Work progressing slowly because multiple other activities ongoing
  - Aim at having all activities with correct durations / relationships in P6 by the end of July with the bulk of M&S costs
  - Labor resources will be added in the 2nd half of August
  - BOE files will be generated in September

# FD APA

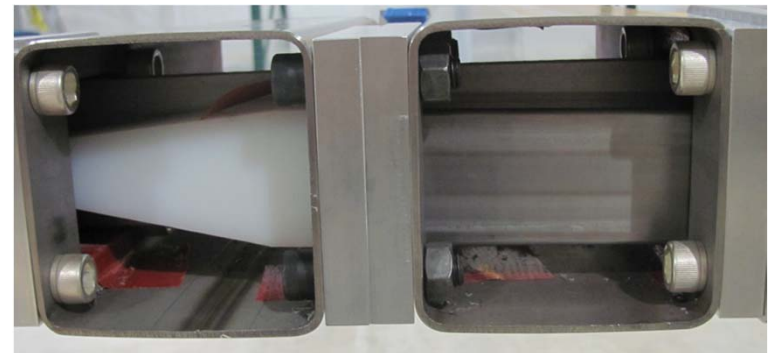
- First draft costing for production setup, APA components and assembly within the DUNE International Project
  - Drafting formal BOEs from ProtoDUNE experience (PSL, U. Wisconsin, is leading the effort)
  - 50 8-hour shifts to complete one APA
  - Using one improved wiring machine and two process carts to parallelize pre- and post-wiring processing the wall clock time required is 40 shifts/APA
  - Resources per winding station: 3.5 FTE tech, 0.5 FTE research physicist, 0.5 FTE postdoc, 1.0 FE engineer
  - First draft costing for DUNE-US APA is being input in P6
  - Still working on design, integration and installation costs

# FD APA

- Progress on CE cable routing through the APA side tubes at PSL, University of Wisconsin

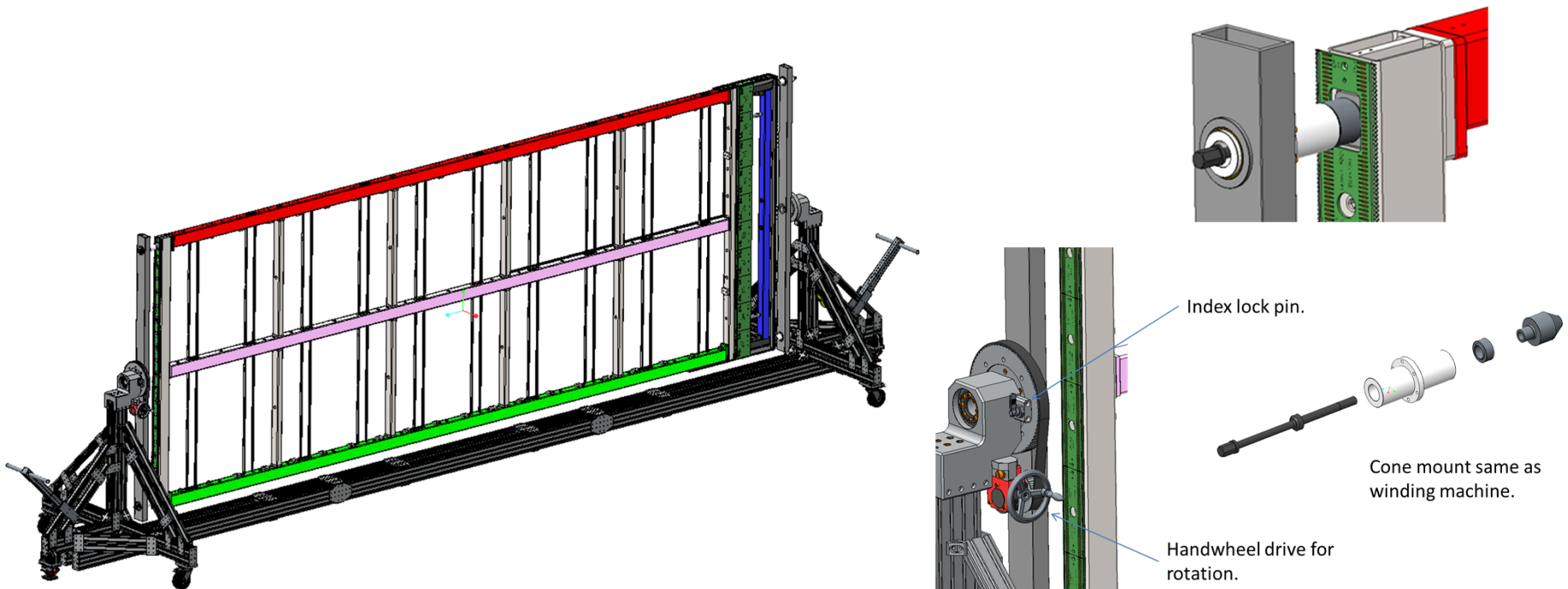


First 1.4 m of cables in a cover duct, works well, but still problems with the remaining of the cable. Extended rectangular duct?



# FD APA

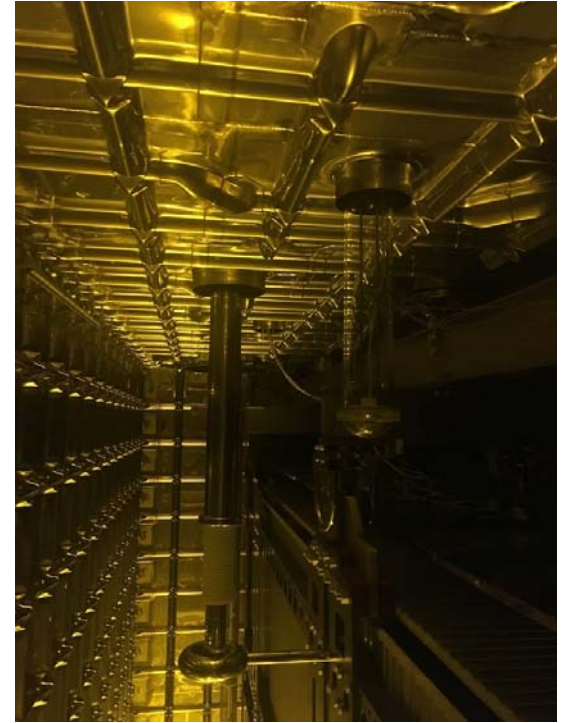
- Progress to get ready to wind the 7<sup>th</sup> ProtoDUNE-like APA at Daresbury Lab., UK, with the modified winder
  - Still waiting for the shafts for the winder head (within a few days)
  - Order in place for the new mesh window frames
  - Manufacturing parts for new mountings for the process cart, compatible with the new winder





# ProtoDUNE-SP: on-site Installation & Instrumentation

- **Detector**
  - Building and detector ground are nicely separated
  - Detector sealed and leak checked
  - All the sub systems (HV, slow control, purity monitor, electronics, DAQ) are being tested/debugged
- **Cryo**
  - Welding complete
  - Commissioning of the control system very advanced
  - Starting the purging of the external lines
- **CRTs**
  - Cabling to the racks is finished for all the modules
  - The downstream module are commissioned (except the trigger)
- **Beam**
  - Only two beam instrumentation components are missing
  - Fine tuning of the alignment and testing of the magnets is ongoing



# Neutrino Day, 14 July @ Sanford Lab



**NEUTRINO DAY 7-14-18**

**Ariel Waldman**  
 4:00 p.m. at the Opera House  
 "The Hacker's Guide to the Galaxy"  
 Book signing to follow, *What's it like in space?*

ALL DAY 9 a.m.-3 p.m.	FEATURED ACTIVITIES
<ul style="list-style-type: none"> <li>Sanford Lab</li> <li>Hennestaka</li> <li>Visitor Center</li> <li>Hourroom</li> <li>Geology</li> <li>Blacksmithing</li> <li>Solar Telescope</li> <li>Emergency Response demonstration</li> </ul>	<ul style="list-style-type: none"> <li><b>9:00 a.m.</b></li> <li>Children's reading activity, Hearst Library</li> <li><b>10:00 a.m.</b></li> <li>Children's reading activity, Hearst Library</li> <li>Live video chat with Fermilab, Visitor Center</li> <li><b>11:00 a.m.</b></li> <li>Chris Mossey, "Engineering for Deep Science," Coeira House</li> <li>Children's reading activity, Hearst Library</li> <li><b>Noon</b></li> <li>Live video chat with scientists underground, Visitor Center</li> <li>Children's reading activity, Hearst Library</li> <li><b>1:15 p.m.</b></li> <li>Education and Outreach demonstration, Visitor Center</li> </ul>

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# Upcoming Events

- LBNC Review, 1-3 August at Fermilab
- Detector Support System 30% design review, 20-21 August at CERN
- LBNF/DUNE Integration Meeting, 22-23 August at CERN
- RRB Meeting, 13-14 September at Fermilab
- DUNE Collaboration Meeting, 24-28 September at Fermilab
- Director's Cost/Schedule Review, 25-26 October at Fermilab
- DOE IPR, 8-10 January 2019 at Fermilab
- DUNE Collaboration Meeting, 28 Jan – 1 Feb 2019 at CERN