

VD Cold Box Mod1 preparation update

S. Sacerdoti - Mod-1 organization

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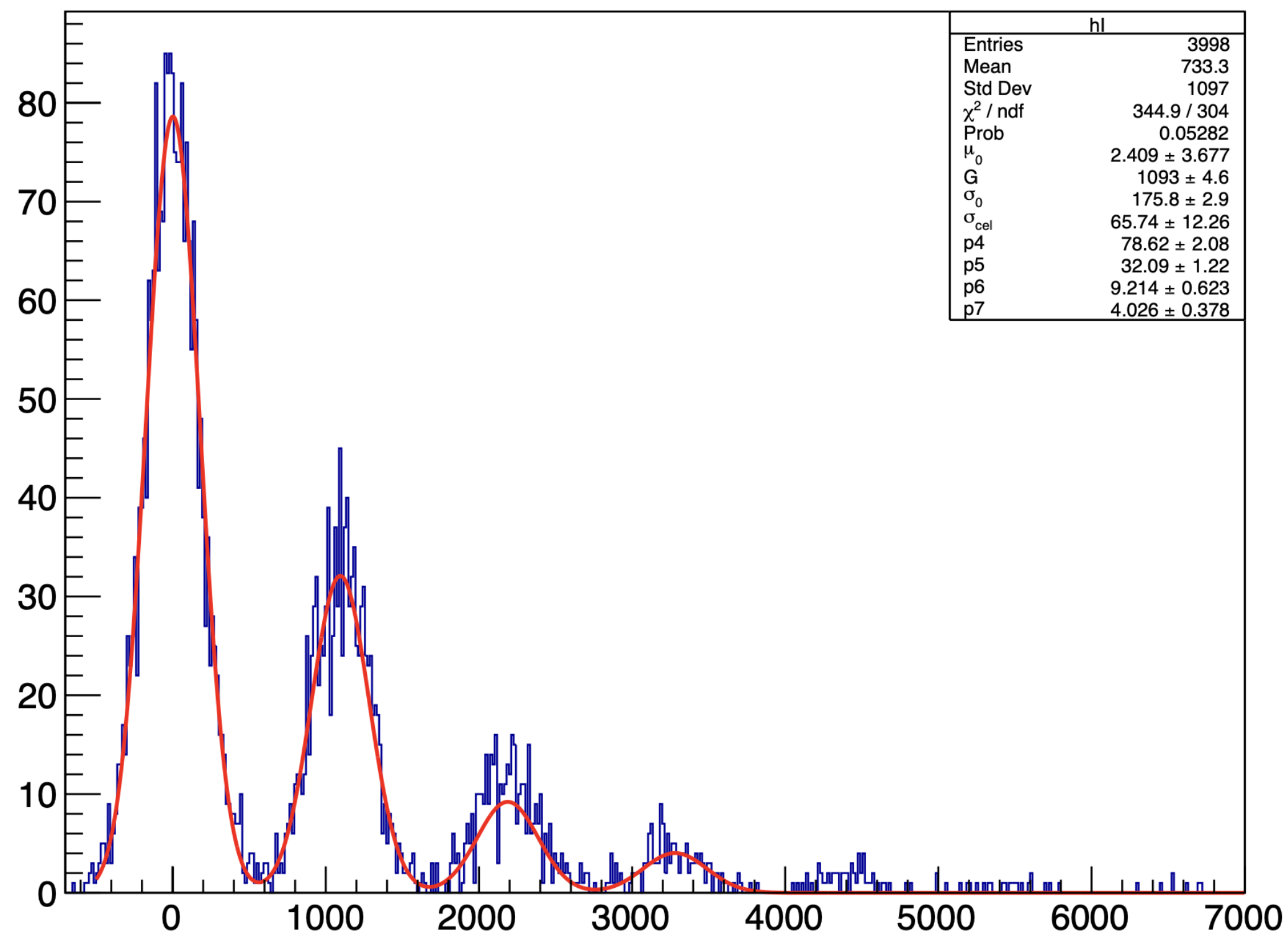
(and lot of help and support by Filippo & NP)

Activities Summary

- Replacement of C3 and C4 cold electronics;
- Tests on the test stand;
- Replacement of some filters on C3 and C4;
- Assembling of the modules on the cathode;
- Later today/Tomorrow: clean & test & plug the fibers of the modules on the cold box;

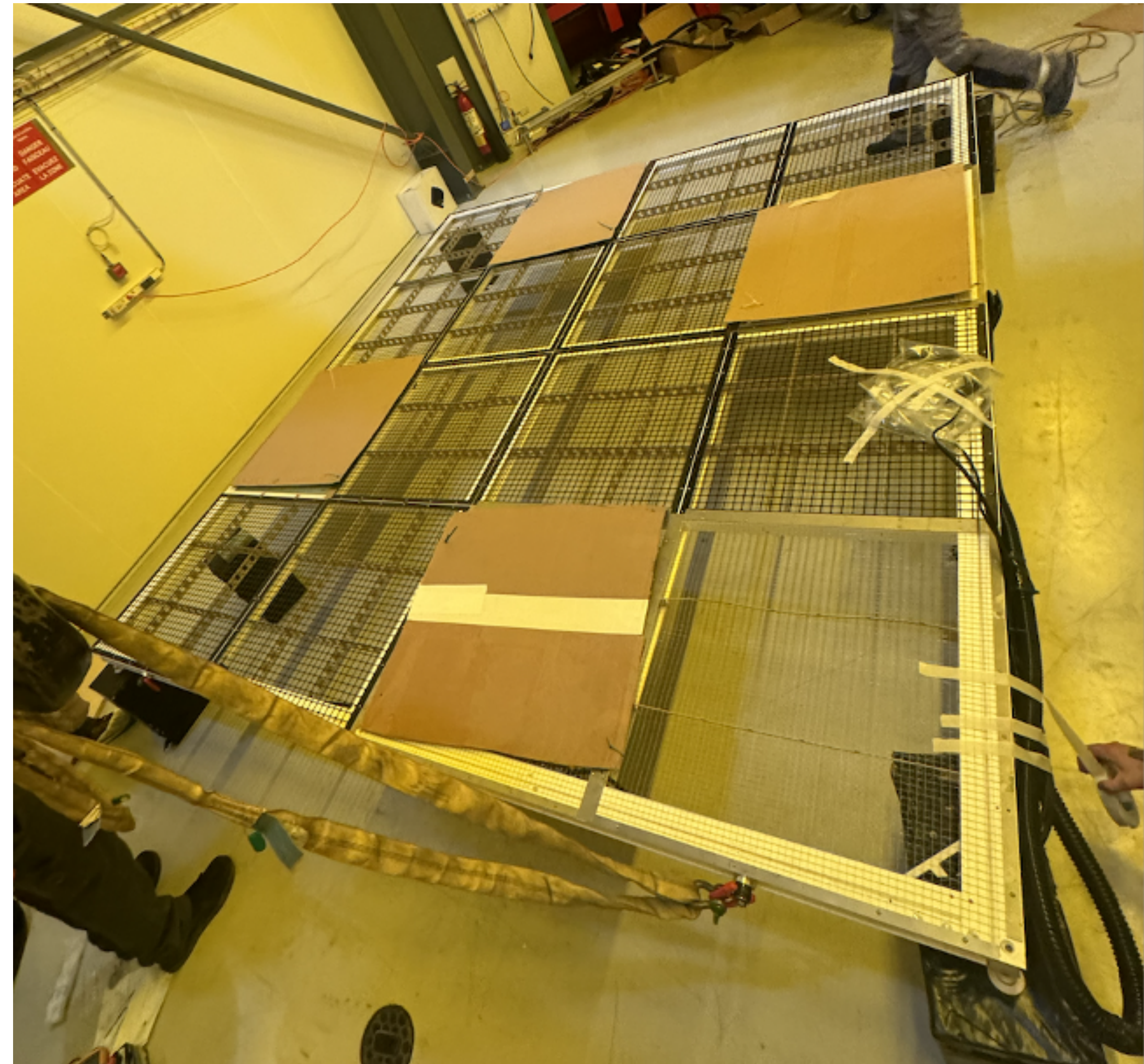
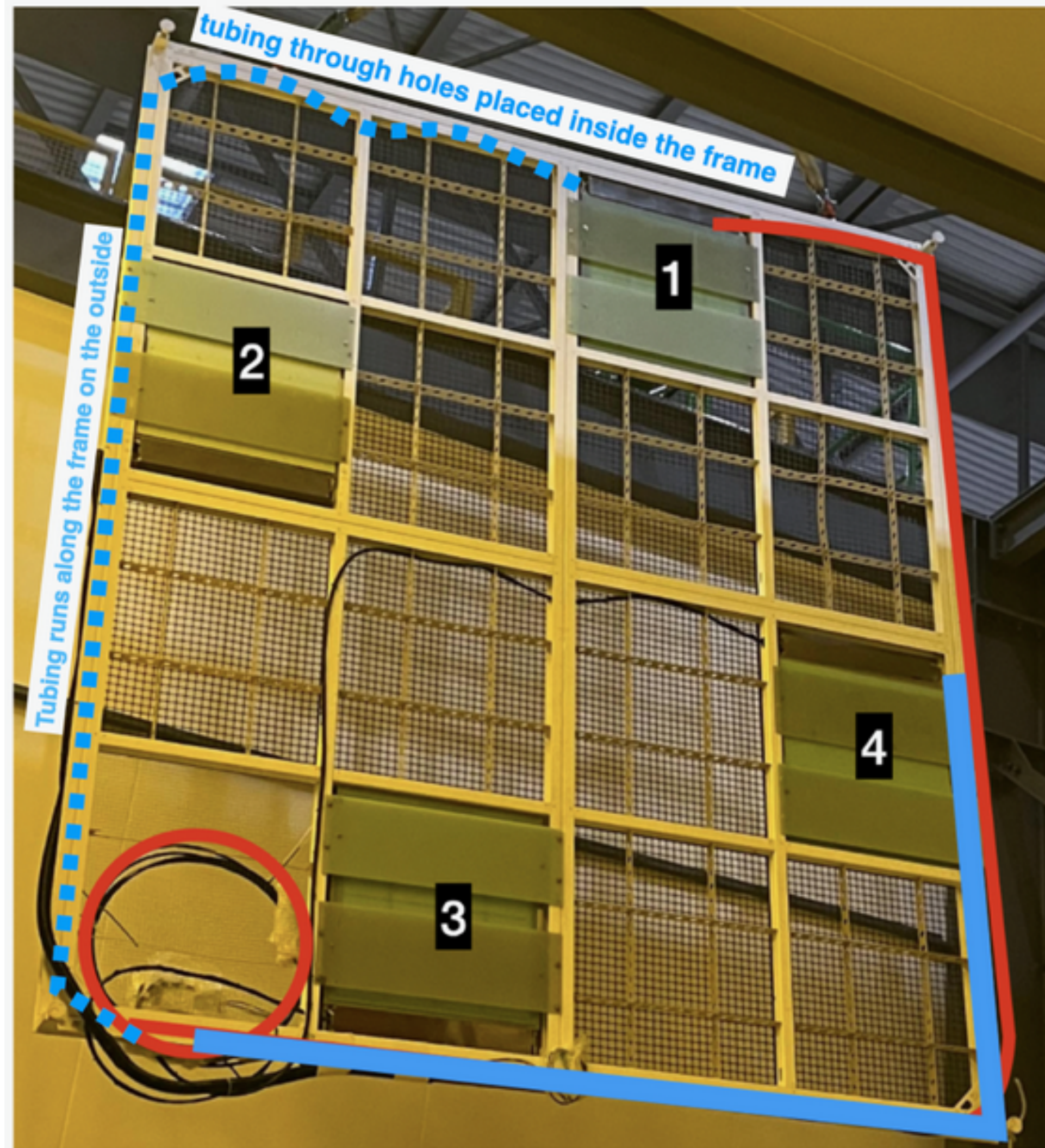


Preliminary results (Test Stand)



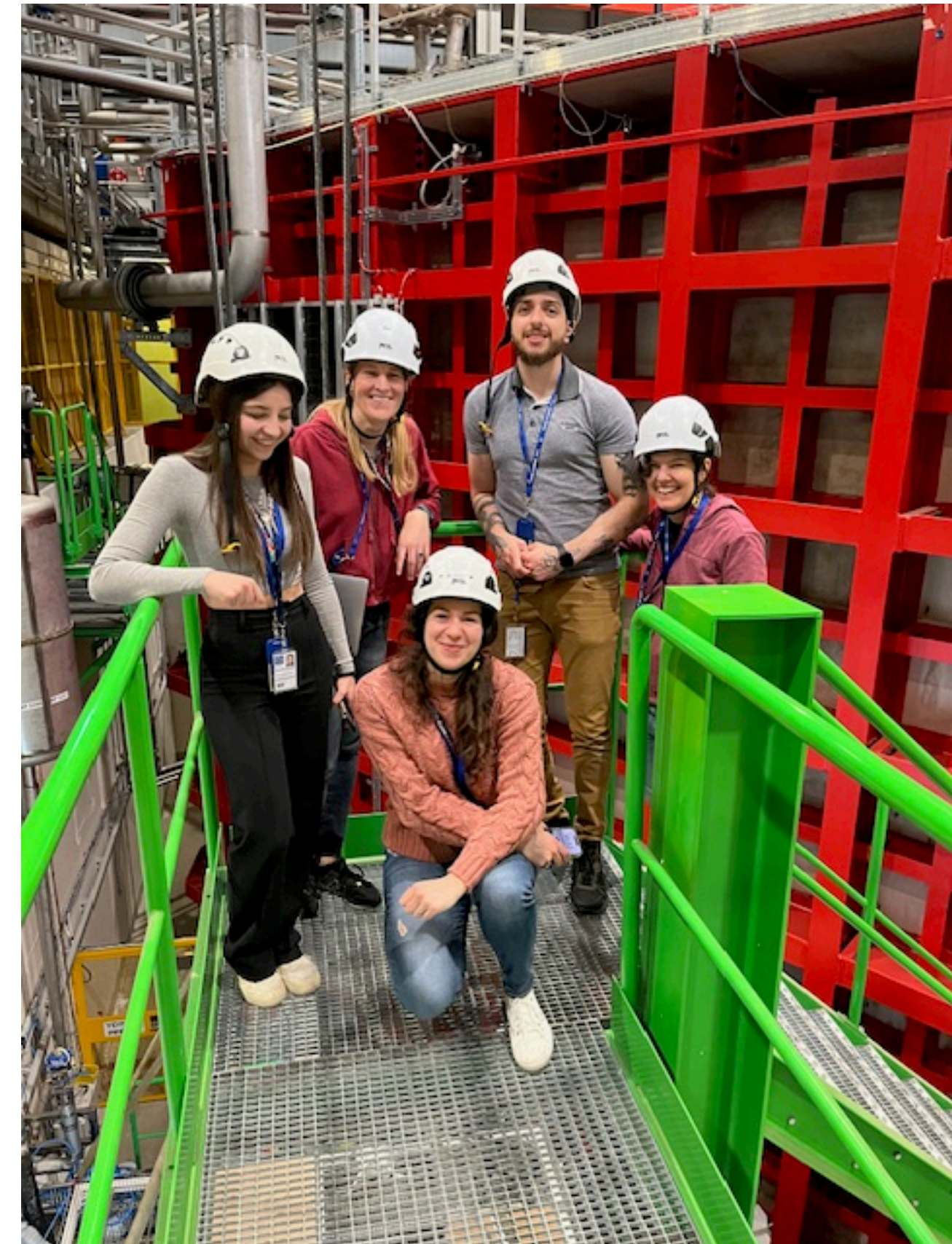
	Renan		Eleonora	
Module	ch 1	ch 2	ch 1	ch 2
C3	5.1 ± 0.3	4.3 ± 0.1	5.6 ± 0.2	4.2 ± 0.1
C4	6.1 ± 0.2	5.4 ± 0.2	6.2 ± 0.2	5.4 ± 0.3

Modification on tube/fibers' routing on cathode



2:27 pm - Mar. 26, 2024

Cathode back into CB

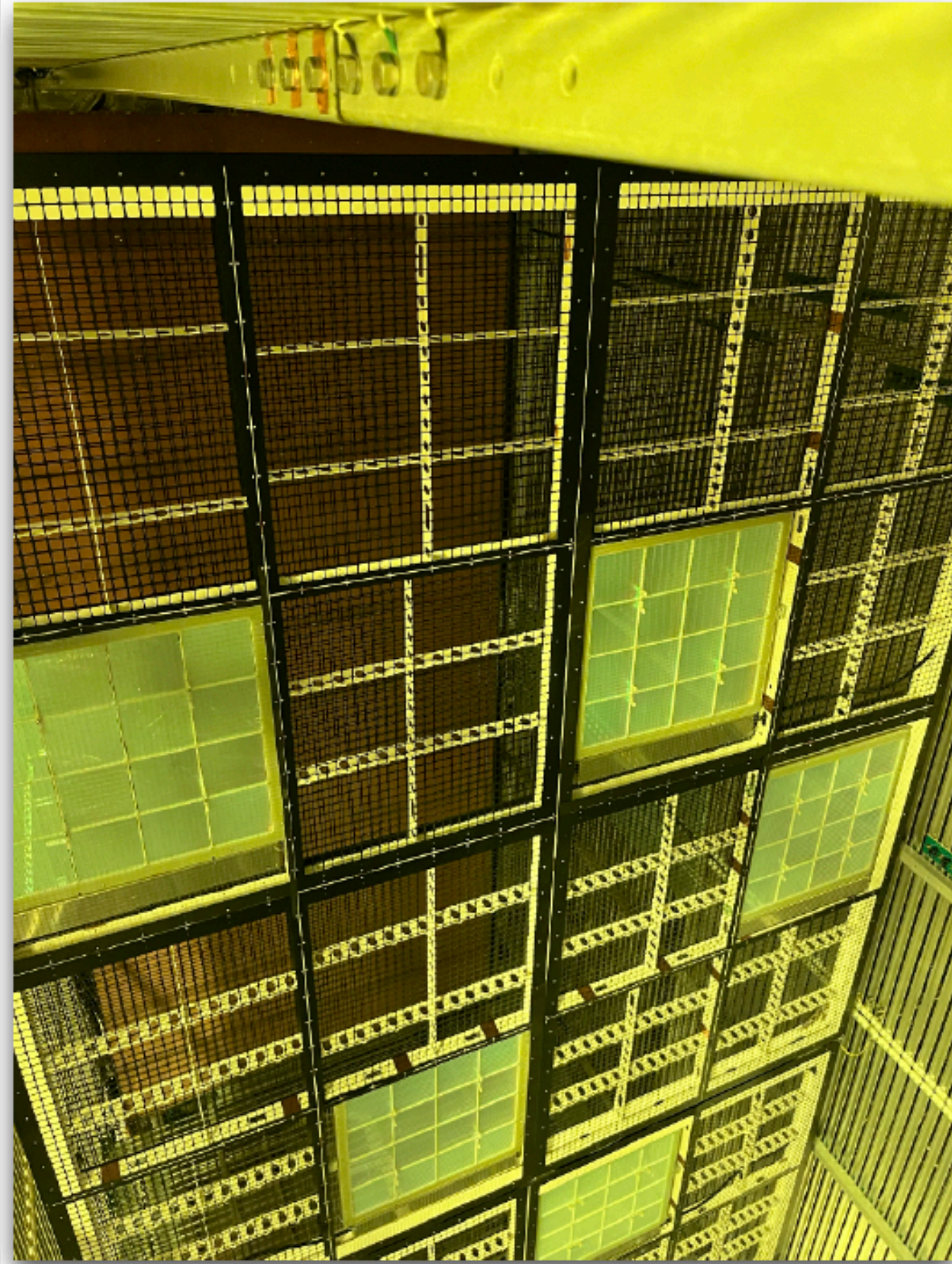


Module-0

PDS Cold Electronics exchange

FLC (and Manuel, Dante, Sabrina, Franciole)

Photon Detector in NPO2/ProtoDUNE-VD Module-O



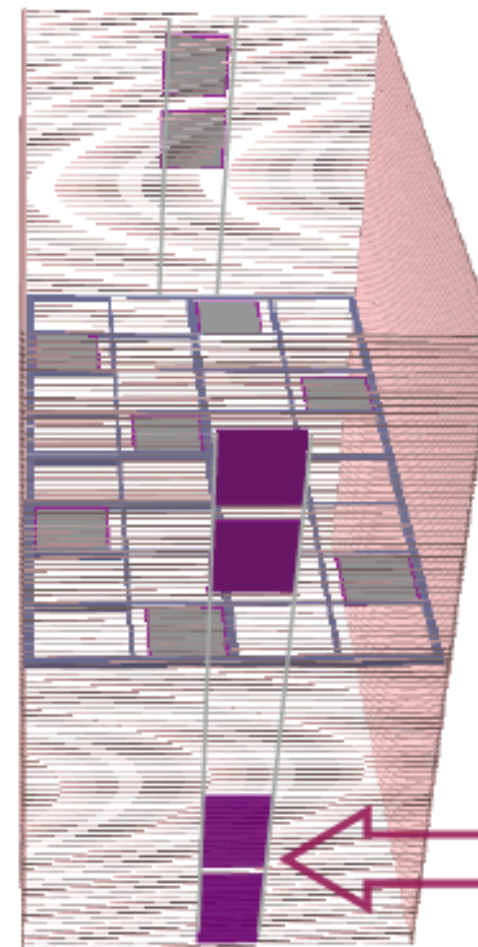
4+4 Cathode-mount PD-Modules

Double-sided XARAPUCA tiles
(~60x60 cm)
w/ PoF and SoF - DCEM CE

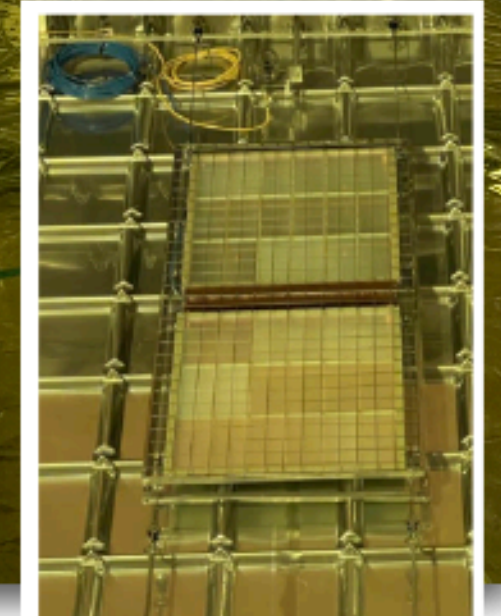
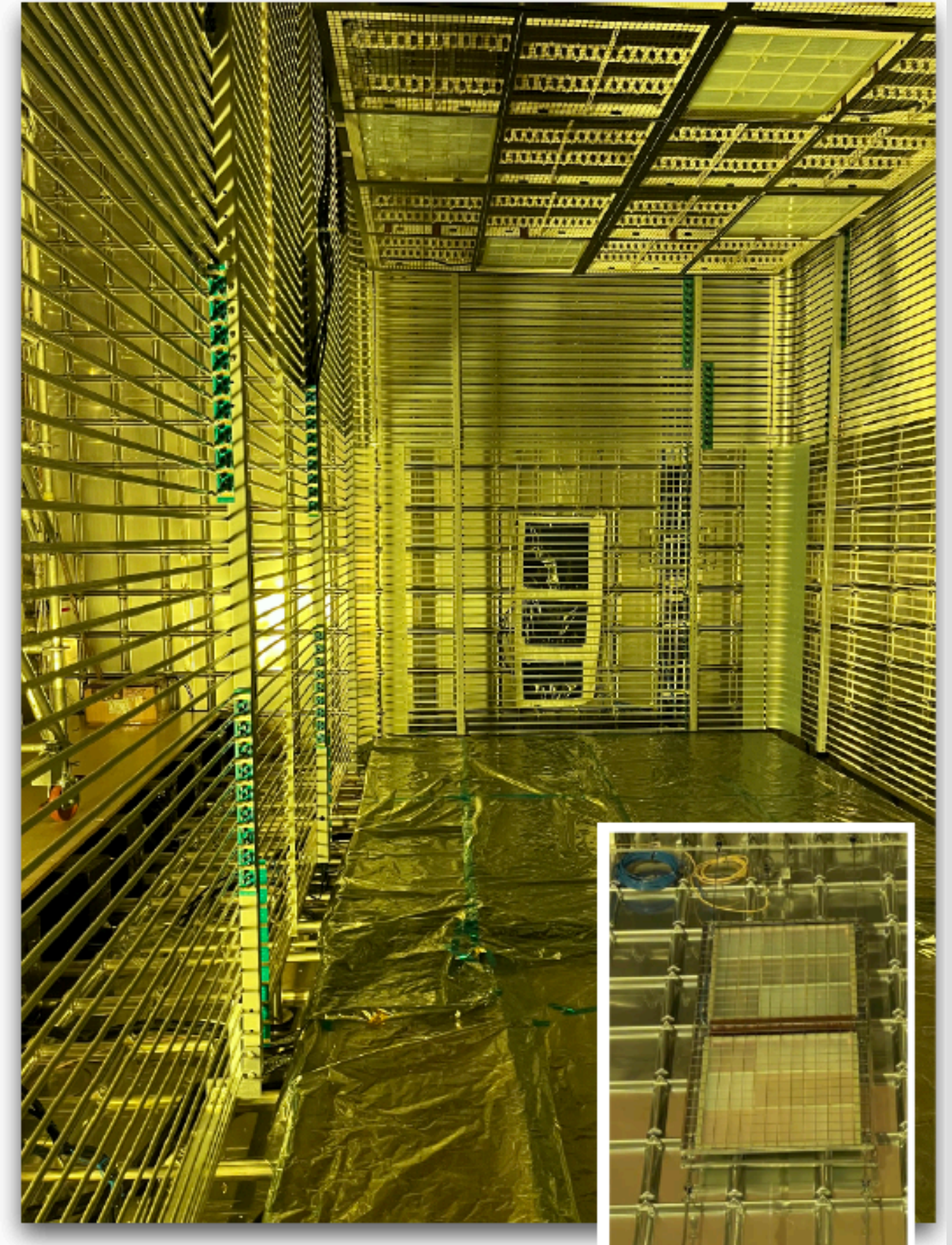
4+4 Membrane-mount PD-Modules

Single-sided XARAPUCA tiles
(~60x60 cm)
w/ signal&power transmission via
copper)

- DMEM CE (HD style signal conditioning)
- DVDM CE (VD style signal conditioning)



M7 & M8 (Membrane TCO-side) ready for installation in
NP02
just before TCO closing



NPO2 (before TCO closing)

4 Cathode Modules and 2 Membrane Modules with Optimised PhotoCollector Solution and with state-of-the-art CE r/o boards - from last generation/iteration during 2023 - are being tested in Cold Box (Dec-Jan24).

If superior performance of the optimized PD system will be demonstrated from Module-1 ColdBox test in Dec-Jan run,
and

NP02 TCO closing delayed further down (eg May-June) in 2024

⇒ we might be willing to swap 4 of the NP02 Cathode-mount modules and 2 Membrane-mount modules with those extracted from CB after test in Feb/Mar.

- Optimal performance and reliability of r/o electronics (both for Cathode and Membrane modules) demonstrated from current CB run - definitely superior to previous generation (fall 2022) currently implemented in Module-0 and very close to final production for FD2.
- It would be unattractive and even counter-productive to operate a sub-optimal PDS in the ultimate VD beam-test experiment
- If access to the cathode is technically possible, and depending on the level of accessibility - we propose to:
 - replace DCEM boards in all C1-C8 Cathode Modules with DCEM v.1.3 boards
 - (Lower priority) Replace fiber bundles (in large diam.tubes across the cathode frame, routed down and up against the membrane wall) with new fibre bundles in smaller PTFE tubes and routed up in C-channel inside FC)

The sequence of extraction and replacement of the components has to be evaluated in detail with engineer Team (and accordingly define time and resources needed).

Preferred period for detector swap: April - May, '24

- Remove 8 Cathode Modules (bridge in place) from NP02:
 - **Total 3 days + PD Team** (3-4 people: 1+1 on the bridge & 2 people on the floor) - bridge and PD module dismounting procedure to be defined in detail (and in contact w/ NP & CRP grp)
- 8 Cathode Modules moved and stored in the PD Lab (*dedicated rack in the tent*):
 - Electronics DCEM 1.1 → DCEM 1.3 swap one by one (*PD Lab*)
 - Test of PD Module w/ new Electronics Board in LAr (*Test set-up in front of PD Lab*):
 - **1 module test/day - Total 2 weeks for 8 PD Modules test + PD Team (3-4 people)**
 - PD Module back to storage (rack in the tent) in PD Lab after test
- Fiber (tip cleaning) & Test (Pwr Meter & Laser box):
 - **32 fibers (PoF & SoF) + spares: 1 day + PD Team (3 people - one-two inside NP02 and one on top)**
- Reinstall 8 Cathode Modules (bridge in place) in NP02:
 - **1 day/module - Total (max) 2 weeks + PD Team** (3 people: 1 on the bridge & 2 people on the floor)

PD Team for pDUNE Mod-0 exchange/refurbishment:

under formation - need to know “absolute timing” and constraint from NP

Components for exchange:

Baseline option (use existing production for motherboard and daughter card)

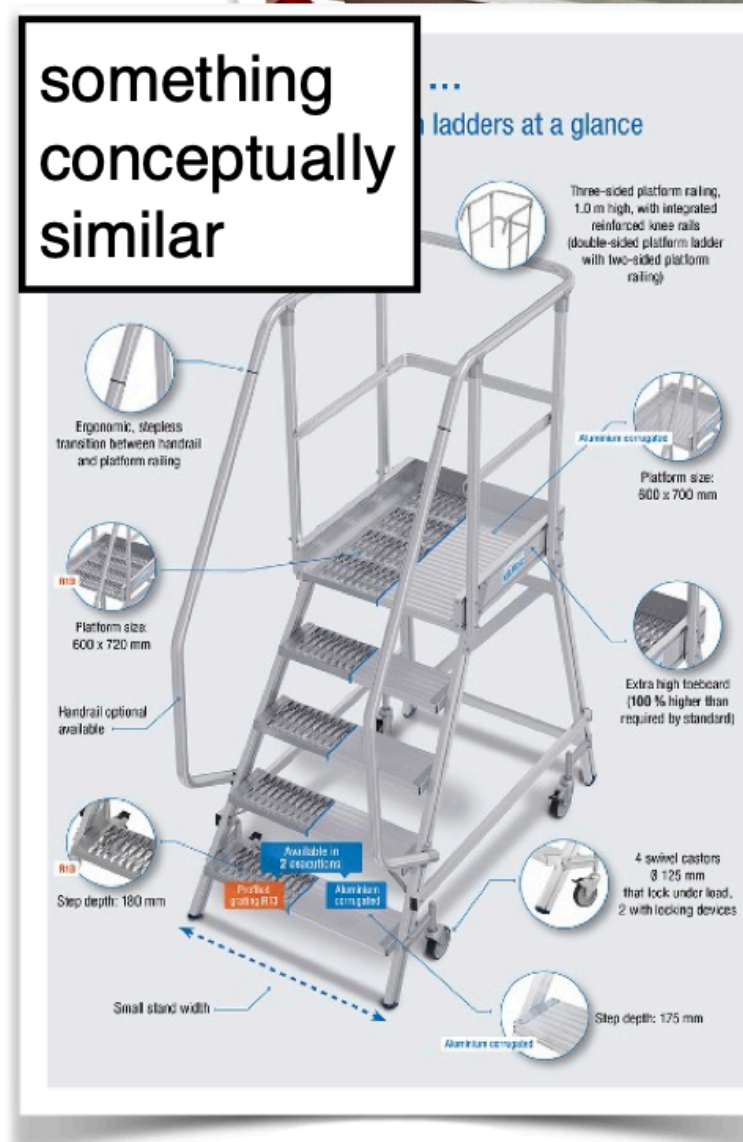
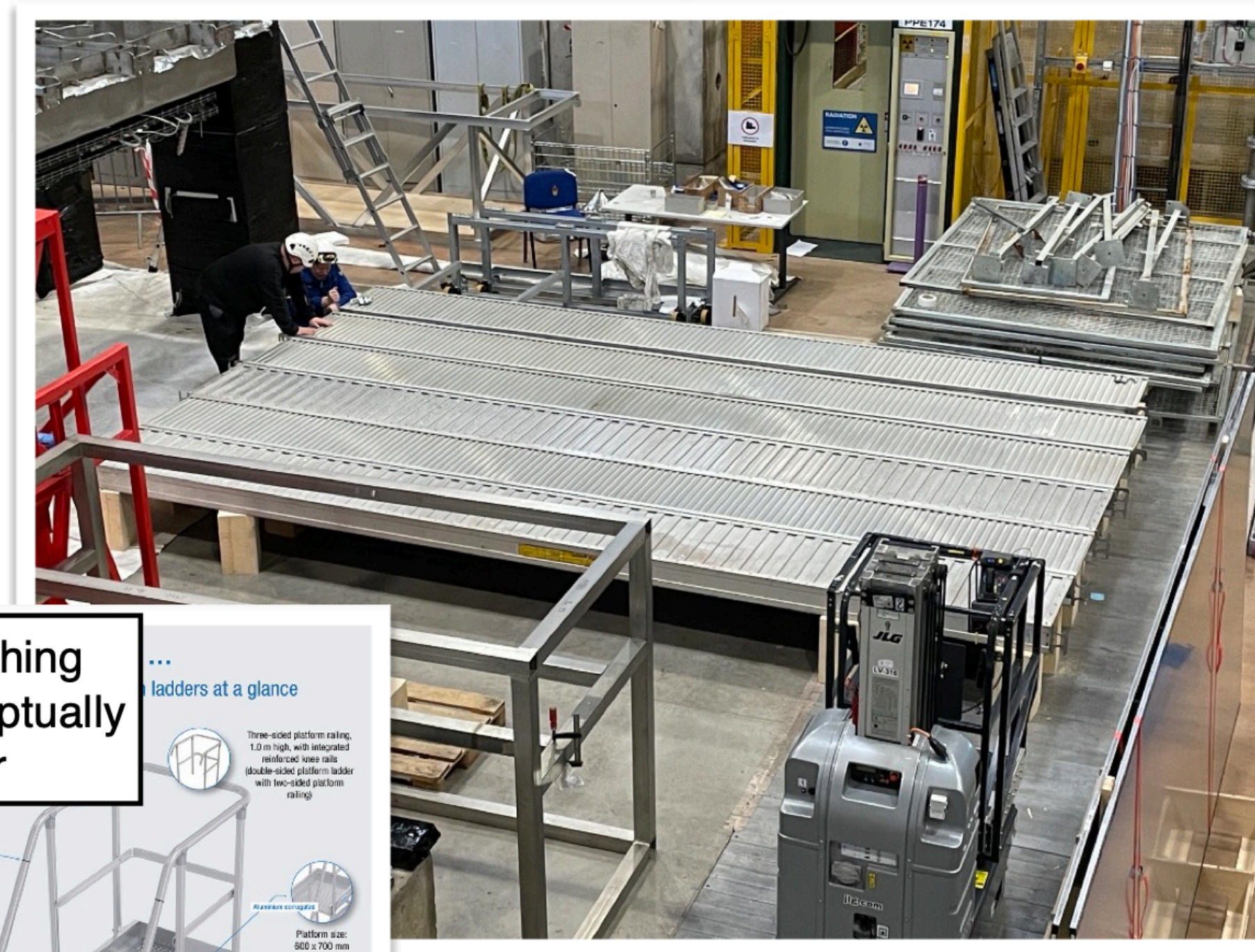
- 4x DCEM 1.3 (w/ SoF driver daughter card - **w/ Bipolar OpAmp**)
 - 2x available immediately after April CB end
 - 2x available at CERN by mid-May (after bench test at FNAL)
- 4x DCEM 1.3 (w/ SoF driver daughter card - **w/ standard CMOS OpAmp**)
 - 2x available at CERN now (from last CB run in Jan).
 - 2x available immediately after April CB end

Alternative option under evaluation: new production for both (or either) DCEM motherboard and SoF daughter card

- 8x shield Boxes for Electronics:
 - Production of 8 new light tight Boxes & OPC new enclosures for replacement

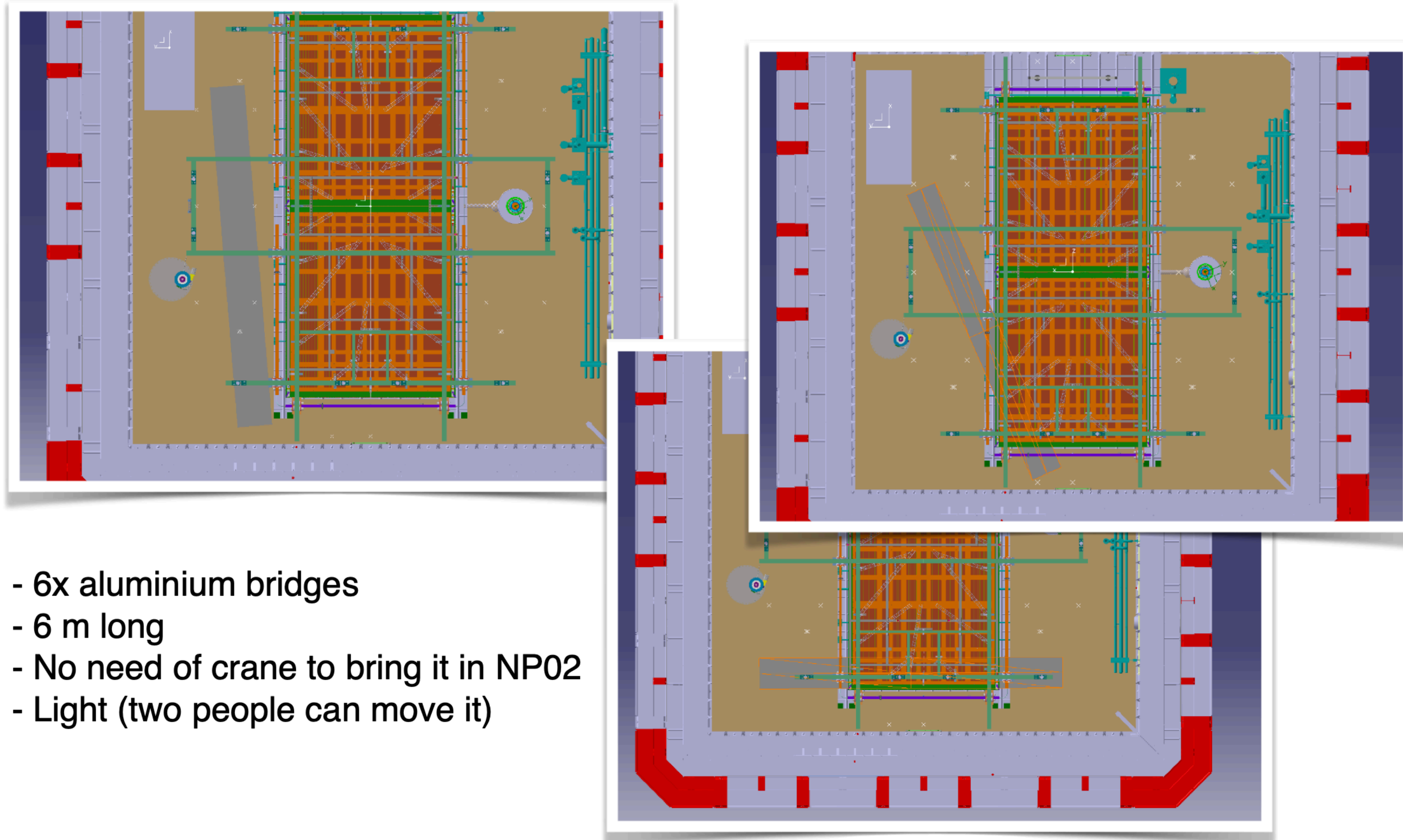
NP02 PD upgrade on cathode

CRP protection platform / false floor



NP02 PD upgrade on cathode

CRP protection platform / false floor

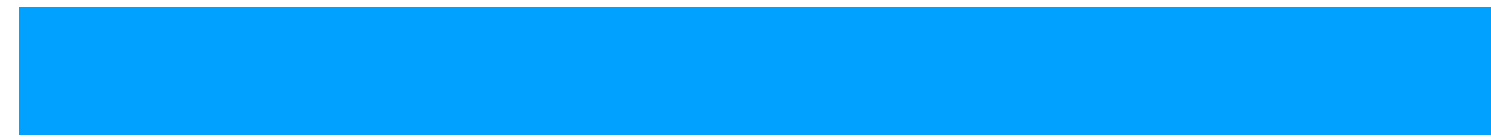


- 6x aluminium bridges
- 6 m long
- No need of crane to bring it in NP02
- Light (two people can move it)

TCO Closing (tentative date, t.b.c)

Apr. 1

May 20



- 8 CE Boards preparation & test at FNAL
- 8 shield boxes fabrication
 - (with new light leakage protection)
- Shipping to CERN
- Test in cold (test setup at EHN1)

in NP02

in NP02

May 15

June 30

- Remove 8 Cathode Modules (bridge in place) in NP02
- Test of PD Module w/ new Electronics Board in LAr
- Fiber (tip cleaning) & Test
- Reinstall 8 Cathode Modules (bridge in place) in NP02

Notes:

- TCO Closing can be delayed (to end July, or even beginning September)
- Next CB run (CRP6.4) expected within 2nd half of June (PD may not be able to participate due to overlap w/ Mod-0 CE exchange)