Status of the SALTRO16 readout system.

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(on behalf of the Lund group)

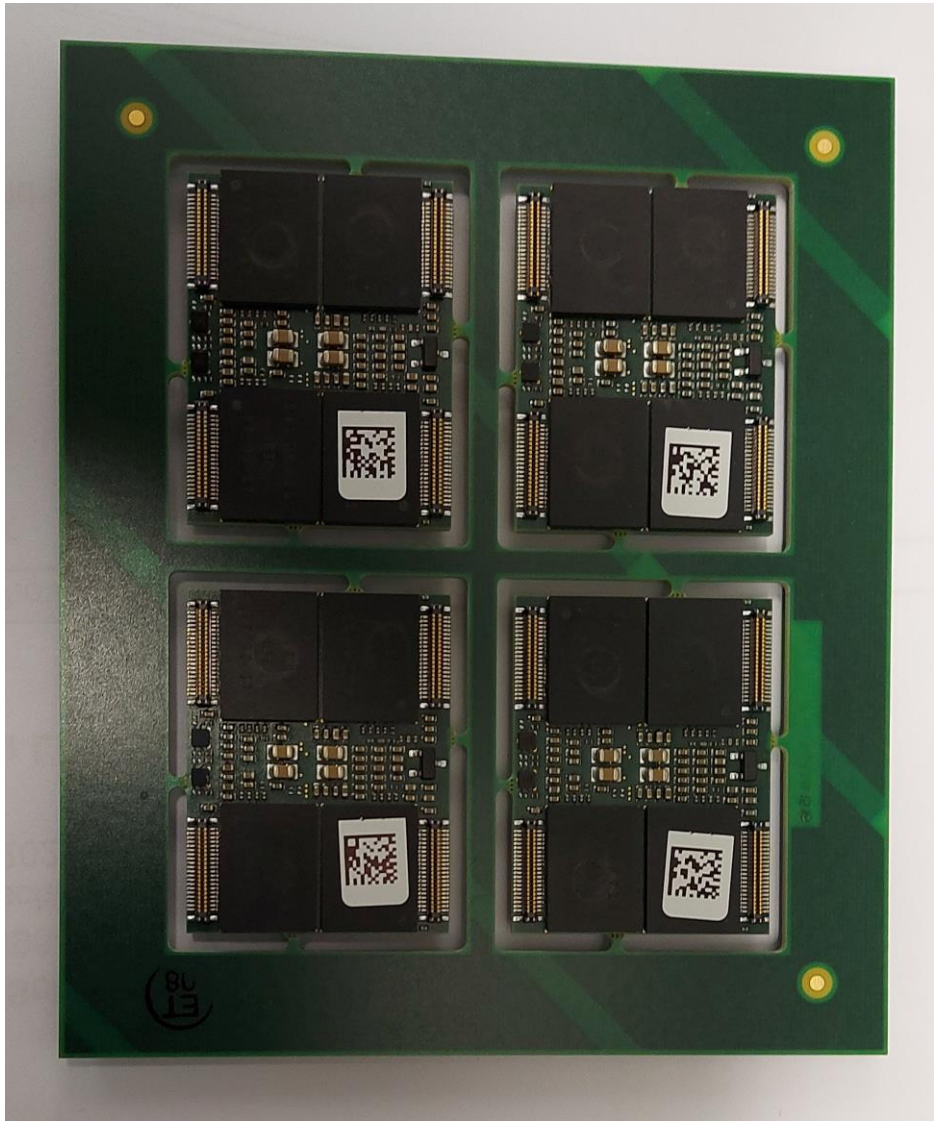
The Lund-group:

Leif Jönsson (retired)
Björn Lundberg (electronics, self- employed, previously the Lund group)
Ulf Mjörnmark (retired, research engineer)
Jonas Nilsson (FPGA-programmer, self-employed)
Anders Oskarsson (retired)
Lennart Österman (electronics)

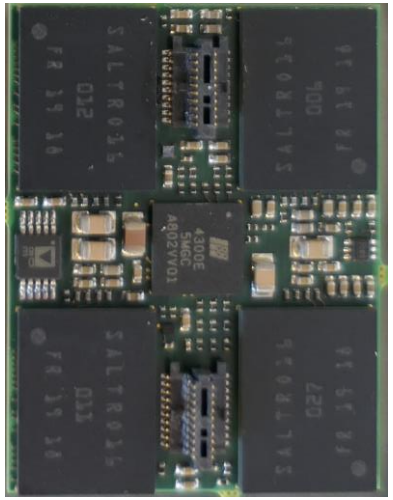
Time development

- After extensive testing and optimisation in Lund we went for the full production of 60 MCM boards at DESY in February 2024.
- In addition we have 8 MCM boards from a preproduction.
- The assembled boards passed the quality tests at DESY and I picked up the boards on the 29.2.2024.
- I will bring them to Lund in week 13.
- A special testing board for tests of all MCM boards has been designed and is ordered.
- We prepare for using the readout system in the nnbar-experiment at the ESS (European Spallation Source) in Lund.
- What about the future of the large prototype TPC at DESY?

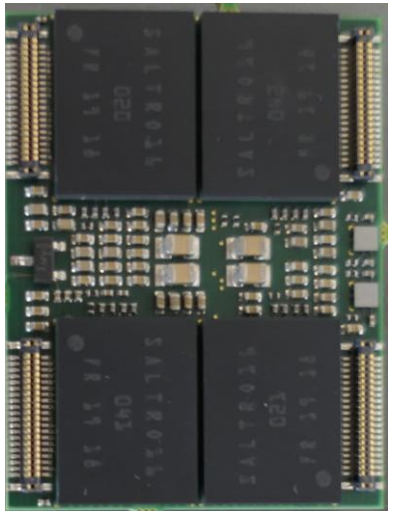
A panel with 4 MCM boards



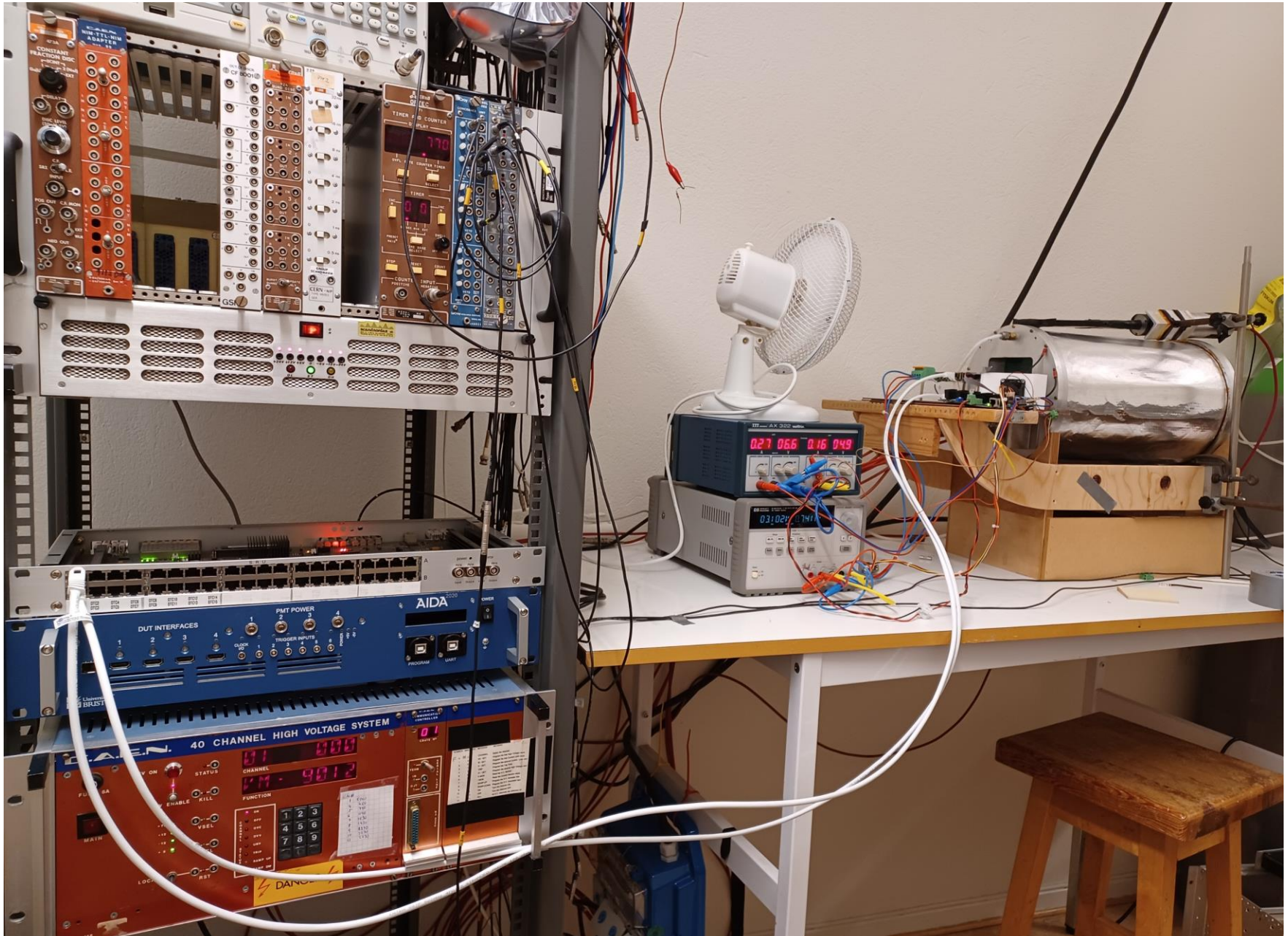
Top side of one MCM board



Bottom side of one MCM board



The test set-up

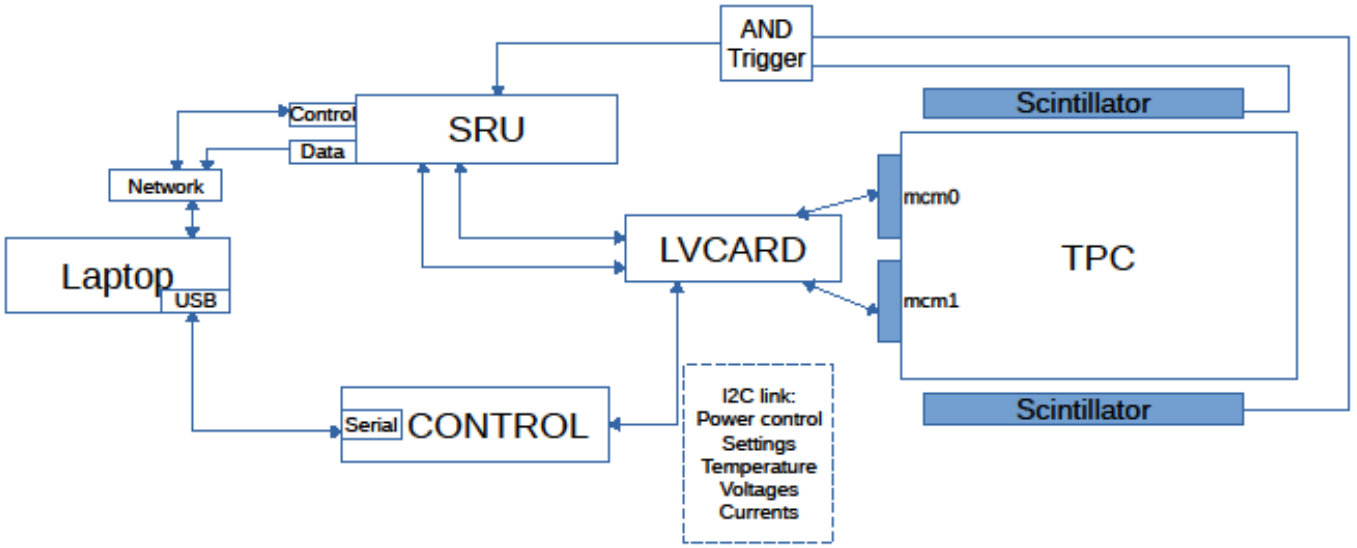


The Lund TPC

This and further TPC:s were built in Aachen by Stefan Roth.
Lund received this contact through Joachim Mnich.

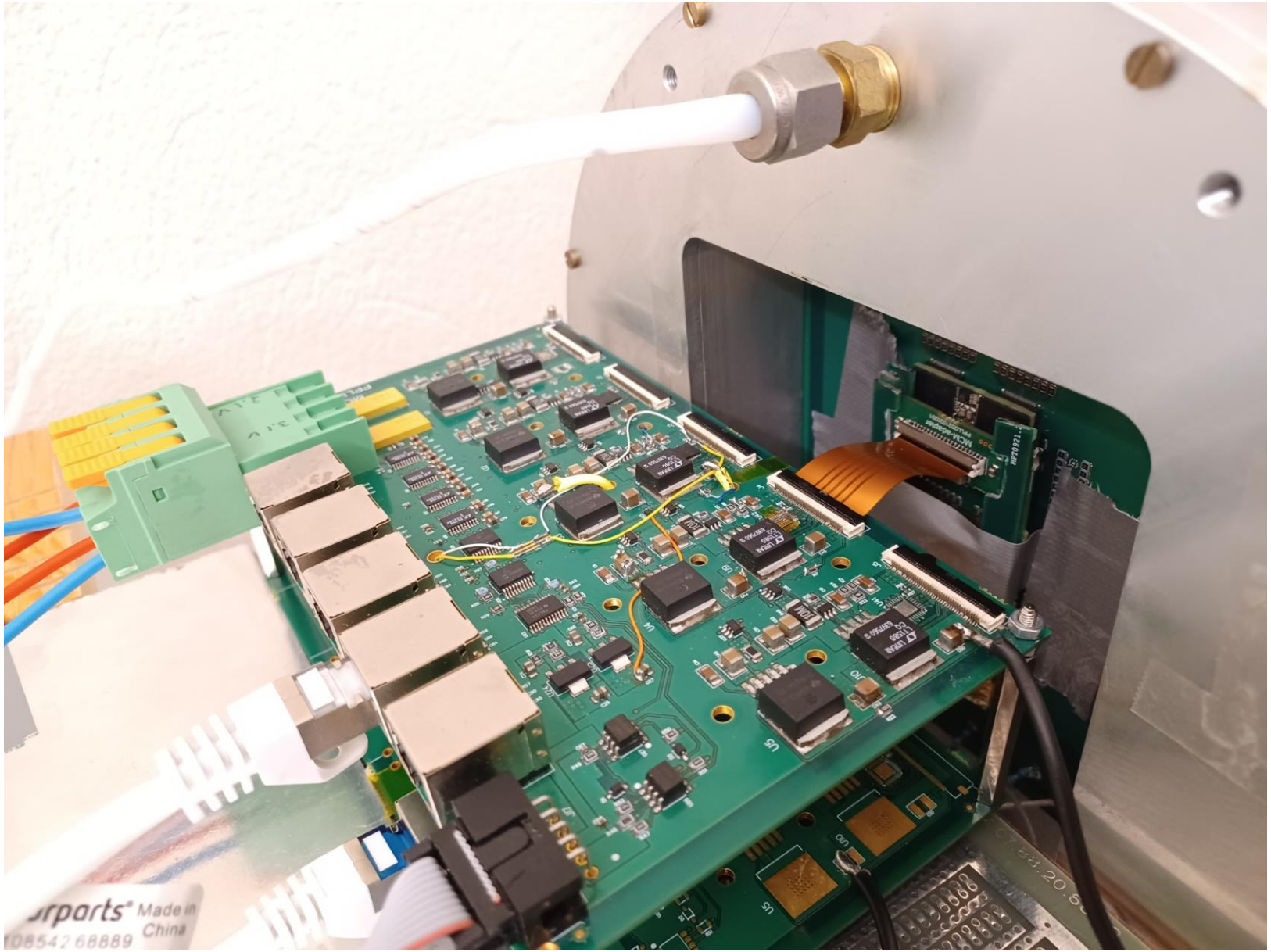
Diameter:	~ 25 cm
Length:	~27 cm (drift length)
Gas:	ArCO2 20% CO2
Drift field:	200 V/cm
Space between GEM:s:	2mm
Voltage over GEM:s:	350 V
∅ Gem-holes:	50 μm - 70 μm
Pitch GEM-holes:	140 μm
Size of pad plane:	10x10 cm

Schematics of the readout system

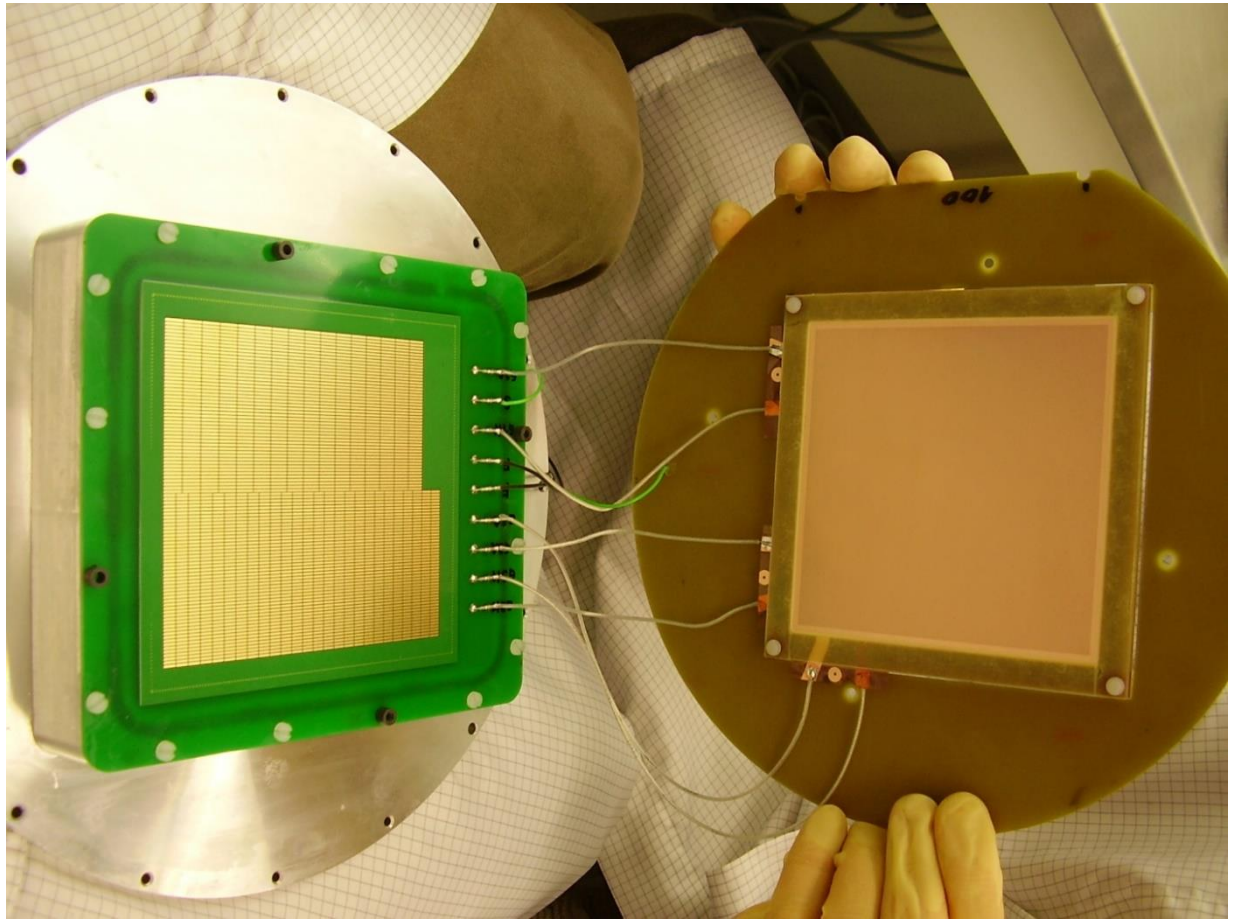


The SRU (Scalable Readout Unit) was supplied by RD51

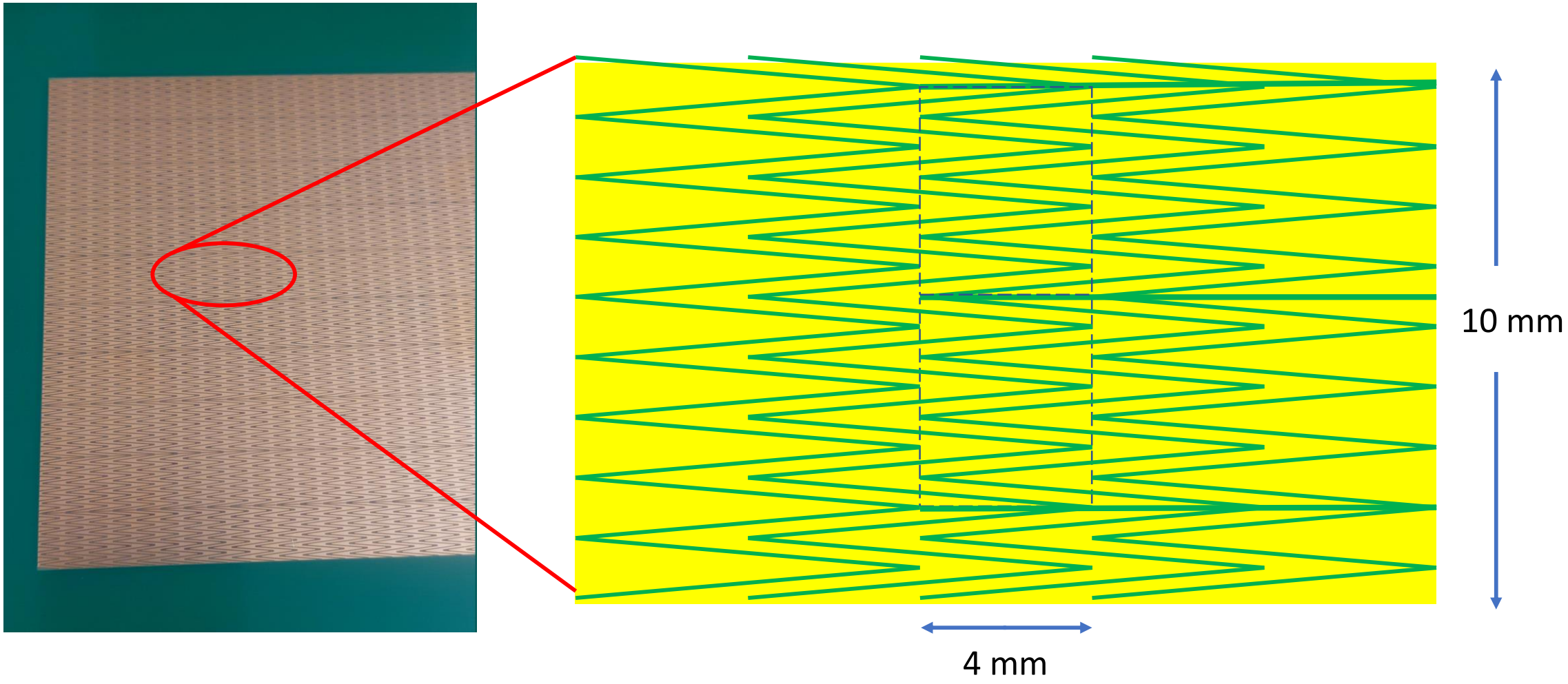
The LV board on the TPC



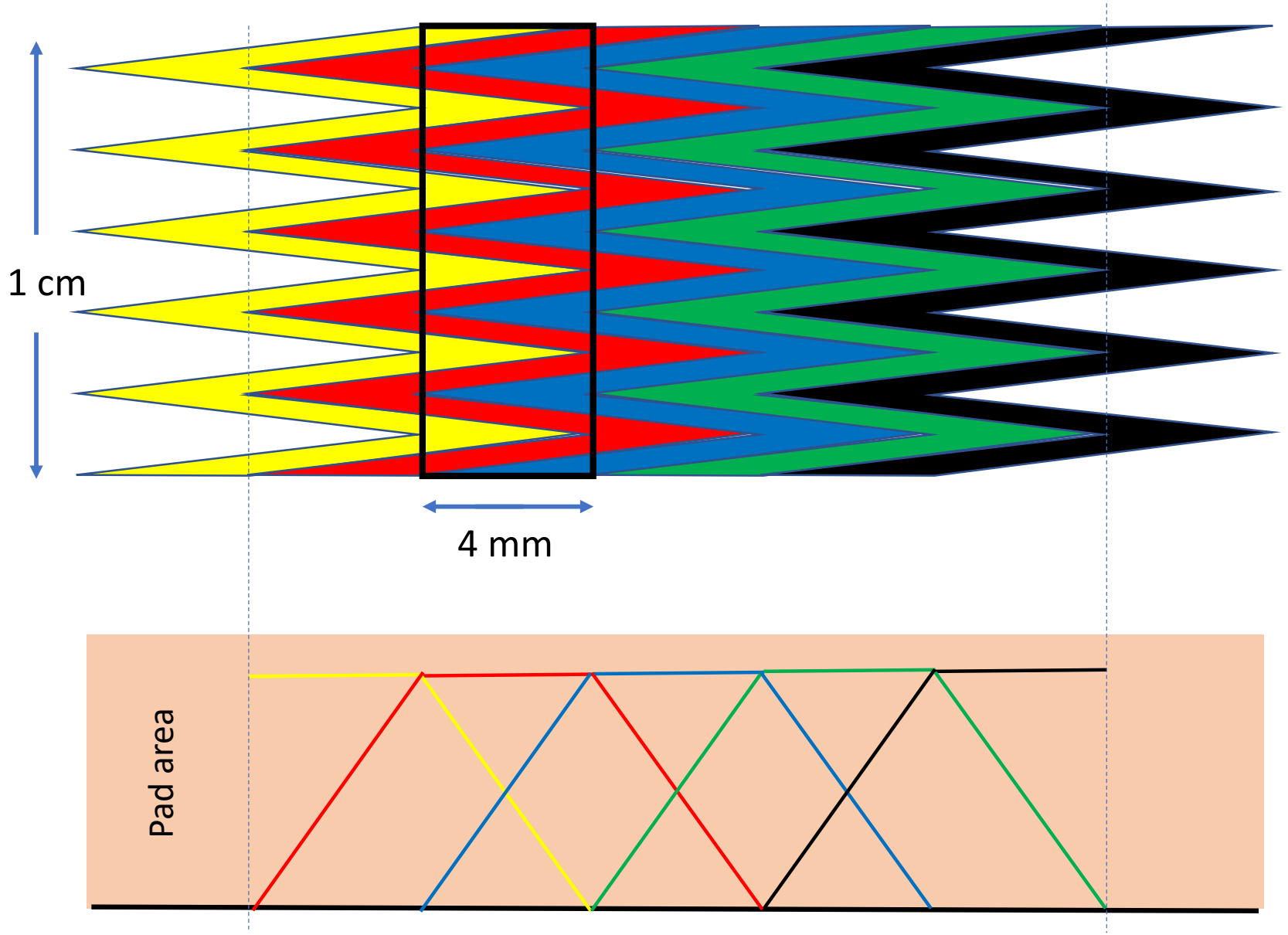
The old pad plane & the GEM stack



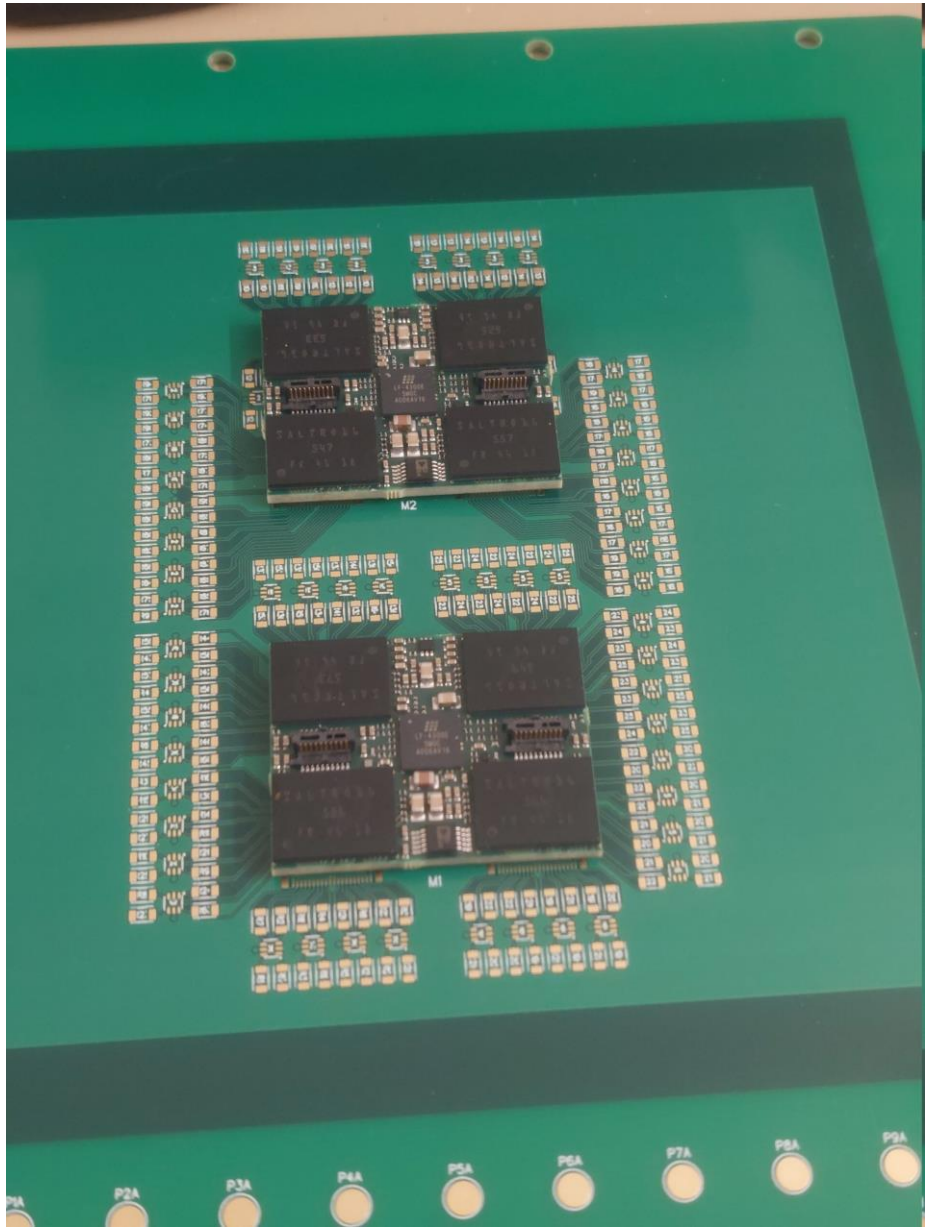
The new Pad Plane



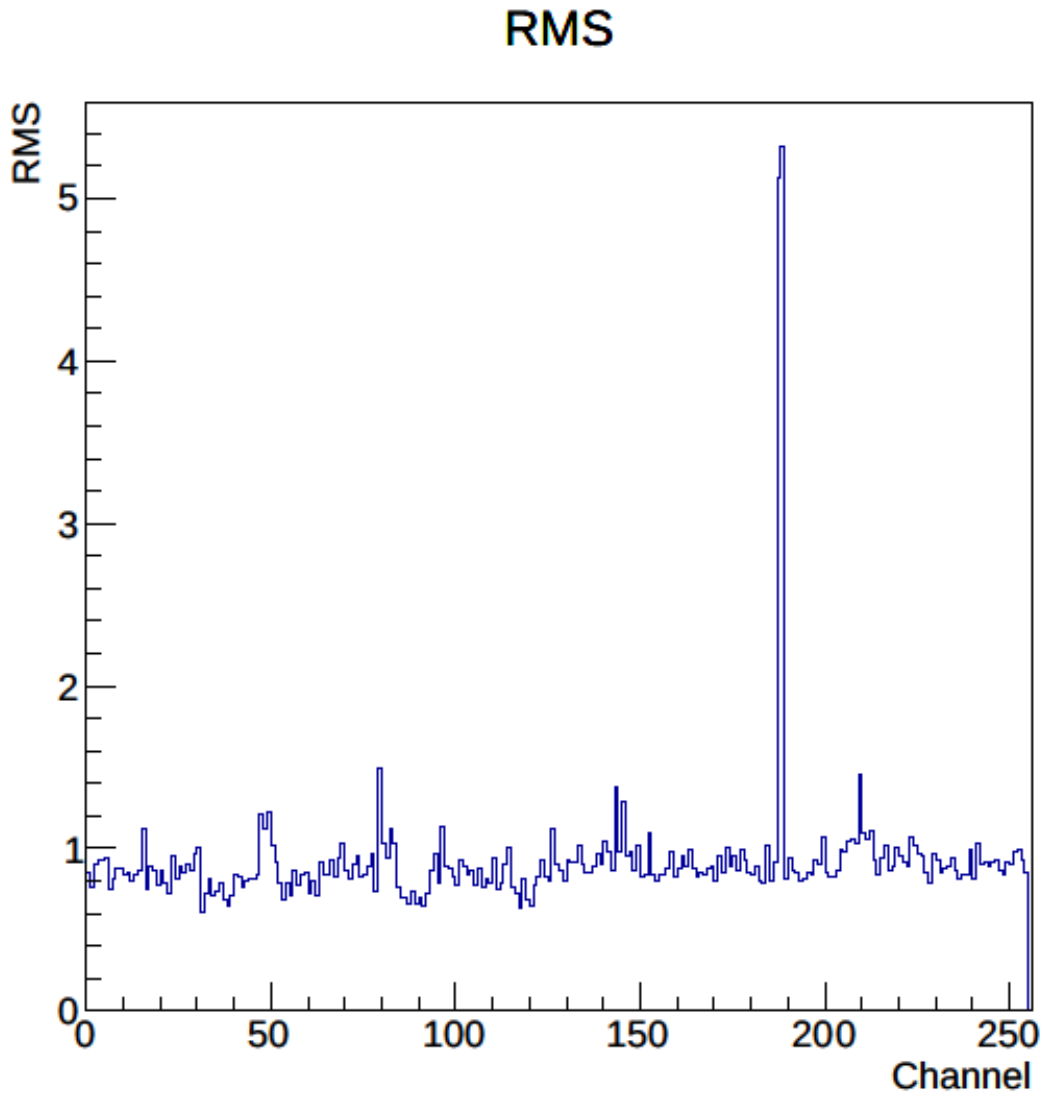
The principle of charge division with zigzag pads



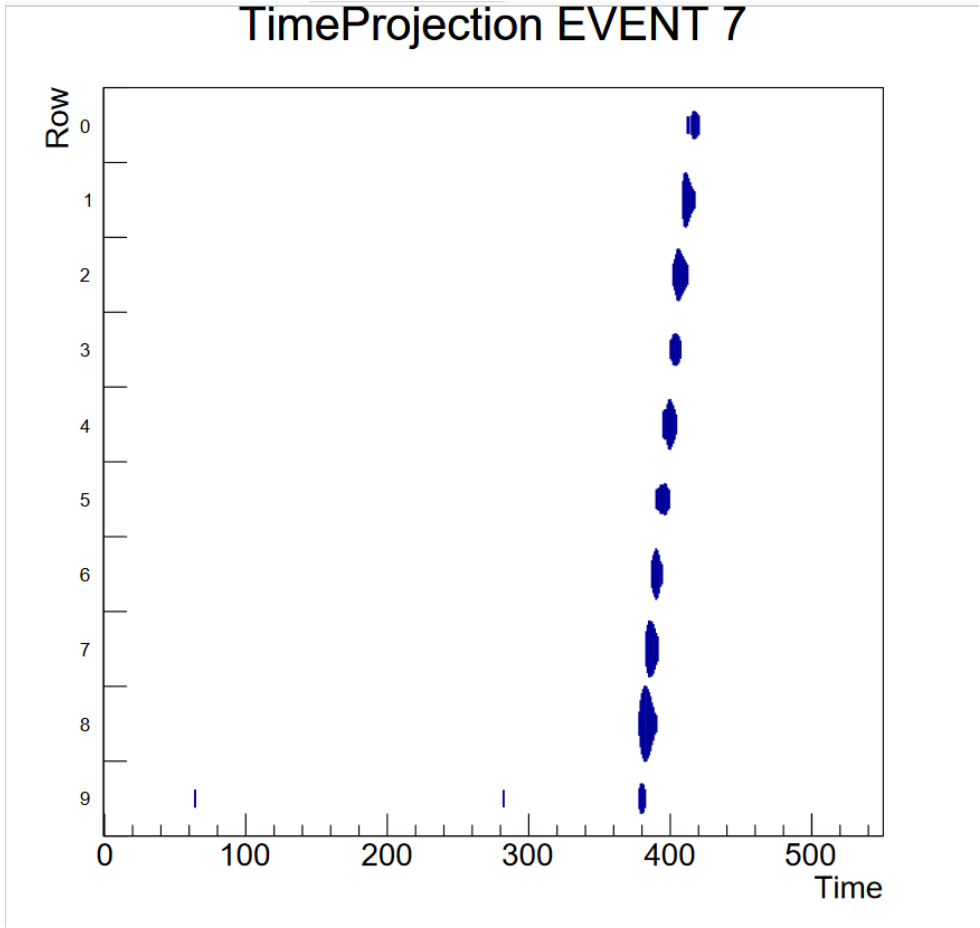
2 MCM boards mounted on the pad plane

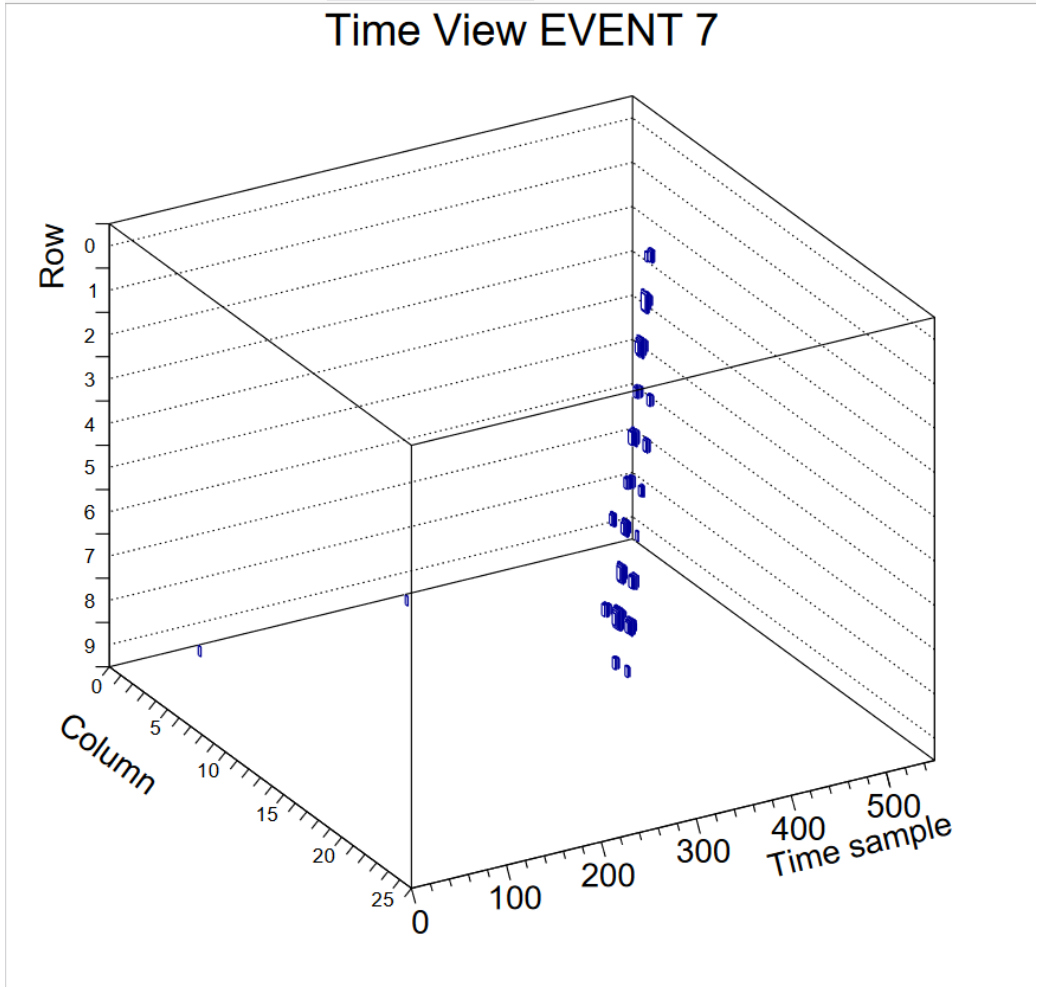


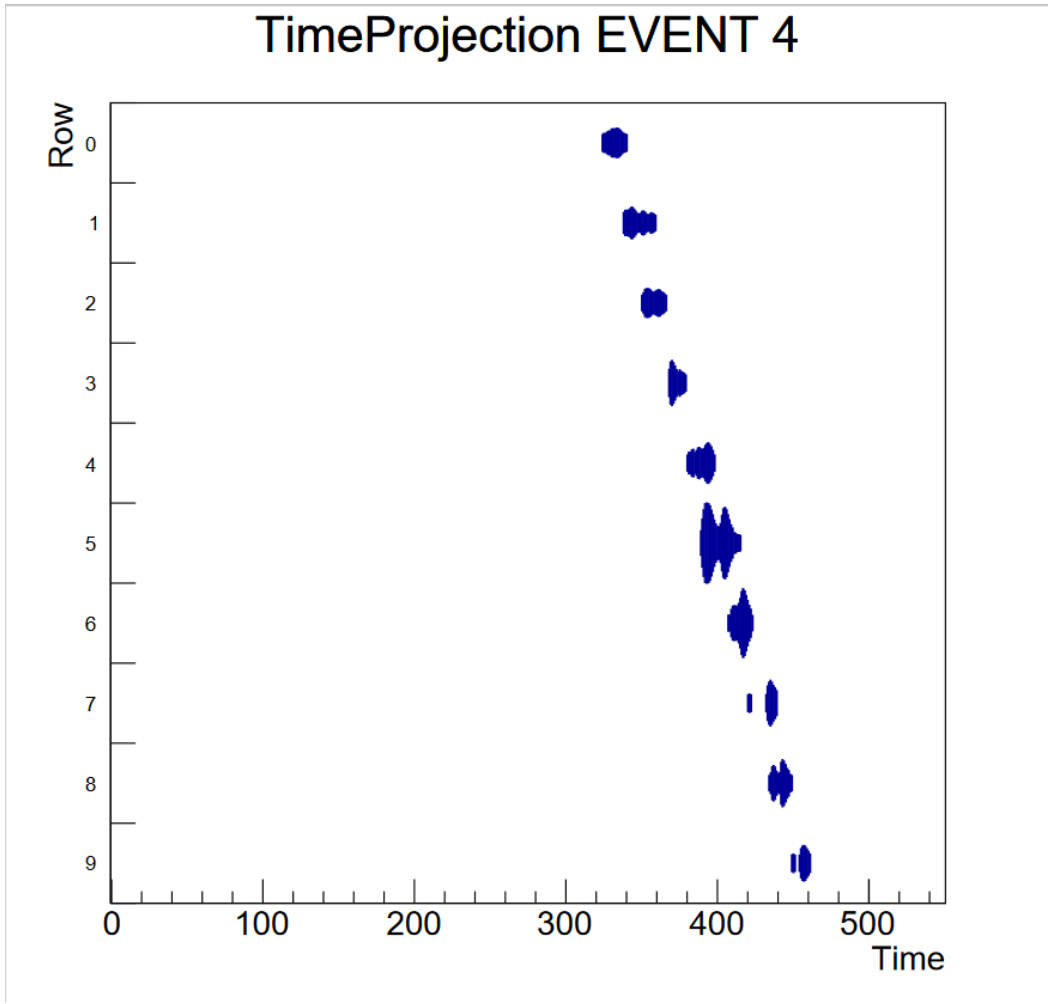
RMS of pedestals (in ADC-counts) for 256 readout channels measured with the whole readout system mounted but without the chamber voltage connected.

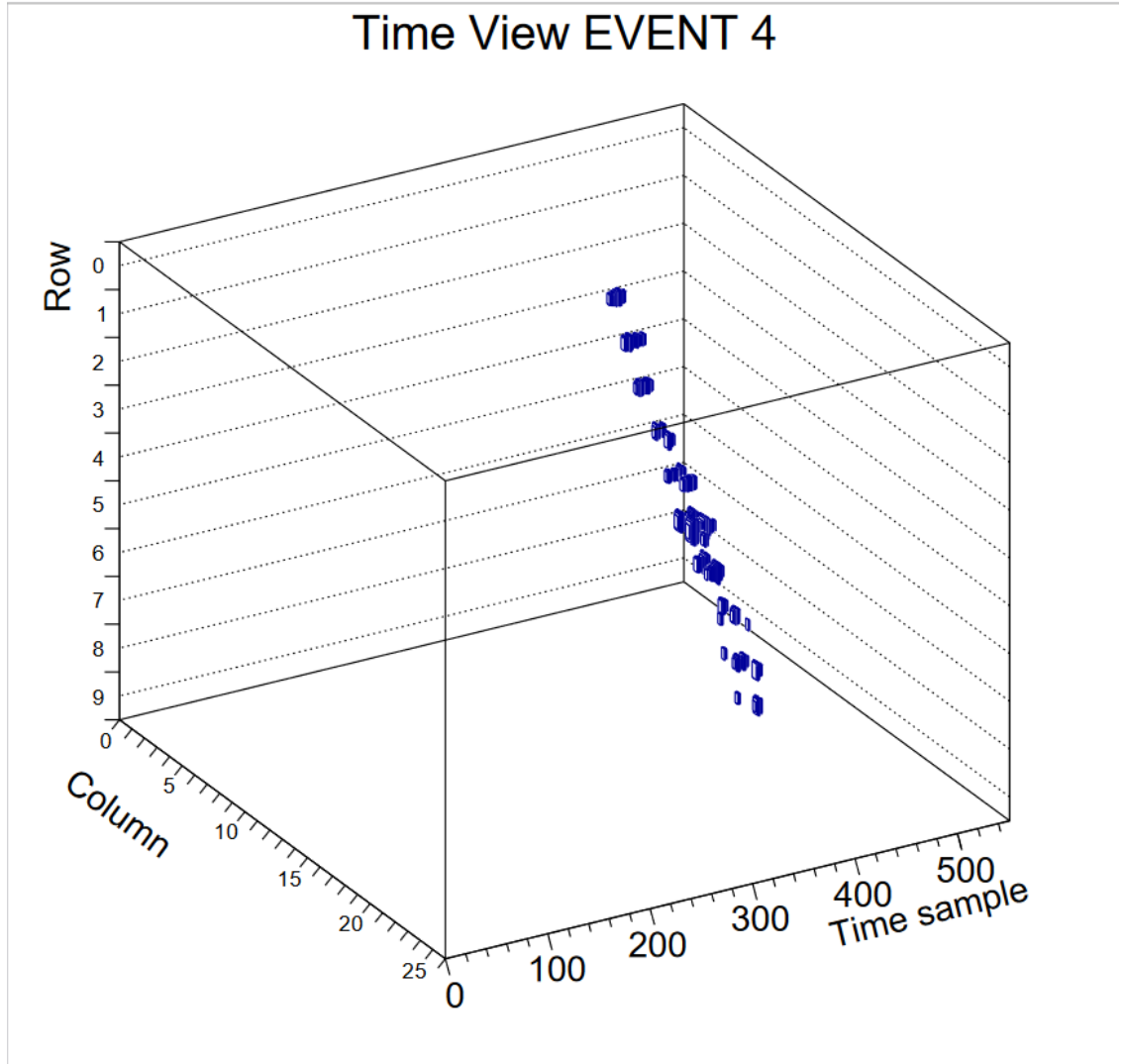


The first cosmic events in the chamber (two examples)





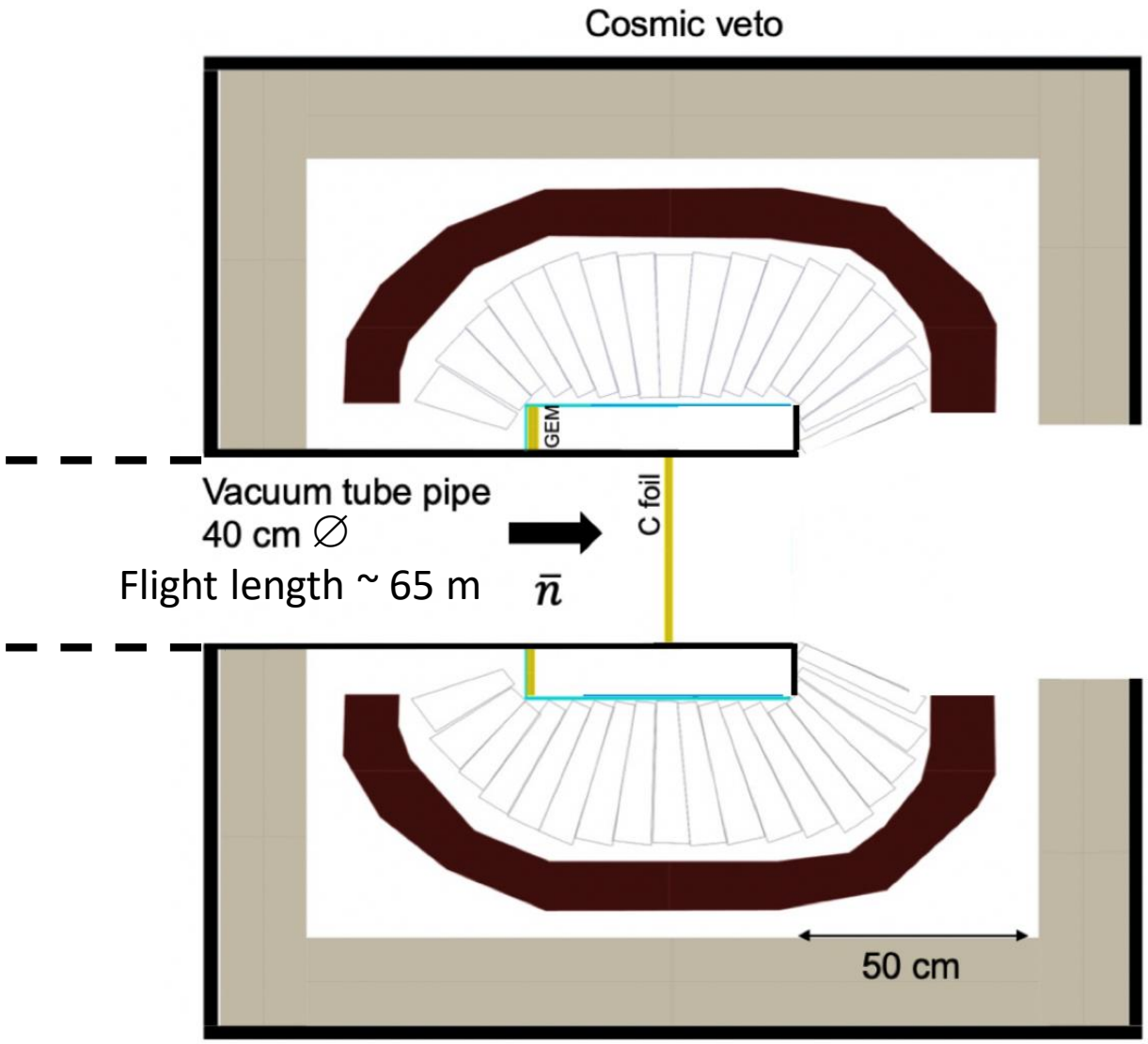

TimeProjection EVENT 4
Row
0
1
2
3
4
5
6
7
8
9
0
100
200
300
400
500
Time


Time View EVENT 4
Row
0
1
2
3
4
5
6
7
8
9
Column
0
5
10
15
20
25
0
100
200
300
400
500
Time sample

Next steps

- Further system optimization to improve the signals and suppress the background
- The test board will be assembled.
- All MCM boards will be tested.
- We will need the expertise from DESY to build the TPC for the nnbar experiment.
- If there is an interest to use the readout electronics in the large prototype TPC a pad plane is needed.

A pre-experiment to the nnbar experiment



Cylindrical TPC: inner ∅ 40 cm
outer ∅ 60 cm
With zigzag pads ~ 400 readout channels

Calorimeter:
CsI (Na) crystals