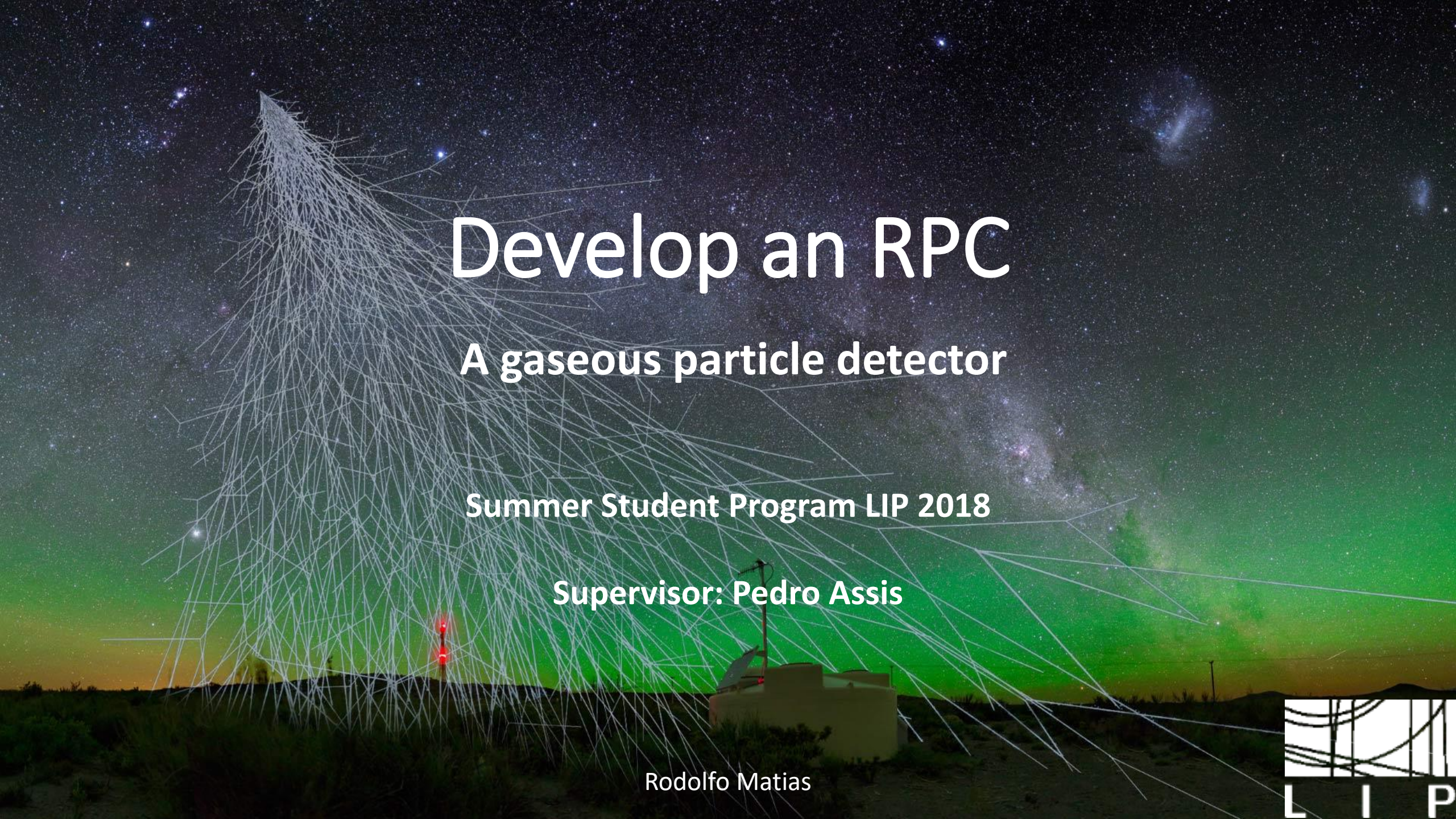


The background of the slide is a composite image. The top half shows a dark night sky filled with stars and the Milky Way galaxy. The bottom half shows a desert landscape at night with a small, light-colored building and a tall antenna-like structure. Overlaid on the entire image is a complex, white, wireframe-like structure that resembles a particle detector or a network of lines.

Develop an RPC

A gaseous particle detector

Summer Student Program LIP 2018

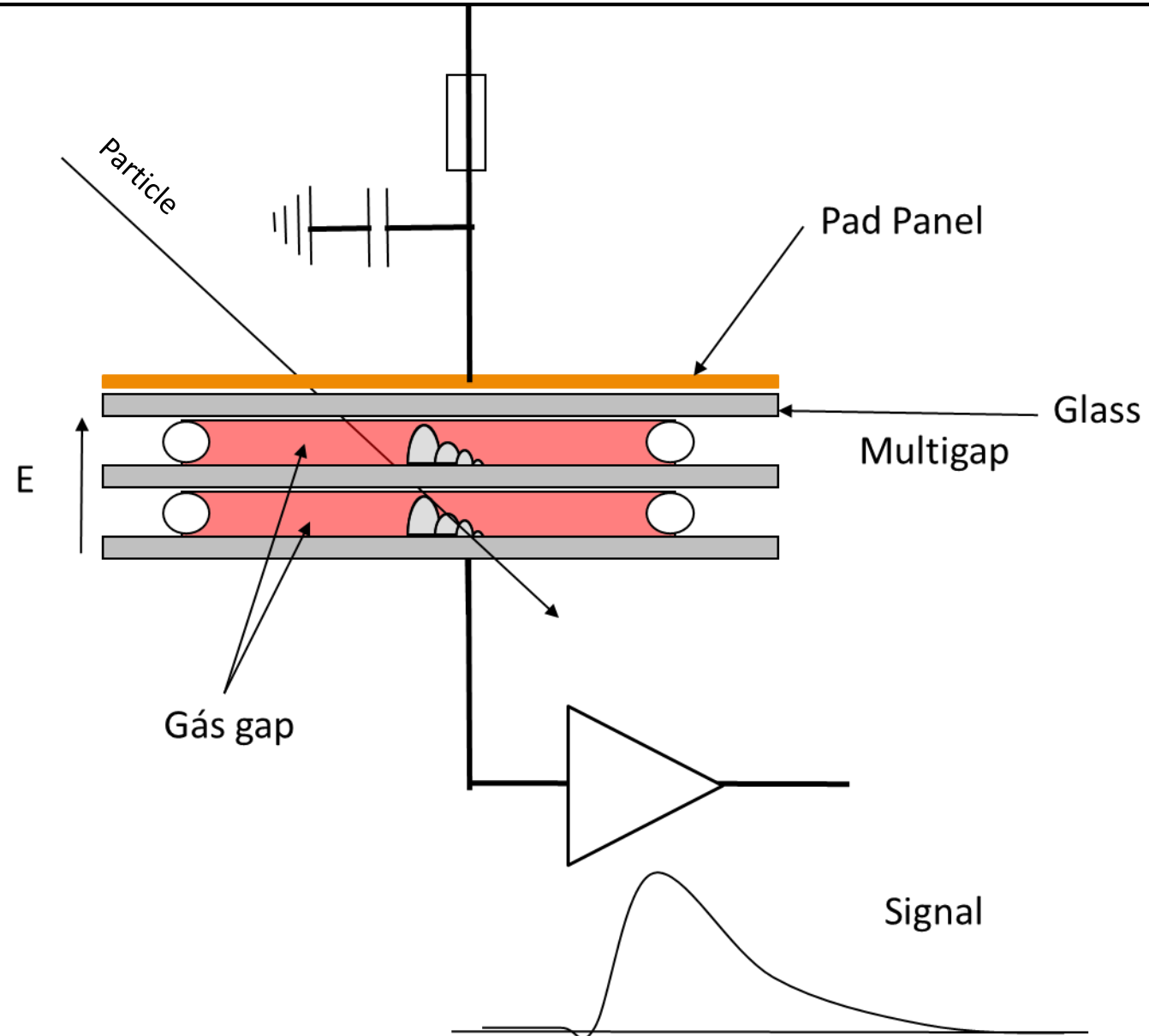
Supervisor: Pedro Assis

Rodolfo Matias



RPC - Resistive Plate Chamber

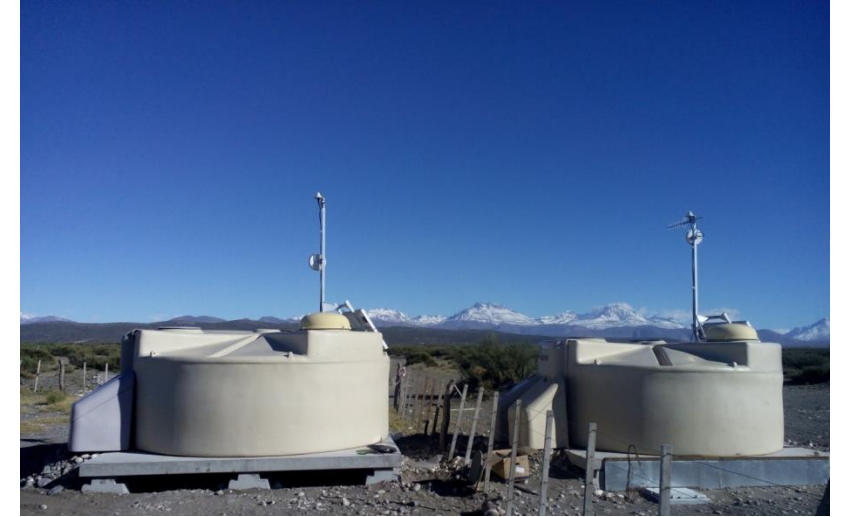
- **Type** of gas and **Thin** gas layer => **High efficiency** ($\sim 100\%$)
- **High Electric field** between plates => faster signal => **High time resolution** ($< 1\text{ns}$)
- **Pad panel or strips** => **spatial resolution** $< 1\text{mm}$
- **Banal materials** (glass, copper,...) => **low cost detector**



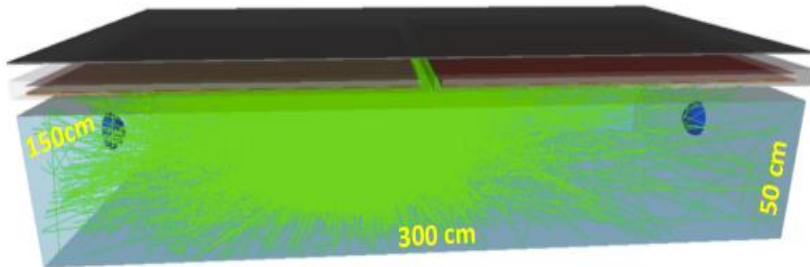
RPC - Applications



HADES

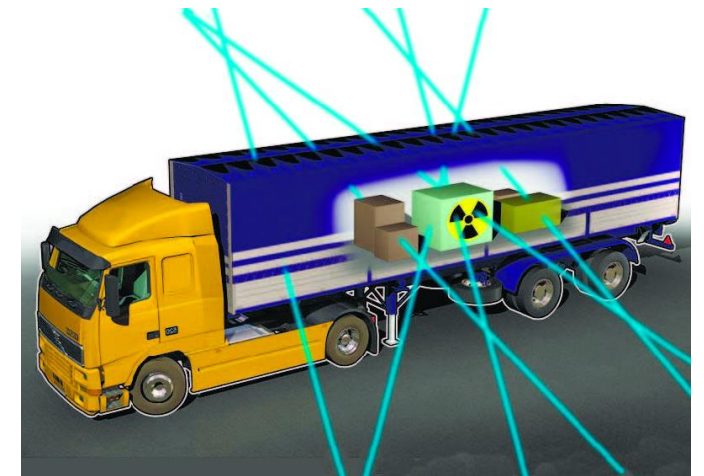


Pierre Auger Observatory



Pb
RPC
WCD

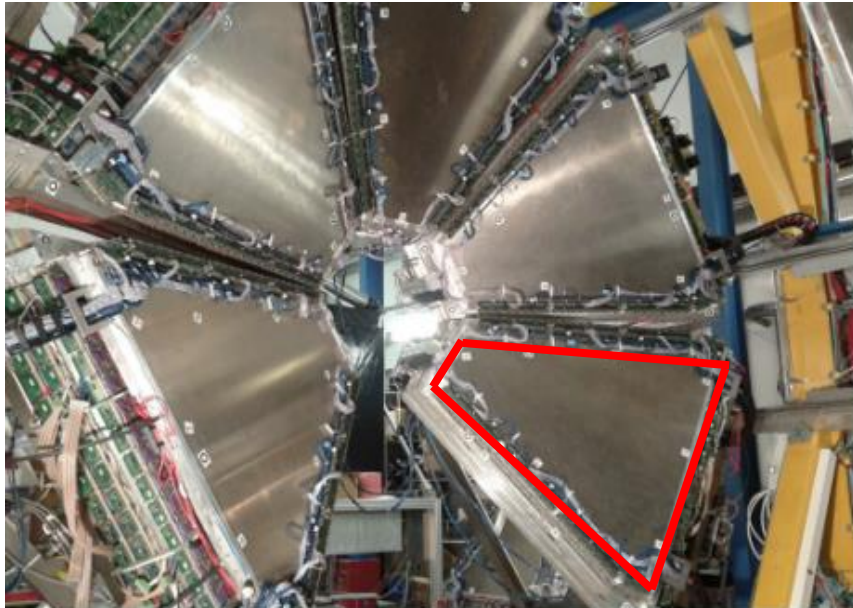
LATTES



Muon Tomography

RPC – HADES @ GSI Frankfurt

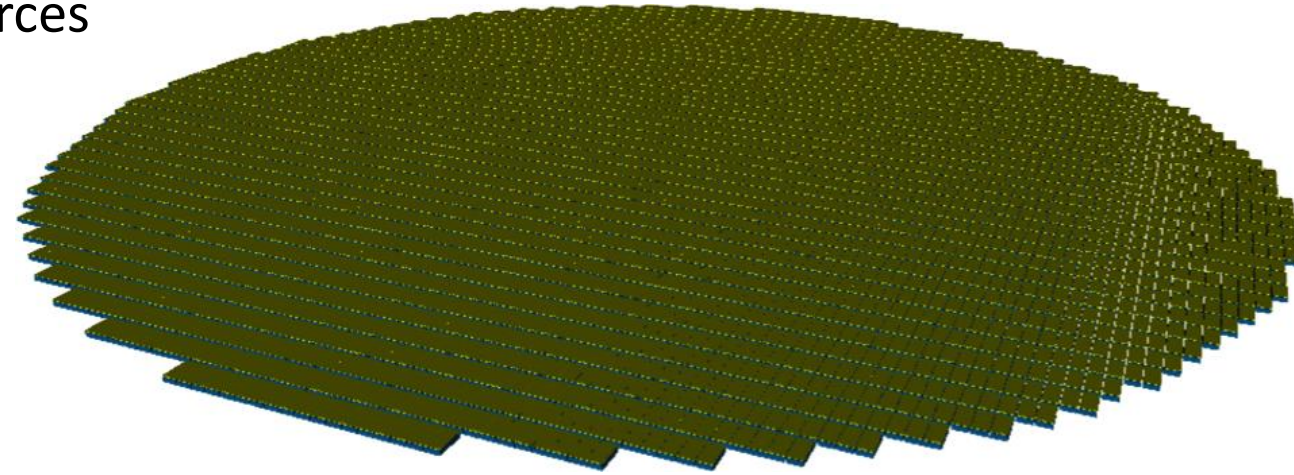
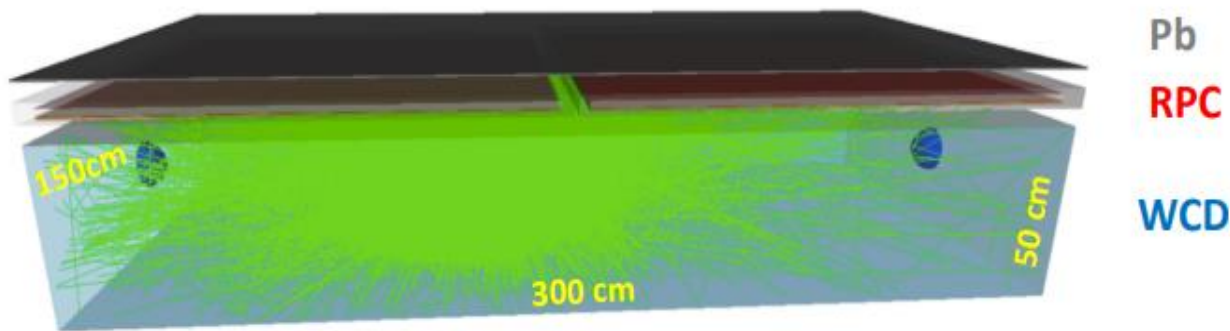
- **H**igh **A**cceptance **D**i**E**lectron **S**pectrometer
- Cold dense matter properties
- Recreates neutron star collision environment



- Measure particles time of flight
- Time resolution 60ps
- Efficiency >90%

RPC - LATTES

- Large **A**rray **T**elescope for **T**racking **E**nergy **S**ources
- 20 000m², 3 600 stations
- Detectors – Pb layer, RPC, WCD



- Very good time (1 ns) and spatial resolution (tens of cm)
- Improve geometric reconstruction

RPC – MARTA @ Pierre Auger Observatory

- Research on High Energy Cosmic Rays
- 3000km², 1600 WCD's and 4 UV Telescopes
- **M**uon **A**rray with **R**PCs for **T**agging **A**ir showers
- RPC's under the WCD's



- Low Maintenance
- Low cost
- Operate isolated
- Resistent

RPC – Muon Tomography

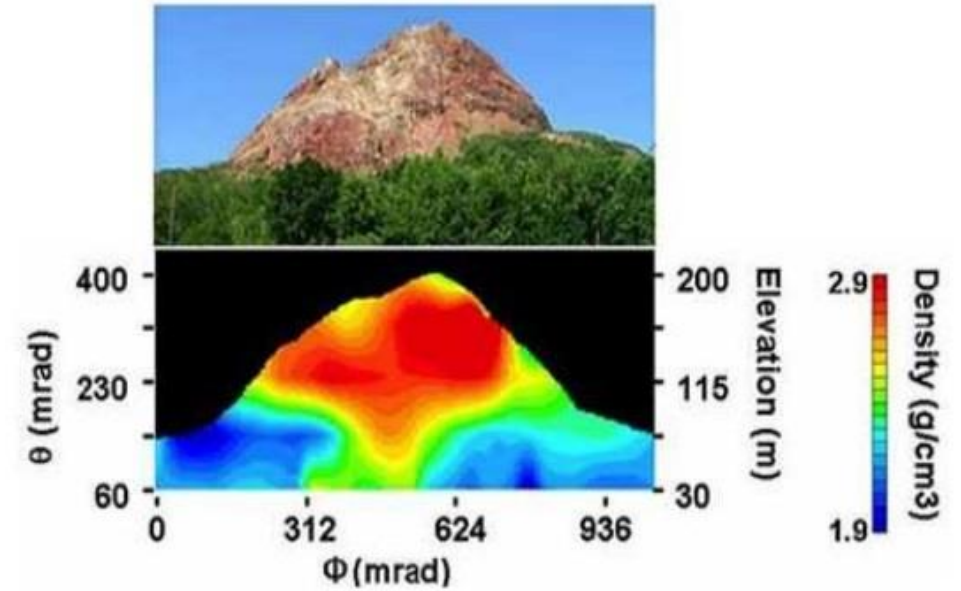
- Containers inspection for nuclear material
- Image of large human and geological structures



Station 1, 2xRPC

container

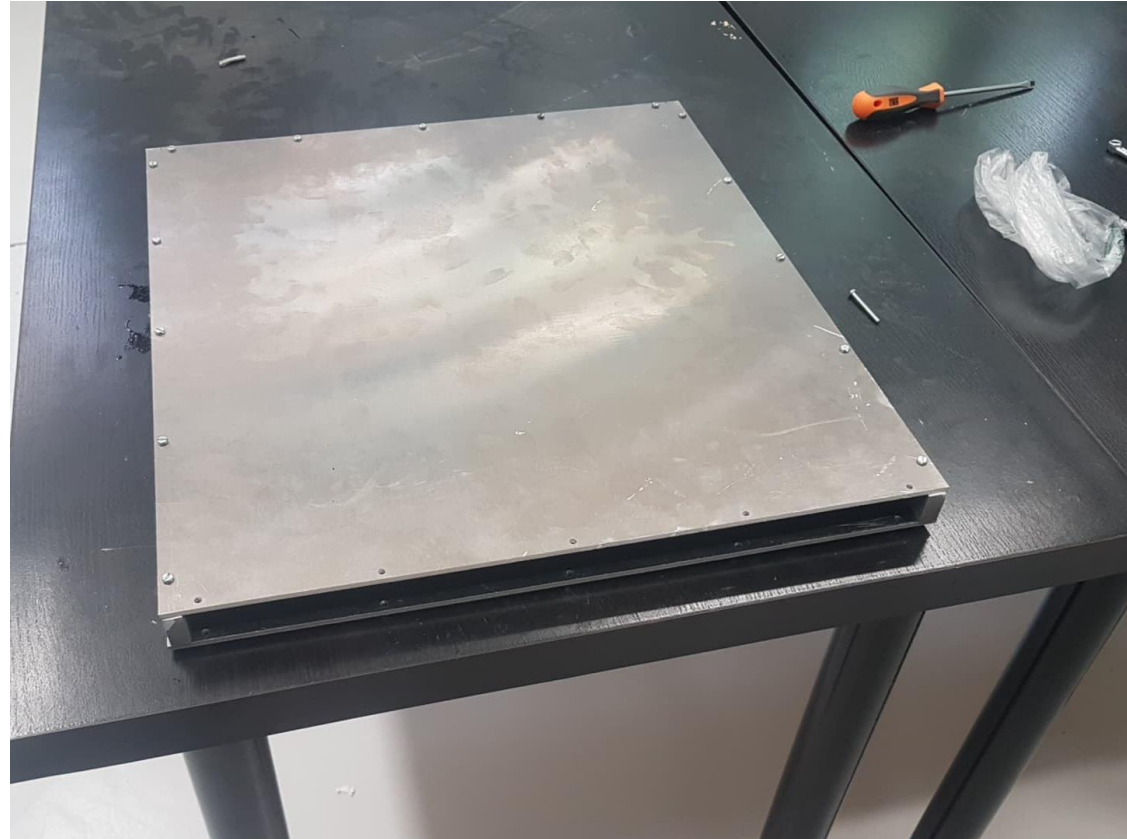
Station 2, 2xRPC



- High efficiency
- Time resolution 150ps and spatial resolution 2-3mm
- Good ratio Cost/optimal area

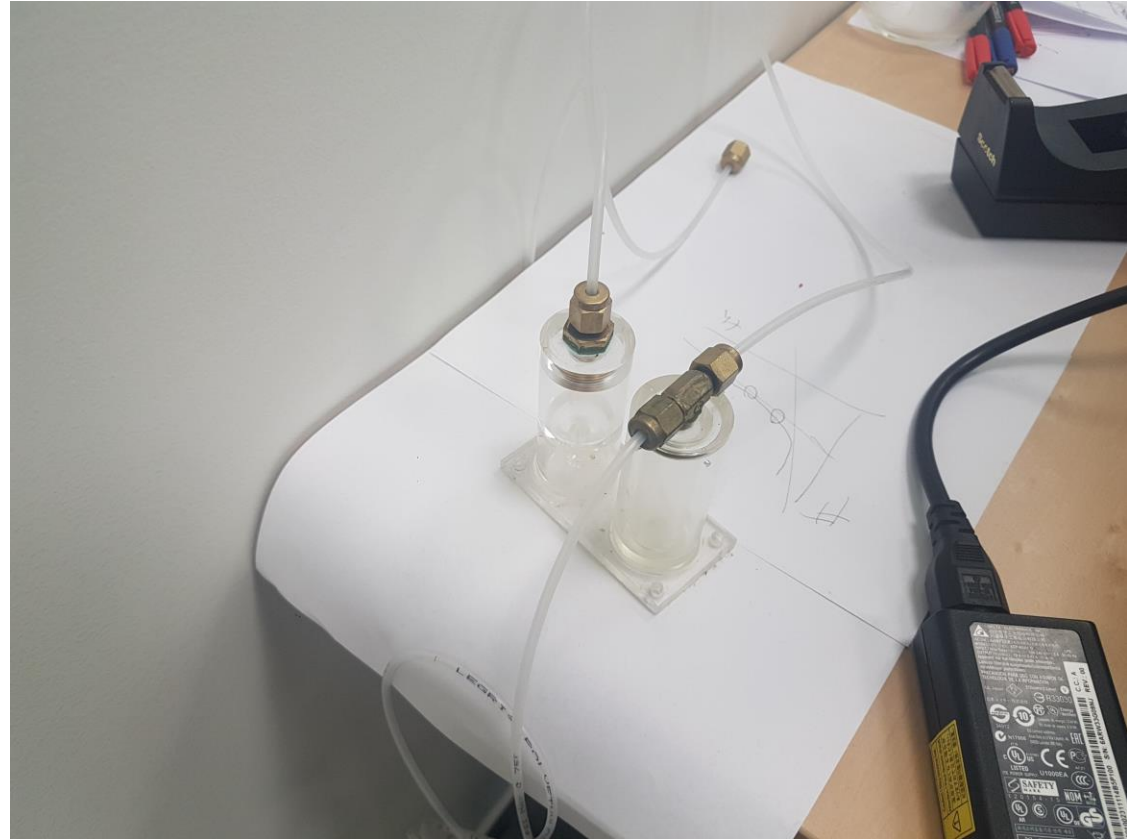
RPC

- Aluminum Box
- Gas System
- HV (High Voltage) System
- Data Acquisition (DAQ) System



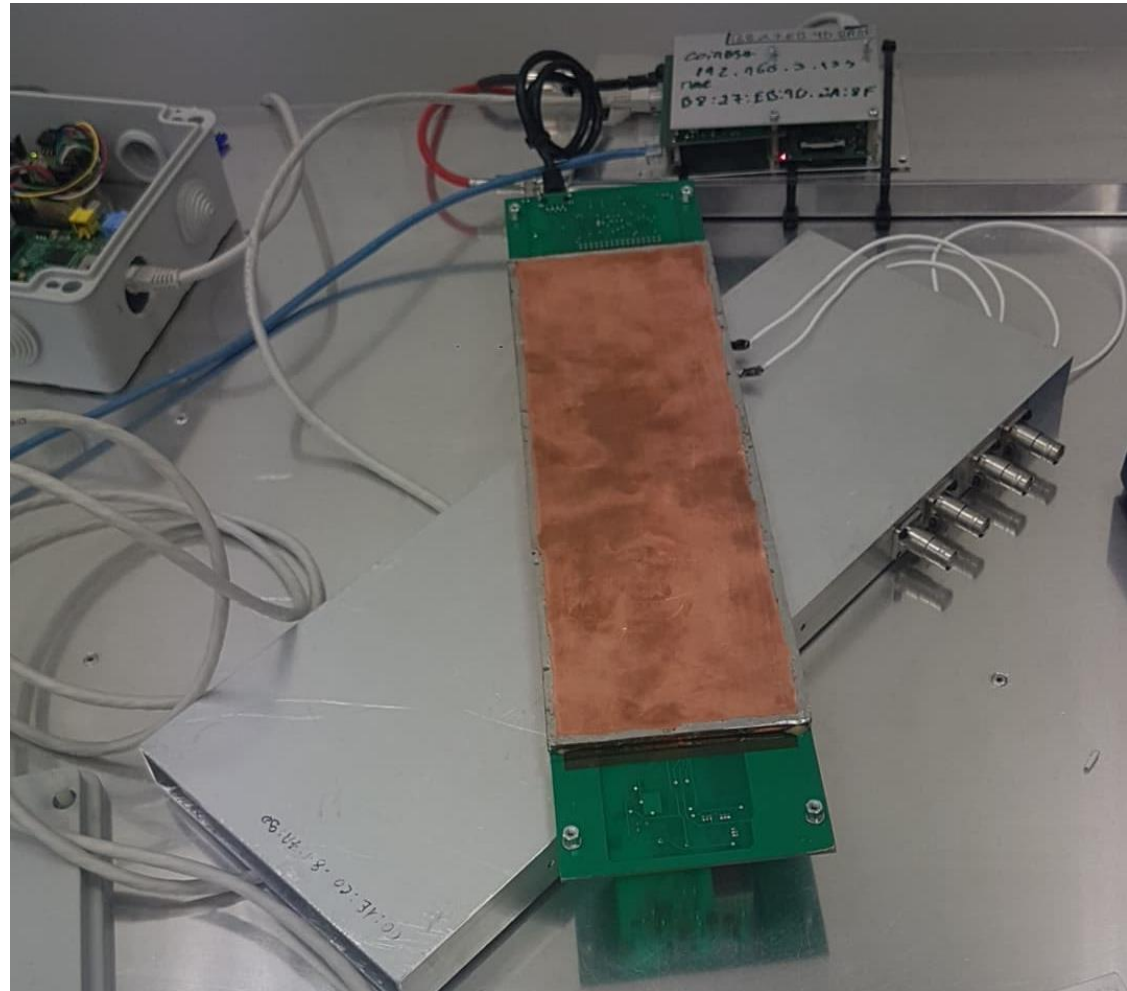
RPC

- Aluminum Box
- Gas System
- HV (High Voltage) System
- Data Acquisition (DAQ) System



RPC

- Aluminum Box
- Gas System
- HV (High Voltage) System
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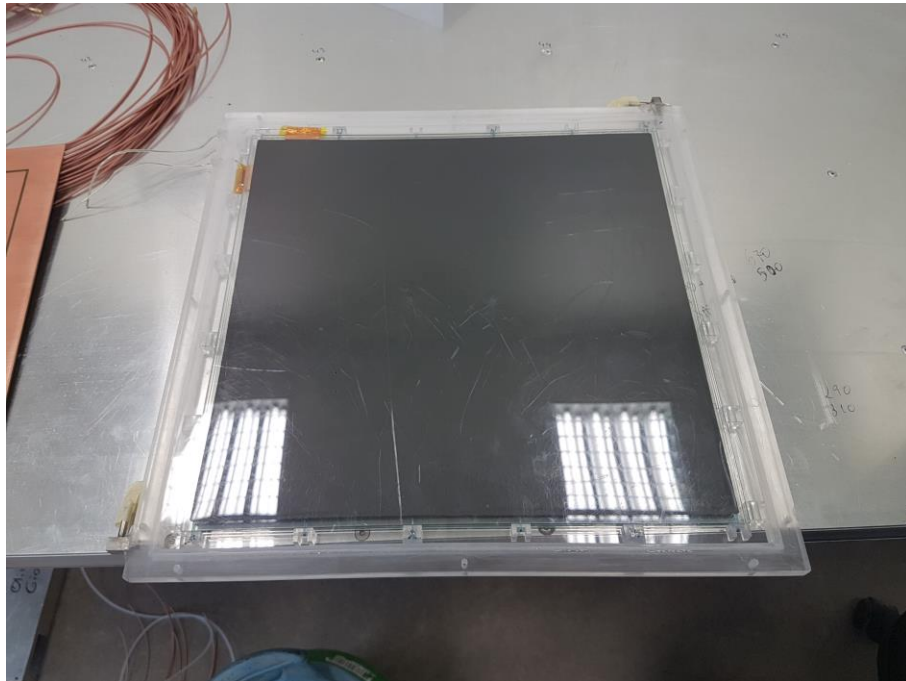


RPC

- Aluminum Box
- Gas System
- HV (High Voltage) System
- Data Acquisition (DAQ) System

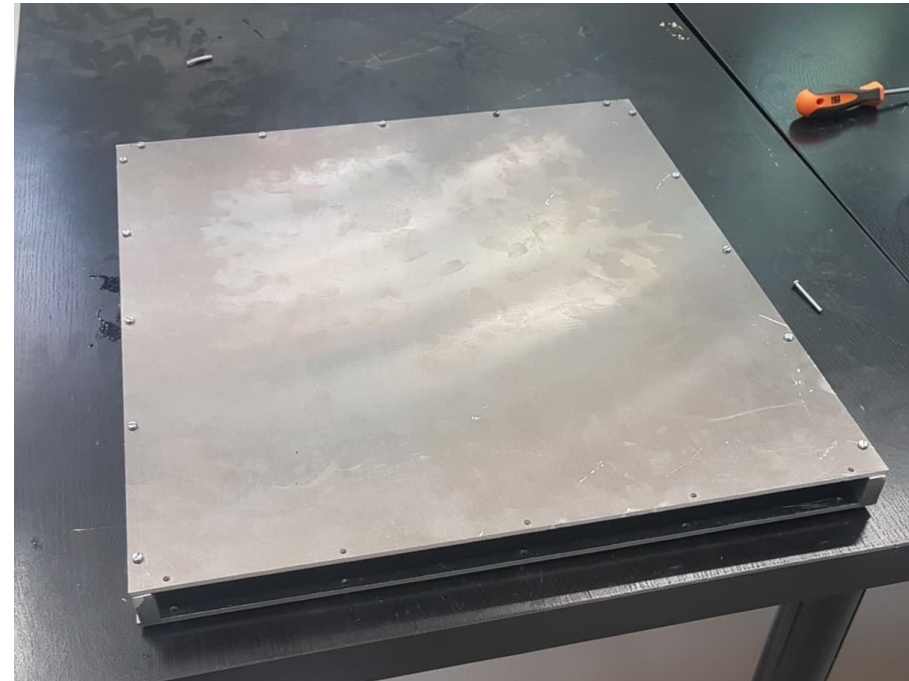


RPC - Aluminum Box

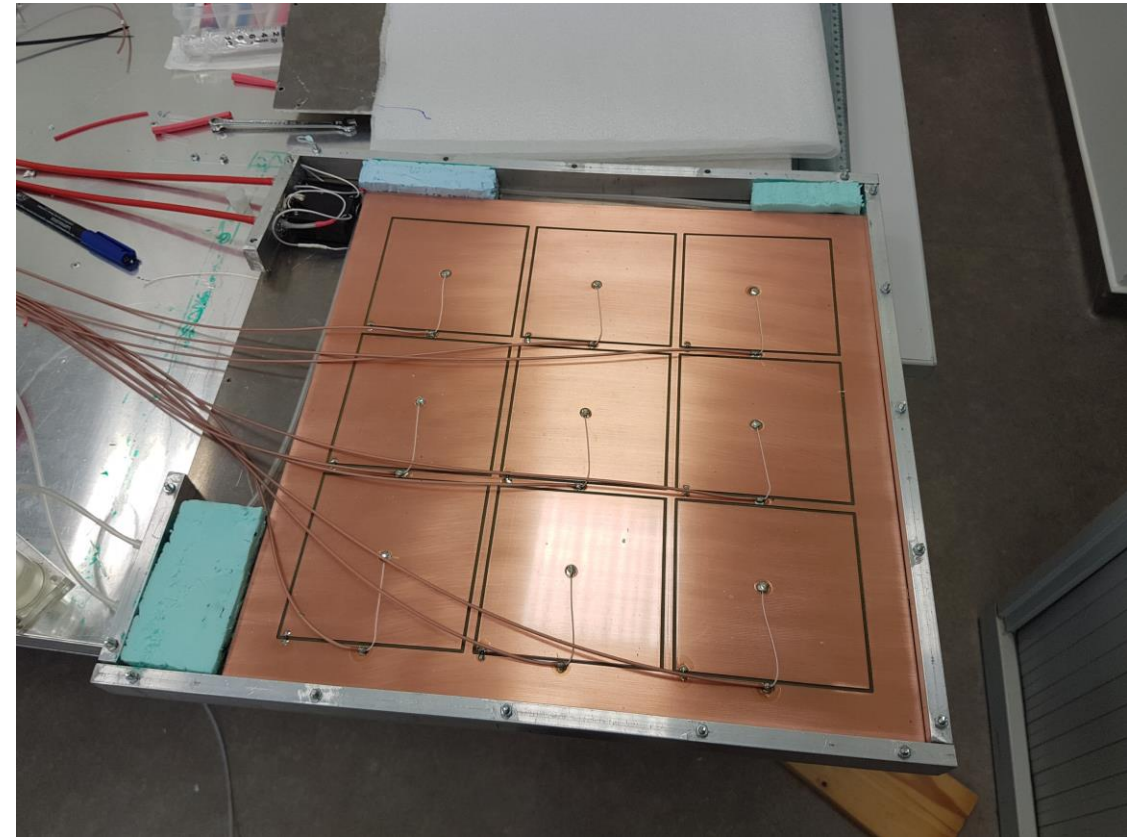
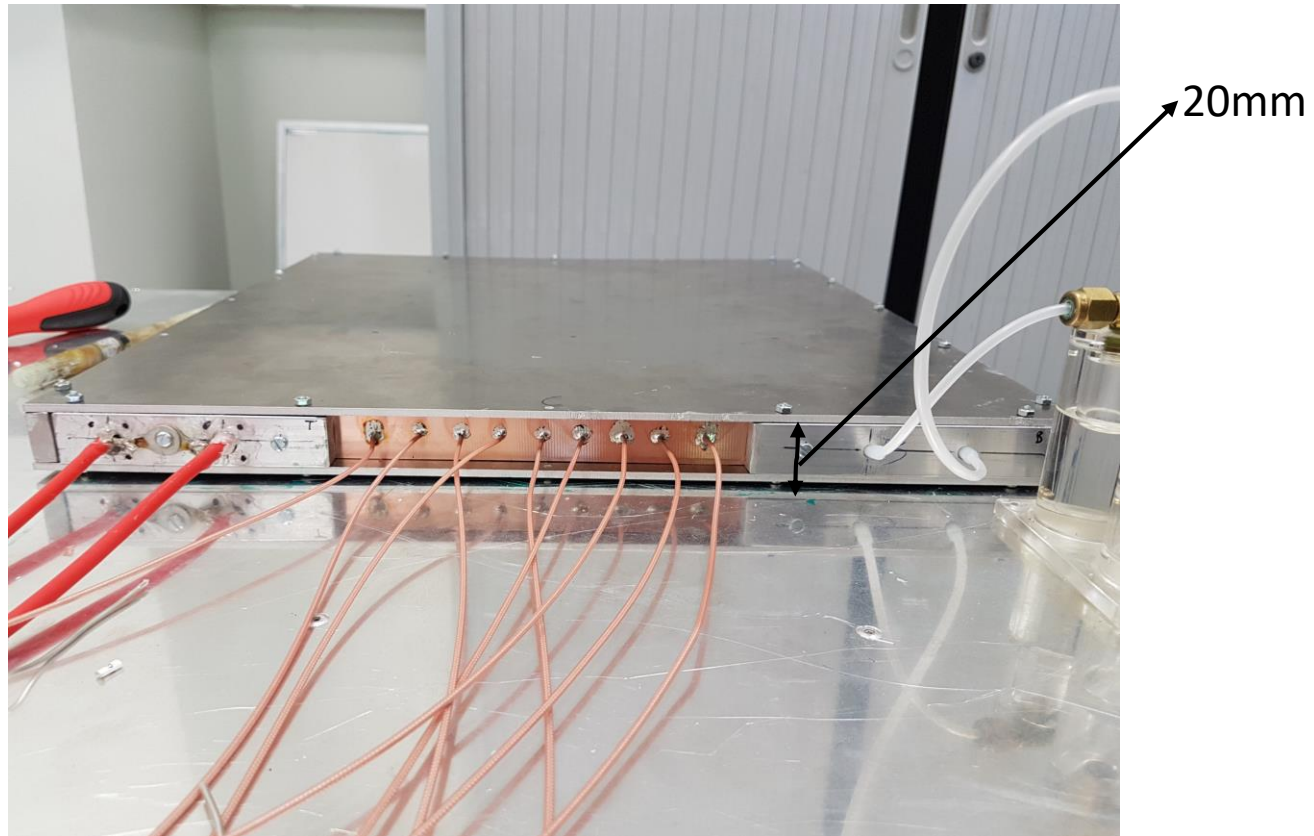


422 mm

393 mm



RPC - Aluminum Box



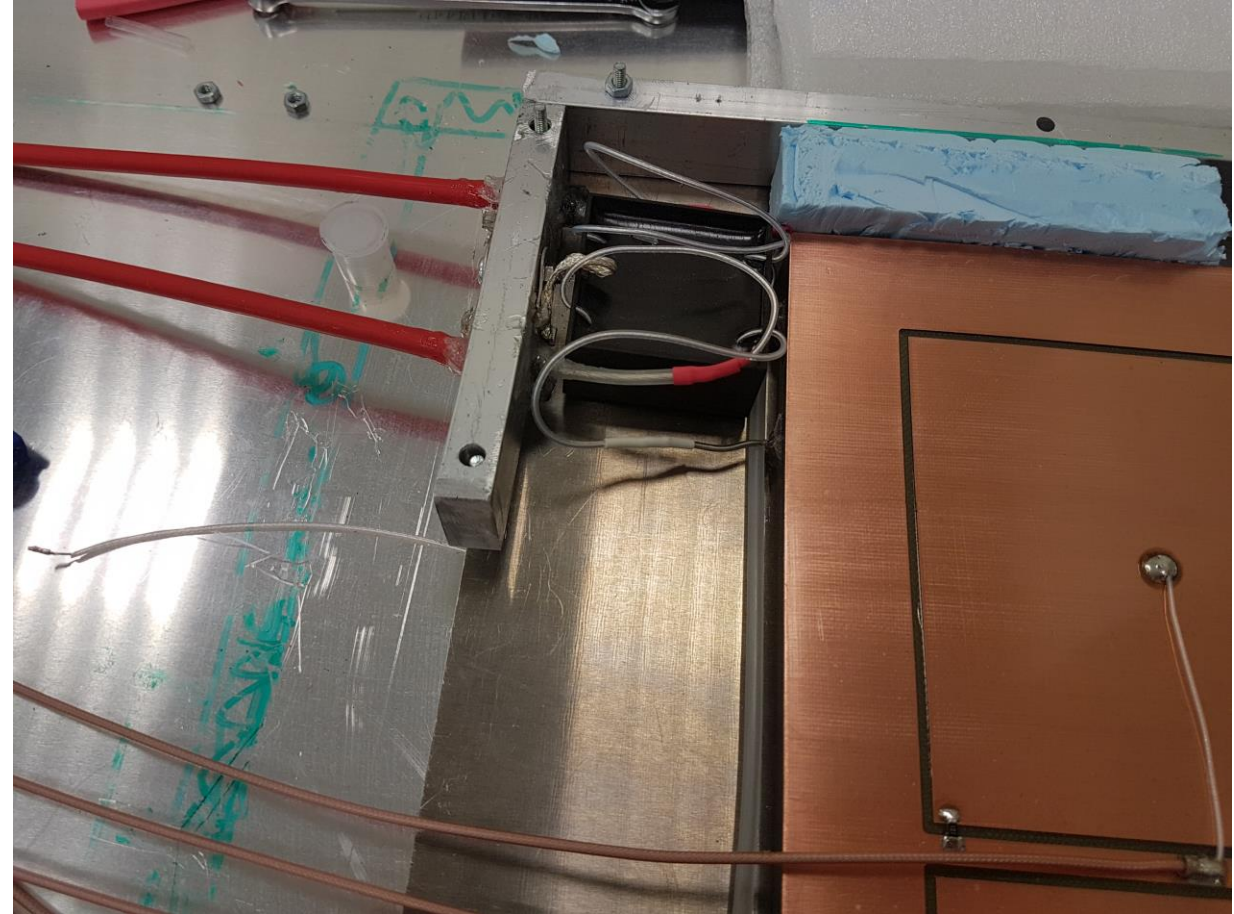
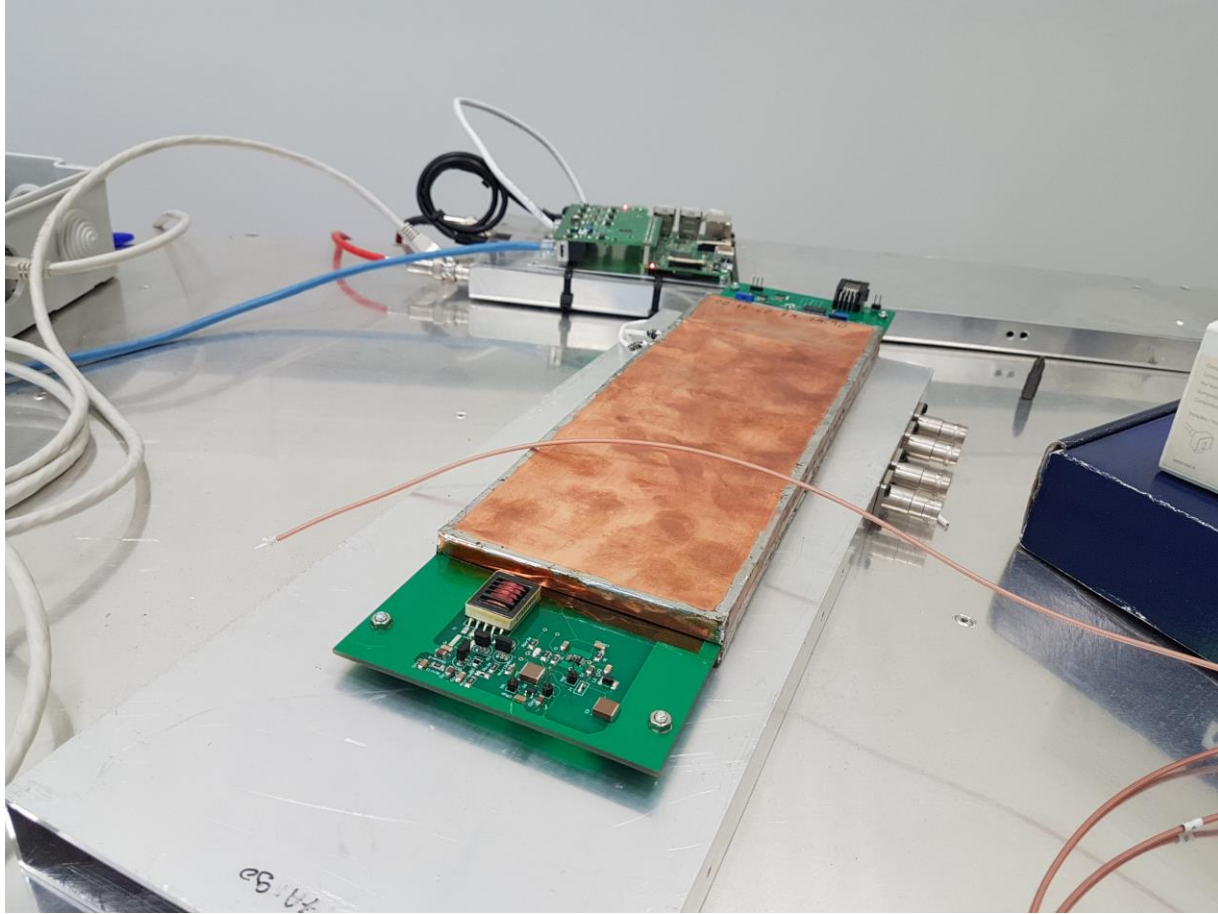
RPC – Gas System

- 12kg gas bottle
- Primary Bubbler
- RPC
- Secondary Bubbler

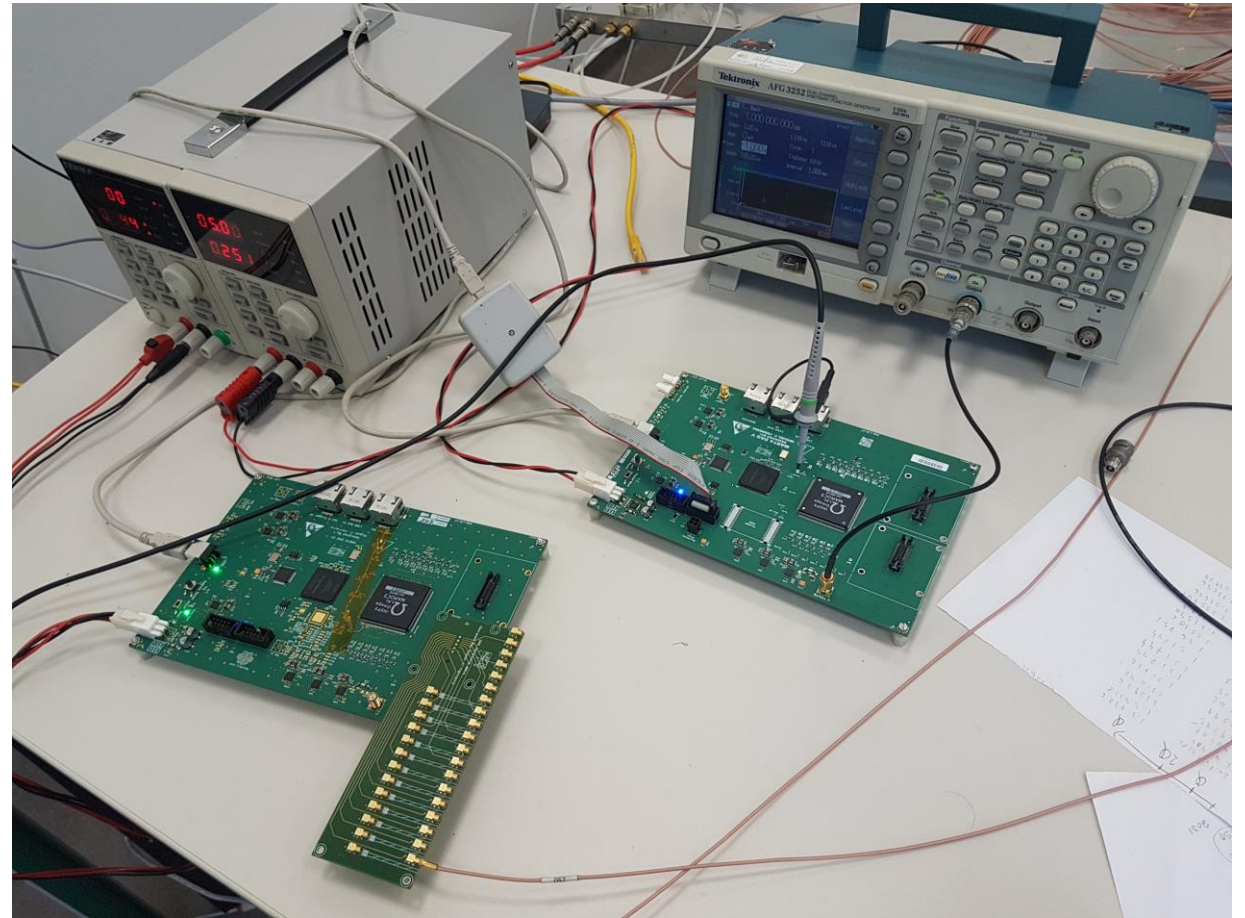
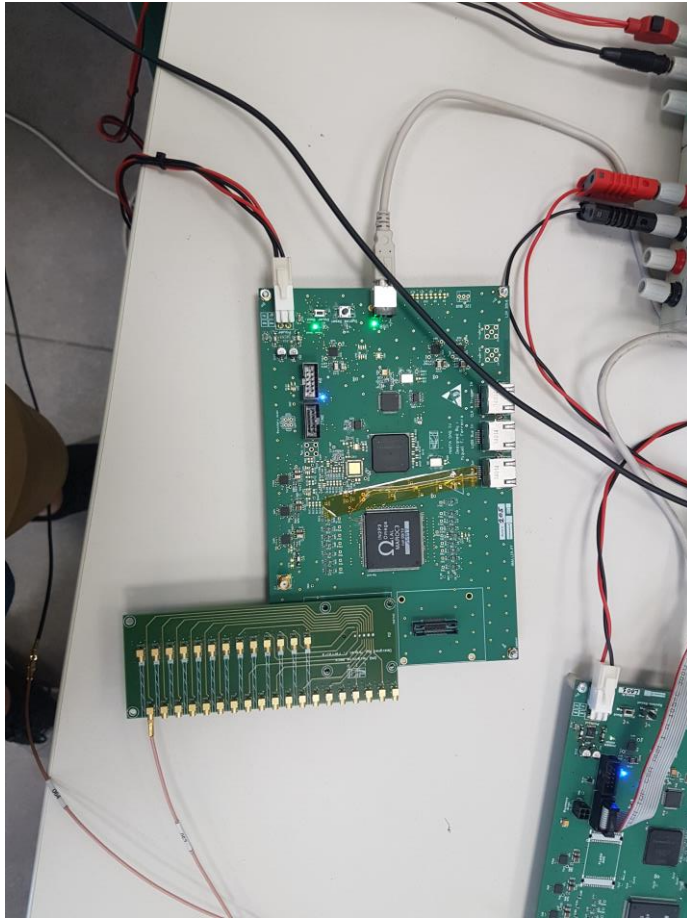


Rodolfo Matias

RPC – HV System



RPC - DAQ System



RPC - Results

IT WORKS!!!!

