

DUNE Project Status

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DUNE PMG Meeting

23 October 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

- Review of design requirements for the 4910L stairway installation for life safety issues
- Draft DUNE detector filling process has been developed and is in the process of being socialized with stakeholders
- Support of the DUNE design review process and development of the Technical Design Report

Quality Assurance

- DUNE Quality Assurance Specialist
 - Completed the telephone interviews for the position
 - In the process of conducting in-person interviews
 - Anticipate position to be filled in November
- Participated in the DUNE Collaboration Meeting
- DUNE Technical Design Report
 - Developed outline for the Quality Assurance section in the Technical Coordination Chapter
 - In process of developing the section.

DUNE Milestones

T2: Federal Project Director
 T3: Fermilab Directorate
 T4: Project Director
 T5: L2 Manager
 T6: CAM

	Sept 2018 P6 Update	August 2018 P6 Update	Variance	Comments
Completed In September				
T2 MS - ProtoDUNE SP Detector ready for operations	9/28/2018	4/11/2019	195	Filling completed ahead of schedule allowing for operations to begin
T4 MS - ProtoDUNE Start Operations	9/28/2018	10/11/2018	13	Filling completed ahead of schedule allowing for operations to begin
Planned for Completion October - December				
T4 MS - Stakeholders Written Approval of 30% FSCF Final Design Documents	10/1/2018	9/17/2018	(14)	Date postponed by CF
T4 MS - Interface Agreement with all Detector Subgroups Complete	11/1/2018	11/14/2018	13	
T4 MS - Stakeholders Written Approval of 60% FSCF Final Design Documents	11/26/2018	11/2/2018	(24)	Date postponed by CF
T4 MS - ProtoDUNE UK APA #3 Arrives @ CERN	12/19/2018	12/19/2018	-	will be postponed until January
T4 MS - Decision on Detector #2 technology design	12/31/2018	12/31/2018	-	new date TBD

DUNE Stop Light Report (current month)

DUNE Files							
September 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	1,020	1,084	1,225	63	6%	(141)	-13%
131.02.01 Project Office - DUNE	372	372	221	0	0%	151	41%
131.02.02 Far Detector	648	712	1,004	63	10%	(292)	-41%
131.02.02.20 Far Detector - Detectors 1-4	602	614	423	12	2%	191	31%
131.02.02.30 ProtoDUNE Design and Construction	0	0	255	0	0%	(255)	-
131.02.02.40 ProtoDUNE Onsite	46	98	326	52	112%	(228)	-233%
131.02.03 Near Detector	0	0	0	0	0%	0	0%
Total	1,020	1,084	1,225	63	6%	(141)	-13%

Cost Variances for ProtoDUNE Onsite & ProtoDUNE Design and Construction due to Year-end labor transfers to correct incorrect charges

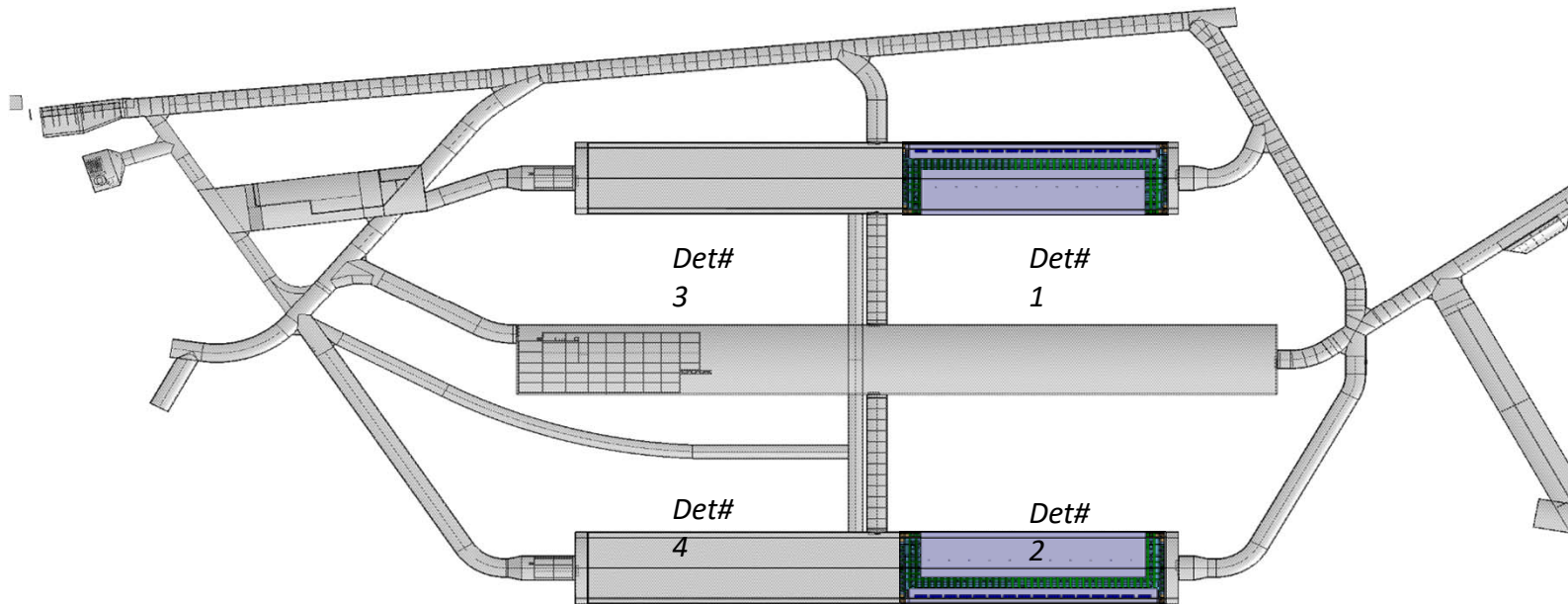
Project Management Highlights

- Director's cost/schedule review later this week, 25-26 October
 - Drilldowns for APA production, CE components
 - Charge requires committee to address CD tailoring strategy
- August LBNF/DUNE integration meeting identified a concern about stored energy associated with filling of detector #1 concurrent with installation of detector #2
 - Alternate installation sequence proposed
 - EFIG meeting on 17 October
 - Requires outfitting of chamber 3 (currently not included in LBNF (DOE) scope)
 - Upcoming installation/integration workshop and LBNF/DUNE interface meeting to further address implications
- Far Site Logistics Manager on-board, 15 October
 - FNAL introduction, 15-26 October, start at SURF 29 October
 - Priorities: warehousing, local transportation, inventory management
- Host Lab Working Group Update
 - Visa issues: drafting white paper on why project requires special skills / visa types
 - Financial: developing proposal for handling of 3rd party financials with non-standard indirect treatment

Far Detector Engineering

- **Detector component integration and installation**
 - Developed test box requirements for vertical testing of APA doublet
 - Analyzed tolerance stack up in warm conditions for APAs
 - Started integration modelling of SP TPC including internal cabling and cryogenics
 - Developed installation clearance valued for APA inside the cryostat
 - Developed outline for technical coordination TDR chapter
 - Developed concepts for routing of the instrumentation cables
 - Participated in interview process for technical coordination QC/QA specialist
 - Developed signature process for interface documents between consortia
- **DUNE Detector electronics and grounding.**
 - Worked to identify the requirements of the Detector Safety System and how that will interface to the overall safety system provided at the 4850L.
 - Participated in meeting with CD Core Computing groups to discuss networking between Fermilab and SURF, including specific ESNET requirements for DUNE at SURF. Bi-weekly meetings continue. Representatives from CD will visit SURF the week of October 29th.
 - Further defining the data and required underground network cables.
 - Defining the distribution of power, electronics readout equipment, and cabling, assuming a detector rack mezzanine is installed.

A new underground installation sequence



- To address concerns during LAr filling, a new sequence to the detector construction has been proposed
 - Detector#1 in cavern #1 and Detector#2 in cavern #3
 - Discussed at EFIG, 17 October
 - Requires outfitting of Cavern #3, which is currently not included in LBNF/DUNE-US scope

Detector Support System

- The loads are being reviewed by technical coordination and the consortia. Changes since ProtoDUNE-SP include a larger APA frame, more cable mass, and changes to the FC ground plane support.
- The tolerances and APA pitch are being carefully investigated to fix the detector envelopes.
- The interfaces between the cryogenic instrumentation group and the DSS structure are being designed.

LBNF/DUNE Interface meeting

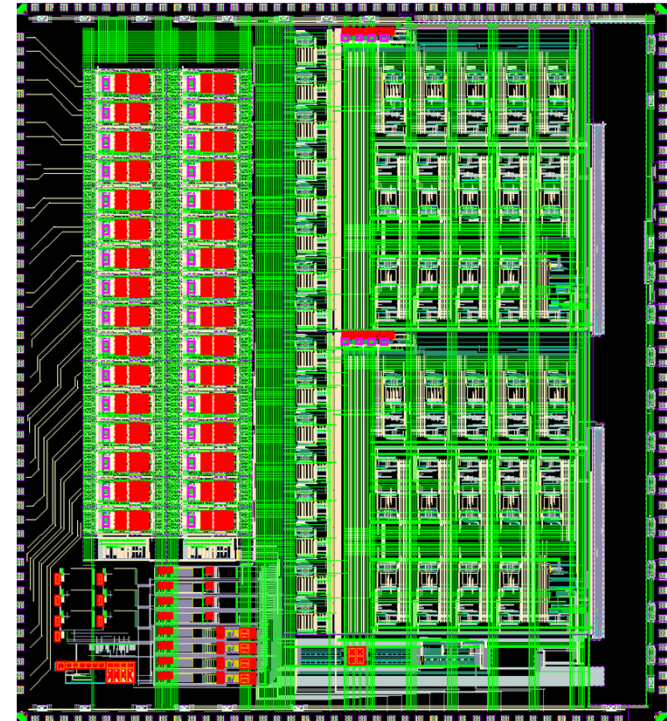
The week of October 29th a LBNF/DUNE interface meeting will be held at SURF.

A DUNE installation and integration workshop will be held earlier in the week to understand the impact of changing the underground configuration on the installation plan.

- The new plan enables significant underground storage and decouples the installation of the 2 detectors

Cold Electronics – ASIC Submission

- Cold ADC will be submitted on 10/24
 - Only minor issues found (and fixed) during final (and very extensive) verifications
- CRYO (3 in 1 solution) will be submitted at the beginning of November
- Postponing submission of COLDATA to early January
 - Finalizing submission of ColdADC required more work, could not free resources to work on COLDATA
 - Planning for November submission was too risky, no submission date in December

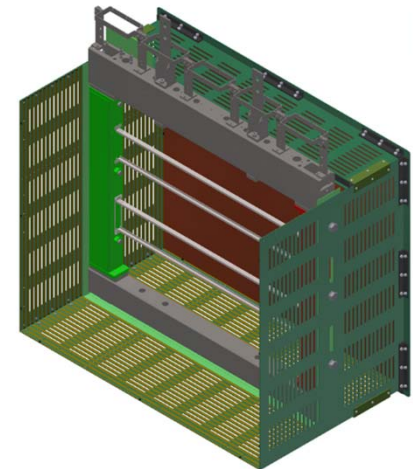


Cold Electronics – Small TPC (i)

- 1280 Channels APA built by PSL (Wisconsin), delivered at the beginning of October



- All Parts are in hand.
- TPC will be constructed at Fermilab in Oct 2018.



Cold Electronics – Small TPC (ii)

- Cryostat and Condenser at Fermilab, need to install transfer lines for LAr



Condenser delivered on 10/3/2018



Scheduled for delivery on 10/22/2018

- DAQ and electronics are being tested
- On track for commissioning of small TPC in November

Cold Electronics – Management

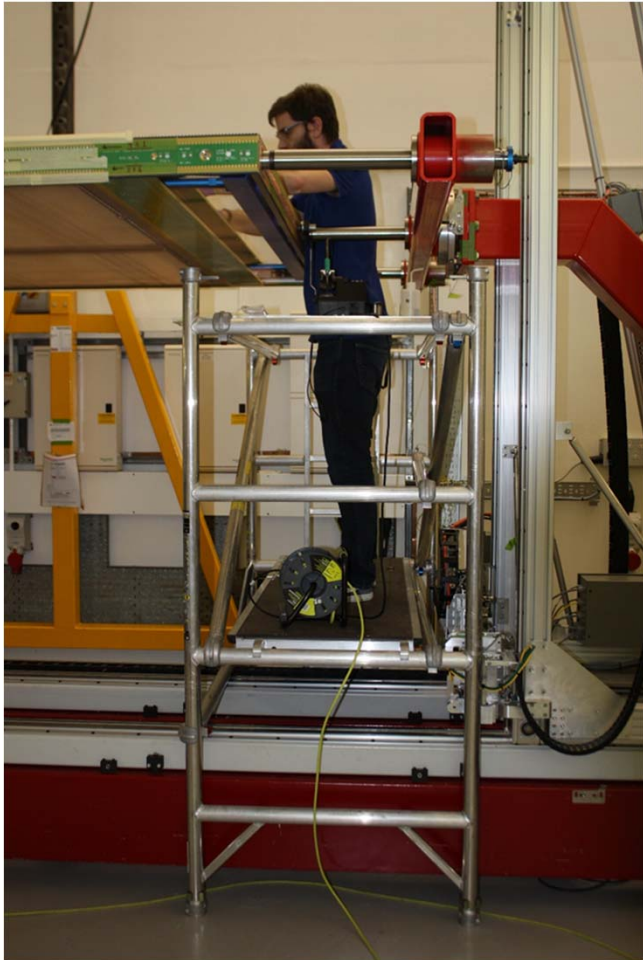
- New schedule / cost estimate available since beginning of October
- Working on assigning final R&D and construction tasks to all the groups from universities & national laboratories
- Put in place SOWs for FY19 and get pledges of resources for future years

FD APA

- Completed APA cost & schedule in P6, with essential input from PSL, University of Wisconsin, based on ProtoDUNE actual costs
- Total cost for 150 APAS (two 10 kt modules) dominated by labor (~1/3 M&S, ~2/3 Labor): \$49M (fully loaded)
- Completed cabling tests at PSL. Ready to ship 2 APA side tubes to Ash River, for a 12 m vertical cable test
- Detailed APA integration drawings with DSS (Detector Support System) and first estimate of APA “envelope” to determine APA pitch for installation

FD APA

Finishing up V plane for ProtoDUNE APA#7 @ Daresbury Lab.



V Wire Plane
Soldering Head End

ProtoDUNE-SP Onsite

- Cryogenics Commissioning and LAr filling up to nominal LAr level completed by September 13. Purity of the liquid relatively low, in the range of 50 mus of electron lifetime. LAr Recirculation started.
- LArTPC Detector activation, with HV ramp up to nominal 180 kV at the Cathode (corresponding to 500 V/cm drift field) successfully performed by September 21.
- First tracks - close to the anode plane - immediately visible. Data taking started.
- Scintillation light detected by the Photon Detection System.

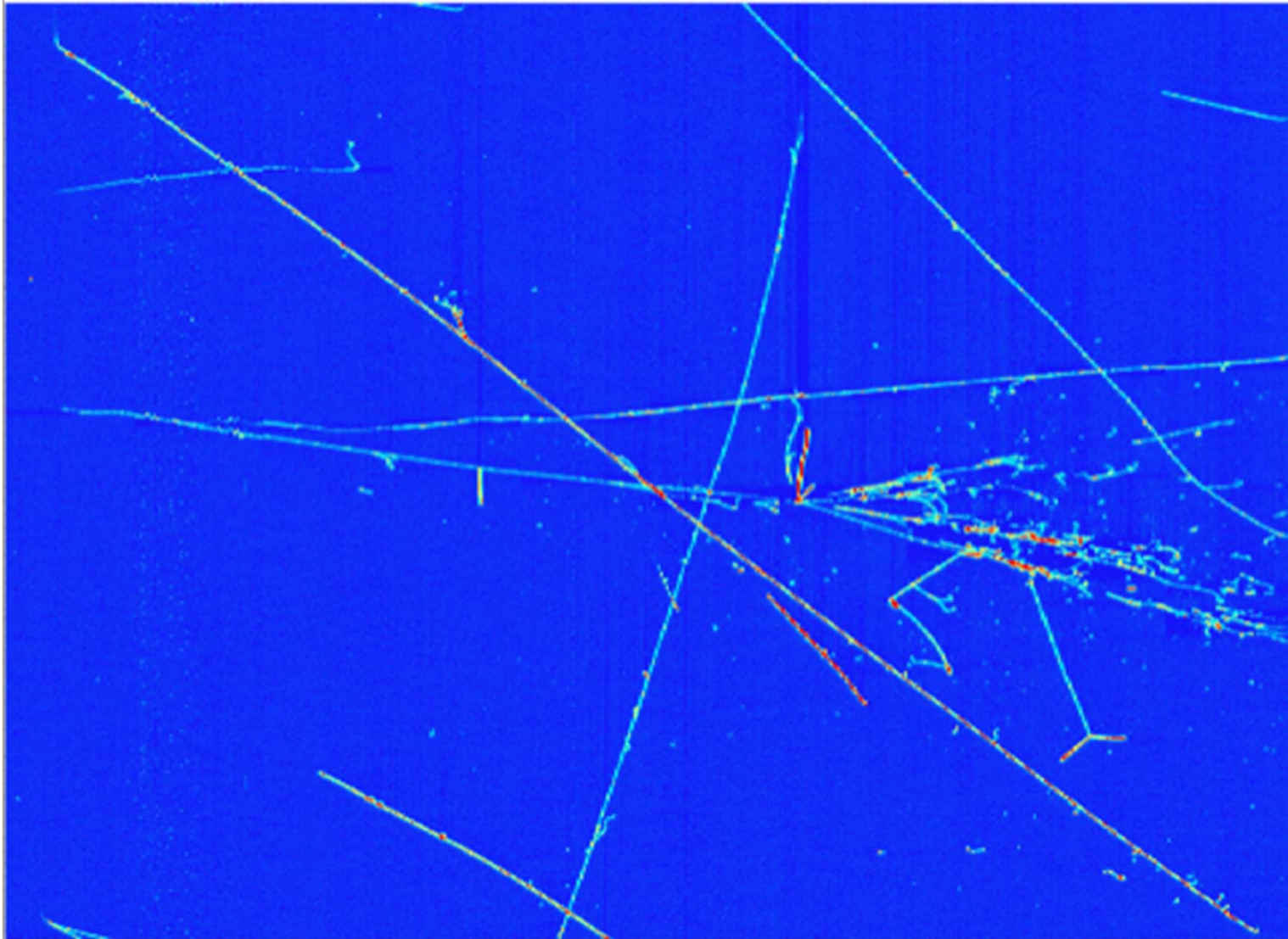
ProtoDUNE-SP Onsite

- HV instabilities due to faulty Power Supply detected at increasing rate, but did not impact data quality.
- On Oct. 4, a lifetime of 1 ms was reached, and first events from the beam (entering the TPC near the Cathode) were seen.
- Physics Run started collecting hadrons at 7 GeV and successively at 1 GeV. Plan for data taking at 2 GeV and 4 GeV and 6 GeV is in place for the remaining weeks of beam time.
- On Oct 16 the Power Supply was replaced with a new HV PS delivered at CERN. HV instabilities largely disappeared with rare minor current draws observed so far.
- Run proceeding smoothly.

7 GeV pion (\rightarrow hadronic shower) shown in 3D view

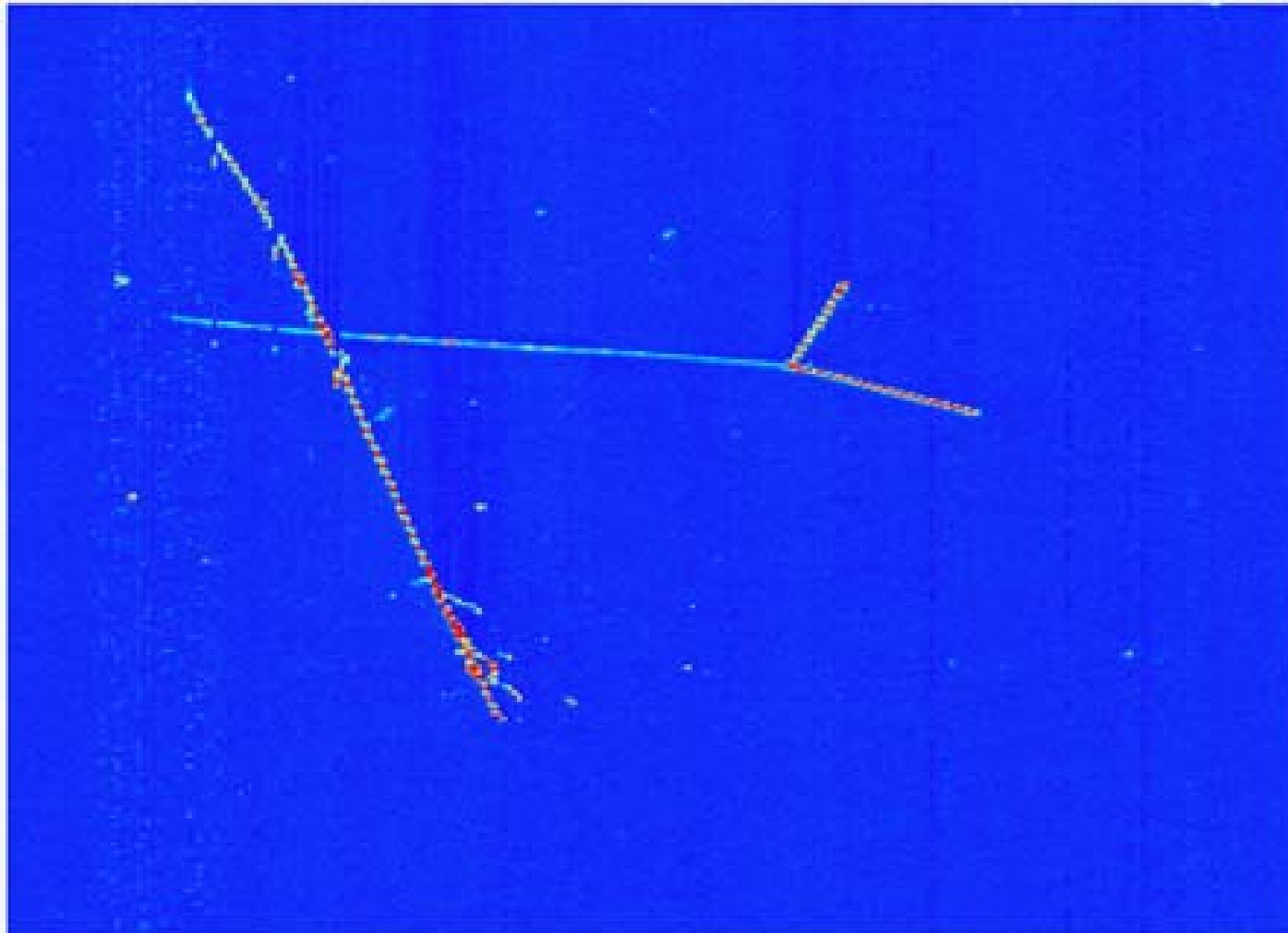


7 GeV pion (\rightarrow hadronic shower) shown in 2D



ProtoDUNE Event Display

1 GeV pion (\rightarrow absorption \rightarrow 2 protons) shown in 2D



Upcoming Events

- Director's Cost/Schedule Review, 25-26 October at Fermilab
- Integration & installation workshop, 29-31 Oct at SURF
- LBNF/DUNE Integration Meeting, 1-2 Nov at SURF
- SP Photon Detector 30% design review, Nov 12-13 at Fermilab
- DAQ 30% design review, 3-4 Dec at CERN
- LBNC, 7-9 Dec at CERN
- DOE IPR, 8-10 January 2019 at Fermilab
- APA design review, 24-25 January 2019 at Daresbury
- CE Mech design review, Feb 2019, date/place TBD
- DUNE Collaboration Meeting, 28 Jan – 1 Feb 2019 at CERN