

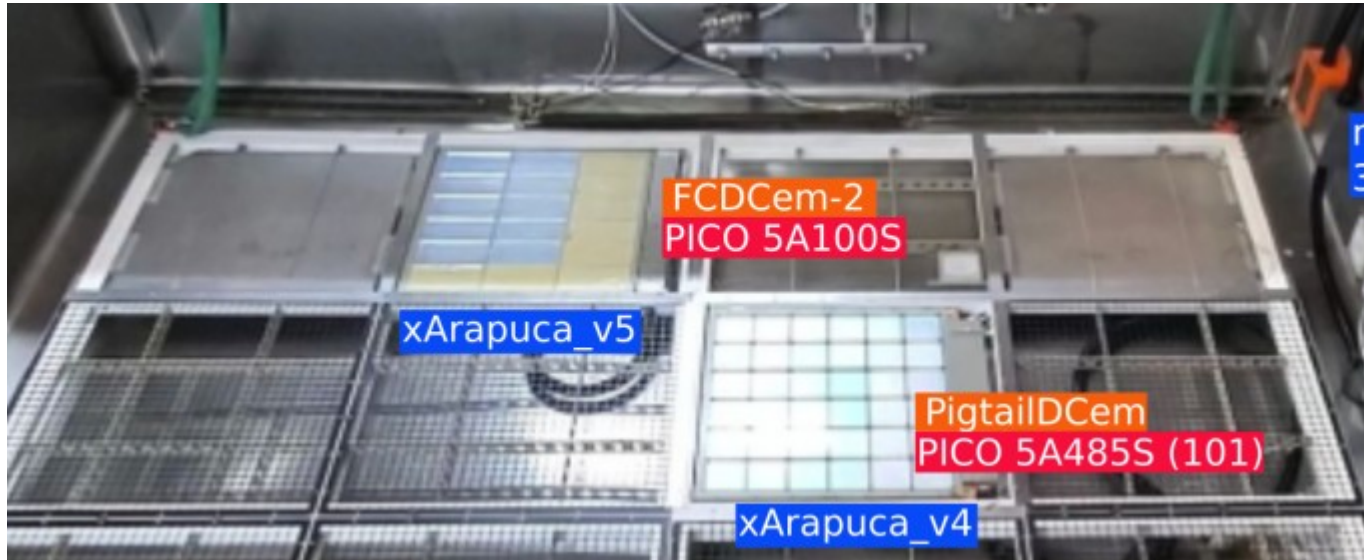
December PDS Coldbox

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for the PDS coldbox team

APC - 17/01/2023

PDS dedicated coldbox

- Two types of xArapuca on the cathode: v4 and v5 (read-out with different boards)
 - V4 extracted for inspection
 - First module implementing and testing large dichroic filters

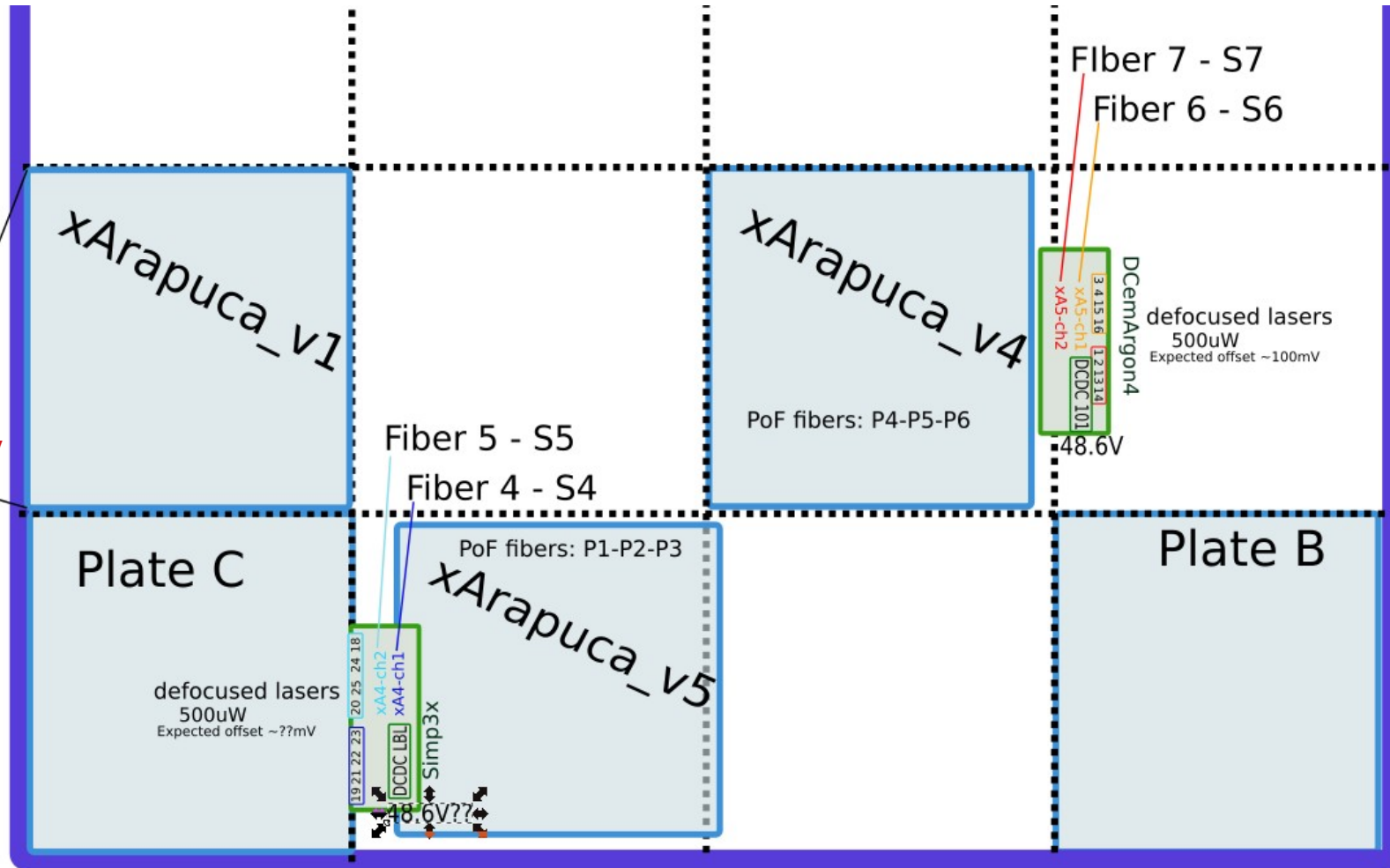


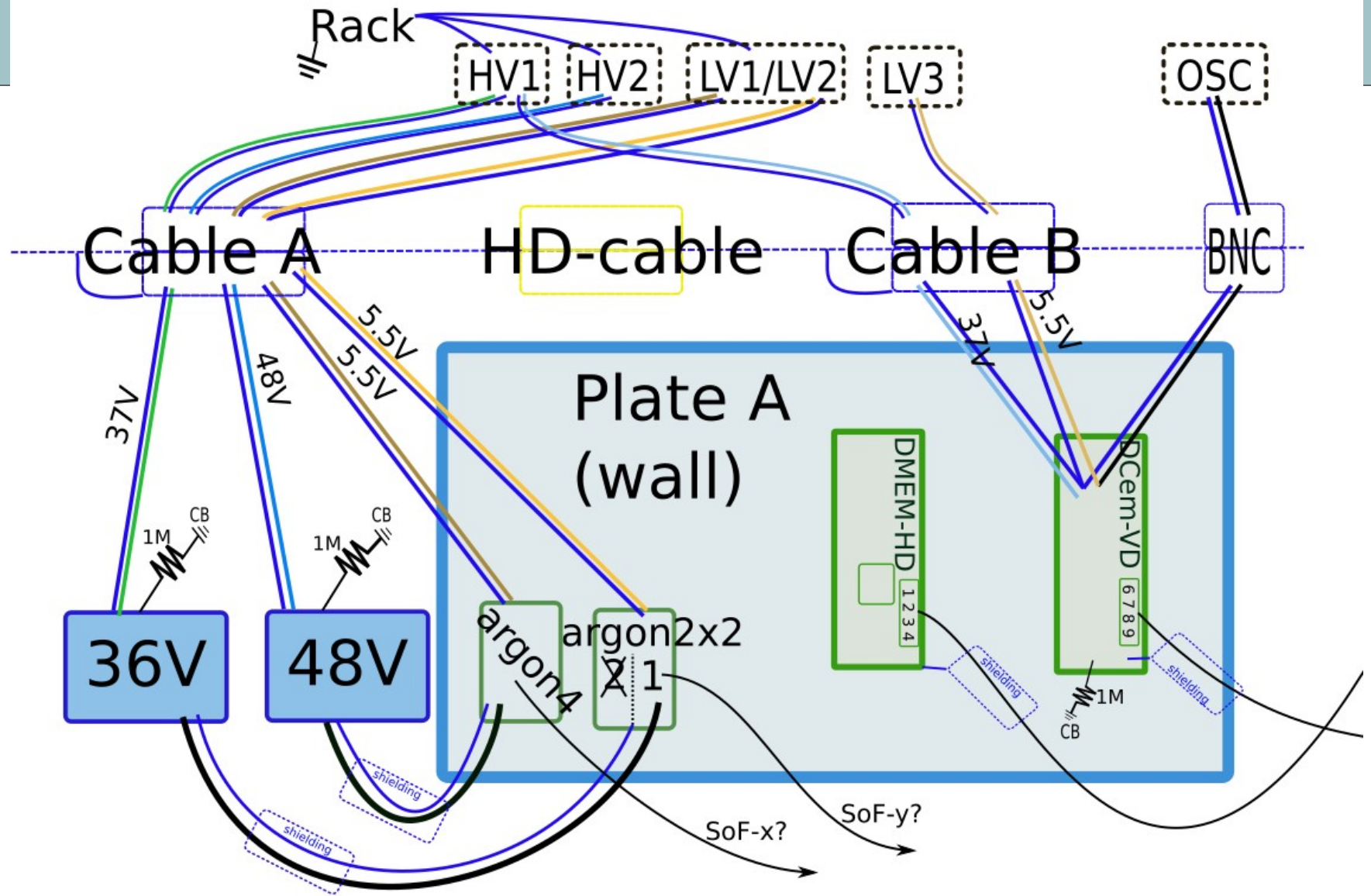
PDS dedicated coldbox

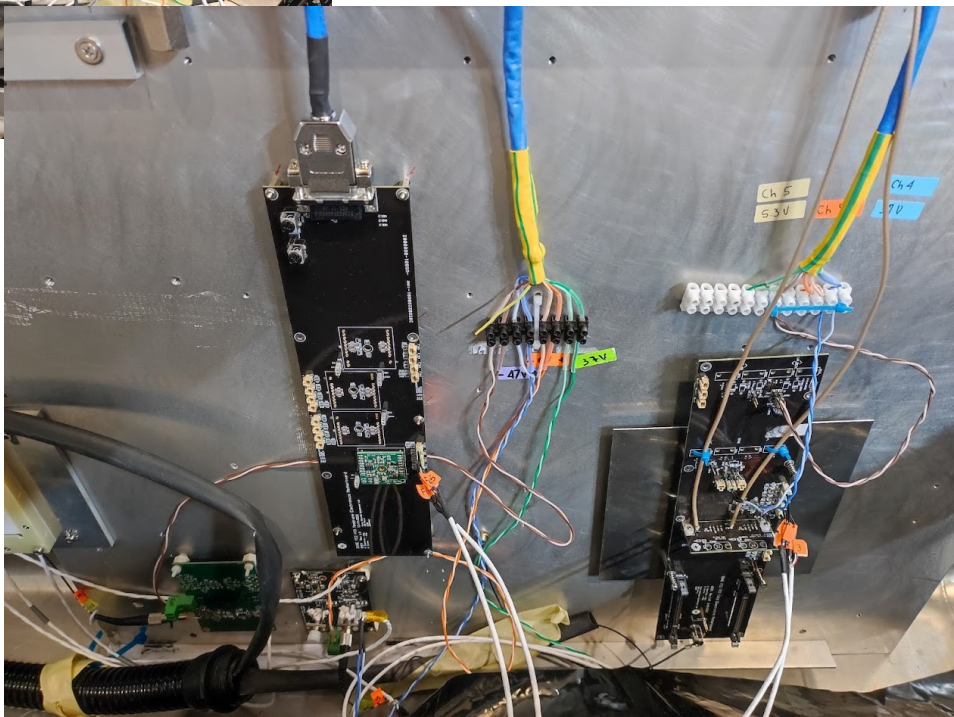
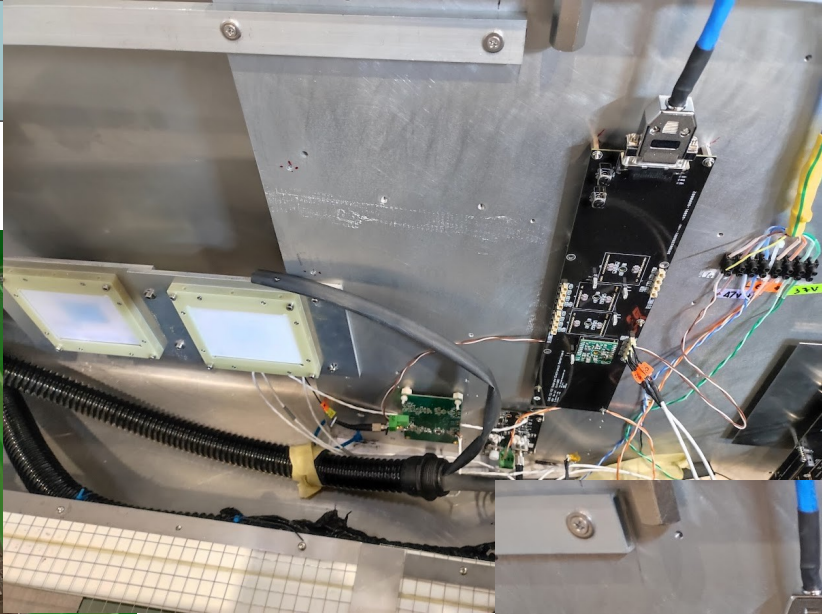
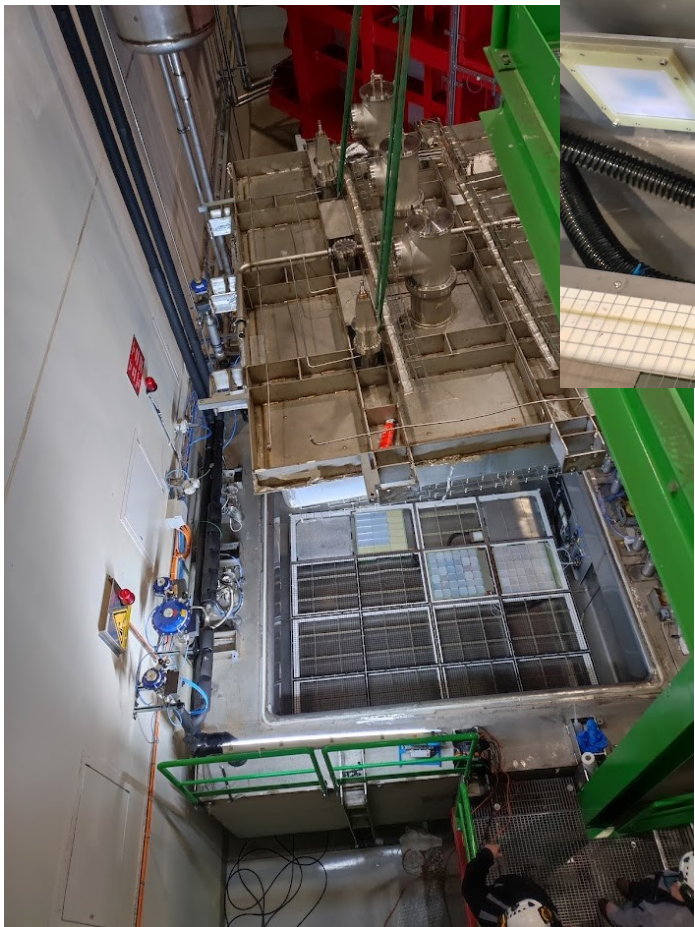
- Two types of xArapuca on the cathode: v4 and v5 (read-out with different boards)
- Two types of cathode readout electronics
 - SoF circuit for protoDUNE and alternative simplified circuit for test
- SoF circuit modified implementing improvements of the previous months:
 - Undershoot
 - Ringing on the signal
 - Laser driver circuit adaptations
- PoF light shielding improved (GaAs PoF)
- Copper readout testing with xArapuca-v1 (produced September 2021, refurbished July 2022)
 - VD-style solution
 - HD-style solution

Cathode

To wall
→ NO HV

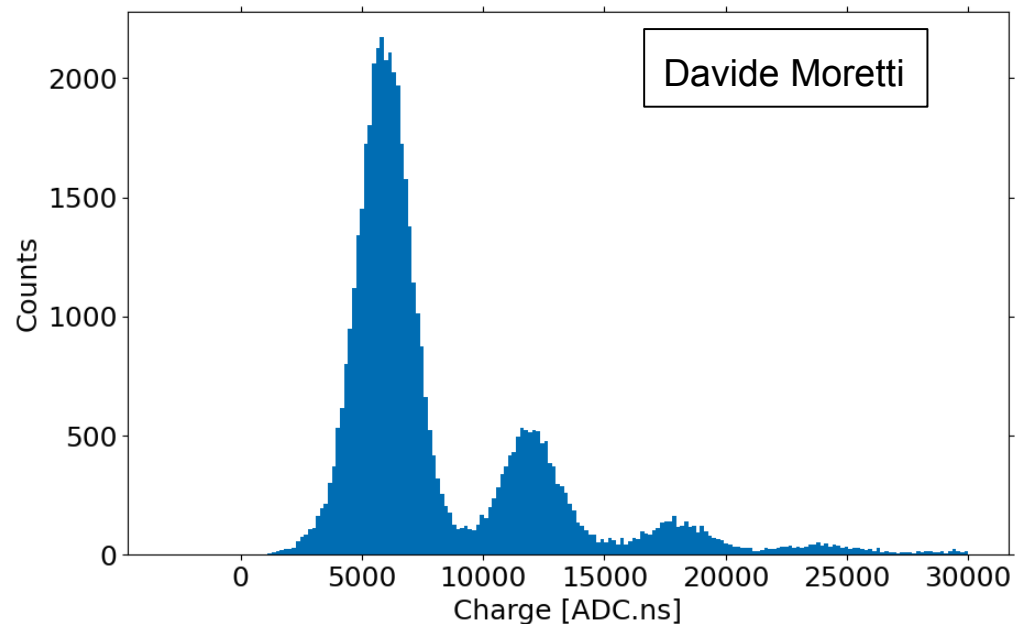






PoF light leakage

- Coverings for OPCs, fibers and FC-FC connectors were heavily reinforced with metallic boxes and tubing
- Using argon2x2 “standard candle” on the wall the check differences between PoF on and off



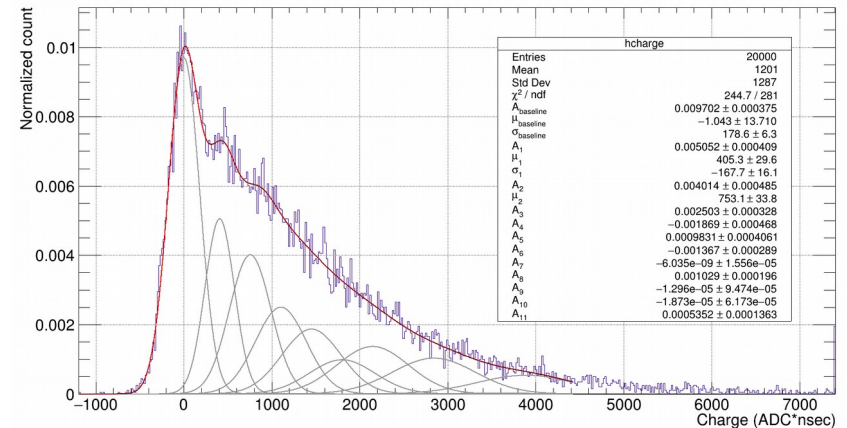
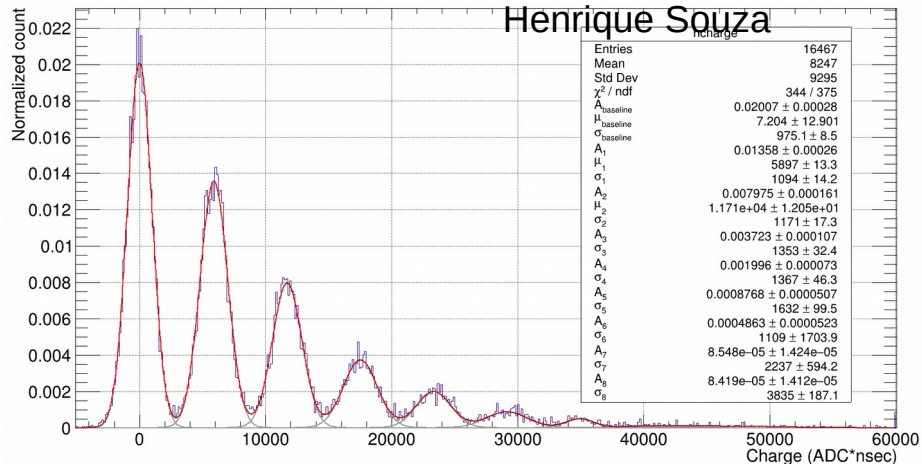
Argon2x2

- 121.642 Hz/mm²
- Events per 20 us: 7.007
- ev 43.8 k

No difference noticed when switching on/off PoF!

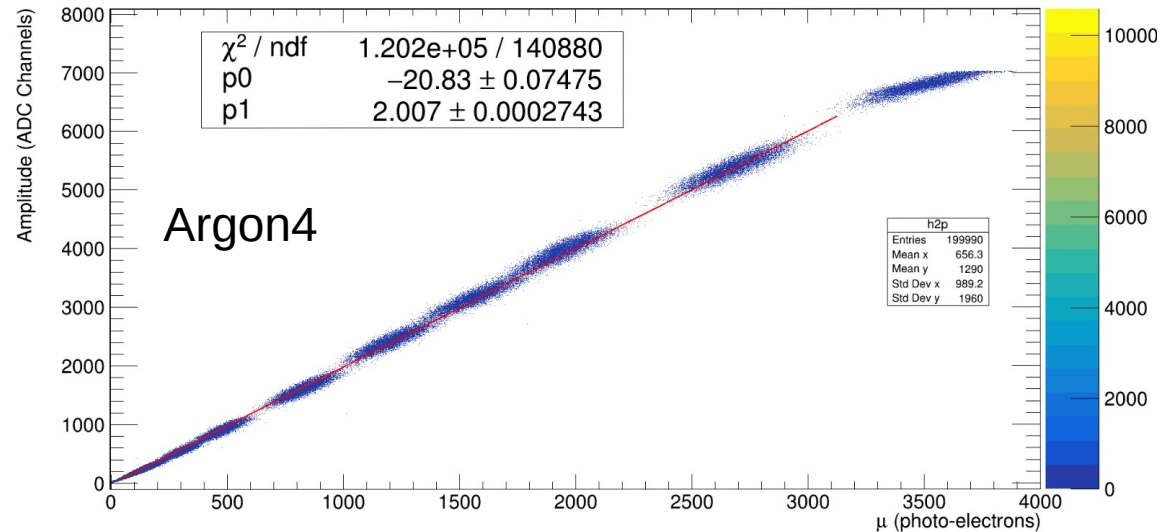
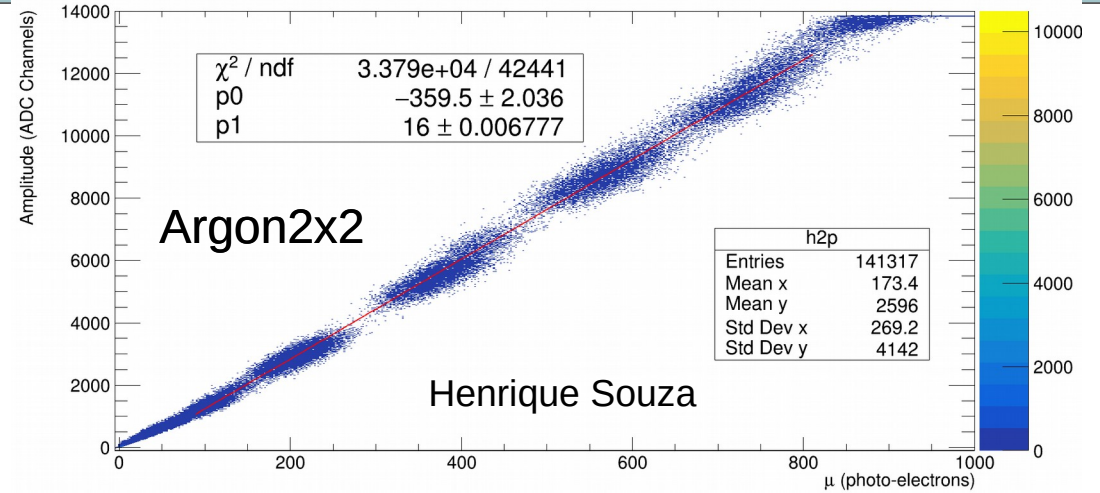
SoF transmitter performance on the wall (copper power)-SPE

- Argon 2x2 circuit and 20x SiPM (36V bias from copper)
 - December 2021 version of circuit with some improvements → SNR ~6
- Argon 4 circuit and 20x SiPM (48V bias from copper, SiPMs known to be low performance)
 - First test of latest circuit design (larger dynamic range, slightly lower gain):
 - SNR ~2.3

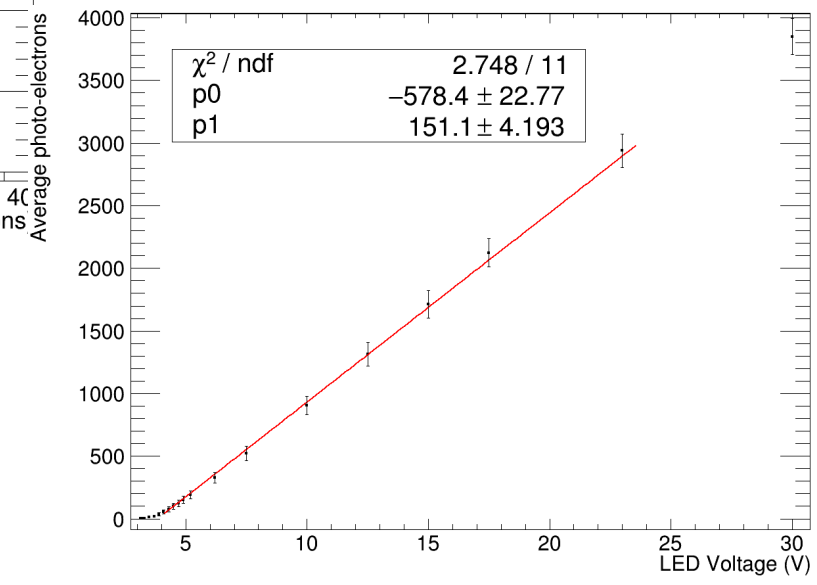
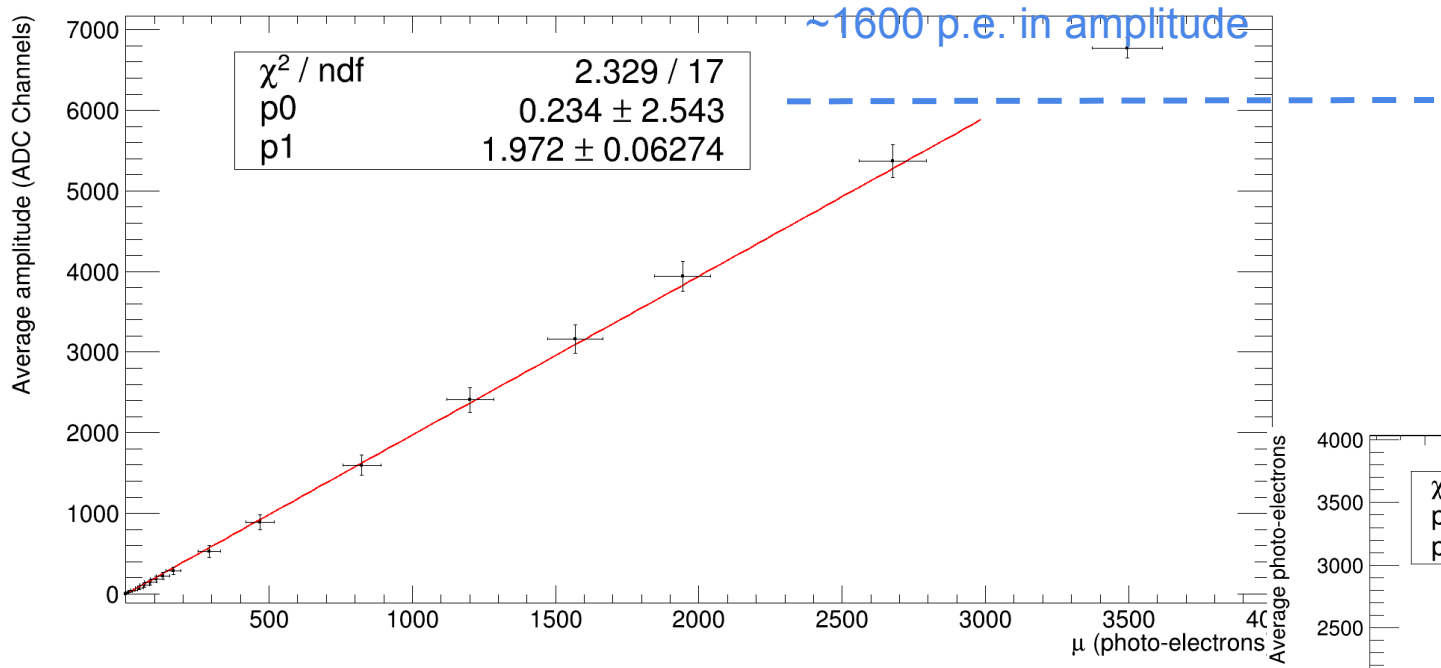


SoF transmitter performance on the wall (copper power)-Dynamic Range

- Improved from ~300-400PE to 1600PE
- Enough space to bring back up the gain if necessary

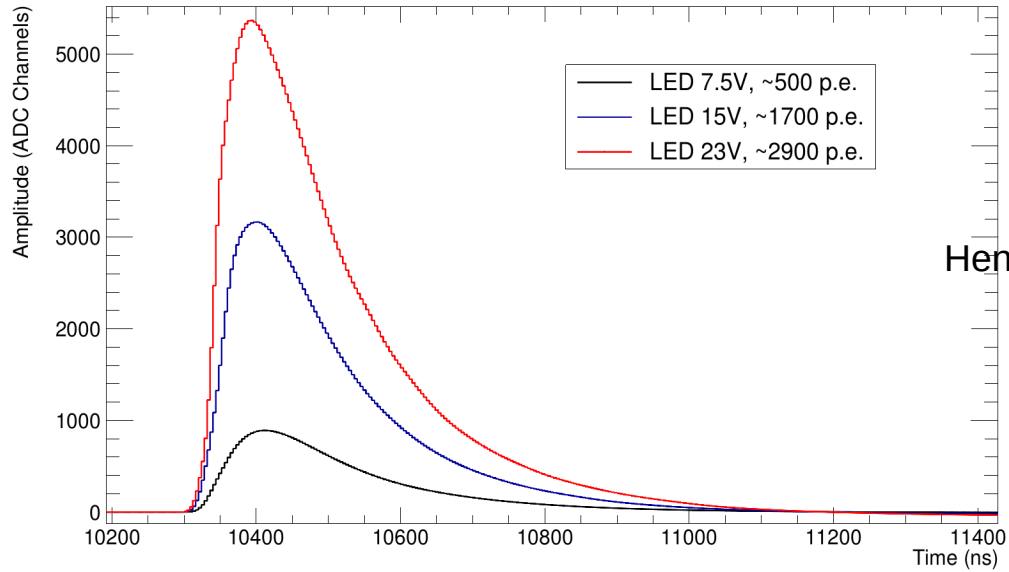


Dynamic range and linearity with LED (Argon4 ch2)

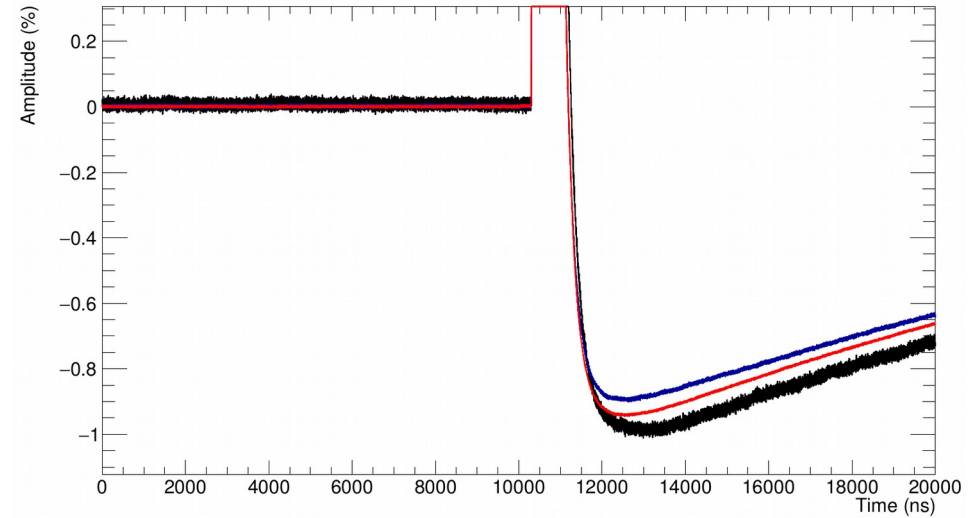


LED data (Argon4)

- Normalized average signals of big pulses, undershoot is ~1%



Henrique Souza

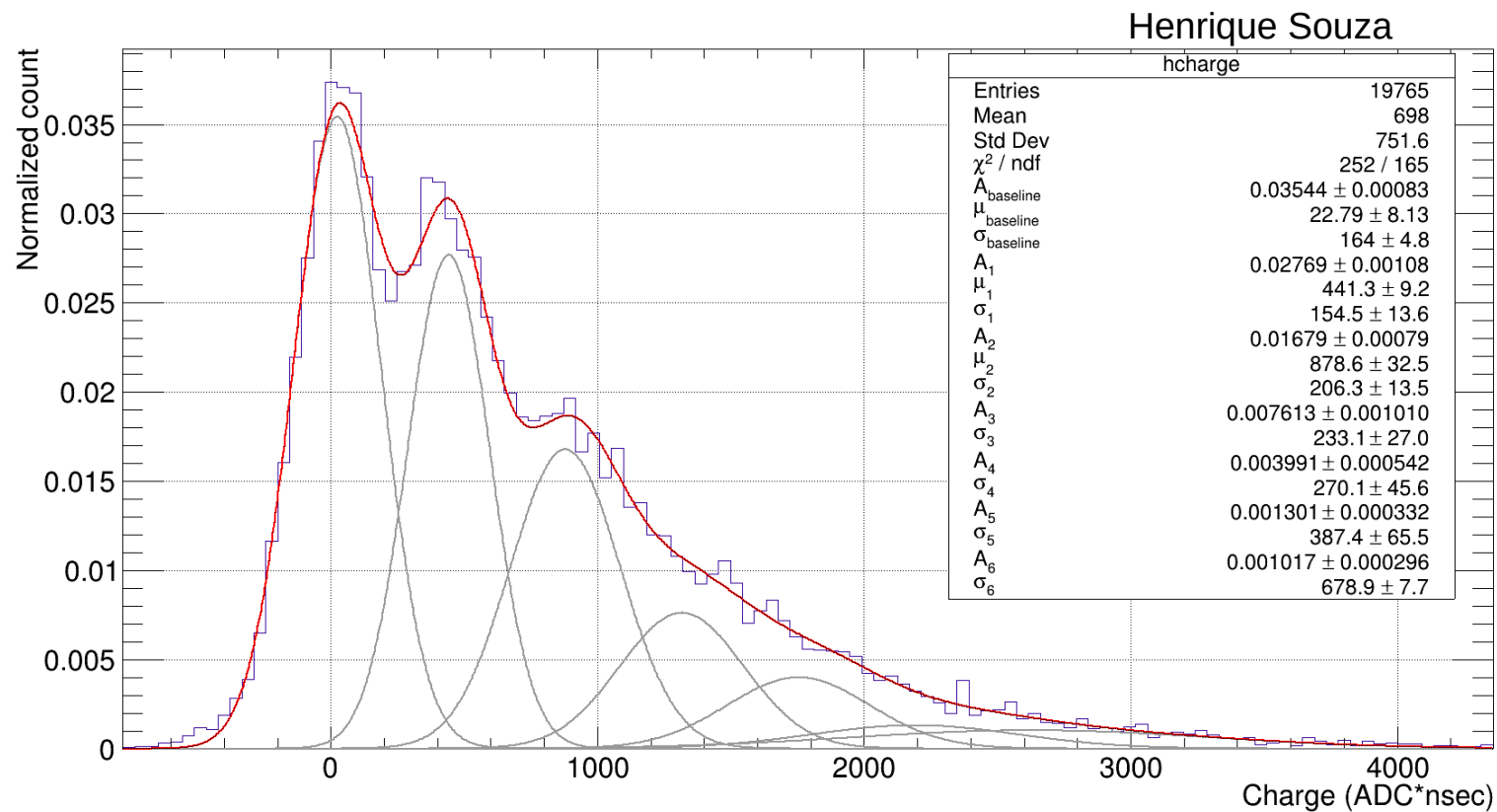


Cathode readout

- V5 readout would only transmit very big signals → to be replaced for next coldbox with a “ProtoDUNE” board – DCDC LBL
- V4 readout board (similar to what is expected for ProtoDUNE but final board was not ready):
 - Some oscillations due to possibly LDO area affected by electrostatic discharge
 - Also possible malfunction due to wrong capacitor type (now being replaced)
 - DCDC bias: PICO
 - Data analysis: so far focused in FFT analysis to understand issues, but further analysis on one of the two channels is still possible (on-going)
- A very large amount of data was taken:
 - LED calibration
 - Muons
 - CRT
 - In Ixplus: `/eos/experiment/neutplatform/protodune/experiments/ColdBoxVD/December2022run`
 - For any question on data taken please contact Henrique :) First results shown next.

xArapuca v4 – DCemArgon4 (ch2)

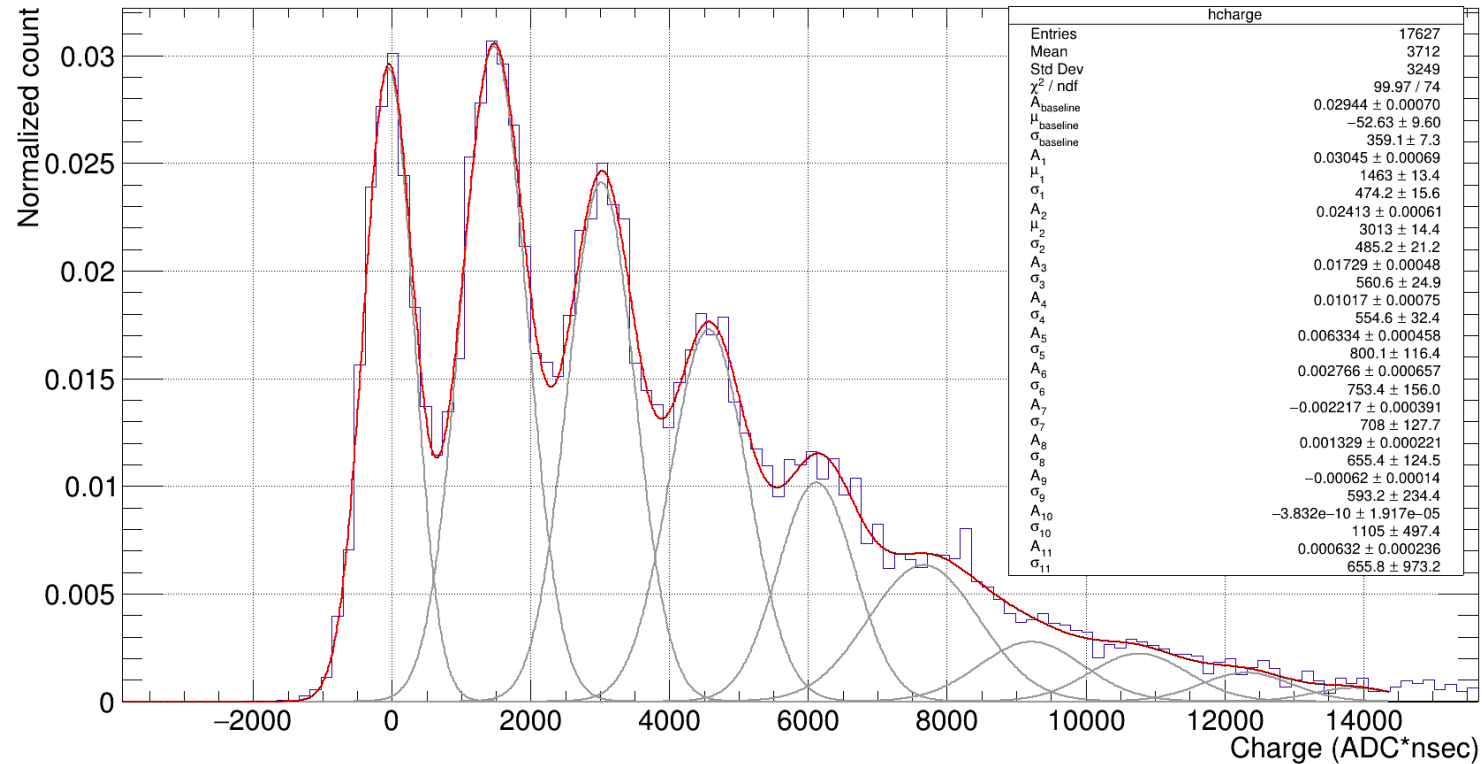
- Laser output lower than expected, and modulations, possible capacitor failure.
- SNR ~ 2.7



Xarapuca-v1, DcemVD (VD-style copper readout)

- First results, SNR ~ 4.1

Henrique Souza



Next steps

- Current CRP coldbox installation on-going
 - Fix v4 board and replace board on v5
- DCDC PICO board used multiple times, LBL on v5 seemed to be Ok too on this first test (will be checked again in this coldbox).
- HD-style board (DMEM) being checked in Milano.
- In parallel the setup for megacell testing has been prepared and a first test of a module has been done.

LED data (Argon4)

- Normalized average signals of big pulses, undershoot is ~1%