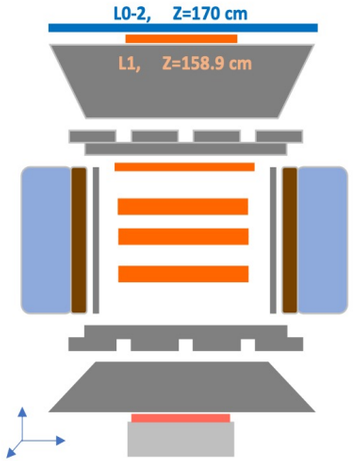
# Beam Test 2024

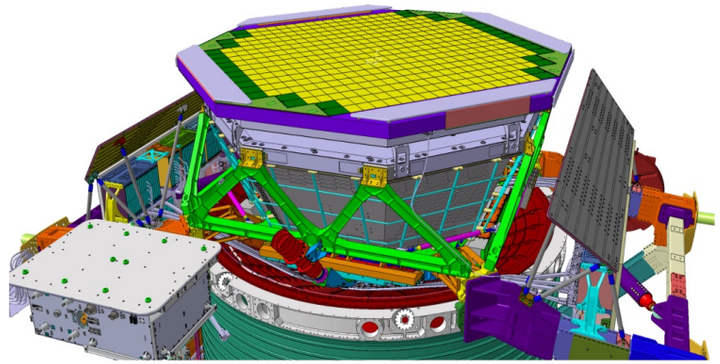
Ions

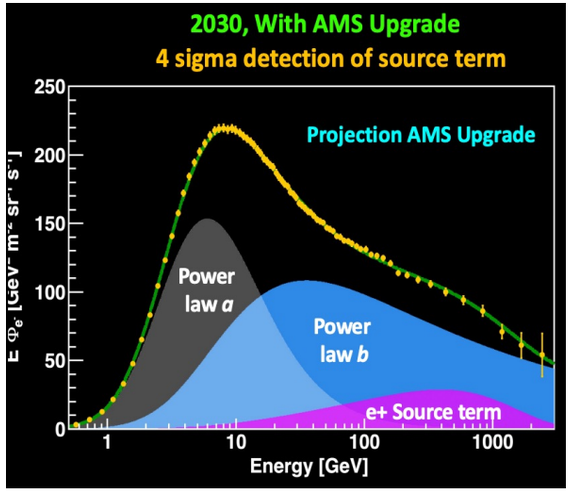
(AMS-L0 INFN Perugia group)

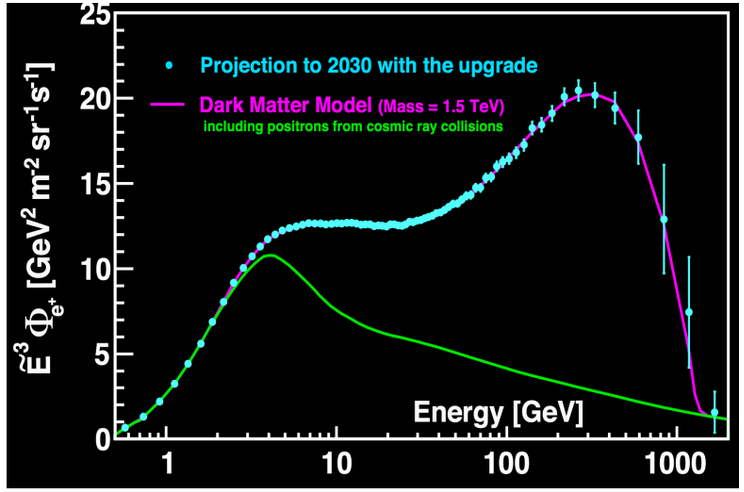
# AMS Layer 0 (L0) upgrade

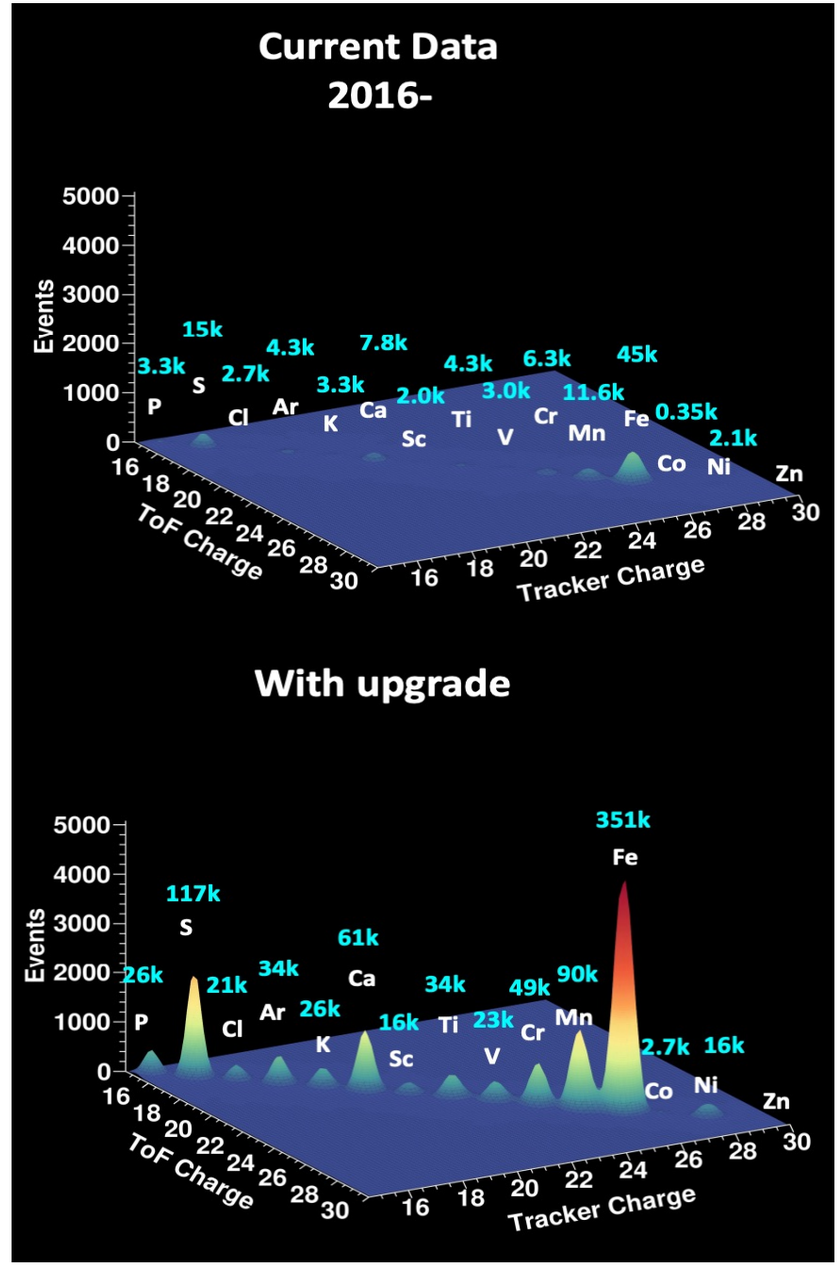
- install a double-layer of microstrip silicon sensors on AMS:
  - measure the charge of nuclei (especially high Z) before fragmenting in the detector material
  - have the longest spectrometer lever arm on an increased (300%) field of view
- target install date: beginning of 2026





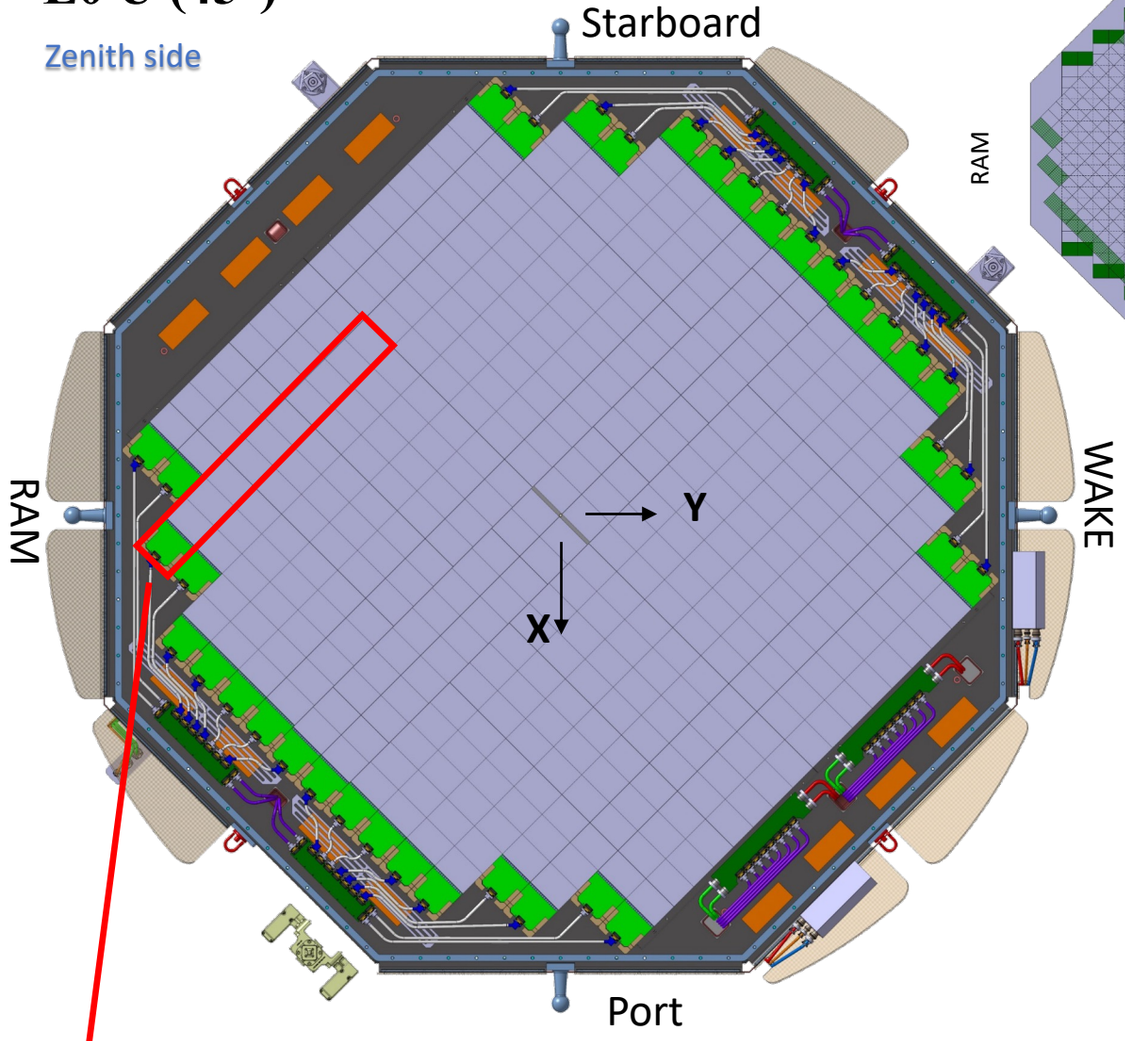



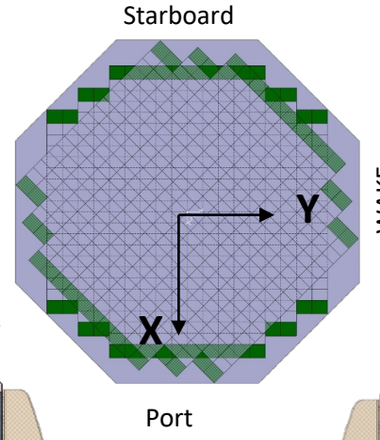



# Sensors: n. 1536 Silicon Strip Detectors, n. 72 Ladders, n. 8 ¼ Layer

**L0 U (45°)**

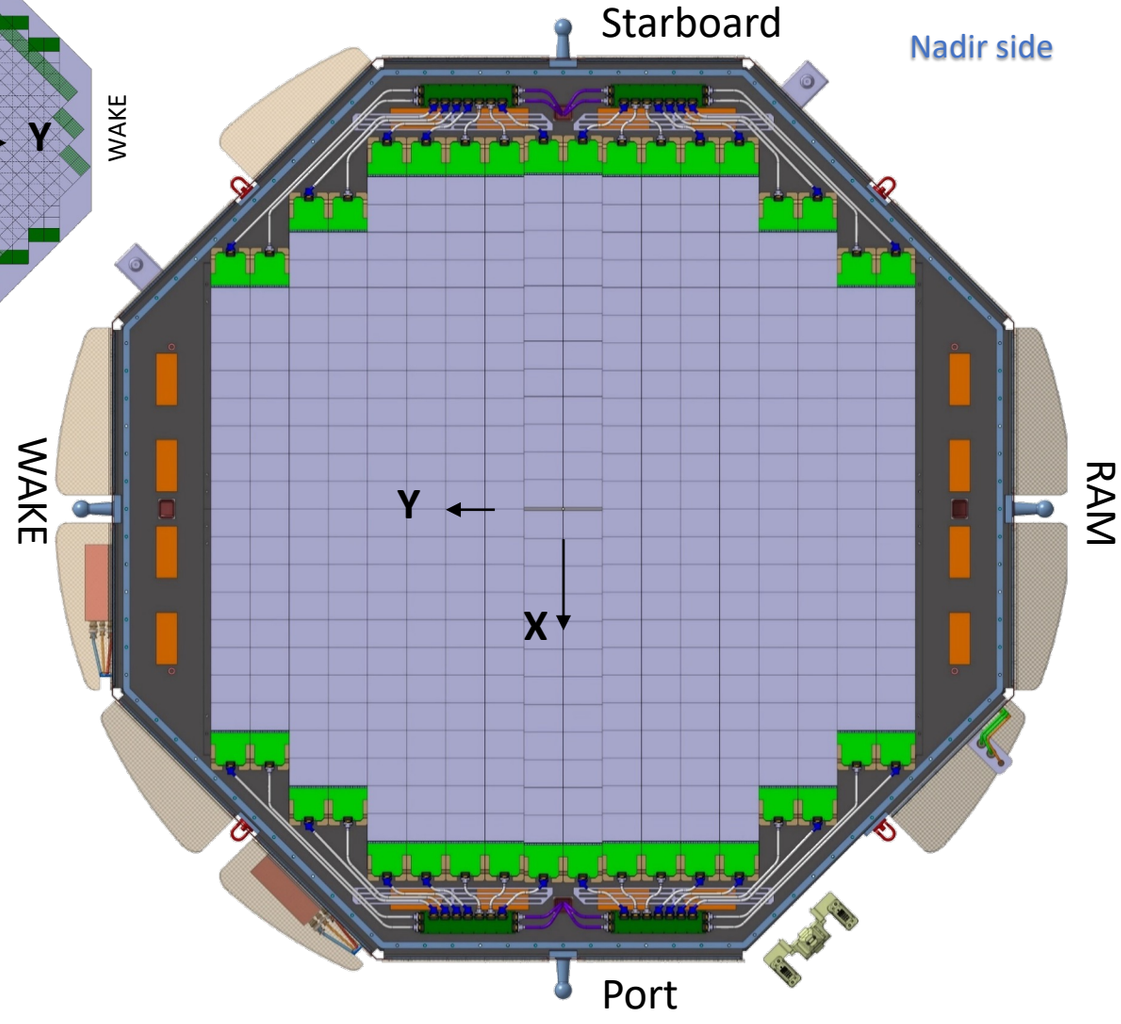
Zenith side



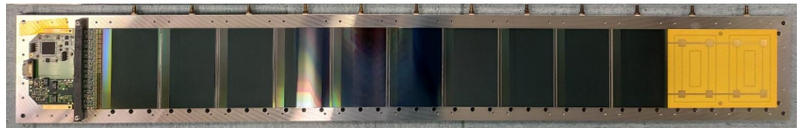




**L0 Y (0°)**

Nadir side




~2 x (2.0 m x 1.9) m² of Silicon Strip Detector are mounted the two faces of the Structural Plane



first 10 wafers ladder prototype

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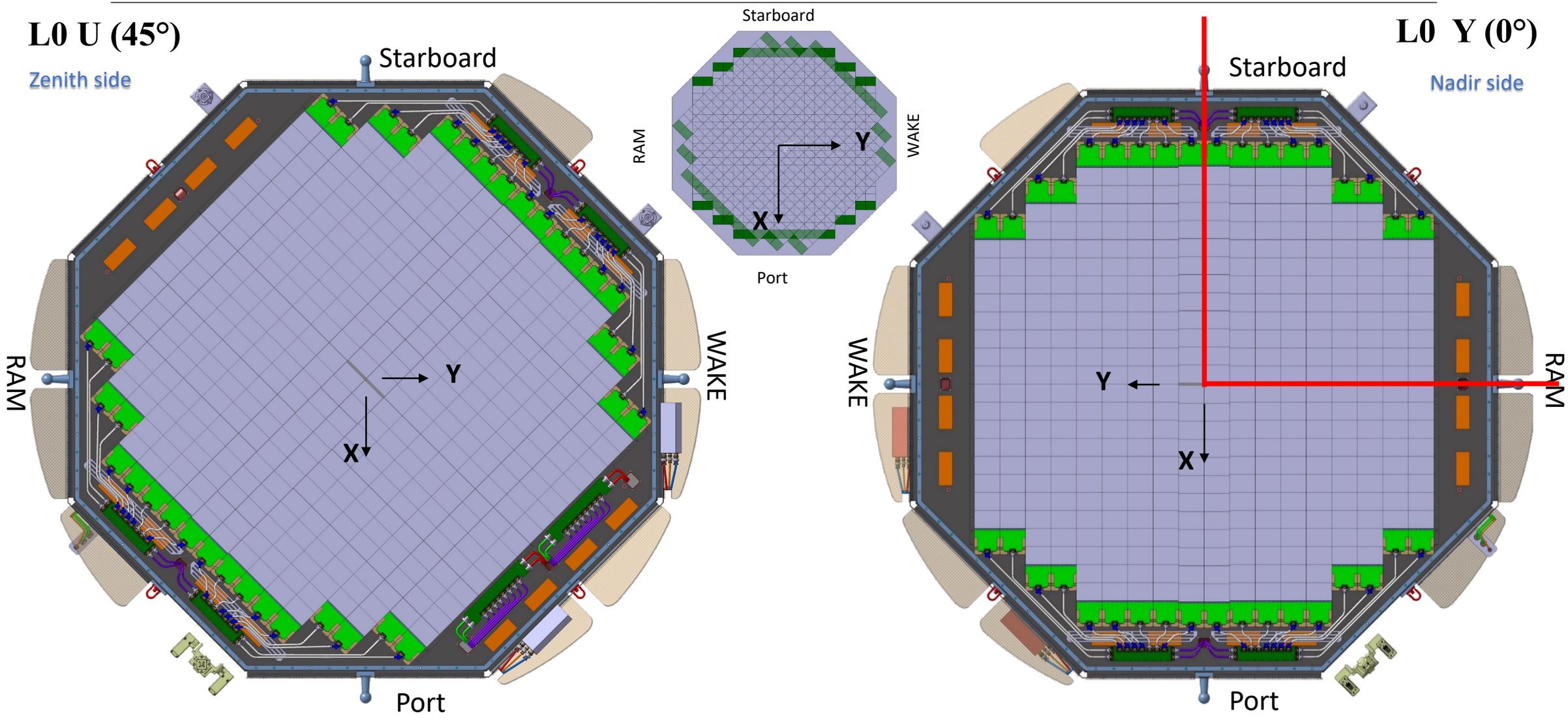
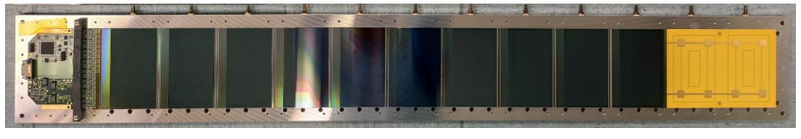



~2 x (2.0 m x 1.9) m² of Silicon Strip Detector are mounted the two faces of the Structural Plane



first 10 wafers ladder prototype

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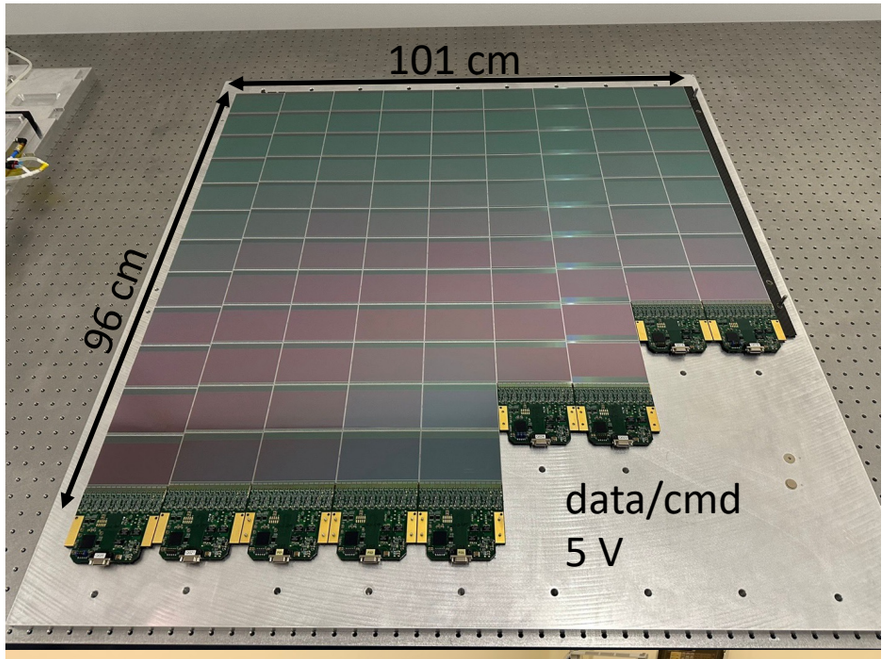
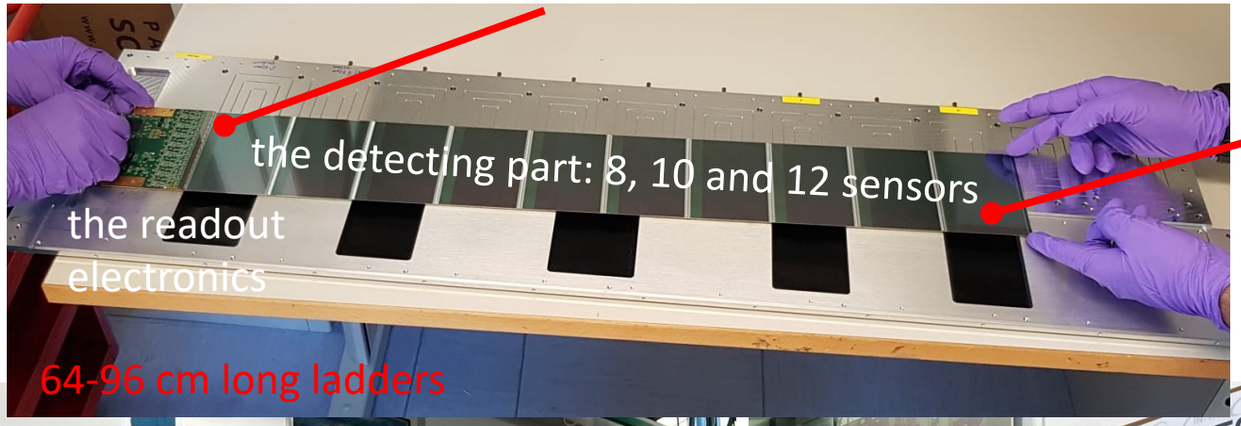
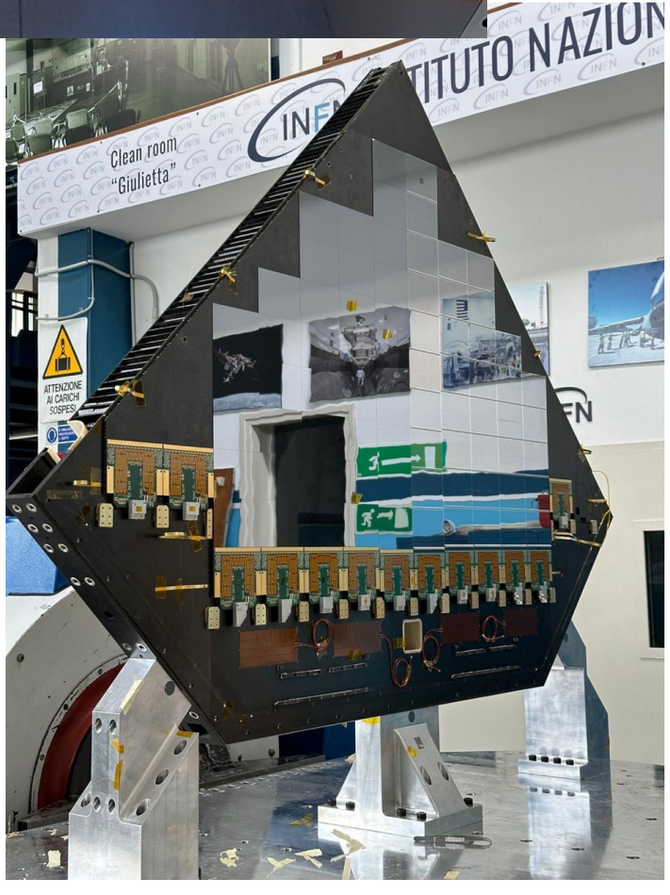



charge measurement: high dynamic range FE




spatial resolution: 110 µm readout pitch

# Requested schedule 2024

We are now building the 72 flight modules

We need:

~~- two BTs in 2023 with single prototype modules~~: done (ions: only 1 night of beam)

- two BTs in 2024 with single final-like modules (~~muons~~ and ions)

- one BT in 2025 with the full L0

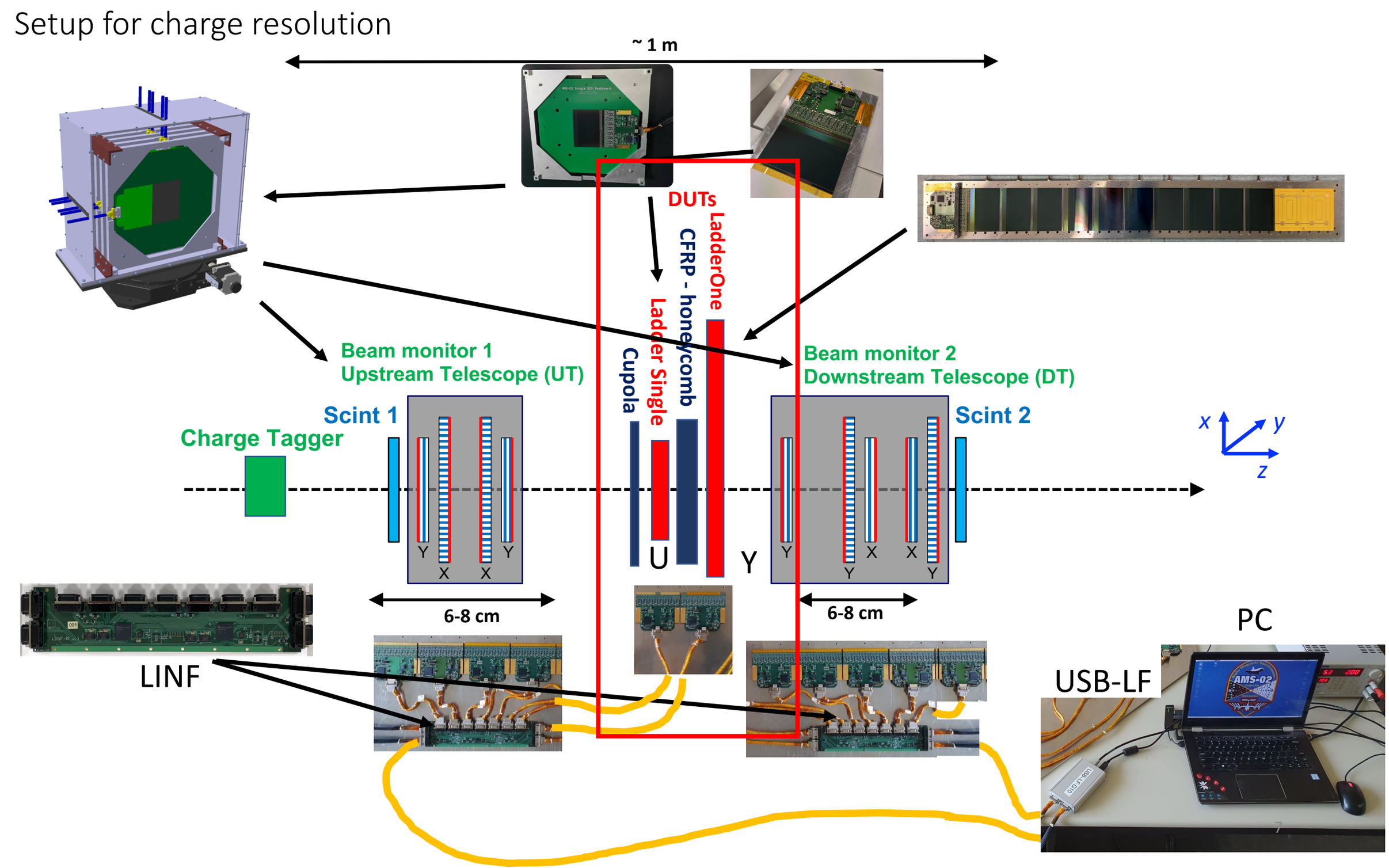
We asked:

- ~~1 week of protons for spatial resolution (with final Front End settings)~~: done (beam dump, very successful)

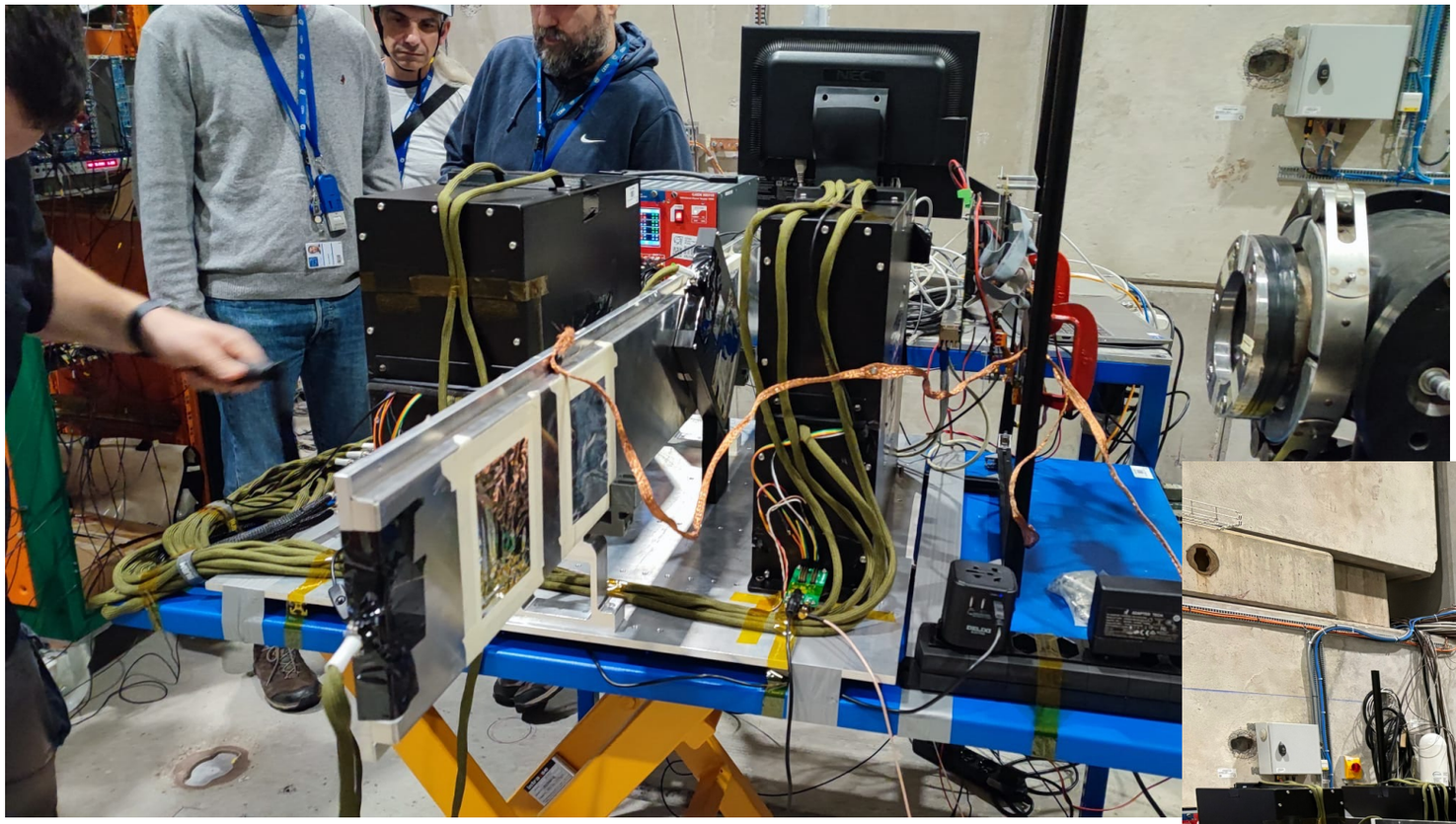
- 2 weeks of ions for charge resolution

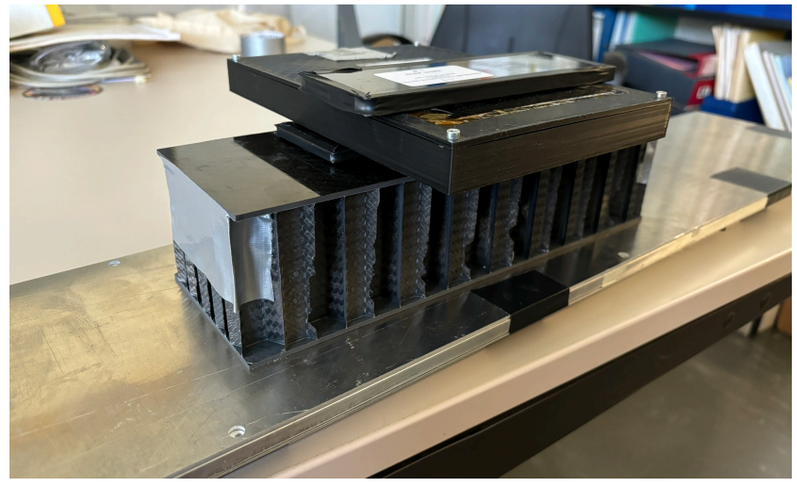
(with final Front End setting + bad luck with beam in 2023)

# Setup for charge resolution



# Pictures (Ions 2023)






**Carbon fiber Honeycomb "mock ups": simulate the real detector structure on *Z***

# "logistics": requests

We simply need:

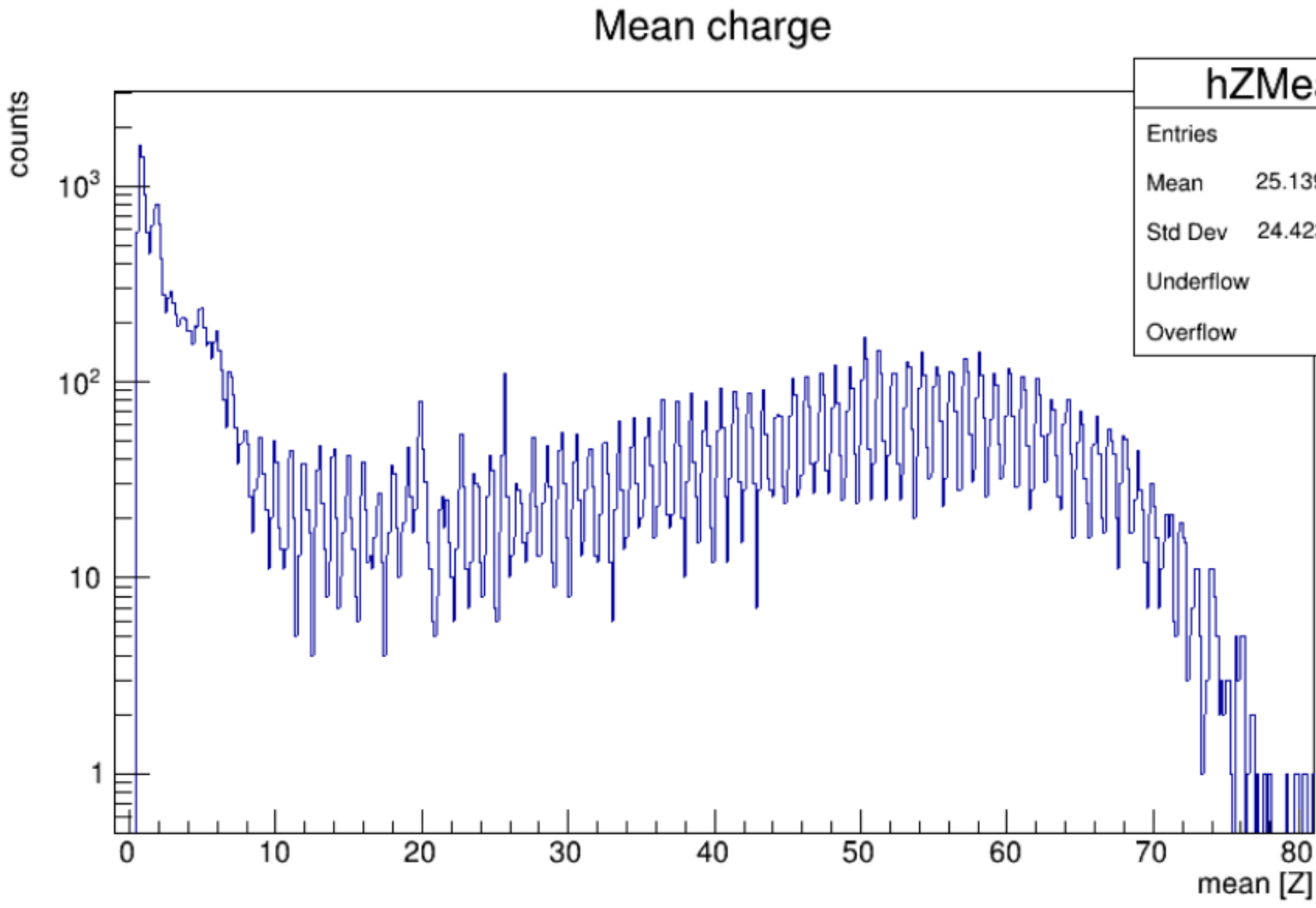
- a couple of "standard" tables/desk for the DUT and for the DAQ (electronics, PCs, etc…)
- the CERN network
- electric power
- a spill-in/spill-out cable
- a control room
- crane (1 basket movement at the begin and at the end)

# "beam": requests

We simply need:

- fragmented ions: A/Z = 2.2 (see next slide)
- beam as wider as possible
- "high" energy mainly to avoid multiple scattering. The highest is the better
- ~ 1 kHz input rate to avoid pile-up with ~ 5 us shaping time: ~ 5 kparticle / 5 s spill

# Charge composition (H8 2023)




**This is A/Z = 2.2**

**With A/Z = 2, the higher charges are less present**