

# DUNE Project Status

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DUNE PMG Meeting

17 April 2018

# Outline

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

# ES&H Update

- Continued development of LBNF/DUNE ESH Introduction video
  - Draft script is out for review to Project Management
- Working with SURF to update User/Subcontractor ESH training
  - Completed ESH site orientation to include revisions to guide training and new unescorted access training
  - Assisting SURF in defining requirements for facility access training including visitors, guides, and a new option for unescorted access for DUNE activities
- Supporting development of DUNE Technical Proposal

# Quality Assurance Update

- DUNE Technical Proposal
  - Reviewing the Technical Proposal sections, particularly for Quality Assurance/Quality Control content
  - Developed guidelines and template for collecting lessons learned data
  - Assisting DUNE management in collecting Lessons Learned from ProtoDUNE



# DUNE Milestones

6th APA delivered, 5 April 2018

Completed In March

DUNE

T4 MS - ProtoDUNE UK APA #2 Arrives @ CERN	3/16/2018	5/3/2018	48	APA#2 arrived ahead of schedule
T4 MS - ProtoDUNE SP Detector Production Complete	3/23/2018	3/23/2018	-	

# DUNE Stop Light Report for Current Month

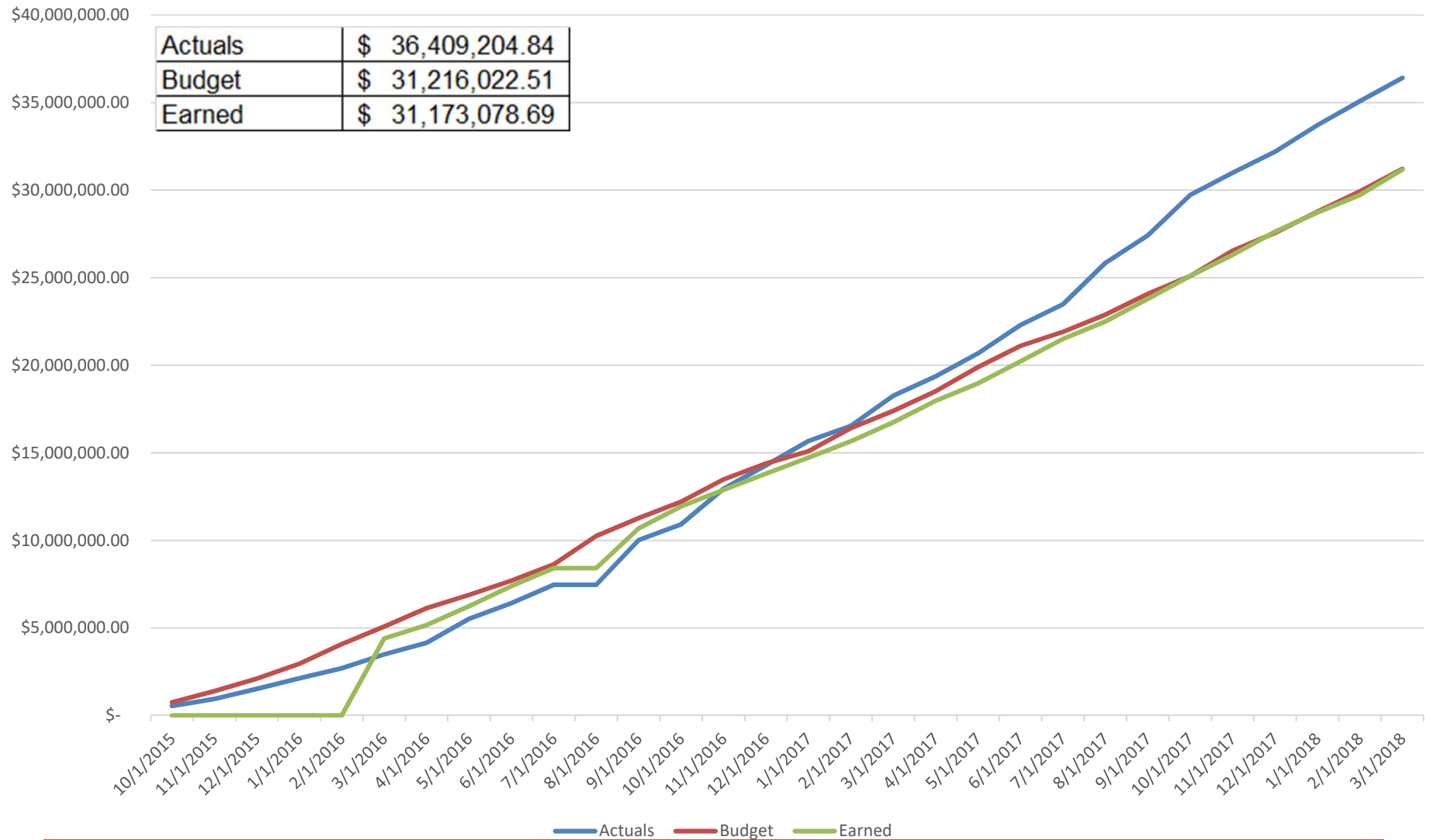
<b>DUNE</b>							
<b>March 31, 2018</b>							
<b>Currency in: \$K</b>	<b>Current Period</b>						
<b>Work Package.WBS (2), Work Package.WBS (3), Work Package.WBS (4)</b>	<b>Budget</b>	<b>Earned</b>	<b>Actuals</b>	<b>SV (\$)</b>	<b>SV (%)</b>	<b>CV (\$)</b>	<b>CV (%)</b>
131.02 DUNE	1,284	1,446	1,324	163	13%	122	8%
131.02.01 Project Office - DUNE	214	214	202	0	0%	12	6%
131.02.02 Far Detector	1,069	1,232	1,122	163	15%	110	9%
131.02.02.20 Far Detector - Detectors 1-4	561	433	334	(128)	-23%	98	23%
131.02.02.30 ProtoDUNE Design and Construction	250	458	612	208	83%	(154)	-34%
131.02.02.40 ProtoDUNE Onsite	259	341	176	83	32%	165	48%
131.02.03 Near Detector	0	0	0	0	0%	0	0%
<b>Total</b>	<b>1,284</b>	<b>1,446</b>	<b>1,324</b>	<b>163</b>	<b>13%</b>	<b>122</b>	<b>8%</b>

# DUNE Stop Light Report – Cumulative

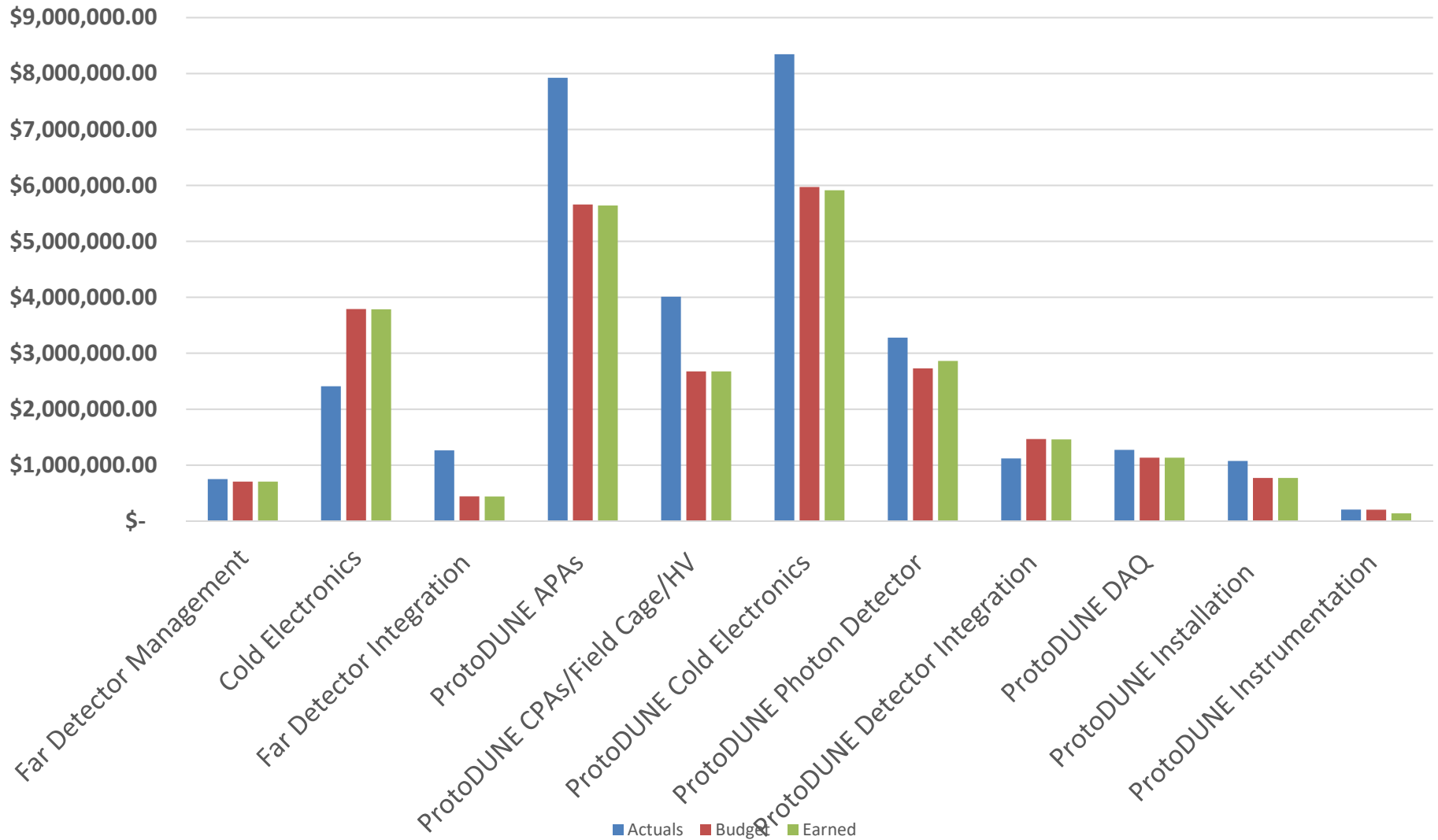
DUNE									
March 31, 2018									
Currency in: \$K									
	Cumulative to Date								
Work Package.WBS (2), Work Package.WBS (3), Work Package.WBS (4)	Budget	Earned	Actuals	SV (\$)	SV (%)	CV (\$)	CV (%)	SPI	CPI
131.02 DUNE	31,216	31,173	36,409	(43)	0%	(5,236)	-17%	1.00	0.86
131.02.01 Project Office - DUNE	4,431	4,431	4,240	0	0%	191	4%	1.00	1.05
131.02.02 Far Detector	26,785	26,742	32,169	(43)	0%	(5,427)	-20%	1.00	0.83
131.02.02.20 Far Detector - Detectors 1-4	5,917	5,884	4,767	(33)	-1%	1,117	19%	0.99	1.23
131.02.02.30 ProtoDUNE Design and Construction	18,169	18,225	24,673	56	0%	(6,448)	-35%	1.00	0.74
131.02.02.40 ProtoDUNE Onsite	2,699	2,634	2,730	(65)	-2%	(96)	-4%	0.98	0.96
131.02.03 Near Detector	0	0	0	0	0%	(0)	-	-	0.00
<b>Total</b>	<b>31,216</b>	<b>31,173</b>	<b>36,409</b>	<b>(43)</b>	<b>0%</b>	<b>(5,236)</b>	<b>-17%</b>	<b>1.00</b>	<b>0.86</b>

- \$6.5m cumulative ProtoDUNE design & construction variances:
  - APA - \$2.3m
  - CPA/FC/HV - \$1.3m
  - Cold Electronics - \$2.6m
  - Photon Detector - \$0.5m

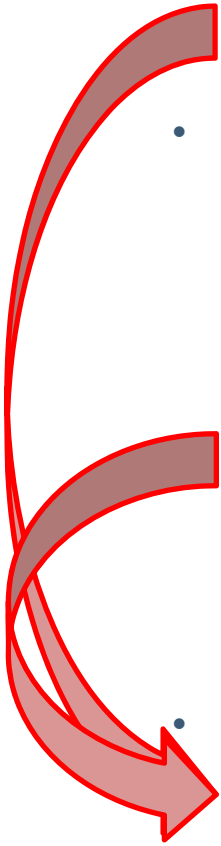
# Far Detector/ProtoDUNE Budget, Earned, Actuals



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



# Project Management Highlights – IPR, 20-22 March 2018

- DOE IPR, 20-22 March 2018
    - Eight findings from Detector Subcommittee
    - One finding from cost/schedule subcommittee:
      - Perform a comprehensive review of bottom-up cost and schedule estimate (for all project elements) in revising the TPC, which should include adequate cost and schedule contingency, prior to the next OPA Review.
    - Six findings from management subcommittee, including:
      - Update the planning and associated cost estimates to provide logistics and system engineering support for LBNF and DUNE before the next IPR.
      - Define the requirements for non-DOE contributions necessary for CD2 by Oct 1.
      - Bring the full LBNF and DUNE US scope, cost estimate, contingency (cost, schedule, and scope) and risk analyses, up to date by Oct 1.
      - The project, the Program, and OPA should agree on a schedule of review(s) to assess progress in executing 3A scope and the entire project's readiness for CD2.
    - We have proposed an alternative timeframe to OHEP, in order to accommodate the re-estimation of all LBNF/DUNE subprojects, a full risk workshop, and all associated updates to the schedule
- 

# Project Management Highlights

- BCR 249 - change to accommodate requirements change, removal of the rock septum – *in process*
- Still need BCRs to cover accommodate ProtoDUNE CRT, TPC at FNAL, additional Far Detector design work needed in FY18
- LBNF/DUNE Interface Meetings
  - 22 March: subproject requirements for technical services at SURF; beginning to address installation interactions with other subprojects
  - 27 March: finalize requirements related to proposed final design changes
  - 10-11 April: Cryostat Slab and Final Design Workshop – essentially the final design kick-off for the Far Site Conventional Facilities
    - Structural discussion, electrical isolation, rock resistivity testing, sealing of concrete slabs on grade, and design changes since preliminary design
- Common fund / host lab costing exercise in process
- Host Lab Working Group
  - Project Support Subteam (top issues): Technical Services, Emergency Response, Storage space at SURF, Expectations between DUNE & SDSTA
  - Business/Liability Subteam: Import / export / tariffs, Insurance

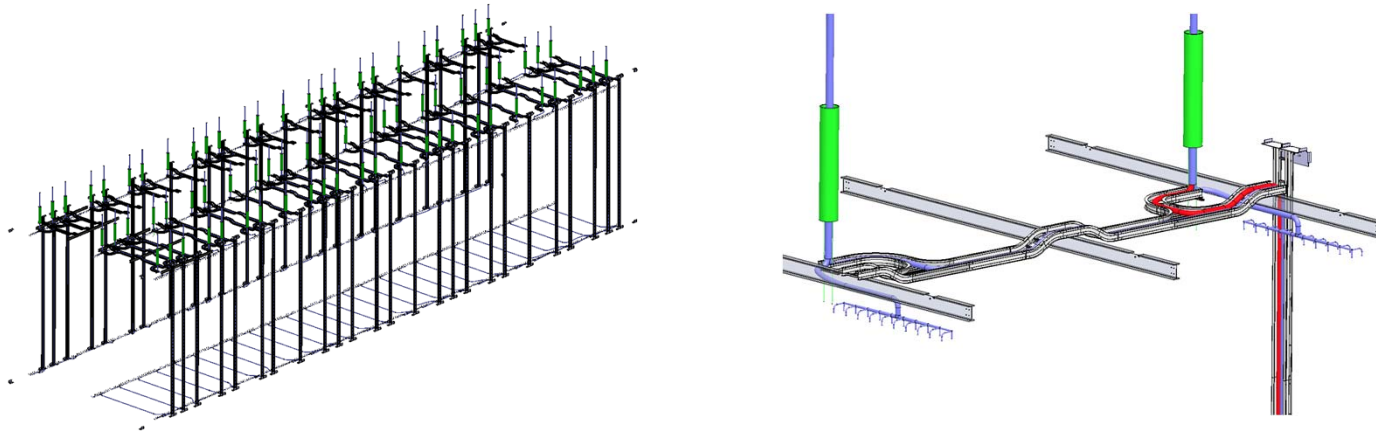
# Far Detector Engineering

- **Detector component integration and installation**
  - Worked with APA, CE and PD consortia to develop plans for cable routing through APA frame
  - Developed plan for testing of cable routing through side tubes of APA
  - Developed justification for removal of the rock septum and
  - Developed installation schemes for single phase detector
  - Participated in workshop with A/E firm to discuss requirements and changes
- **Detector electronics and grounding**
  - Revised grounding plan for the cavern and detector based on the removal of rock septum
  - Developed plans for placement of detector and ancillary power components
  - Developed preliminary requirements for electronics cooling
  - Developed preliminary plans for data room in CUC
- **Detector interfaces**
  - Reviewed interface documents between consortia and made comments
  - Met with some of the consortia and discussed updates to the documents



# Installation

- The installation team has worked on alternates to the installation plan which was developed in February. TC management has requested several alternate layouts be investigated. At present we have not found a second configuration that meets the needs of the experiment but are continuing the studies.
- The alternate cable routing scheme where the detector cables are routed along the wall of the cryostat and not through the APAs was developed to a conceptual level. This model was use to determine the maximum cable length which is critical for the electronics consortia to determine if this scheme is viable.



# Single Phase TPC Electronics (i)

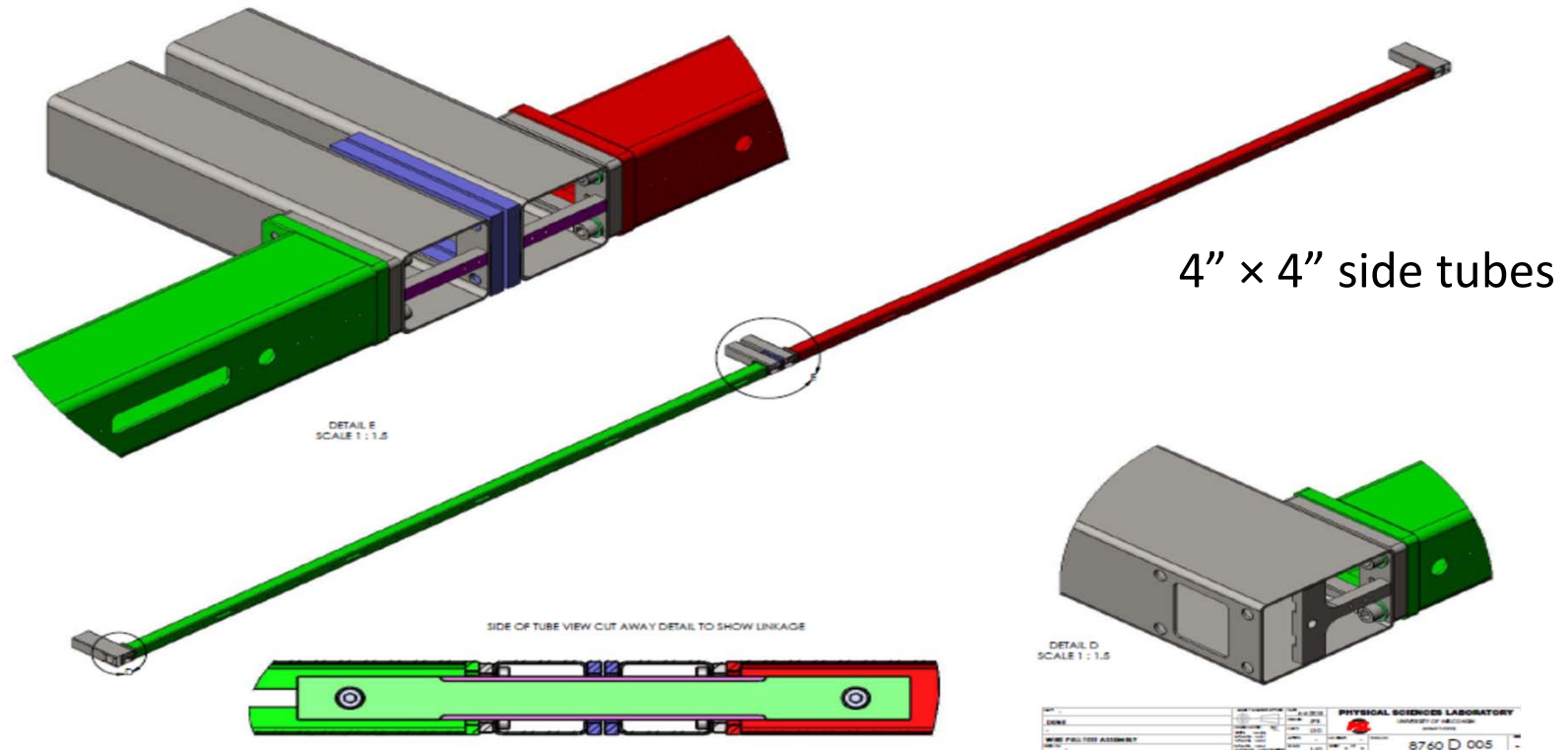
- LArASIC v8
  - Submitted to the foundry in mid-March, expect chips to be available mid-June
- Cold ADC (LBNL+BNL+FNAL)
  - Originally planned for submission in June, however we now have a 4-6 weeks delay
  - In part due to misunderstanding in design responsibility for some blocks
    - LBNL to take (from BNL) design of buffers for voltage / current references for ADC
  - In part due to technical issues
    - Results on test structures indicate that bandgap reference circuit may have range of parameters where it can work at both LAr and room temperatures
    - Decided to implement a current reference (LBNL) in addition to bandgap reference (BNL)
    - Additional funding required at LBNL
  - Expect delay of 4-6 weeks
  - Time window for having system test results prior to submission of Technical Design Report becoming very narrow

# Single Phase TPC Electronics (ii)

- COLDATA
  - Design progressing, measurements on long cables becoming critical
  - Still expect to be able to submit by end June
- CRYO
  - Delay of at least 2 months relative to original plan
  - Correct for decrease in ADC precision due to parasitic capacitances (done)
  - Working on noise on front end amplifier caused by linear voltage regulators
  - Next submission opportunities April 24, May 22
  - Start planning for front end motherboards for system tests
- System tests
  - protoDUNE cryostat will be closed in such a way that it will be possible to reopen it, replace 3 APAs, close again
  - Planning for 2<sup>nd</sup> protoDUNE run in 2021 with final APAs/electronics

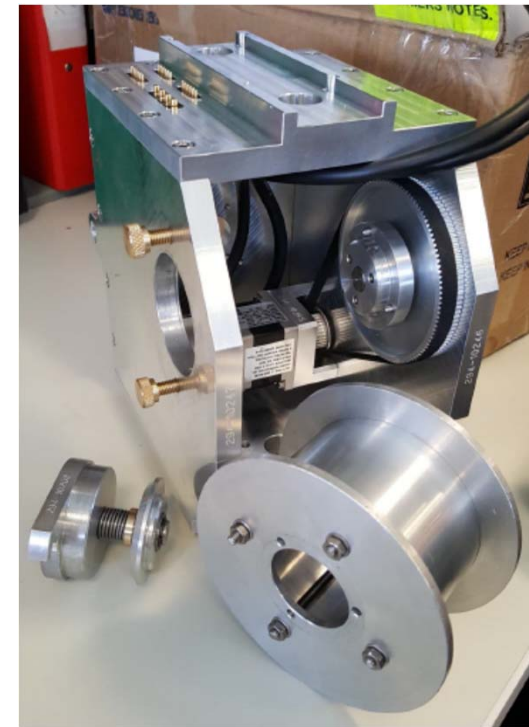
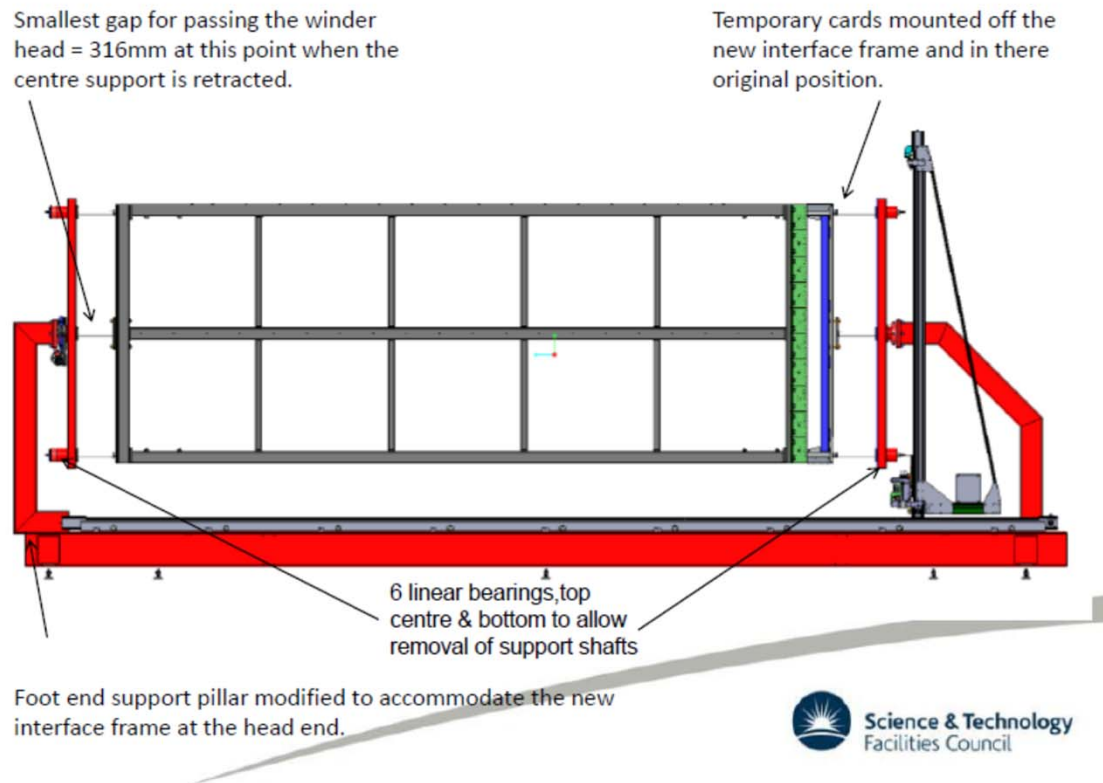
# FD APA

- Progress on the definition of the Cold Electronics (CE) and Photon Detectors cabling through the APA frame. A test of the CE cables through the side tubes of the APA frame is in preparation at PSL, Madison



# FD APA

- Progress on APA winder modifications at Daresbury, UK



- Preparation of the APA section of the DUNE Technical Proposal, to be submitted today

# SPPD Design & Construction – Subsystem Reports

- ✓ APA – all delivered
- ✓ Photon Detector – all delivered
- ✓ Cold Electronics – delivery this week
- ✓ CPA/FC/HV – delivered & mostly installed



# OnSite - Installation and Instrumentation

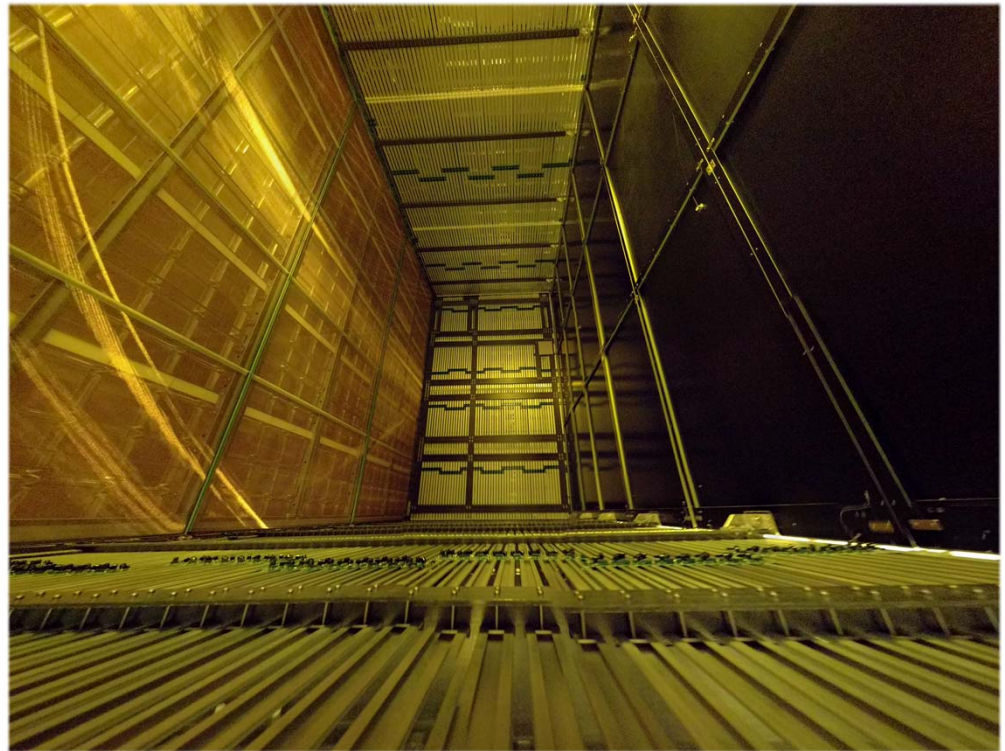
## APA#5:

- PD installation completed, all CE boxes installed and tested
- Moved into Cold Box - Cold test in preparation.

**Major Milestone achieved:  
First Drift Volume (Saleve Side) of the TPC  
completed inside the cryostat**

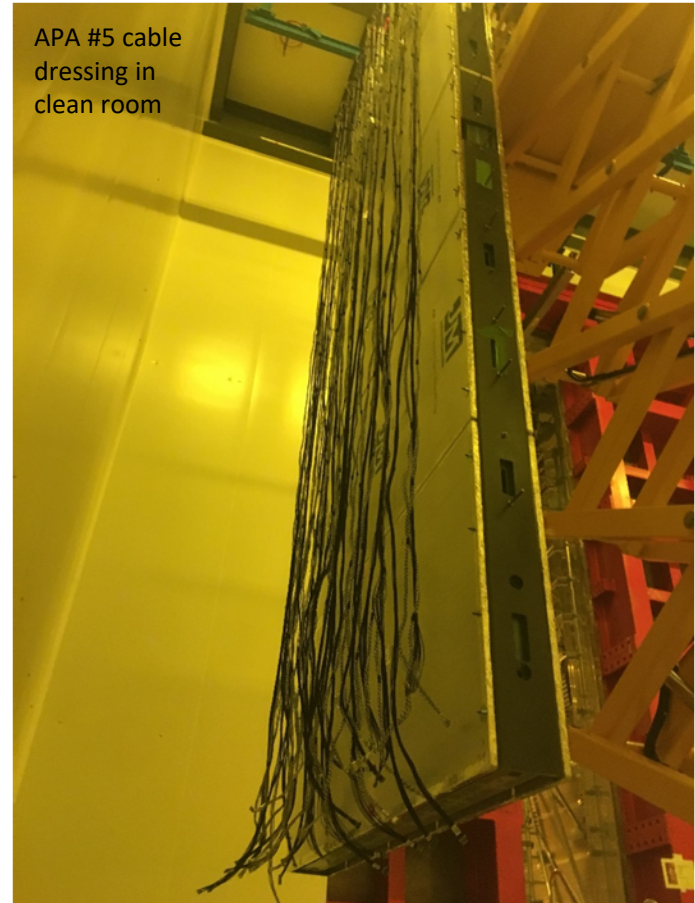
## Inside the Cryostat:

- ✓ ALL remaining components (APAs, CE boxes, PD module and PD r/o electronics, FC) to complete the second Drift Volume (Jura side) delivered at CERN
- ✓ Cable routing for first volume completed - for second drift volume in progress
- ✓ DAQ switched to new timing system firmware and running multiple parallel partitions



# SPPD OnSite Installation & Instrumentation

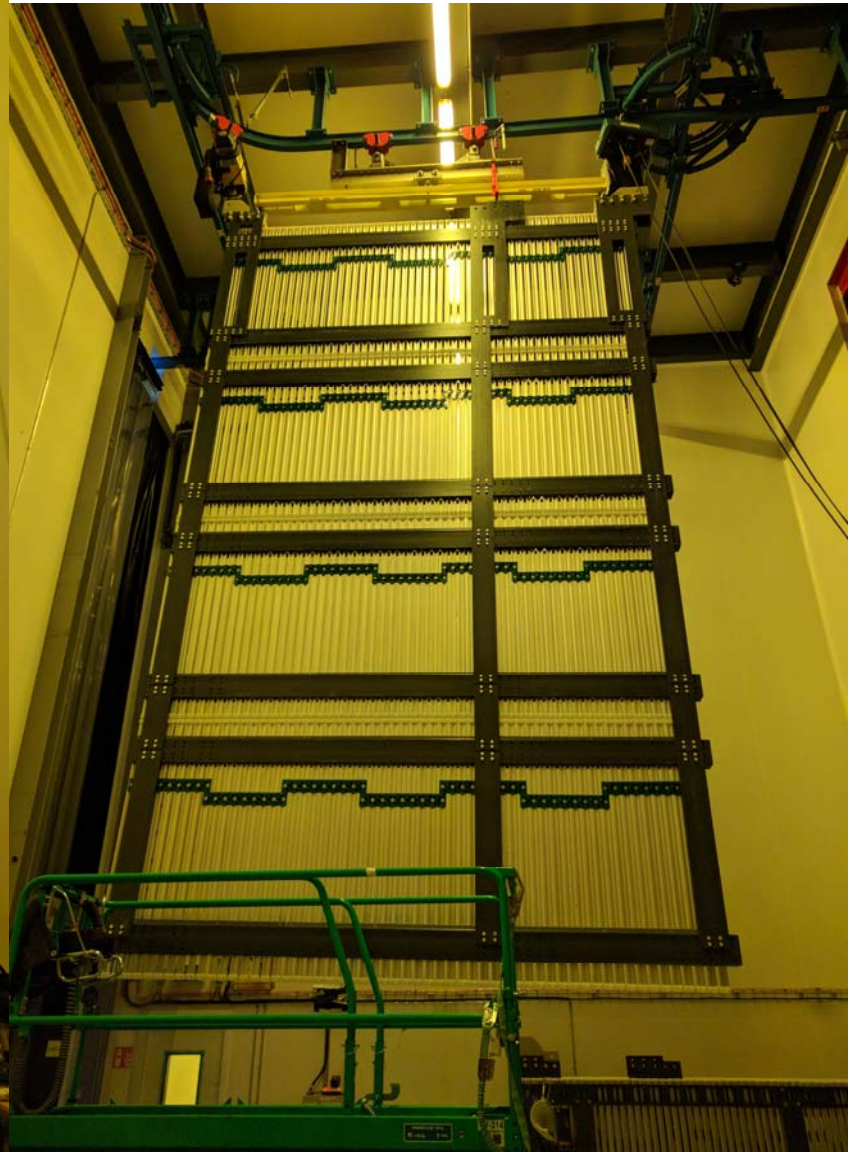
- **APA #6 (the last one!)**
  - 5 April – arrived at CERN from UW-PSL (US)
  - 13 April – Moved into clean room & inspected
  - PD installation completed; CE installation in progress
- **Cryogenics System**
  - All components at CERN
  - Installation in progress at Neutrino Platform
- **NP04 Beam Line**
  - Shielding blocks & support platform
  - Magnets under test
  - Installation in progress at Neutrino Platform







left: APA#3 (UK) out of the cold box  
below: End wall field cage fully assembled

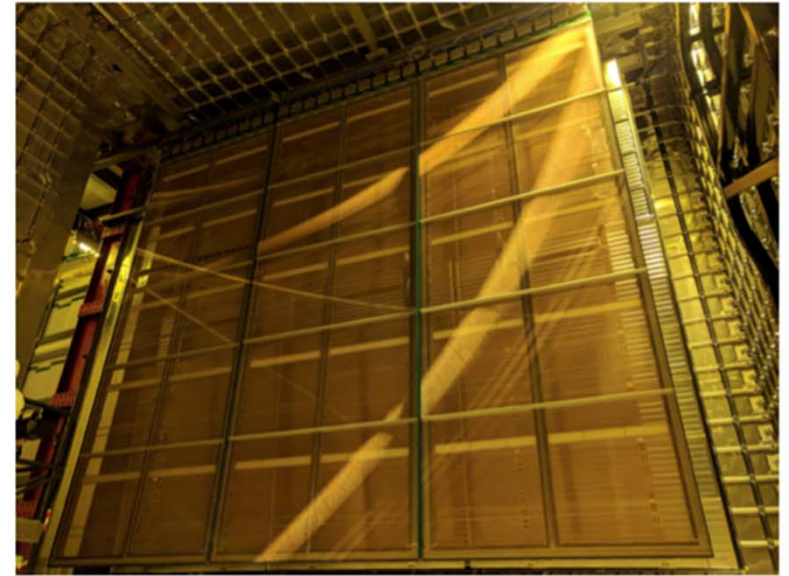




# SPPD On-site – Photos February through April



APA#6 into Clean Room SAS; APA crate being loaded onto truck



Above: APA1-3; below: CPAs & top/bottom field cages



# Upcoming Events

- DUNE Collaboration Meeting, 15-18 May at Fermilab
- Logistics Industry Day, 31 May at Lead, SD
- Risk Workshop, July at Fermilab
- LBNC Review, 1-3 August at Fermilab
- DOE IPR, this fall/winter TBD





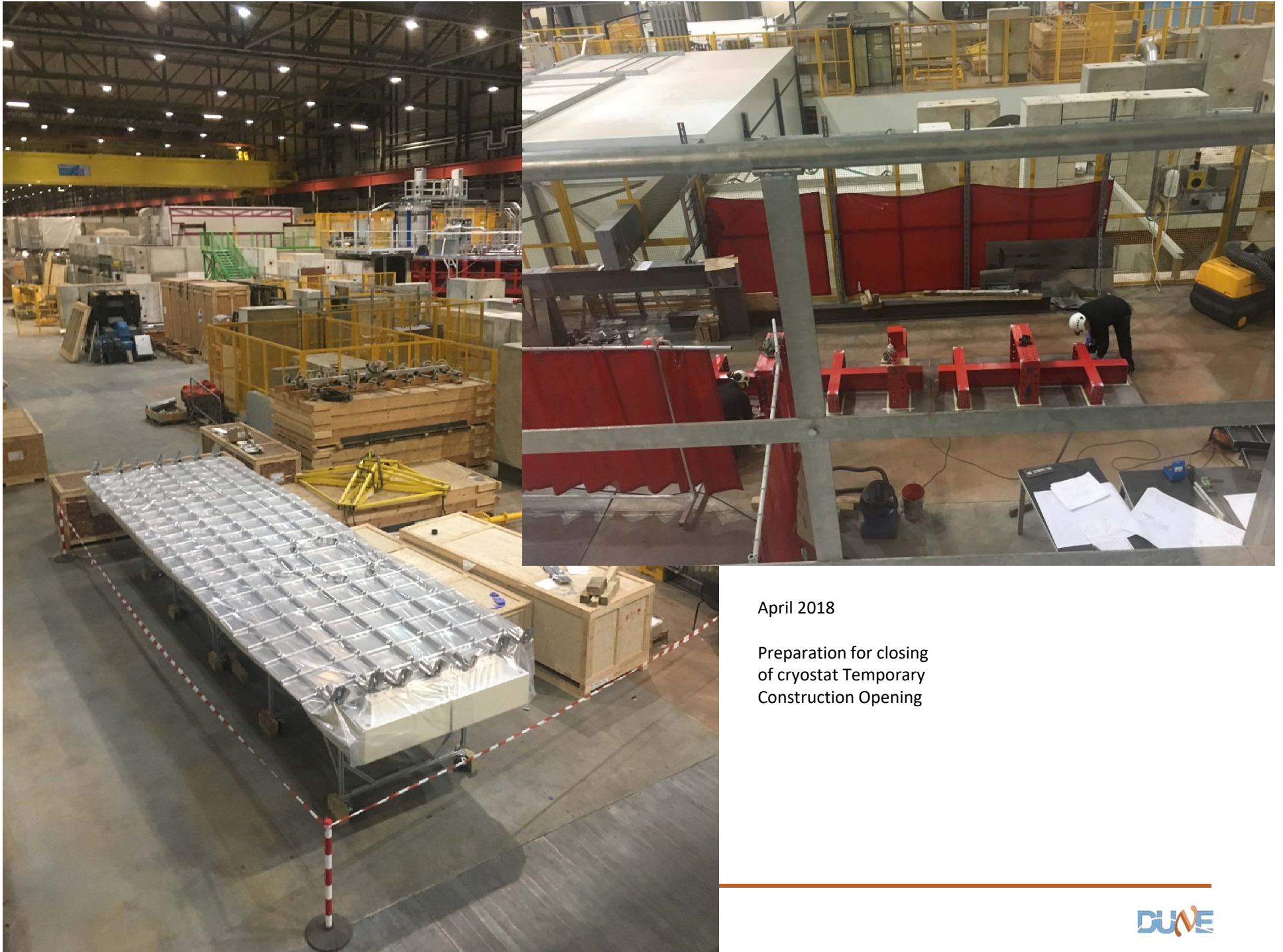
EHN1, 10 April 2018





EHN1, 6 April 2018





April 2018

Preparation for closing  
of cryostat Temporary  
Construction Opening