CENTRO FERMI
MUSEO STORICO DELLA FISICA E CENTRO STUDI E RICERCHE ENRICO FERMI

Extreme Energy Events
Science inside Schools

Marco Garbini
May the 2nd, 2018

The Polar QuEEEst experiment

The Polar QuEEEst Mission

Detecting and measuring
cosmic rays at various latitudes
simultaneously

3 PolarQuEEEst detector

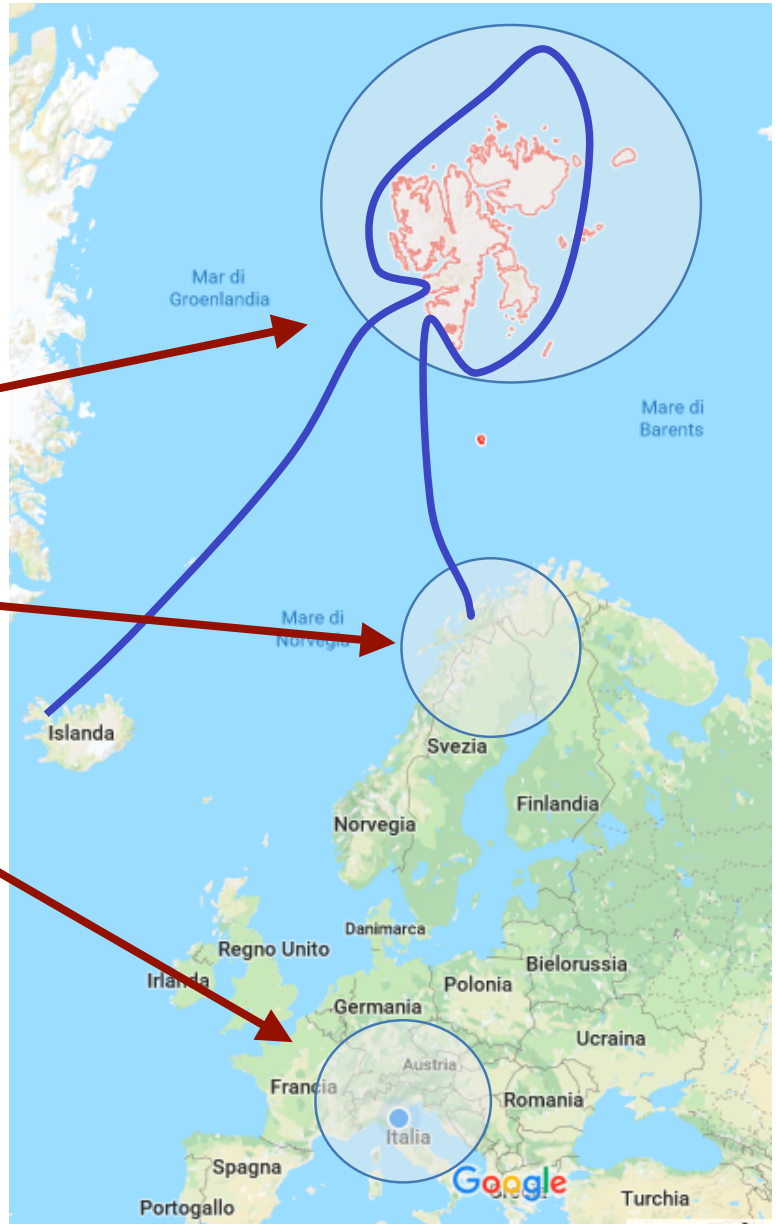
Onboard on Polar Nanuq

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

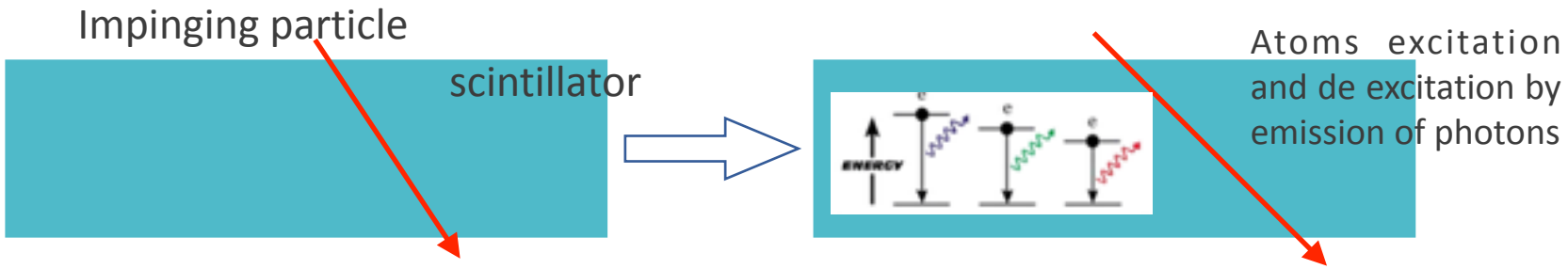


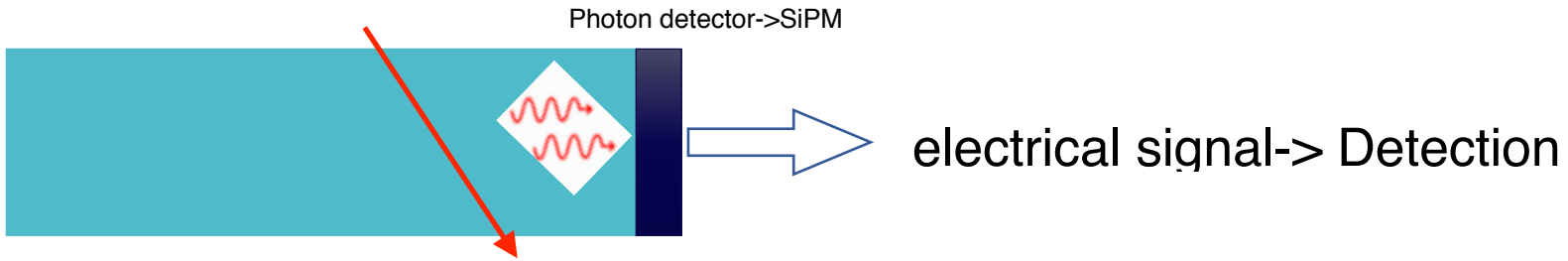
How do we detect cosmic rays

An extremely compact, full optional, cosmic ray telescope

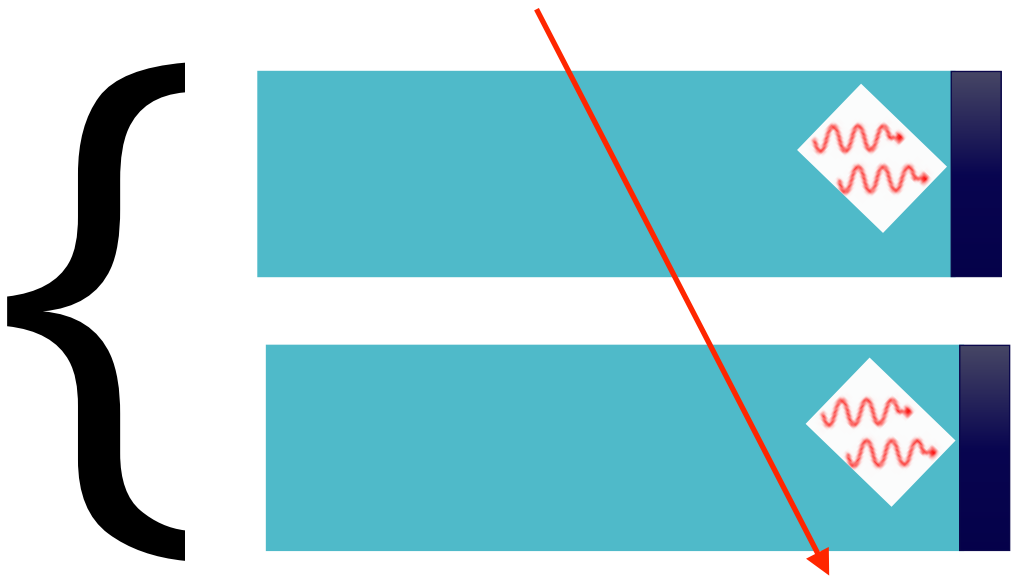
What does it mean?
How do we see particles?

The detection principle & the telescope

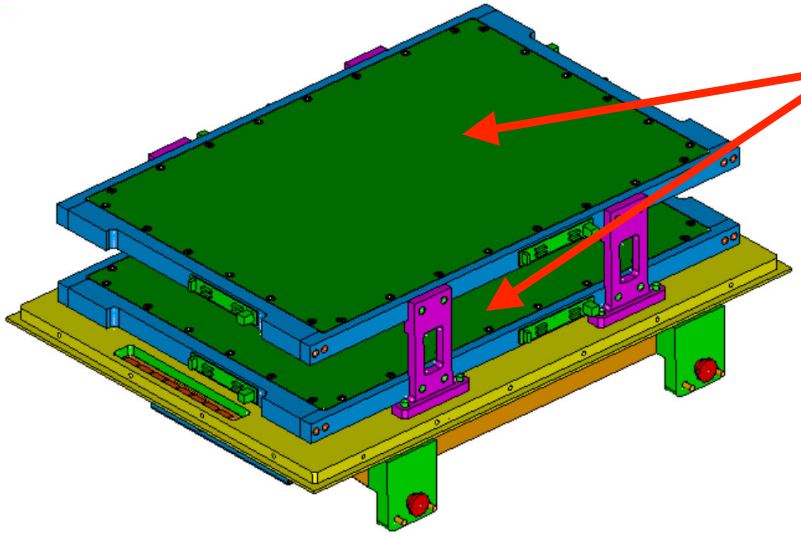




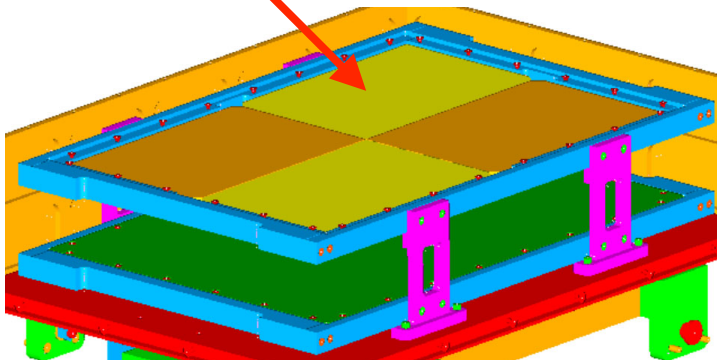
2 Scintillator detectors or planes, usually called telescope



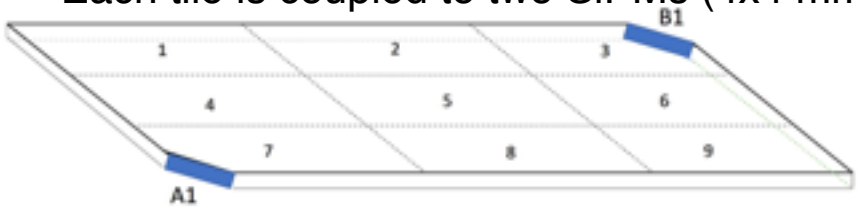
The Polar QuEEEst Detector

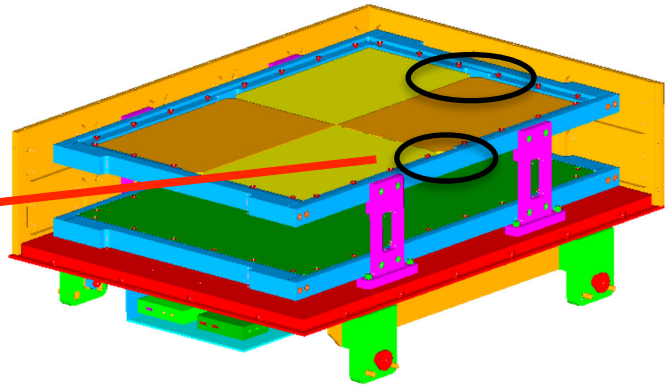


2 scintillators planes (11 cm apart) each constituted by 4 20x30 cm^2 plastic scintillator tiles.

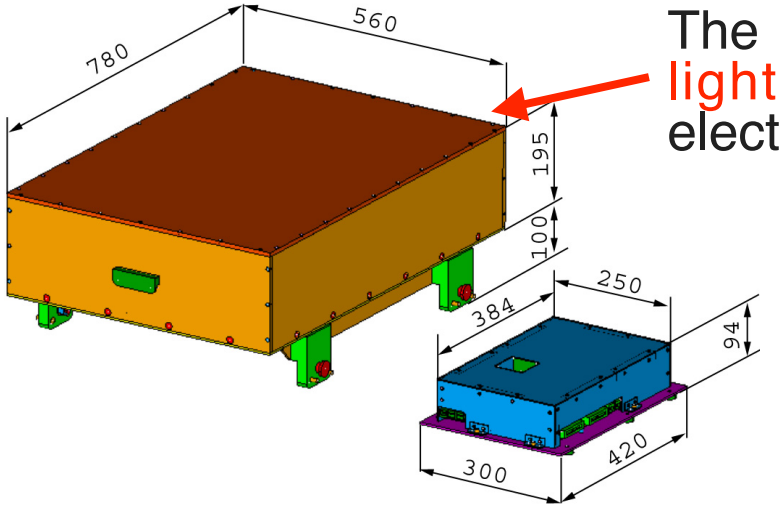


Each tile is coupled to two SiPMs (4x4 mm^2), A1 and B1 in fiture kept in optical contact

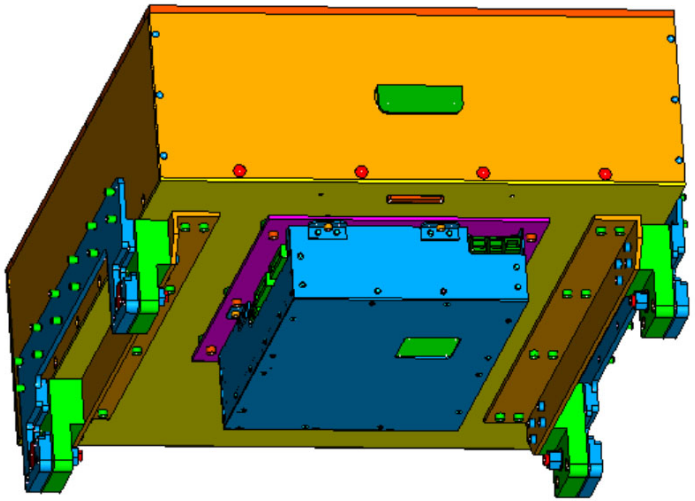




How does it look at the end?



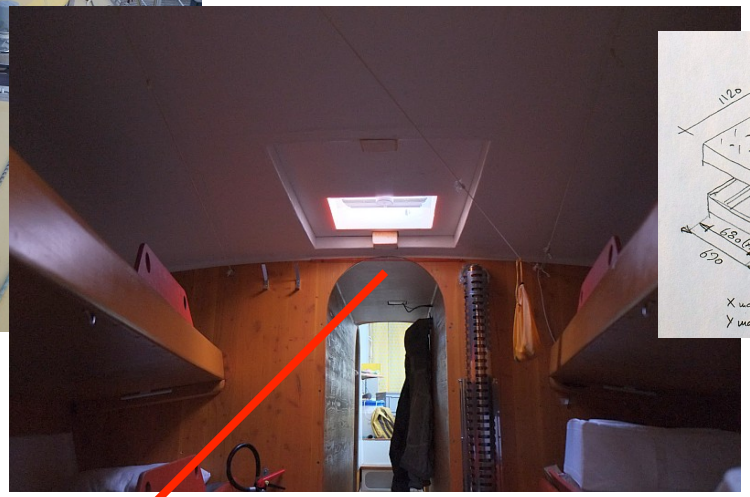
The scintillators planes are enclosed in a light tight box; and all the needed electronics are inside a dedicated box

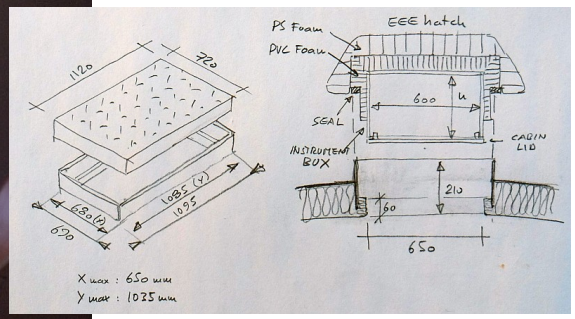


The telescope can be mounted also in a more compact design (on board of the Nanuq)

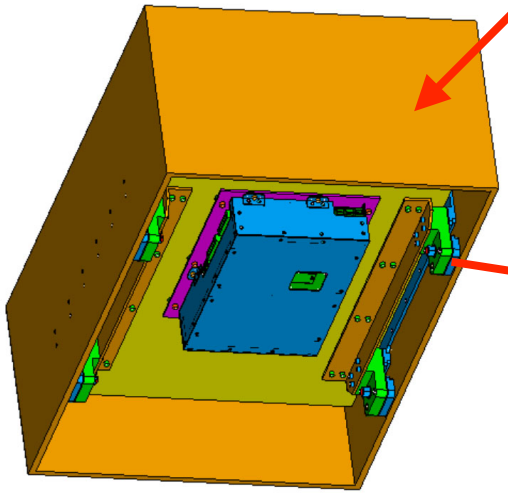
The Nanuq setup

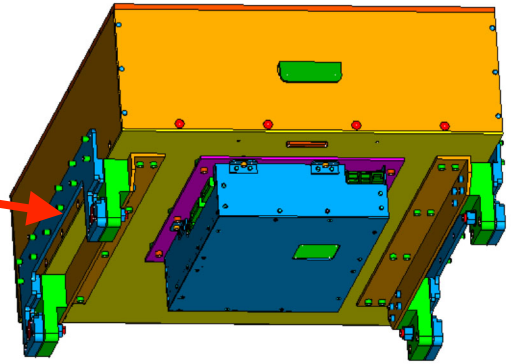
The Cosmic hatch



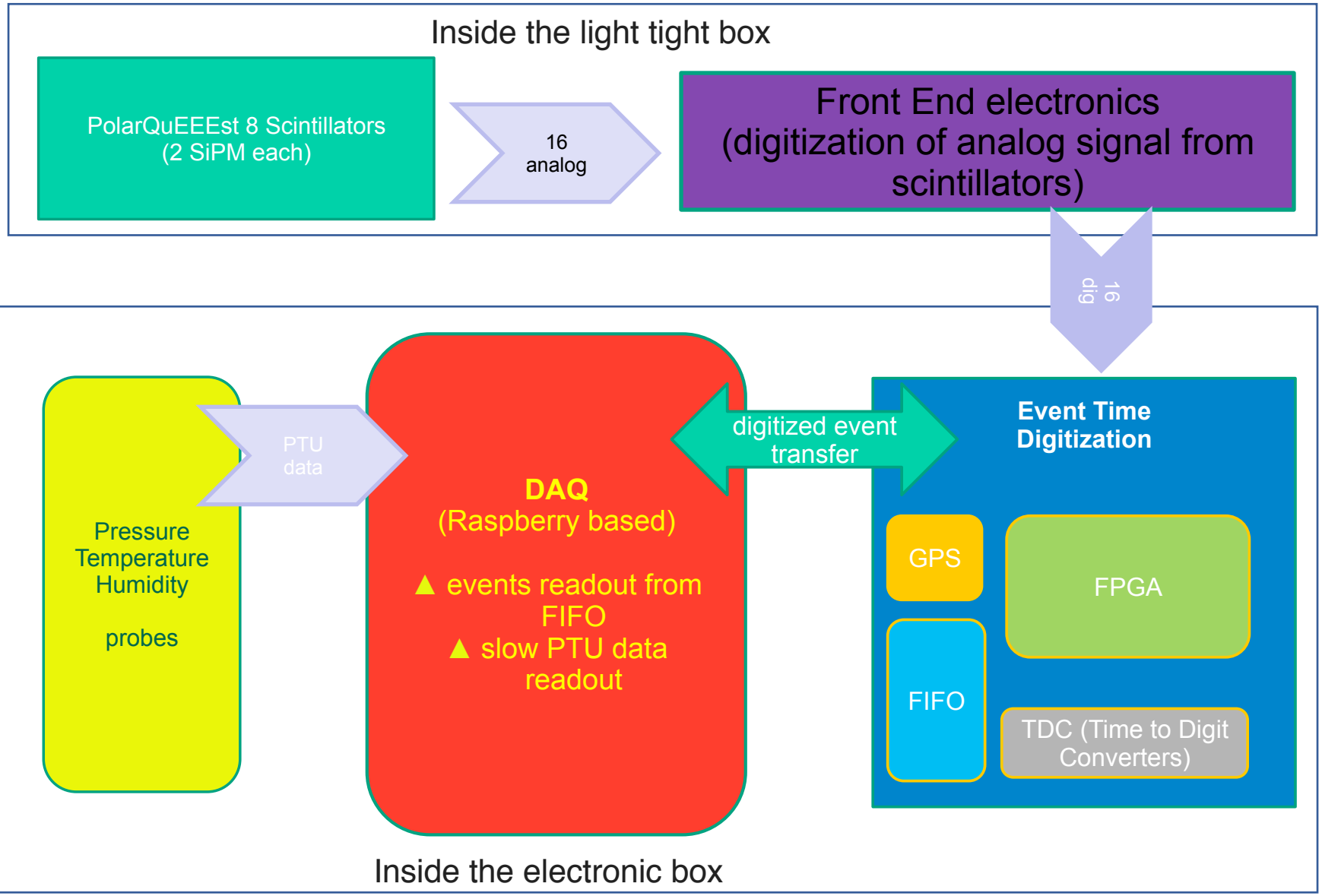


The Polar QuEEEst Detector will be fixed to the walls of the hatch.





Readout & Data Acquisition



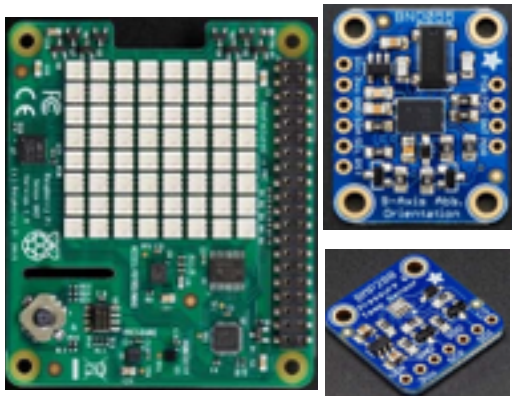
Some pictures

The Box

front end

Readout&Trigger Board

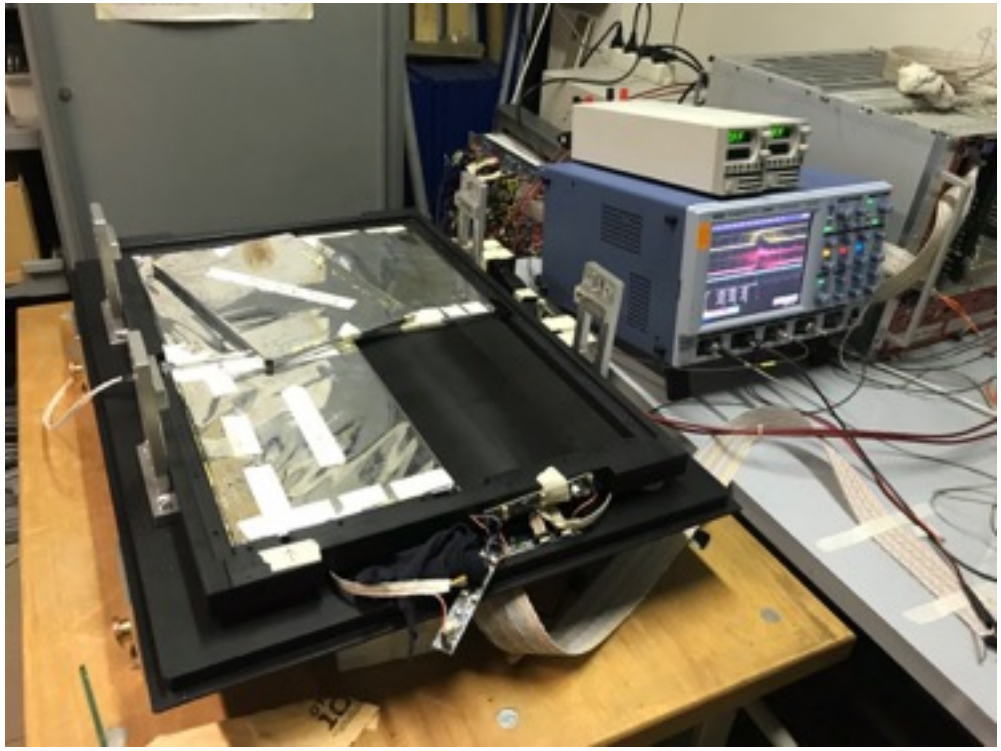
Some sensors



Raspberry

What is the status

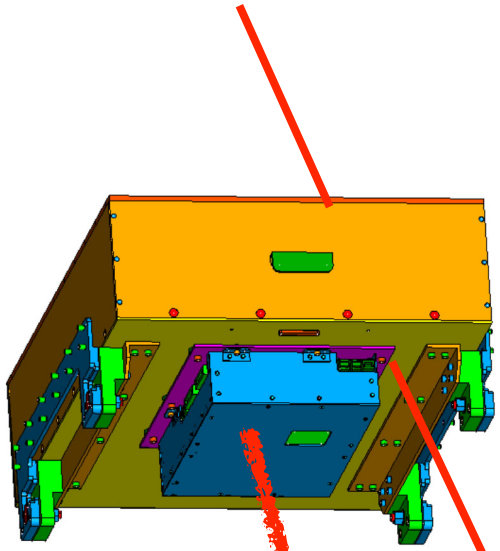
Integrating the first prototype



What?

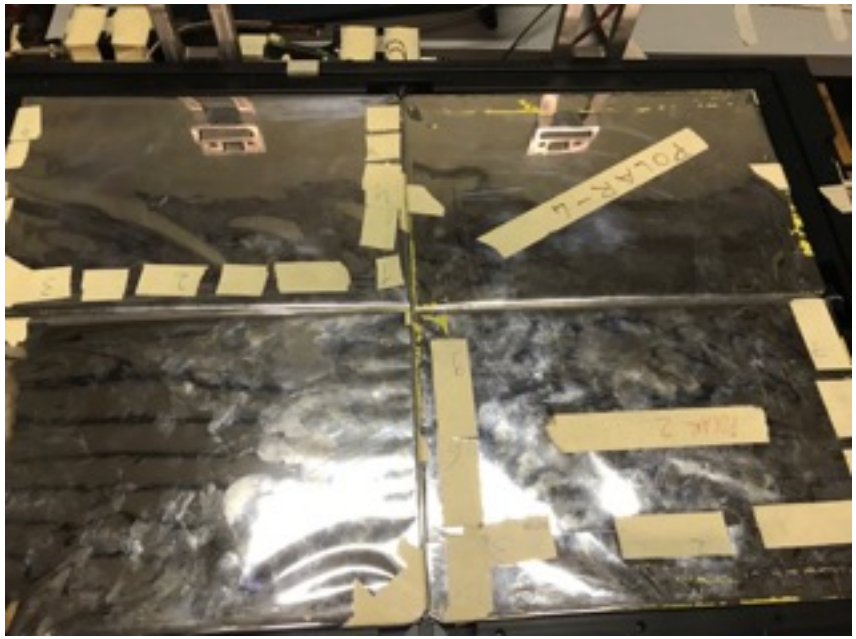
Integrating means

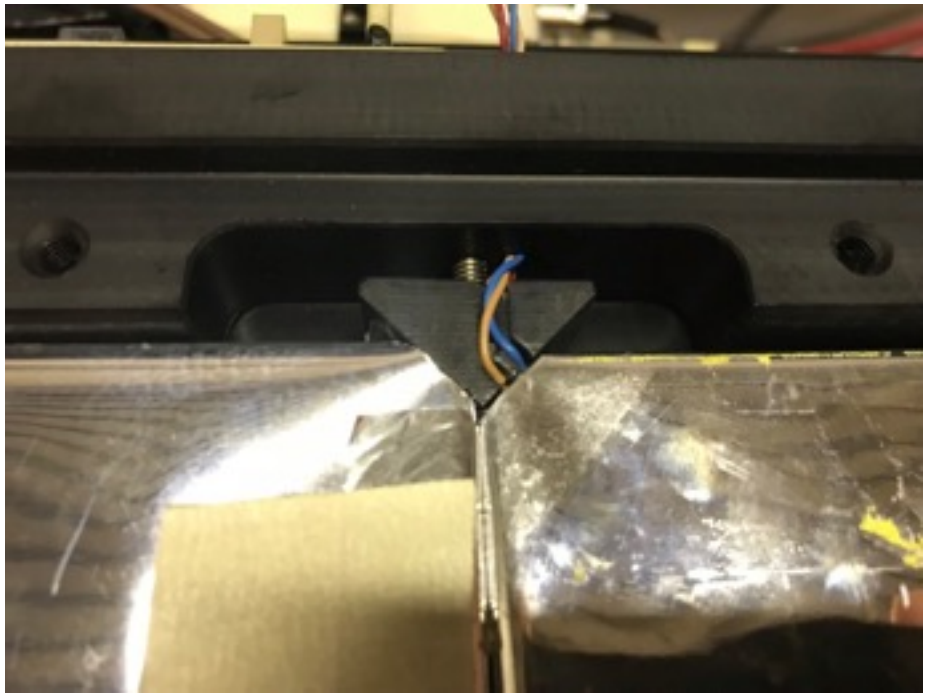
- Mechanical Design test
- Detector assembling &tests
- Front End electronics tests
- Read out electronics test
- Raspberry programming
- Sensors setup



Data analysis & detector validation

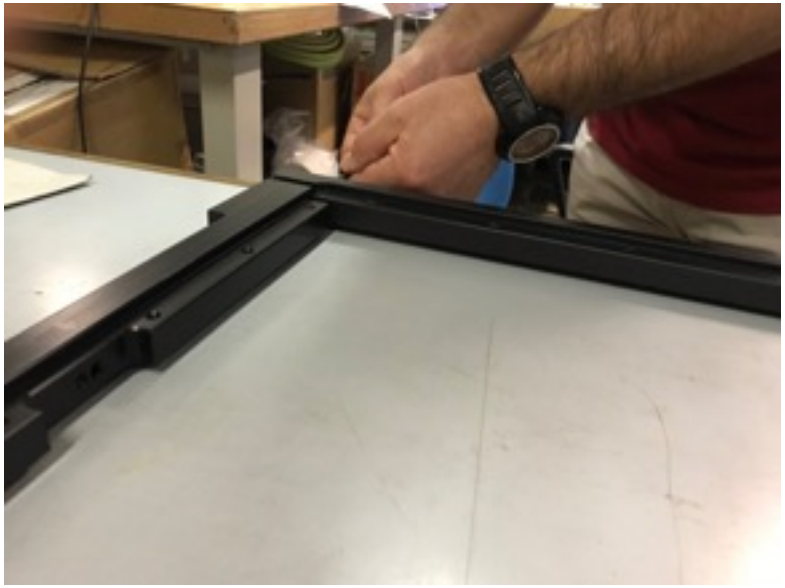
Some pictures

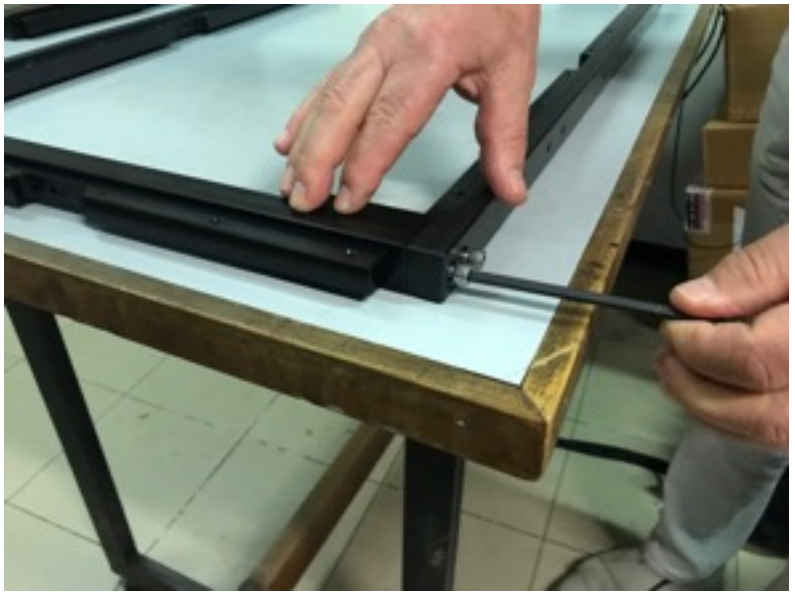




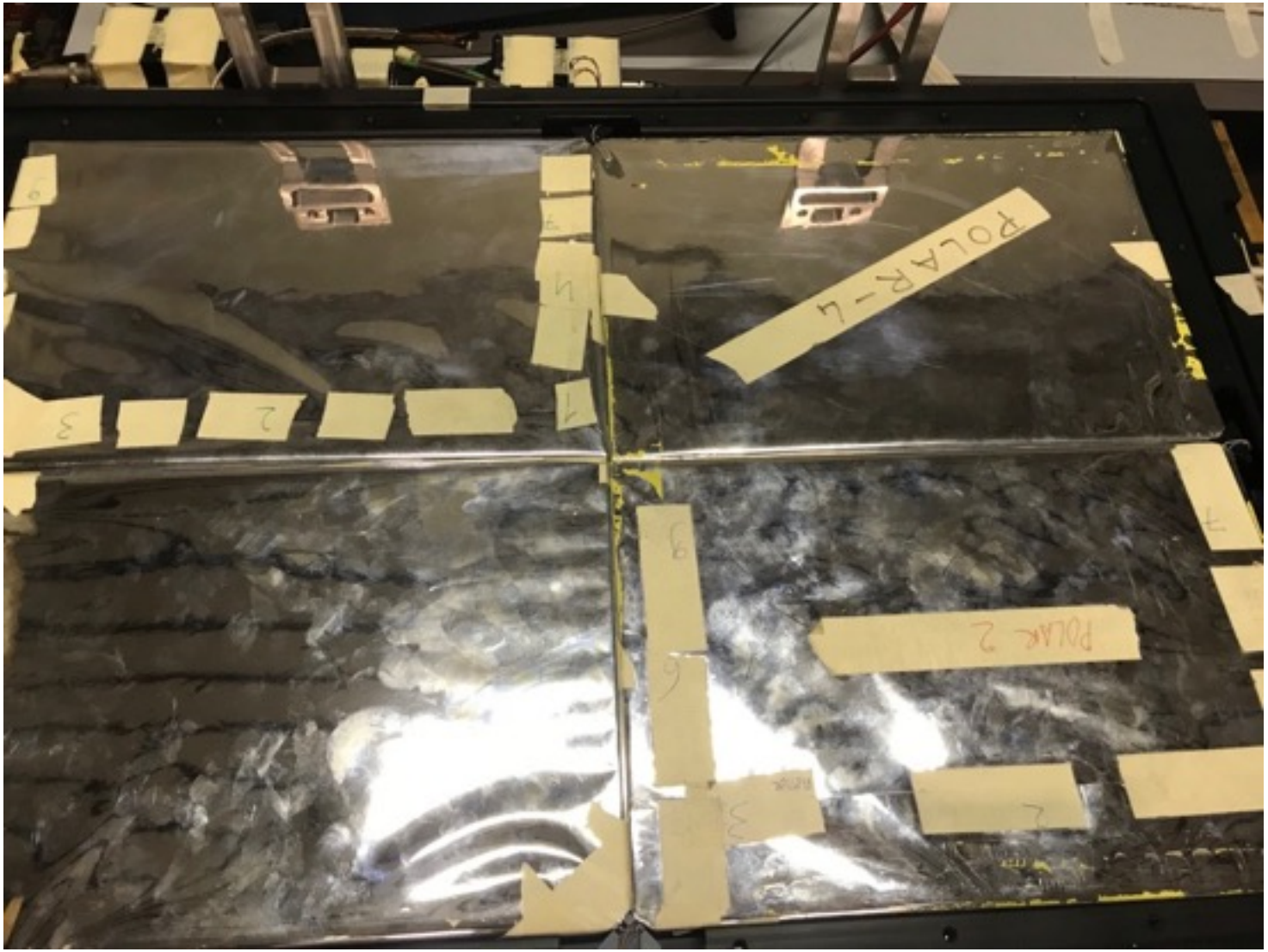
Some pictures

Some pictures





Some pictures



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)*