HD SC PDE measurements in LAr @ MiB, square and cylindrical dimples: preliminary results

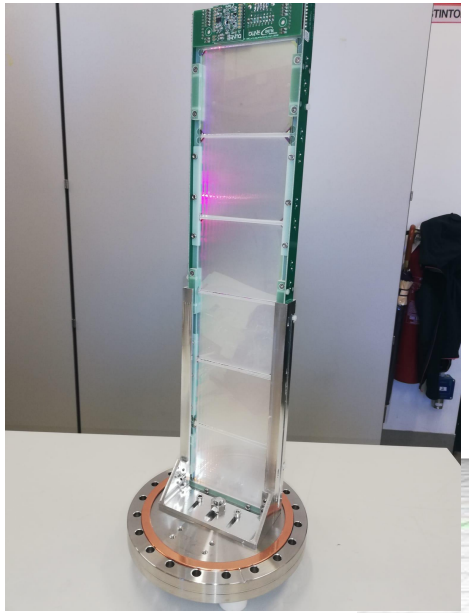
C. Brizzolari, on behalf of the MiB group
25/10/2022

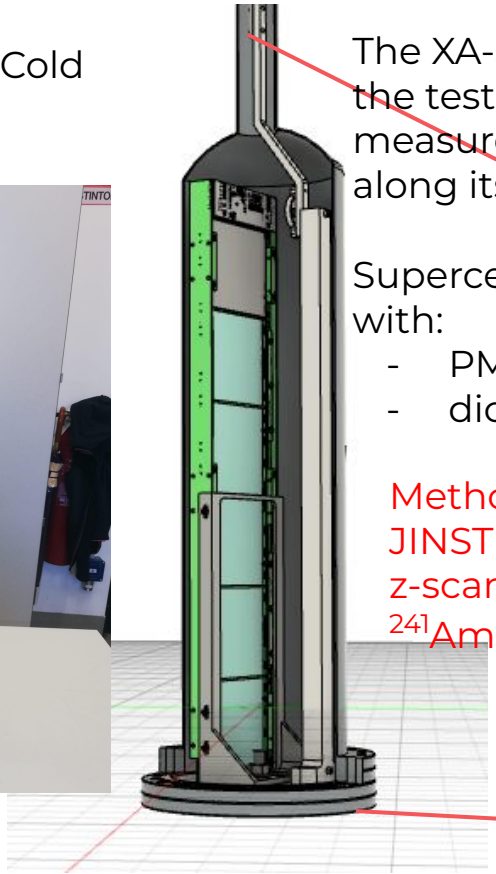
INFN Istituto Nazionale di Fisica Nucleare
SEZIONE DI MILANO BICOCCA

UNIVERSITA' DEGLI STUDI DI MILANO BICOCCA

Setup to measure the XA-HD-SC PDE in LAr

The XA-HD-SC w. Cold FE circuit (top)





The XA-SC installed in the test chamber to measure the PDE along its z-axis.

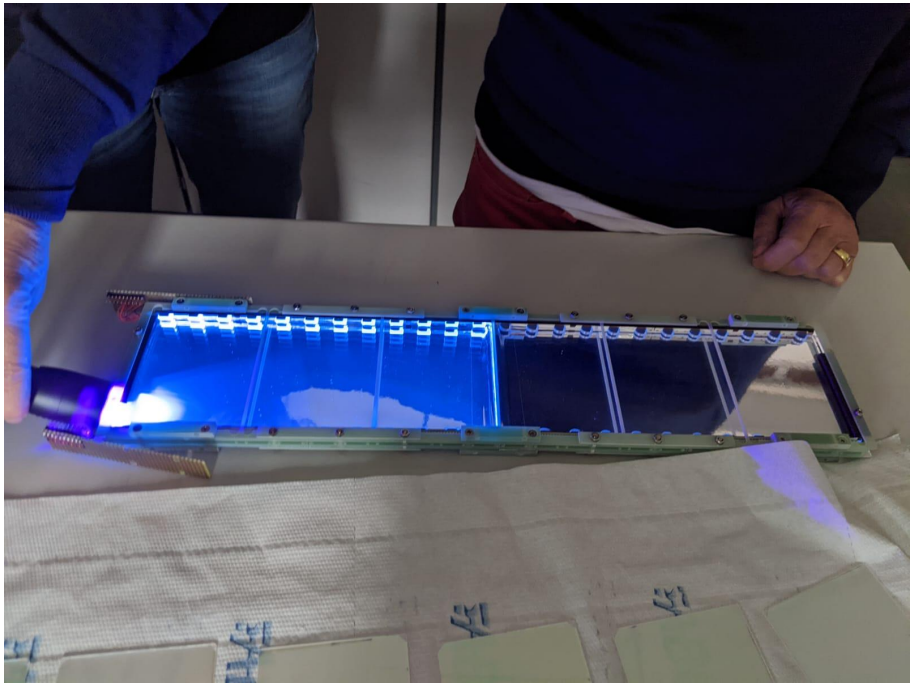
Supercell equipped with:

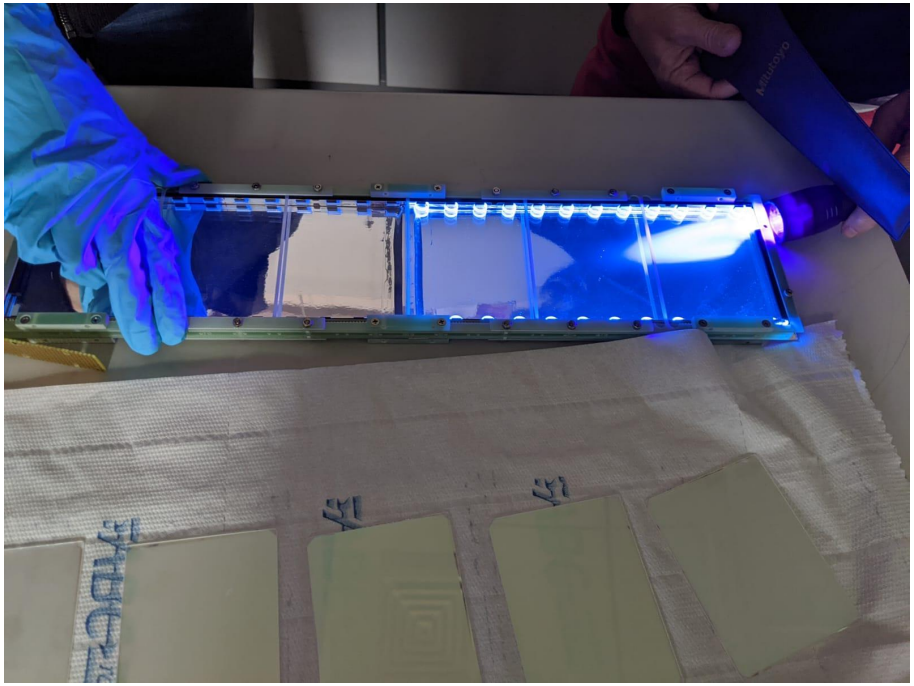
- PMMA WLS (G2P)
- dichroic filters

Method as published in JINST 16 (2021) 09027: z-scanning with an ^{241}Am exposed α source

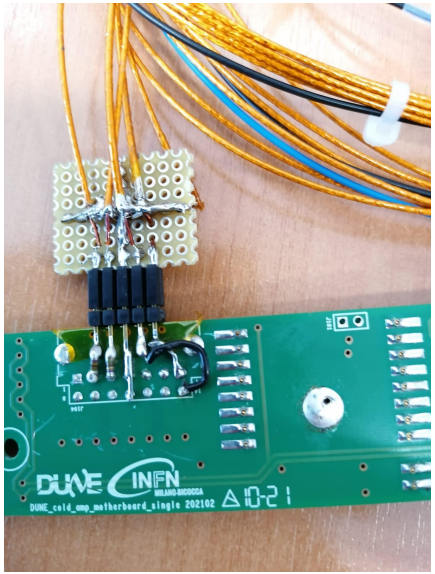
Features of the XA HD Supercell under tests

Size/type of the WLS slab Dichoics	**2 G2P** 240 x 93 mm^2, ***one with square dimples and one with cylindrical dimples***, Vikuiti on ALL short edges 6 x dichroics (Opto-Campinas)
SIPMs	HPK DUNE-75um-HQR, +3V OV (50% PDE) on flex circuits + springs behind (to push against the WLS bars)
Ganging	x 48 SiPMs by MiB cold Amplifier
# electronic channels	1
SiPMs -Cold Amp. Cold Amp dyn. range	AC 2000 ph.e.
s.ph.e. (50 Ω, 45 V)	~ 2.0 mV on 50 Ω
Chamber volume	~ 10 l
Digitizer	CAEN 14-bit 250 MS/sec, 4 ns/sample





Hardware

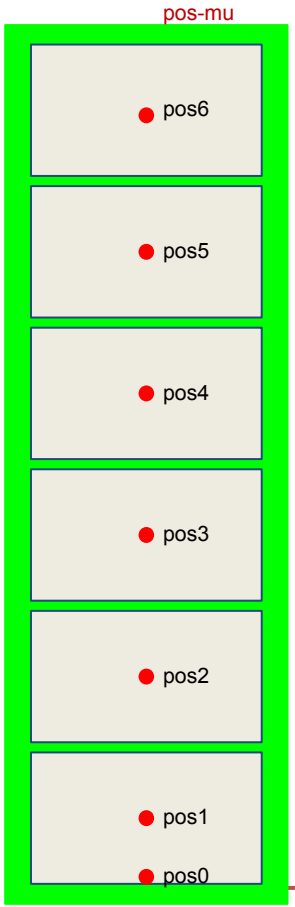


- Cold cables: a bundle of five Kapton RG178 coaxial cables. No DUNE blue cable & Hirose connector due to mechanical (dimension, stiffness) constraints of the setup

- Warm cables: 2.5 m, 50 Ω LEMO cables

- Cold-to-warm flange: 10 contacts vacuum/pressure connector mounted on a CF40 flange - No Hirose:
  - **the chamber and its payload are pumped down to 10^{-4} mbar prior filling →**
  - **high LAr purity achieved with high reproducibility**
  - **the purity is maintained w.o. any recirculation along several days from filling**

Method & Data taking



z-scanning of the SC with the ^{241}Am α (5.480 MeV) source at the following positions:

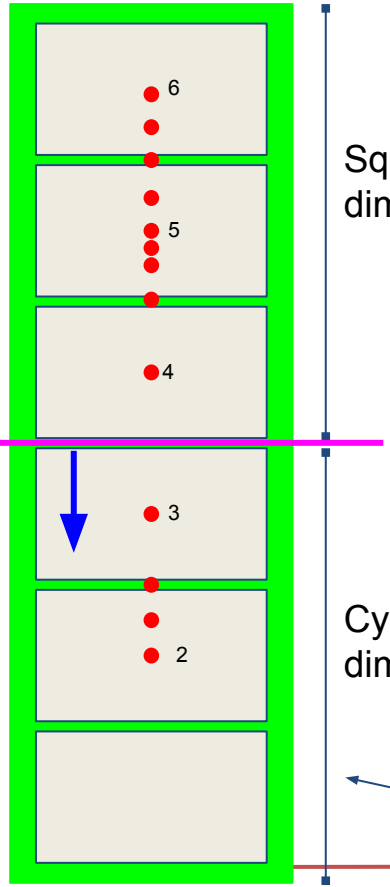
1. **pos0**: (the lowest possible): ~2 cm above the flange.
2. **pos1, 2, 3, 4, 5, 6**: the center of each dichroic filter.
   Acquired: 10^4 x 4 wfms; 20 μs length; ~5 μs pretrigger.

3. Source at the topmost position (~49 cm from the flange) and ~ out of LAr:
   - one **μ run** (10^4 x 4 events; 20 μs, 5 μs pretrigger)
   - one **s.ph.e. run** (10^4 x 8 events; 20 μs length; 1.6 μs pretrigger)

Source-to-dichroic filter distance: (55 +/- 1) mm.

Data taking & analysis

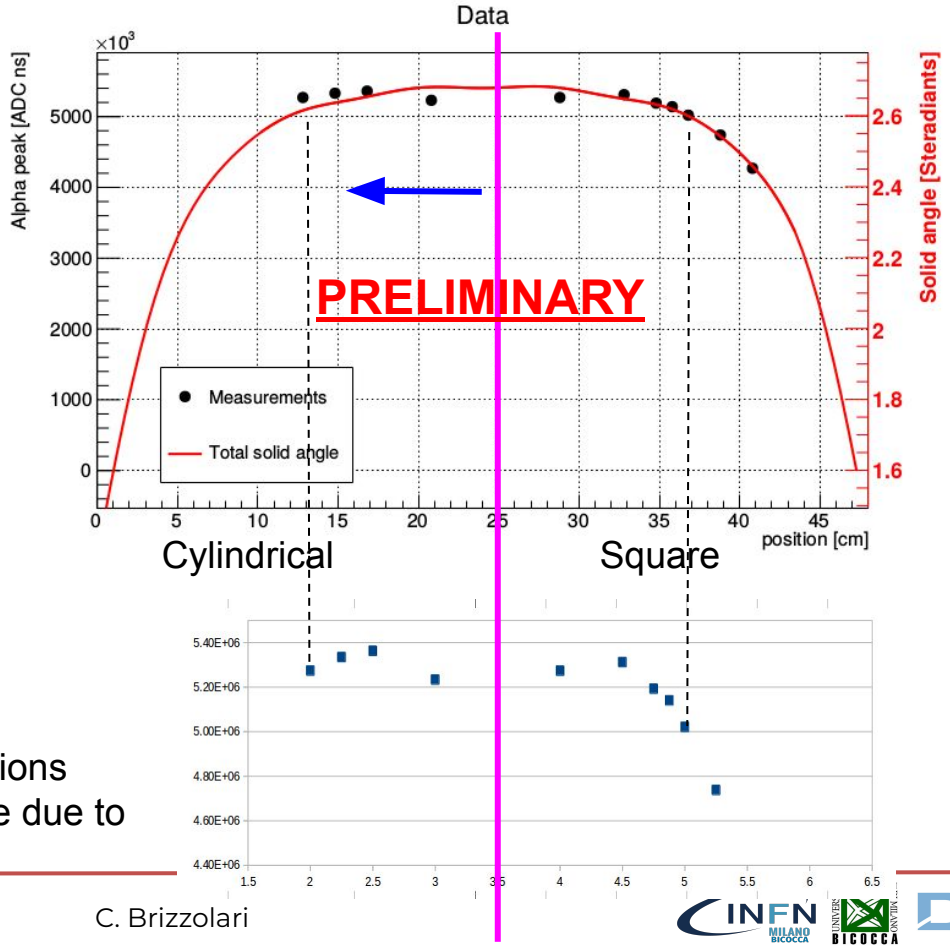
Data acquired on 14/10/2022

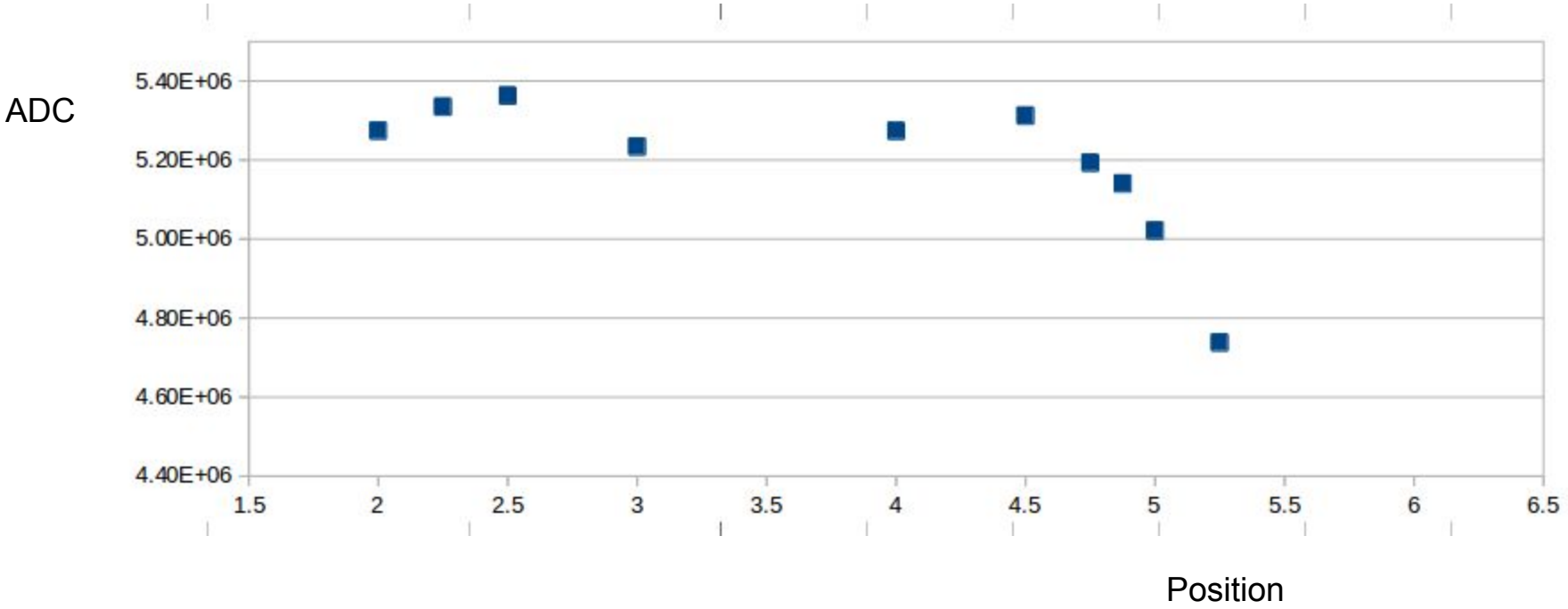


Square dimples

Cylindrical dimples

Lower positions inaccessible due to stuck cable




ADC
5.40E+06
5.20E+06
5.00E+06
4.80E+06
4.60E+06
4.40E+06
1.5
2
2.5
3
3.5
4
4.5
5
5.5
6
6.5
Position

Conclusions

- Analysis ongoing
- For now, no clear evidence to prefer one dimple over the other