

Final work for – membrane modules

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ProtoDUNE bottom membrane modules

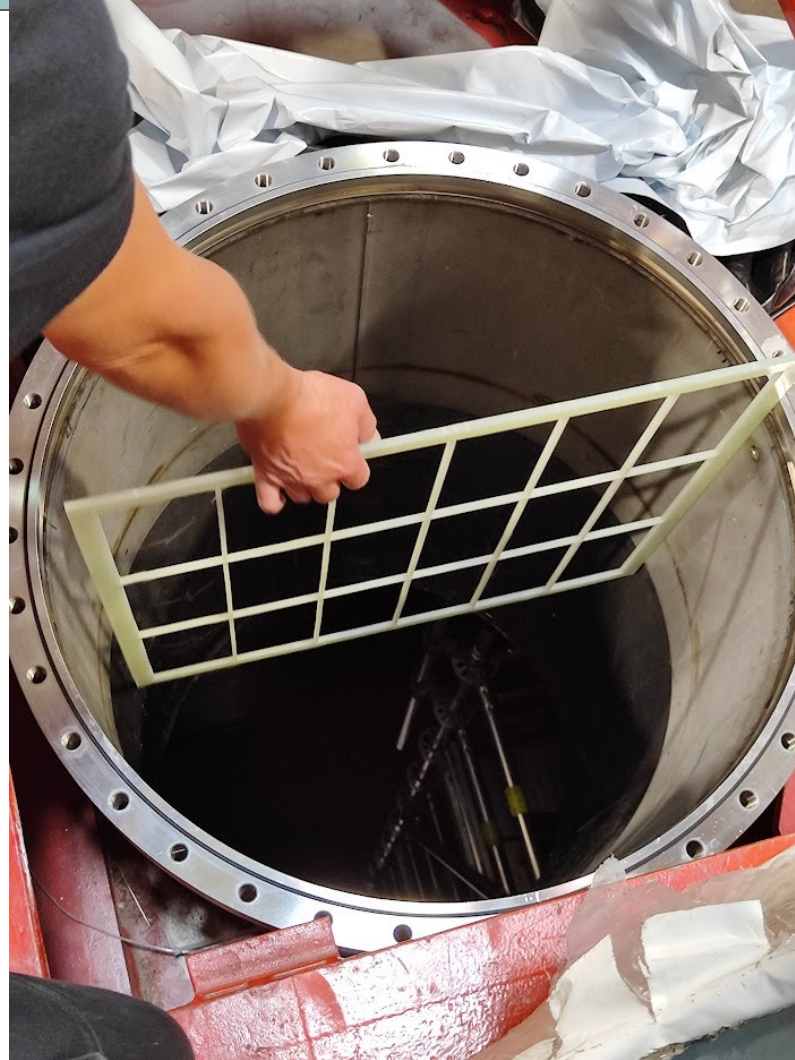
List of items currently missing on each module:

- M5: non-TCO bottom-down, FBK, DVDM, tested July 24 (Jaime/Henrique)
 - Broken WLS to be replaced (4 new WLS in box in PDS room) w/o disconnecting SiPMs
 - backplane and filter frame (currently inside clean tent)
 - glass substrates
- M6: non TCO bottom up, HPK, DVDM, new WLS, tested August 24 (Sabrina/Renan)
 - glass substrates
- M7: TCO bottom up, HPK, DVDM, dimples WLS, tested June 24 (Dante/Jacob)
 - Replace filter frame for new UV-frame (inside clean tent)
 - UV filters (inside clean tent, on the table) and glass substrates
 - **Discussed: replace WLS too**
- M8: TCO bottom down, FBK, DVDM, dimples WLS, tested June 24 (Dante/Jacob)
 - Glass substrates
 - **Discussed: replace WLS too**

Plan of action

- Works for TCO closure starting 22/08, cover in place on 26/08
 - Very last limit day to bring things in through TCO is 25/08
- 2 modules could (potentially) be finalized and brought in through TCO next week:
 - 48 evaporated glass substrates -finally- arriving to CERN today
 - **IF** they're ok, could be mounted on M6 and M8 → modules that don't require further frame work
 - To be placed inside box and on the floor on non TCO side
- **List for Anselmo: BRING IN MESH FOR M7 and M8!!! check blue cables on the inside (TCO side specially), remove top covers**
- 2 modules to be brought in through porthole (training required for working in confined spaces):
 - Zach and/or Jay at CERN late September/early October
 - 35 evaporated glass substrates leaving Campinas today
 - Porthole width ~69cm, xArapuca is 64.5cm → need a special frame to hold it
 - **If replacing WLS in M7 and M8 this makes it 3 modules**
- Mounting of 4 modules by Zach and Jay + team from CIEMAT?
- Meshes: for M5 and M6 inside cryostat. Other 2??
- A warm test should be done following installation before closure of porthole

Porthole with old xArapuca frame



Final cathode configurations

- More comprehensive info [here](#)

Module	WLS	Filters	SiPM	SPE (mV)	SNR _{ch1-ch2}	comments
C1	No dimples, thin	ZAOT	HPK	1 – 0.8	7 - 5	Just mechanical adjustments
C2	No dimples, thin	ZAOT	HPK	0.8 – 0.9	5 - 6	Just mechanical adjustments
C3	No dimples, new 5.5mm	glass	HPK	1.1 -1	8 - 7	Used C4 from coldbox/M1
C4	No dimples, new 5.5mm	ZAOT	HPK	1 – 0.8	8 - 6	Flex B1 has first SiPM partially lifted

Final cathode configurations

	WLS	Filters	SiPM	SPE (mV)	SNR	comments
C5	No dimples, new 5.5mm	ZAOT	HPK	0.6 - 1	5 - 7.5	
C6	No dimples, new 5.5mm	ZAOT	HPK	1.5 - 1	8 - 8	Oscillations seen, gone in second test. Suspect flex tension?
C7	No dimples, new 5.5mm	glass	HPK	0.8 – 0.5	6 - 4	replaced with C2 from CB
C8	No dimples, new 5.5mm	ZAOT	HPK	1.2 – 0.9	8 - 5	Flex B3 has first SiPM partially lifted

Final membrane configurations

	WLS	Filters	SiPM	SPE (mV)	SNR	comments
M1	No dimples, thin	ZAOT	HPK			Installation in March 23 – no data
M2	No dimples, thin	ZAOT	HPK			Installation in March 23 – no data
M3	With dimples, thin	ZAOT	HPK			Installation in March 23 – no data
M4	With dimples, thin	ZAOT	HPK			Installation in March 23 – no data

Final membrane configurations

	WLS	Filters	SiPM	SPE (mV)	SNR	comments
M5	No dimples, new 5.5mm	glass	FBK	2	9 – 6.5	Voltage scan from 30 to 32.5V. Info at 32.5V
M6	No dimples, new 5.5mm	glass	HPK	1.7-1.9	19-18	Voltage scan from 45 to 47V. Info at 47V
M7	No dimples, new 5.5mm	glass + UV	HPK	2.1 - 2	10.5 - 10	Voltage scan from 30 to 32.5V. Info at 32.5V
M8	No dimples, new 5.5mm	glass	HPK	2 -2	12 -13	Voltage scan from 45 to 47V. Info at 47V

Update of Module 1 schedule....

- Cathode can be extracted after 19/09
- Date of next run to be defined (will likely not be in October due to delays in CRP components → November)
- Module re-building:
 - C1 is metal-in-trench FBK → need to replace SiPMs (**8 HPK** pre-prod sample?)
 - C2 and C4 are in Module 0 now → need to refurbish the extracted modules
 - New WLS (in hand)
 - Other mechanical corrections?
 - Replace SiPMs for new **FBK** → **16 flexes**
 - C3 is :((HPK, only some ptp on the WLS → replace for a WLS with dimples?)
 - Needs to be rebuilt, possibly frame parts missing
 - Ordering new full cathode frame?
 - Membrane modules: do we need >2 modules to reach a conclusion on the electronics?
- Filters:
 - C1 is almost all ZAOT (except one filter??)
 - C2,C3,C3 had PE: proposal was to clean the ptp off and use this on the back planes
 - Carla provides one set of ZAOT filters → need two sets (32) of glass substrates
- Test stand: no metal tube for fibers → need new one
- Coldbox:
 - LED calibration was taken to NP02
 - No PoF (note: #4 burnt... ft fiber damaged?)