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Extreme Energy Events
Science inside Schools

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May the 2nd, 2018

The Polar QuEEEst experiment

The Polar QuEEEst Mission

Detecting and measuring
cosmic rays at various latitudes
simultaneously

- **3 PolarQuEEEst detector**

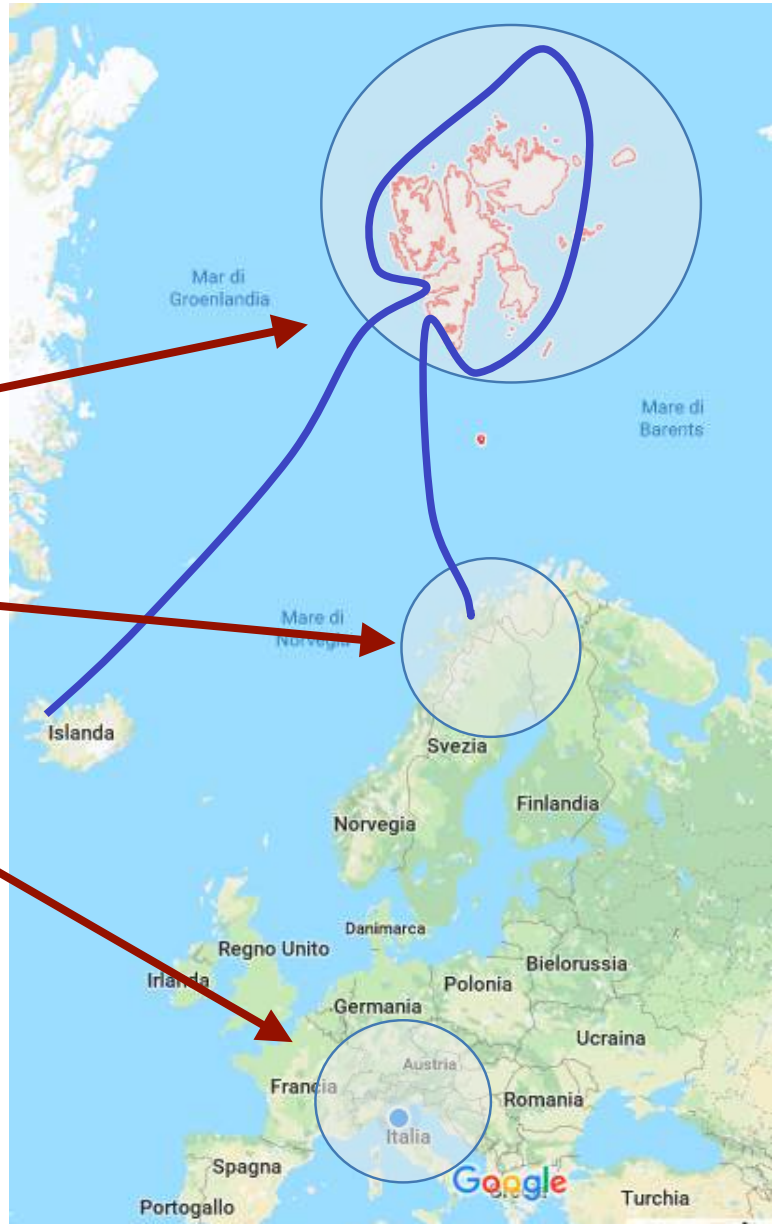
Onboard on Polar Nanuq

Installed in a Norwegian High School

Installed in an Italian High School

As in EEE tradition all detectors will be mounted by students

≈ 45°in latitude, span 5000 km

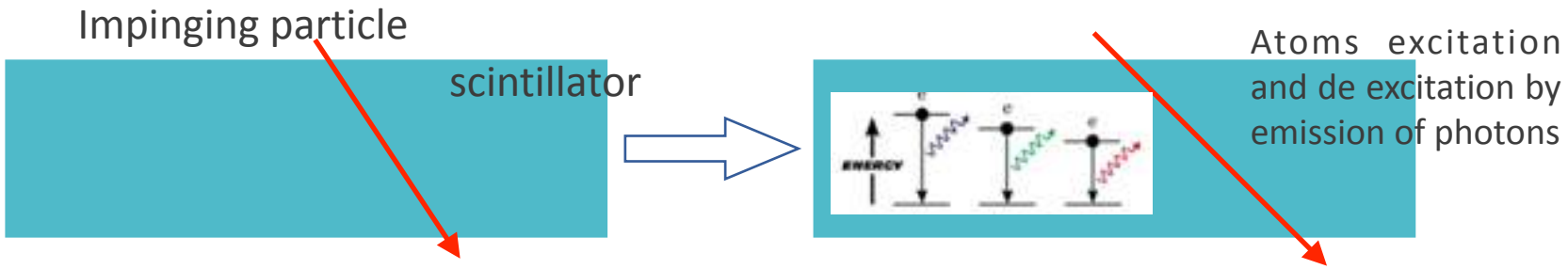


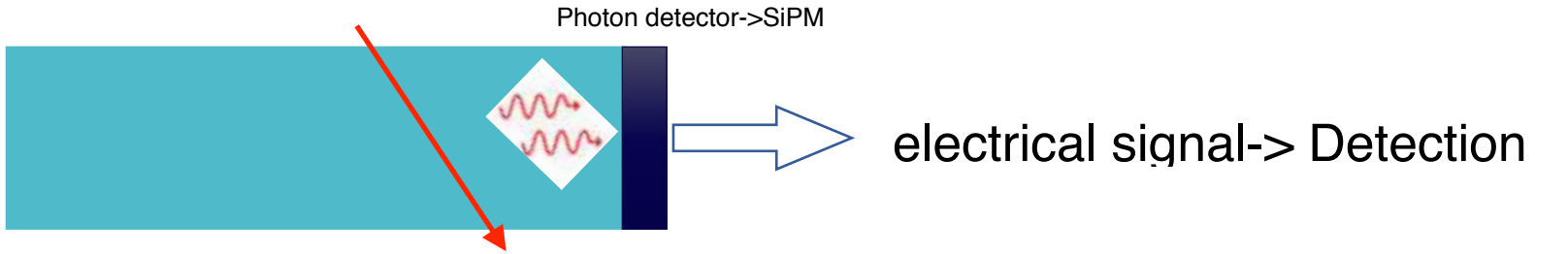
How do we detect cosmic rays

An extremely compact, full optional, cosmic ray telescope

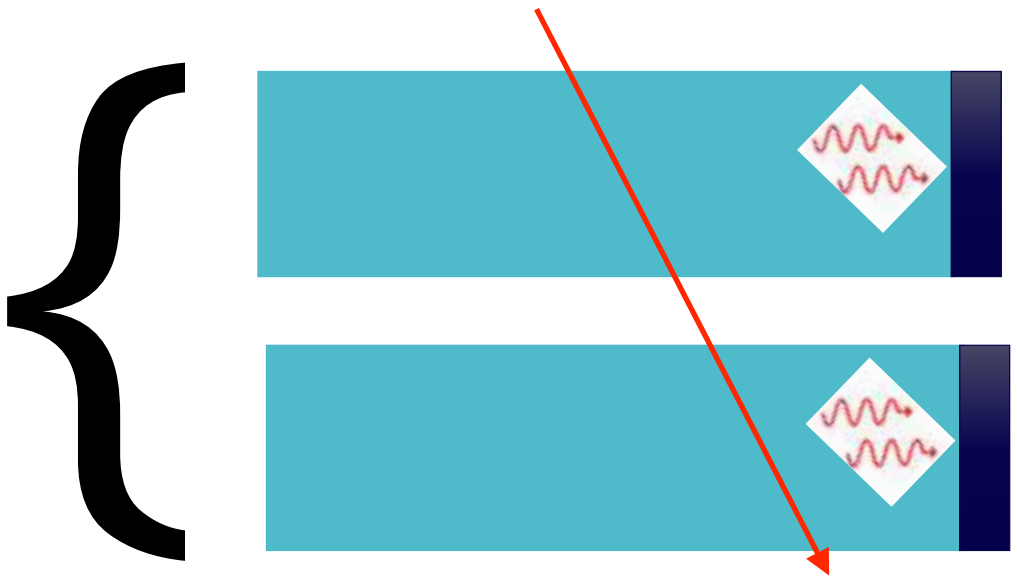
What does it mean?
How do we see particles?

The detection principle & the telescope

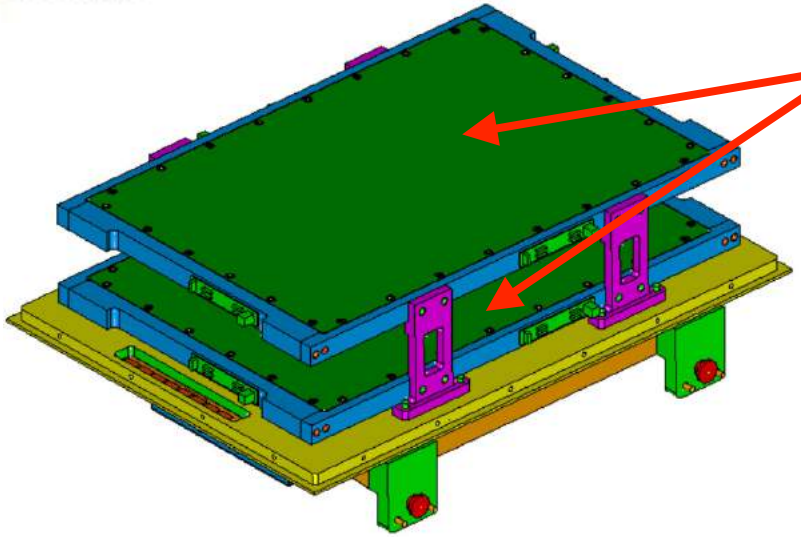




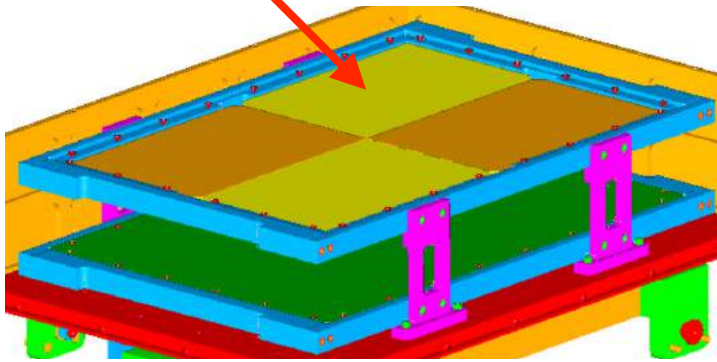
2 Scintillator detectors or planes, usually called telescope



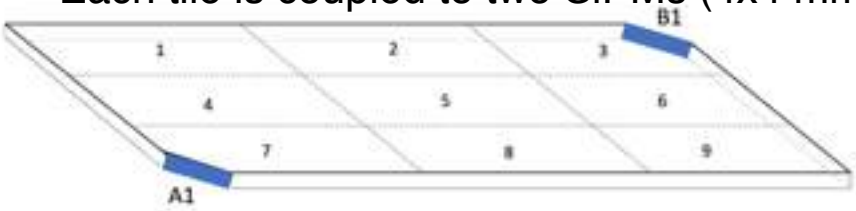
The Polar QuEEEst Detector

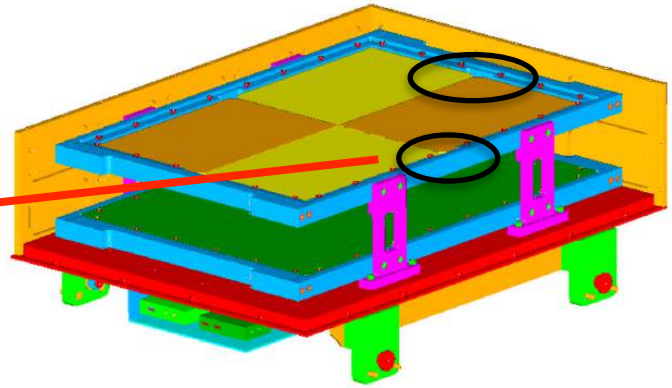


2 scintillators planes (11 cm apart) each constituted by 4 20x30 cm^2 plastic scintillator tiles.

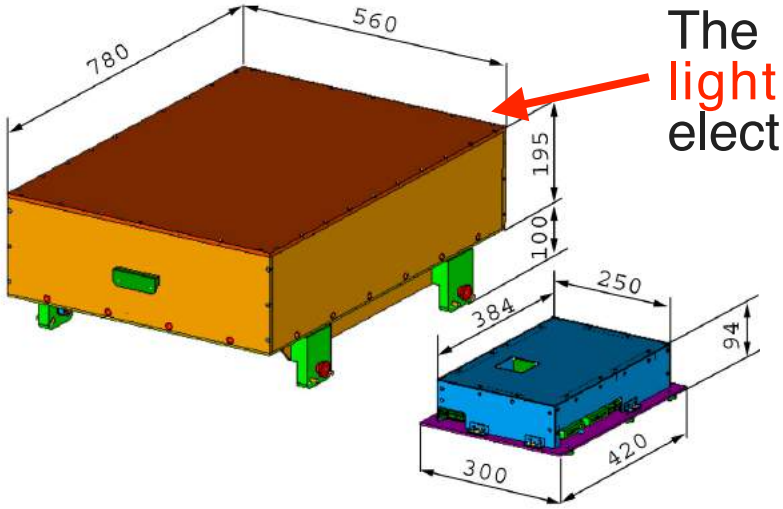


Each tile is coupled to two SiPMs (4x4 mm^2), A1 and B1 in fiture kept in optical contact

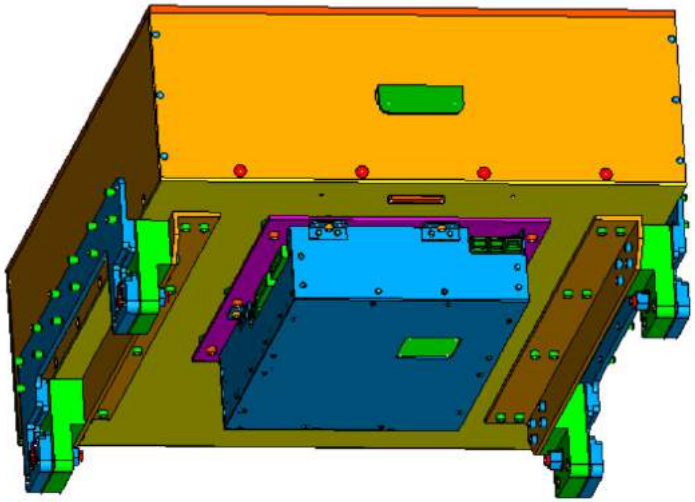




How does it look at the end?



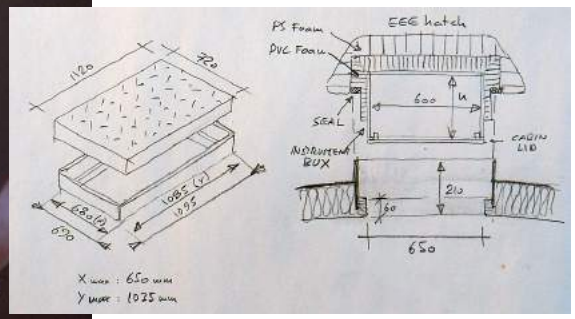
The scintillators planes are enclosed in a light tight box; and all the needed electronics are inside a dedicated box



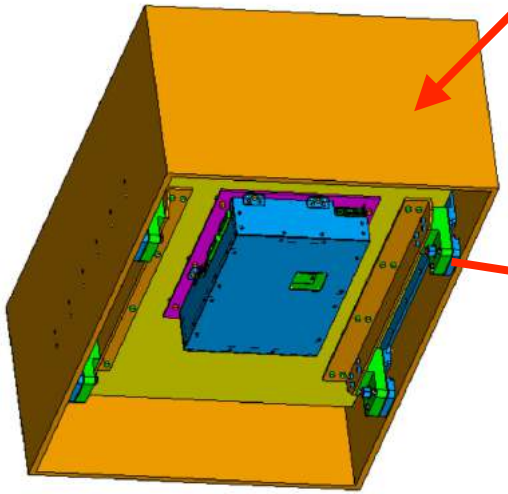
The telescope can be mounted also in a more compact design (on board of the Nanuq)

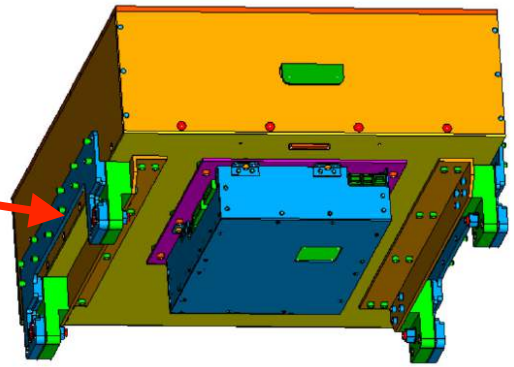
The Nanuq setup

The Cosmic hatch

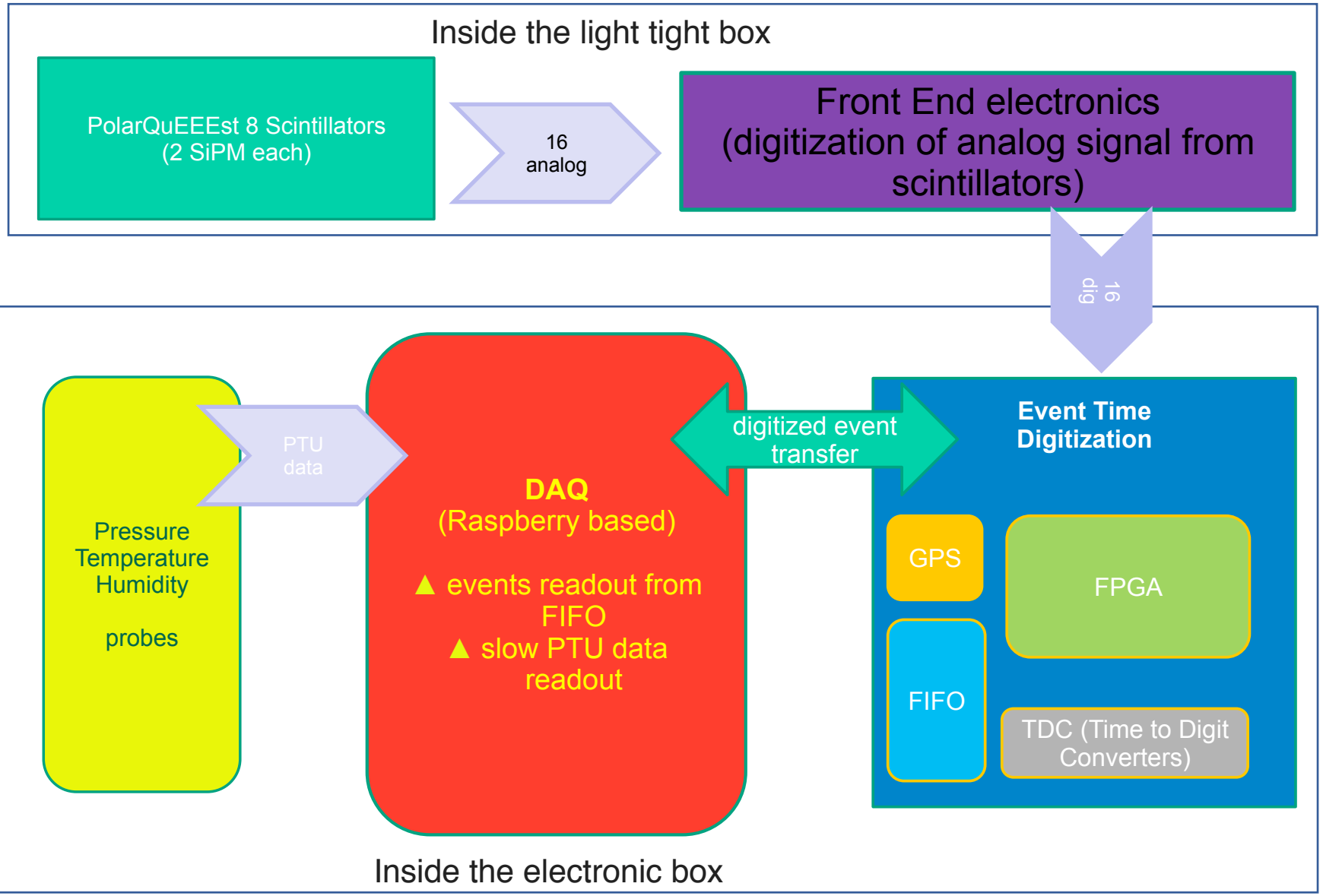


The Polar QuEEEst Detector will be fixed to the walls of the hatch.



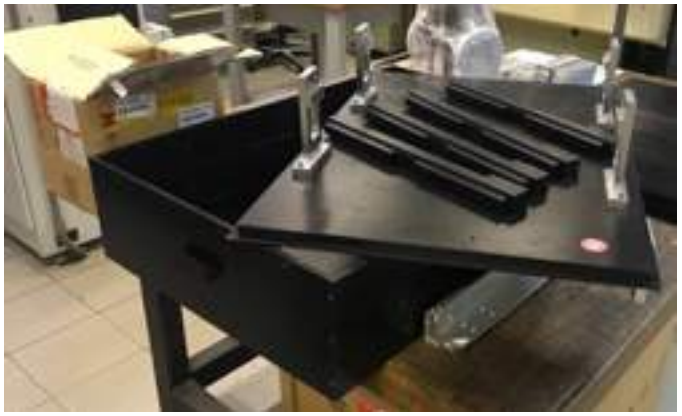


Readout & Data Acquisition



Some pictures

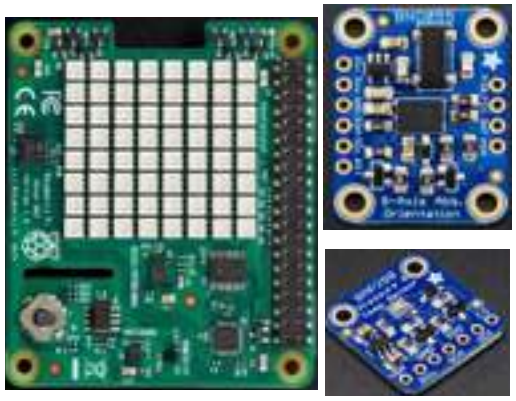
The Box



front end

Readout&Trigger Board

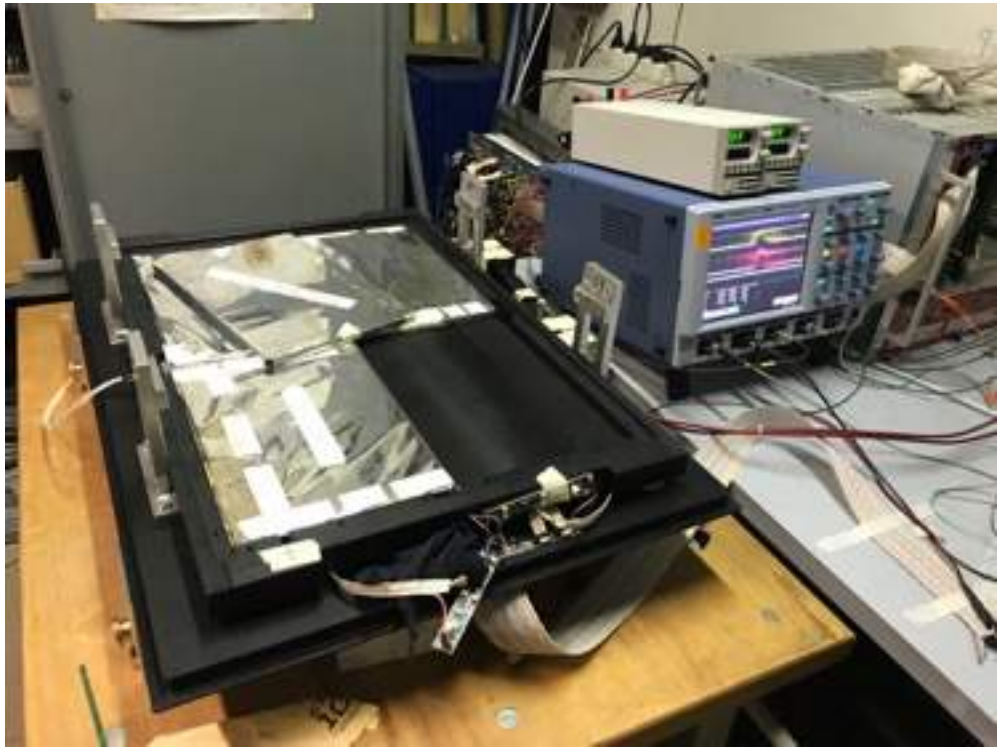
Some sensors



Raspberry

What is the status

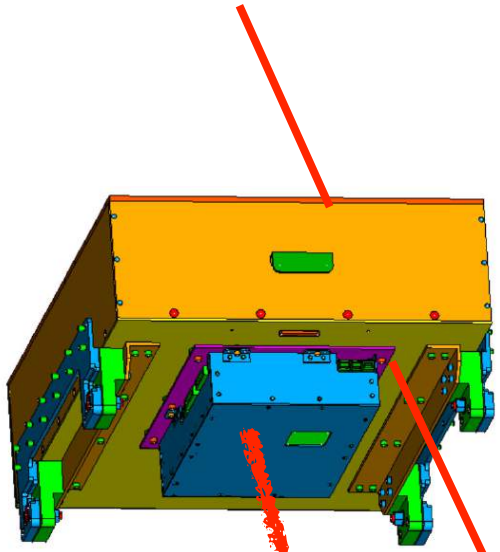
Integrating the first prototype



What?

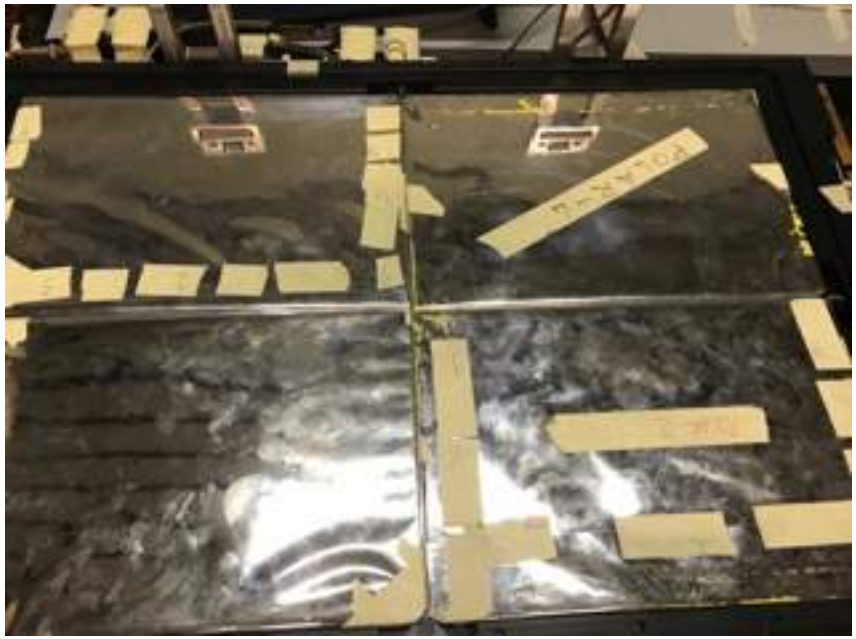
Integrating means

- Mechanical Design test
- Detector assembling &tests
- Front End electronics tests
- Read out electronics test
- Raspberry programming
- Sensors setup



Data analysis & detector validation

Some pictures



Some pictures




Some pictures

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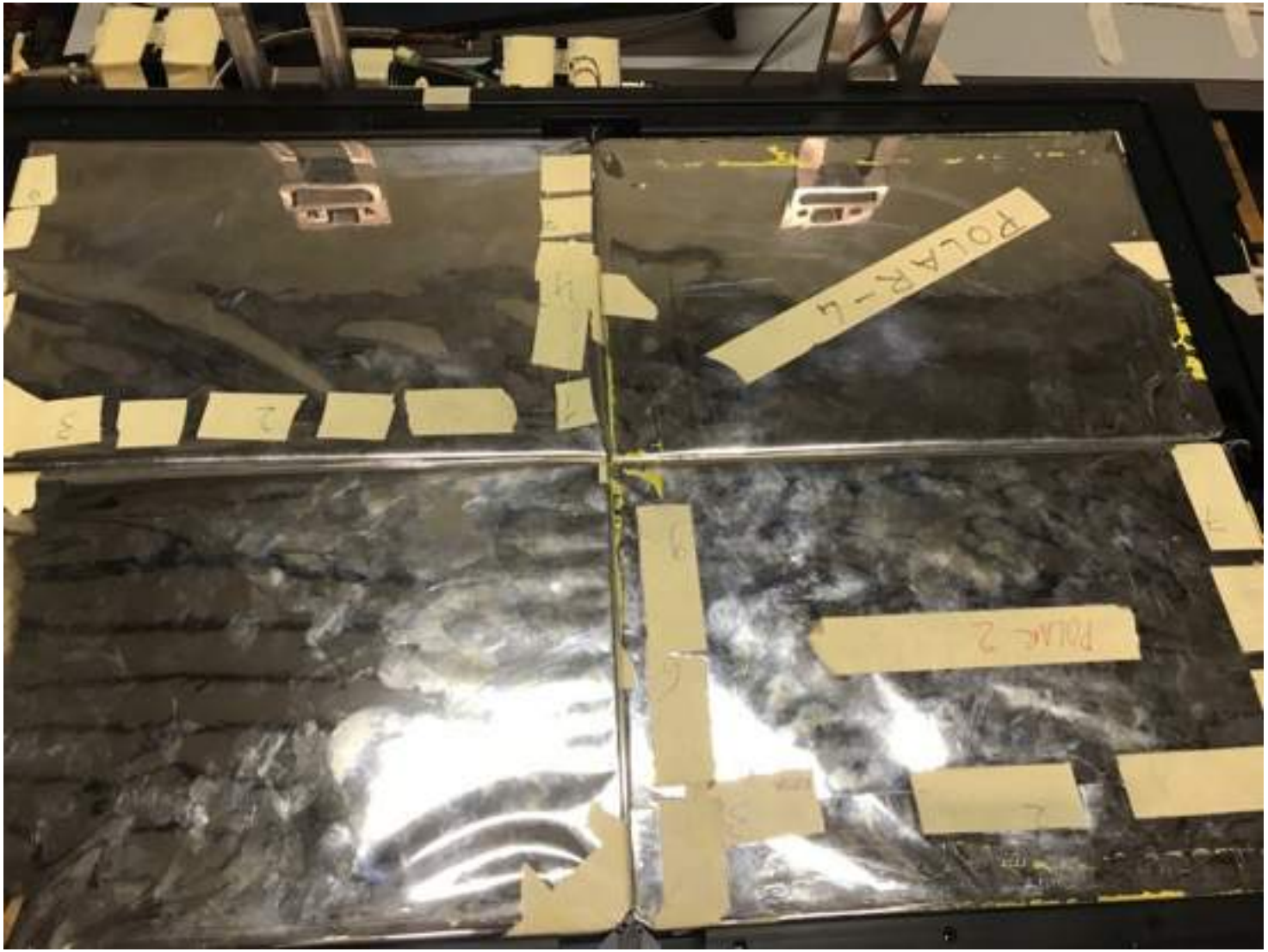

Conclusions

- *The Polar QuEEEst mission is going to run 3 cosmic rays telescope simultaneously at 3 different latitudes and study cosmic rays flux (and correlation with atmospheric and geomagnetic effects)*
- *To do this the detector based on scintillators coupled to SiPMs has been designed basically from scratch (and taking into account the environmental condition on the Nanuq boat).*
- *Scintillator, SiPMs and electronics have been chosen and separately tested.*
- *First prototype integration to get the firs working telescope is ongoing now in Bologna with all the involved people.*
- *Stay tuned for next phases:*
  - *detector integration results*
  - *construction at CERN of the 3 detectors to be employed)*