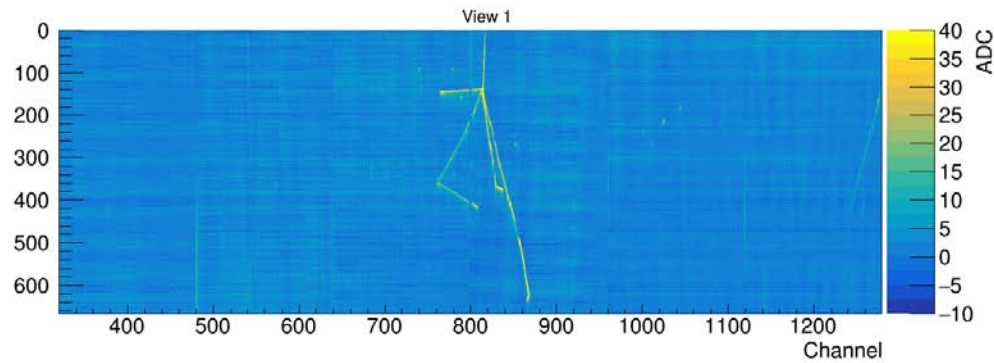
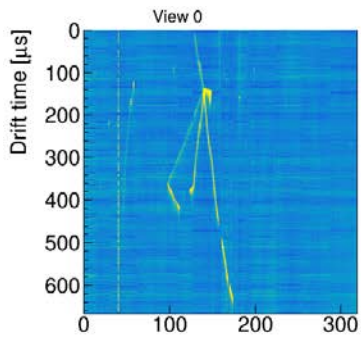
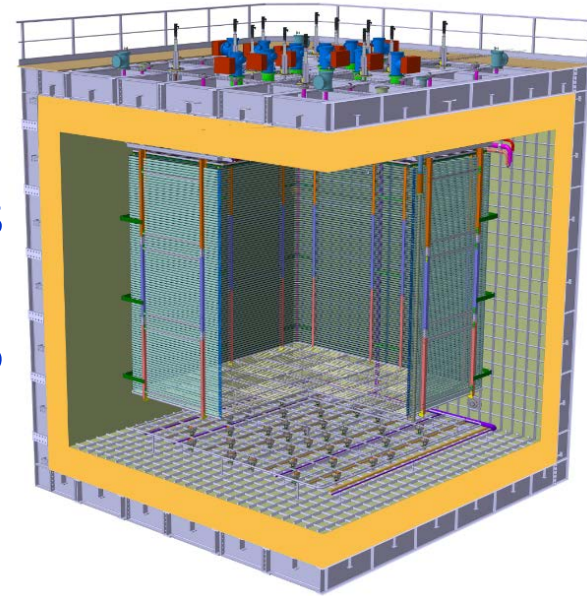


ProtoDUNE-DP status update

D. Duchesneau



- 3x1x1 latest news
- Activity in EHN1
- Status of first CRP

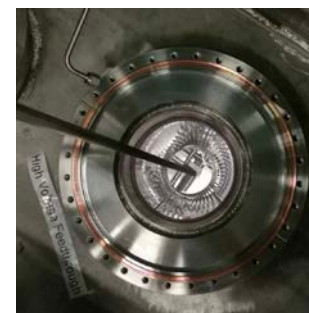
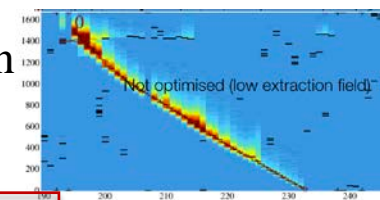
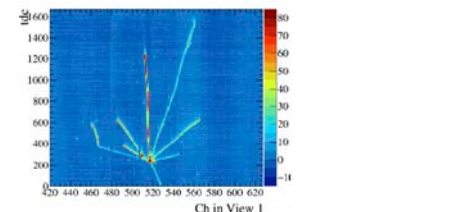
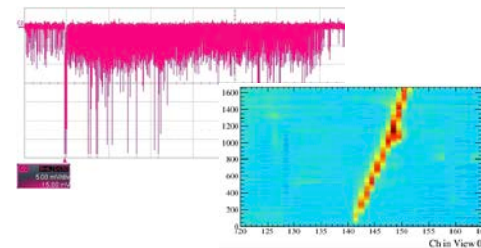


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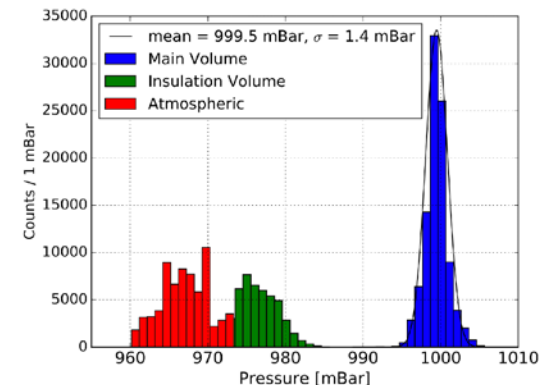
short summary of operations

- **beg. June:** CRP alignment HV trials
- **June 15th-22nd:** first electroluminescence signal followed by first cosmic muons track
- **July-August:** data taking at different HV and trigger settings. 350 k events collected
- **Sept-October:** dedicate tests on the HV system distribution and understanding of the “multi-LEM operation” in a CRP. Tests of LEMs one by one. WA105-3x1x1 review <https://indico.cern.ch/event/664977/>
- **November:** separate field scans (induction, amplification and extraction) extra 50 k events collected.

• **Yesterday (Dec 7th):** the tank with LAr near nominal level was brought to atmospheric pressure and the High voltage feedthrough was extracted. We are trying to visualise parts of the detector (CRP, grid,..) with an endoscope.

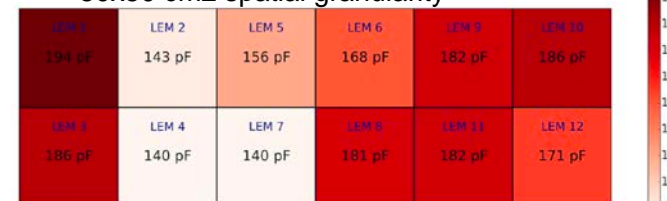


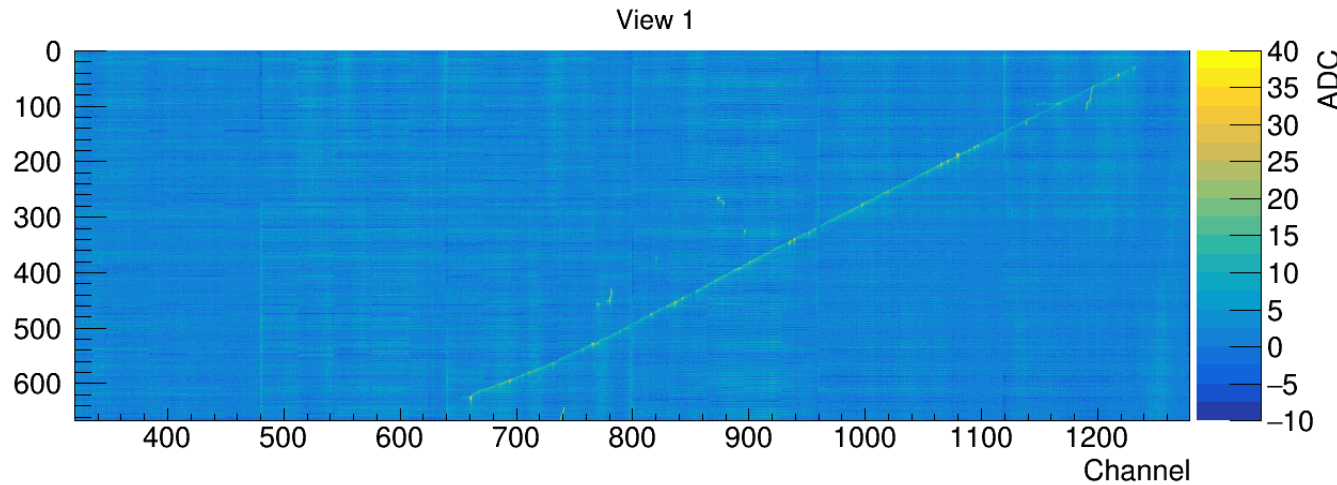
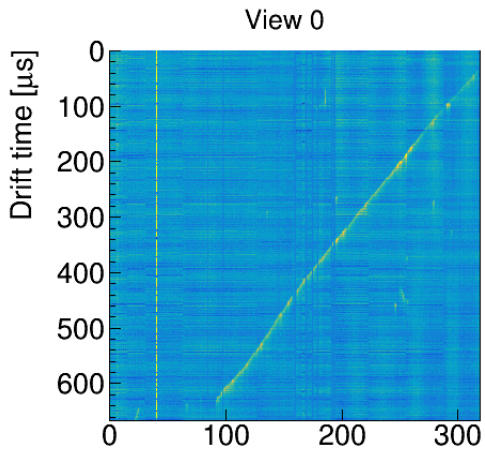
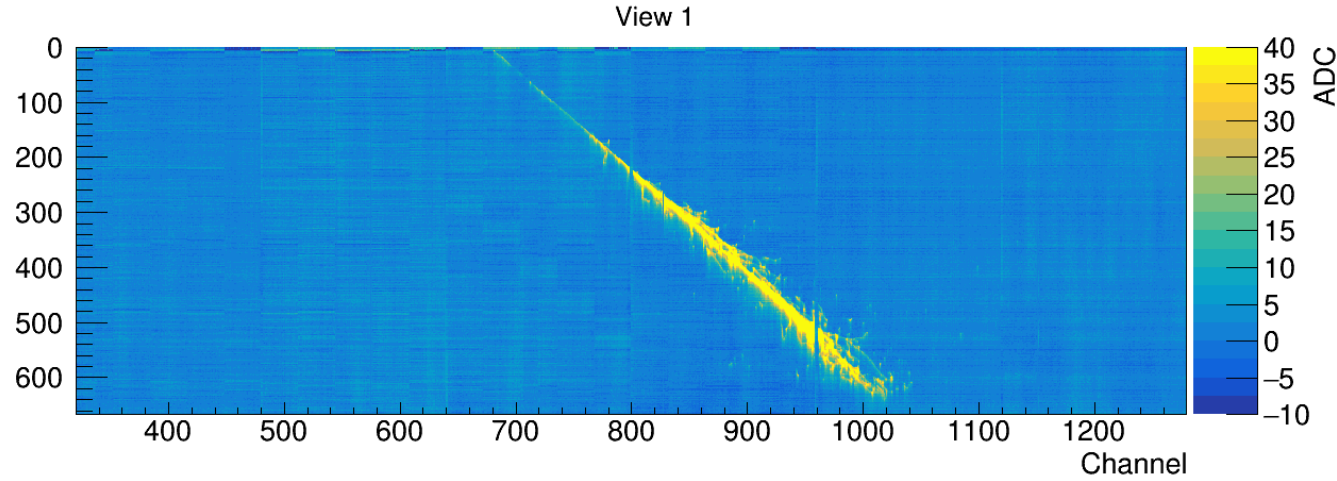
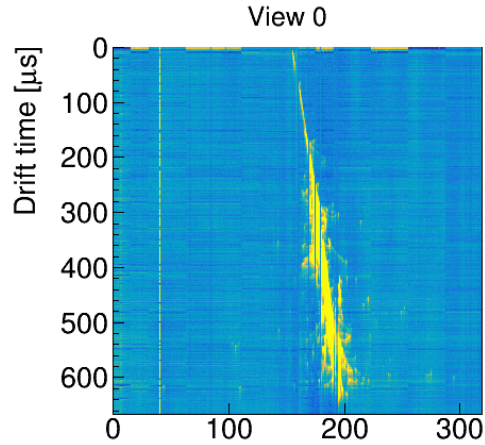
- Cryogenic performance: purity compatible with ~ 40 ppt [O_2 eq], liquid argon surface is flat and allows for charge extraction over $3m^2$, the pressure and temperature in the gas are stable.
- Grid HV: limited by discharges at ~ 5 kV. Many testing done to understand this problem, the source is not yet clear. Current evidence points to a faulty HV-contact or a broken grid wire (or both)
- LEMs HV: attempt to reach highest possible voltage across
 - Operated all LEMs on the CRP (except the 4 in the corner) up to 31 kV/cm for some time ($\sim h$)
 - Operated individual LEMs at 32 kV/cm
 - A different design is being considered to achieve higher fields
 (see next slides)
- CRP operation: gained a lot of understanding on multi LEM operation within a CRP. Measured the capacitances between each electrodes including the anode, the LEM down, the LEM up, the grid and the field cage.
charge readout: charge sharing between views, noise at cold and warm,..
- Light readout: operation of single bias PMTs, ...



	Capacitance
LEM	7.5 nF
LEM-Grid	4nF
LEM-anode	1.01 nF

the LEM-grid capacitance can be used to measure the liquid level variation with a 50×50 cm² spatial granularity

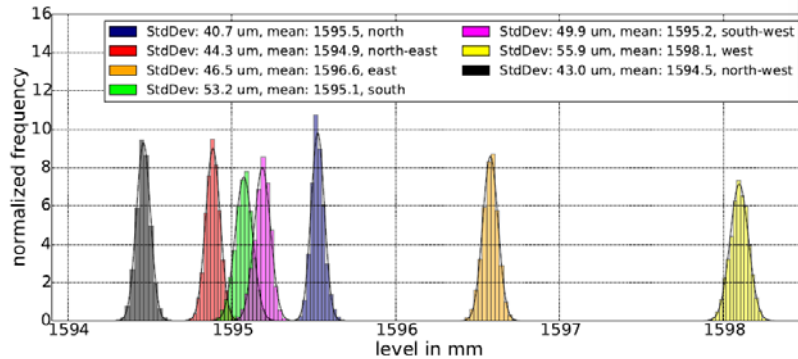
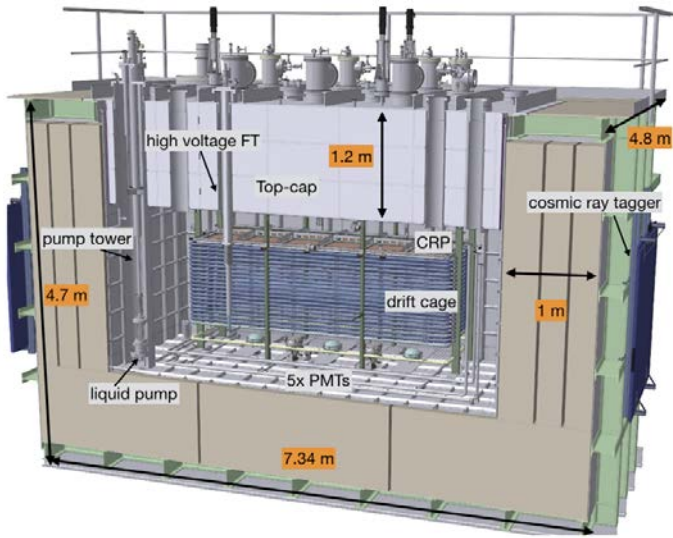




All Data is available at FNAL and reconstructed with LArSoft

	field (kV/cm)	potential to above (kV)
Induction	1.5	$L_{up} = 300$
LEM	29	$L_{down} = 3100$
extraction in liq.	2.2	grid=5000

Editorial board: **F. Sanchez**, M. Campanelli, , V. Galymov, E. Mazzucato, S. Murphy



A 5 ton demonstrator for large-scale dual phase liquid argon time projection chambers

Abstract

Keywords: Neutrino, liquid argon TPC

1 Contents

2	1 Introduction	1
3	2 Overview of the set-up	3
4	3 Cryostat and cryogenic system	5
5	4 Description of the TPC	13
6	5 Charge Readout scheme and data processing	18
7	6 Ancillary instrumentation and slow control	18
8	7 Operational experience	20
9	8 Collected data and first results	21

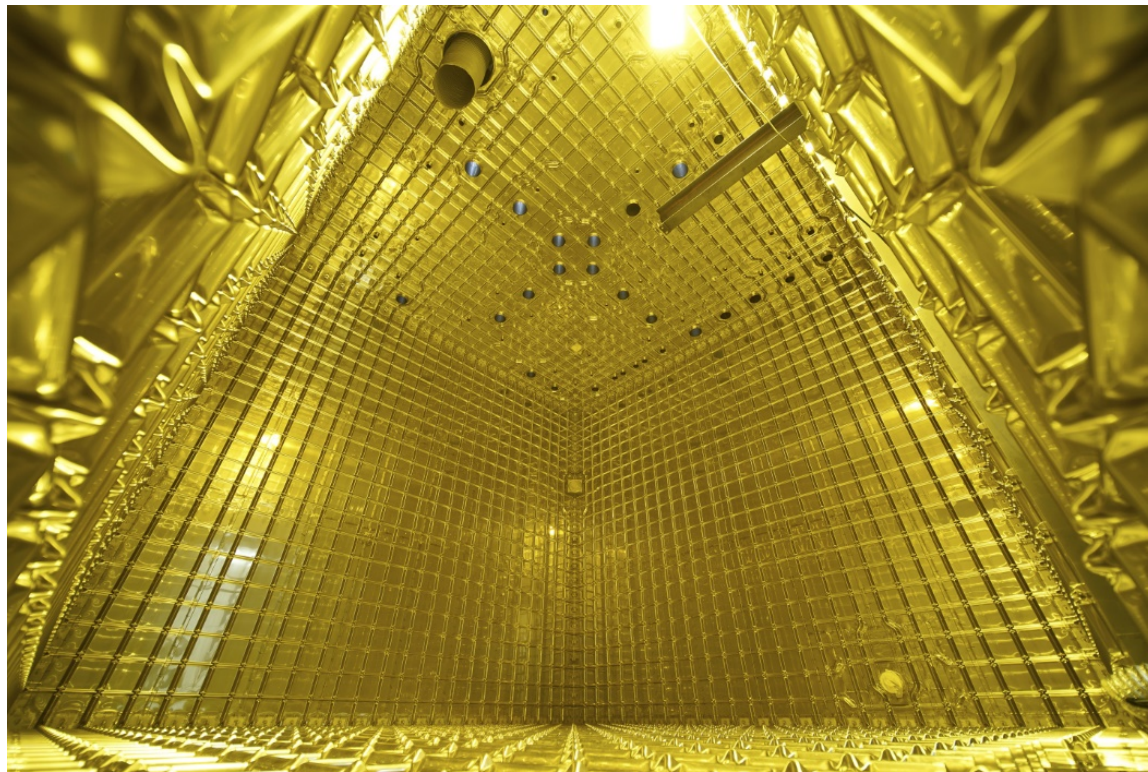
Goal: publish by Feb 2018

Status of cryostat and CRB

EHN1 infrastructure:

Achieved and actual milestones from NP :

- Membrane completed: Sept 21 2017
- CRB finished: Oct 2017
- Leak tests performed Oct-Nov
- Internal piping: installation going on
- Field cage: test installation going on



08/12/2017

D. Duchesneau



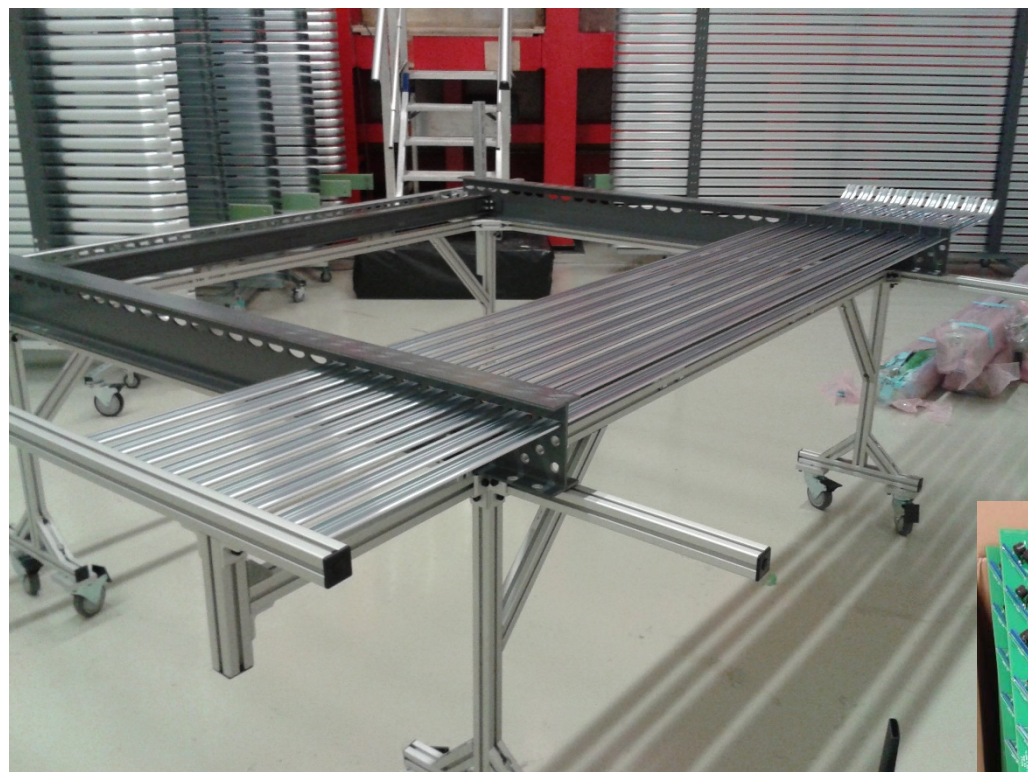
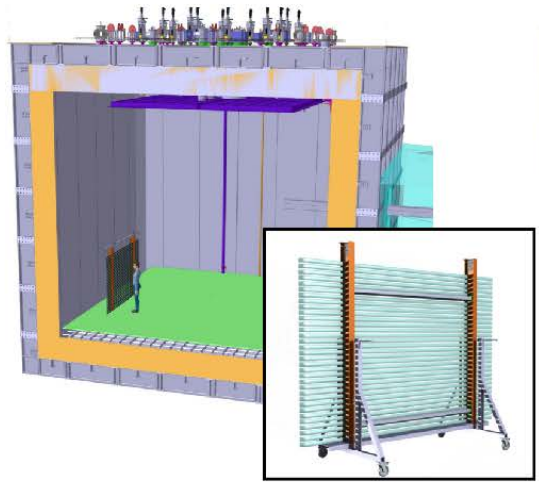
Clean Room Buffer

ProtoDUNE-DP drift cage

Planned: Installation of 1/3rd of the drift cage before end of the CERN year closure

All parts are at CERN

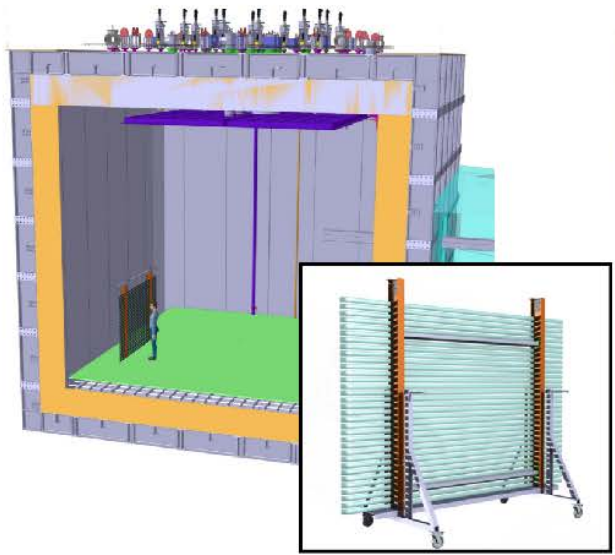
- Assembly of modules started November 27th in CRB



Voltage divider boards

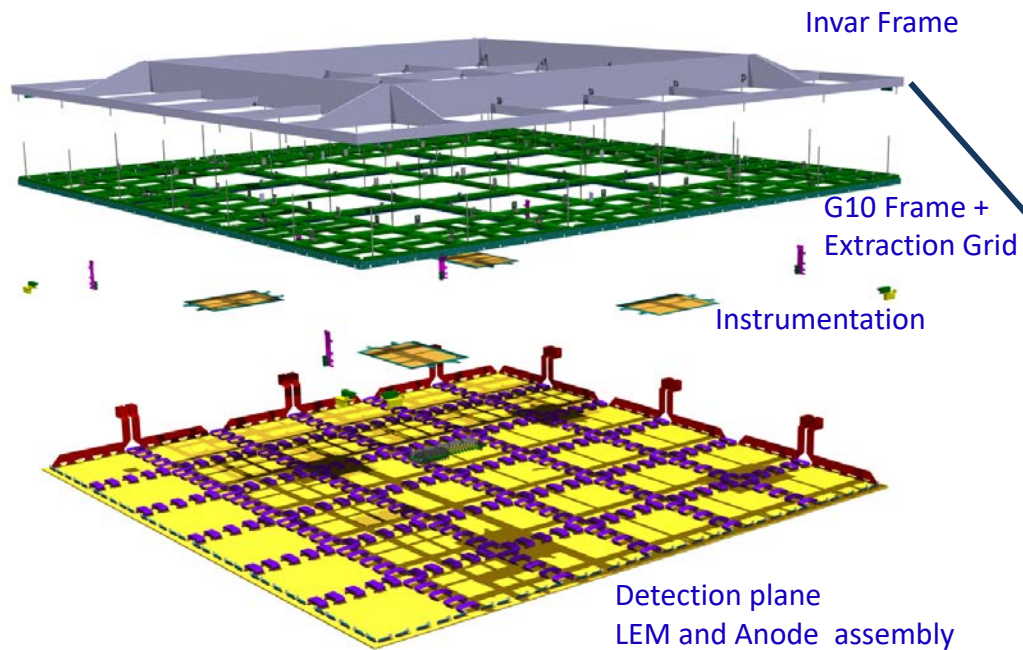


ProtoDUNE-DP drift cage



8 over 9 modules already assembled
Hanging structure will be mounted next week

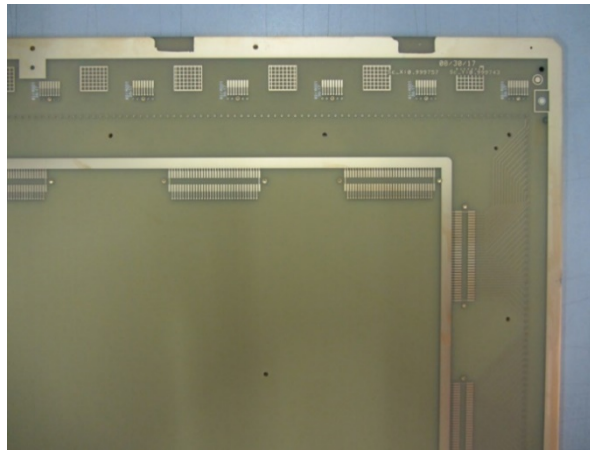
First CRP status



- All parts have been ordered including all construction structure, screws, bolts etc....
- The main Invar structure frames are under production at the firm: some issue in the production process and some revisions have delayed the delivery to beginning of 2018
- The G10 frame structure is produced and is expected to be sent this week to CERN

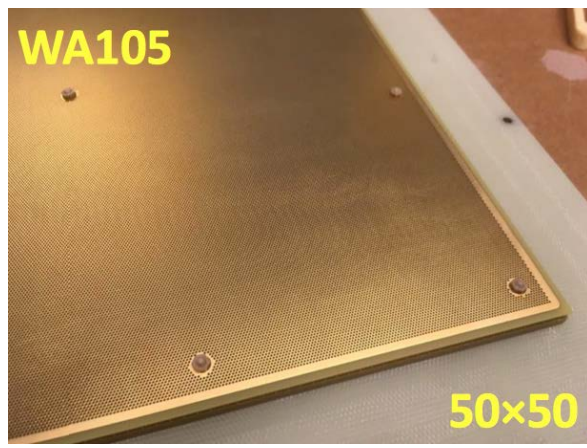
CRP#1: Anode status:

- 80 anodes ordered
- First prototype anode received in September and tested
- First batch of 5 received last month => some defaults observed
- 5 more this week : should have additional visual quality control

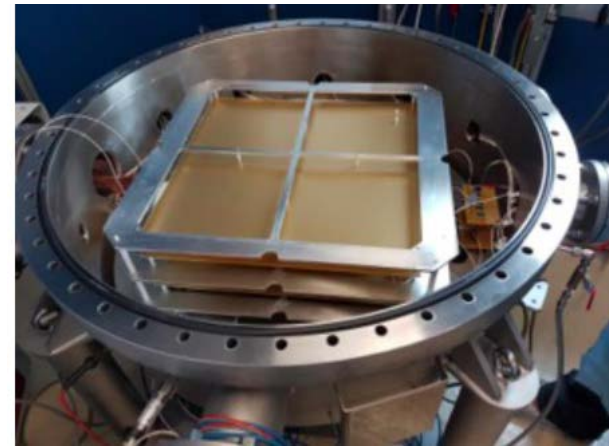


LEM status

- 40 LEM identical to 3x1x1 ones have been already produced and tested in Saclay.

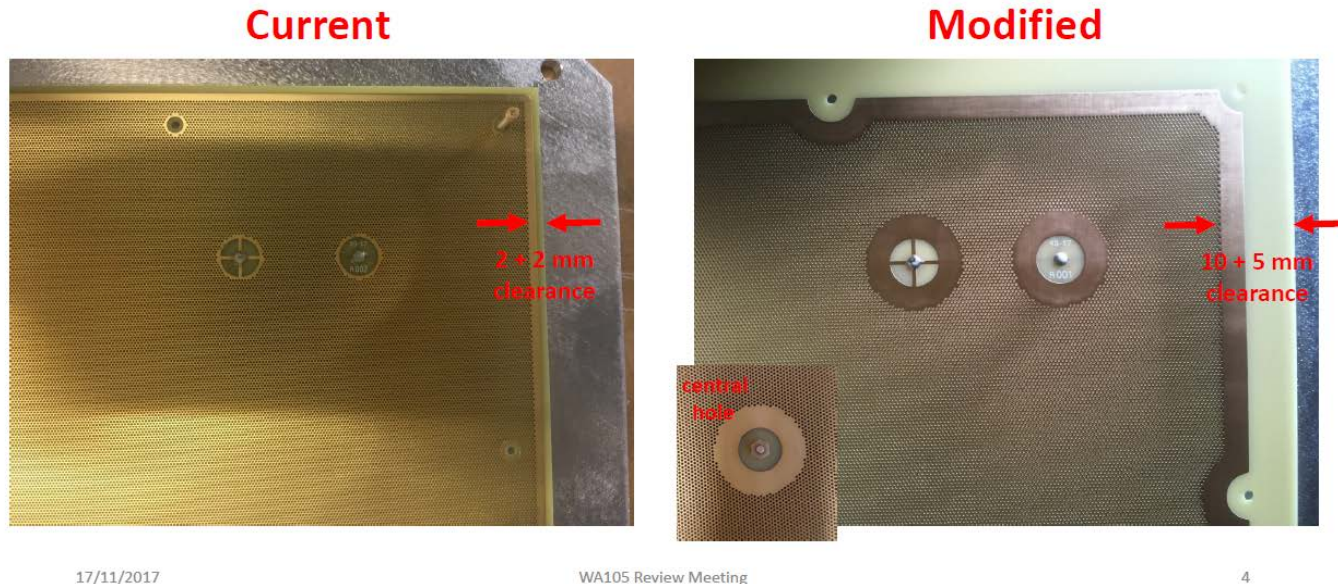


- Full set (40) ready to be at CERN by January



After specific HV test results: decision to produce a modified version with different guard rings configuration: Tests are conclusive towards better HV behaviour

Modified LEM Design



From the test facility at Saclay

- Significant gain in HV^{MAX} ($> 300V$) with modified design.

Gain limitations with current LEMs appear to be due to a large extent to insulation problems.

Production will resume soon to provide 40 LEMs with new design for the first CRP

Summary:

- **3x1x1 detector**
 - Shutdown starting today
 - Analysis is going on
 - Papers are under preparation

- **ProtoDUNE-DP**
 - Field cage assembly test is going on
 - CRP parts are in production
 - Assembly of elements of the first CRP may start in January
 - A cold box is under design to allow one full CRP to be tested at cold: requirements have been defined.
 - More activities will be reported at the DUNE collaboration meeting next month

Additional slides