# The ProtoDUNE-VD race

Sabrina Sacerdoti, for APC

APC - 14/06/2024

### Module 1/coldbox

- Cathode modules were removed, they were covered in pTp (like everything in the cb):
  - Laura cleaned all of them :). Placed on top of the module rack. All CB components are there.
- Cathode had to be "re-assembled"
  - Resistive mesh placed in the four modules positions. Copper tape used to link them to the rest of the meshes. No ribs were added (could not find them in time)
  - The removed metallic meshes were placed with other IJCLab material (green box)
  - HV cable was broken, fixed by Filippo
- Ongoing: data taking with DAQ. Stopped on Friday
  - Both HD and VD electronics were modified for this run
- Opening needs to happen by Tuesday
- Another CB run expected in ~end of September/October, things to keep in mind
  - We'll need to recover the metallic meshes
  - Need filters/substrates for ~3 modules → could re-use damaged filters for bottom part, after removing ptp

## **ProtoDUNE-VD**

- Module testing has started
  - C3 (FBK) tested with M1 electronics from FBK module → SPE size is ~1.5 ADC very hard to see → Decision about FBK on cathode??
  - New electronics produced in May 24 arrived  $\rightarrow$  assembled and checked at CERN
    - First time no surprises when testing electronics :)
    - Some weird things done by Cyrexx though
- Electronic boxes: 4 arrived last week 4 this week (hunted down by Flavio and Dante... unclear) → They're very nice!!
  - Note1: I still think we might need to clamp the fiber tube for easier installation
  - Note2: big holes on the side, are they necessary? Could they be closed a bit?

green=at cern, yellow=could travel		MAY			JUNE	JUNE				
		1 2 3	4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 1	9 20 21 22 23 24 25 26 27 28 29 30 31	1 2 3 4 5 6	7 8 9 10 11 12 13 14 15 16 17 18 19 20	0 21 22 23 24 25 26 27 28 29 30	1 2 3 4 5 6	6 7 8	
Testing Setup	Assembly									
	Commissioning									
8 Cathode Modules removal from NP02	Dismount from cathode									
	Secure fibers									
	WLS replacement									
	Additional WLS at CERN						?			
Modules move to PD lab	e-boxes swap (incl lleak. kit)				aser					
	Test CE			a	adapte <mark>r</mark> s ar	าด				
	XA testing									
	Storage				DCDC at	DCEM at				
	Replace DF/glass			C		CERN	Rest of			
Fiber (tip cleaning) & Test (Pwr Meter & Laser box)								VVLS		
							batch			
Install OPC termination and	light protection									
Reinstall Cathode Modules										
Final warm test						Assembly and				
Light monitoring system	Install bottom fibers					testing done				
	Insallation preparation									
	Testing and installation					within 2 days				

# ProtoDUNE-VD

#### • WLS:

- 5 cathode modules have dimples  $\rightarrow$  expecting to replace at least those
- Modules will be tested before WLS replacement
- Still, not clear if we'll manage to replace all of them

#### Filters/Substrates:

#### Need to remove M5 and M6

Jay at CERN

- Need to replace 128 PE filters
  - 64 cathode needed by 24/06 because we need to install modules
  - 64 membrane :(M5, M6, M7 and M8) if they arrive later BUT before TCO closing is ok, we just need to place modules inside.
- 105 ZAOT substrates were ordered and sent to Campinas for pTp coating. Some have broken
  - Have boxes arrived to Campinas? YES, state to be checked
- 35 substrates at CIEMAT , should got o CERN after test (when?)

green=at cern, yellow=could t	travel	MAY	JUNE		JULY	
		1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 25	9 30 31 1 2 3 4 5 6 7 8 9 10 11 12 13 14	4 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30	1 2 3 4 5	6 7 8
Testing Setup	Assembly					
	Commissioning					
8 Cathode Modules removal from NP02	Dismount from cathode					
	Secure fibers					
	WLS replacement				Need al	l sub
	Additional WLS at CERN			?\		
	e-boxes swap (incl lleak. kit)				at CER	N
Modules move to PD lab	Test CE					
	XA testing					
	Storage					
	Replace DF/glass			Doot o	f M/L C	
Fiber (tip cleaning) & Test					of WLS	
(Pwr Meter & Laser box)				batch		
Install OPC termination and	light protection					
Reinstall Cathode Modules						
Final warm test			4 WLS already	Zach replaces		
light monitoring system	Install bottom fibers		at CERN			
PMTs	Insallation preparation			WLS and other		
	Testing and installation			mechanical		
				fixes. 1		
				module/day		

## ProtoDUNE-VD fibers/PoF

- Verification of fibers using PoF laser w/OPC+load (voltage output)
- Cleaning of fibers
- Installation of 2 GaAs OPCs per module, soldered to a little PCB

- Done for all modules
- SoF fibers should be checked still.



Because the fibers need to be pulled back to install the modules, the light leakage
protection part could not be installed in advance

# ProtoDUNE-VD PoF

- A VERY precise and careful procedure will be needed to install the PoF protection.
  - Risk of breaking OPCs
  - The fiber's tube needs to be peeled off
    - $\rightarrow$  risk of breaking fibers
  - Potting is needed (first test stand results showed light leakage from PoF)





# ProtoDUNE-VD – lot's still to do

- A large activity for module refurbishing that should address
  - WLS replacement (at least 4)
  - Replacement of parts for thicker WLS
  - Addition of spacer to avoid WLS bending
  - Potential replacement of FBK SiPMs
- Also a lot to do inside NP02:
  - Meshes need to be replaced
  - One cathode still to be fully done (fiber check? OPC mounting)
  - Fiber routing into the modules will be tough
  - PoF protection to be inserted in all modules + potting with silicon. Yes, upside down.

### ProtoDUNE-VD – UV grade fused silica windows

- 5 weeks lead time
- Depth 1 mm
- On the membrane  $\rightarrow$  how to bring them in after TCO closing?
- 150x150
- No time to evaporate  $\rightarrow$  will need to be placed together with the evaporated glasses
- One module (M7 or M8)  $\rightarrow$  16
- Could be ordered by IFIC
- Likely to be placed on modules, inside the cryostat
- $\rightarrow$  to be looked over by Jay, Zach, w/Filippo at CERN