First performance study of 5 gaps 1m x 1m MRPC for SDHCAL

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Overview

➢ Layout of the prototype

➢ The fishing line configuration

➢ Efficiency study

➢ Multiplicity

➢ Comparison of three different MRPCs and discussion

Reminder

The idea:

A SDHCAL module using Multi-gap Resistive Plate
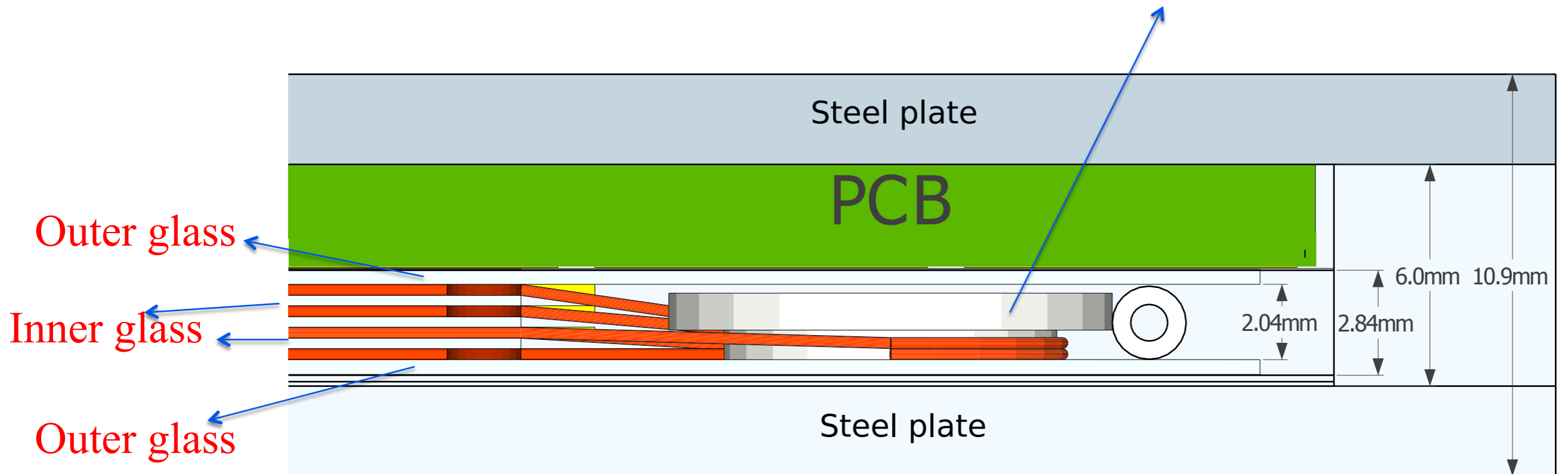Chamber Effective area : 1m x 1m
Pick up pad segmentation : 1cm x 1cm
Time resolution : <100 ps.
Count rate : better than 1000 Hz/cm^2

Cross section of the chamber
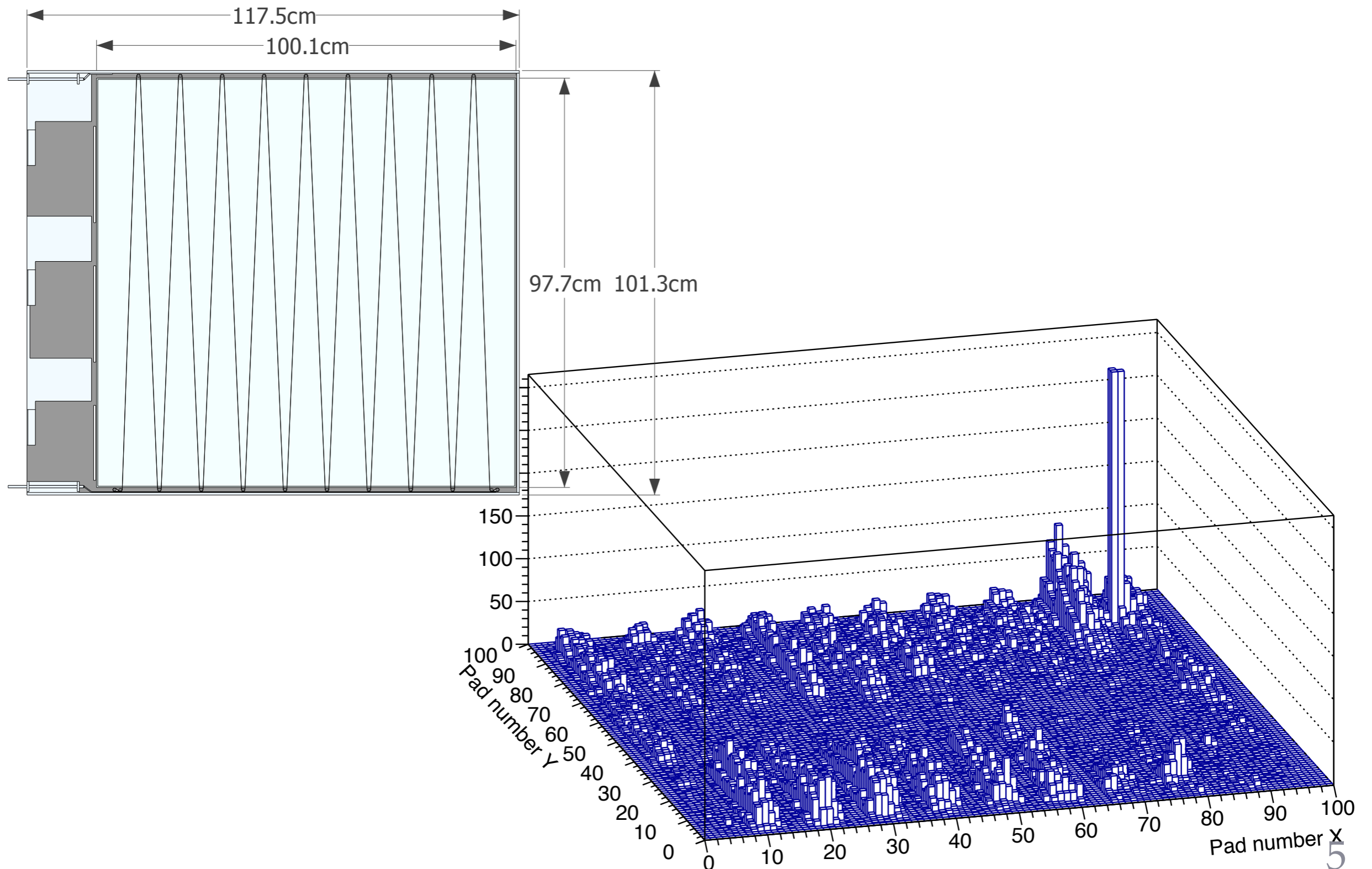

4 gas gaps MRPC: 3 inner glass sheets (280 μm), 2 outer glass sheets (400 μm)
5 gas gaps MRPC: 4 inner glass sheets (280 μm), 1 outer glass sheet (280 μm), 1 outer glass sheet (400 μm)
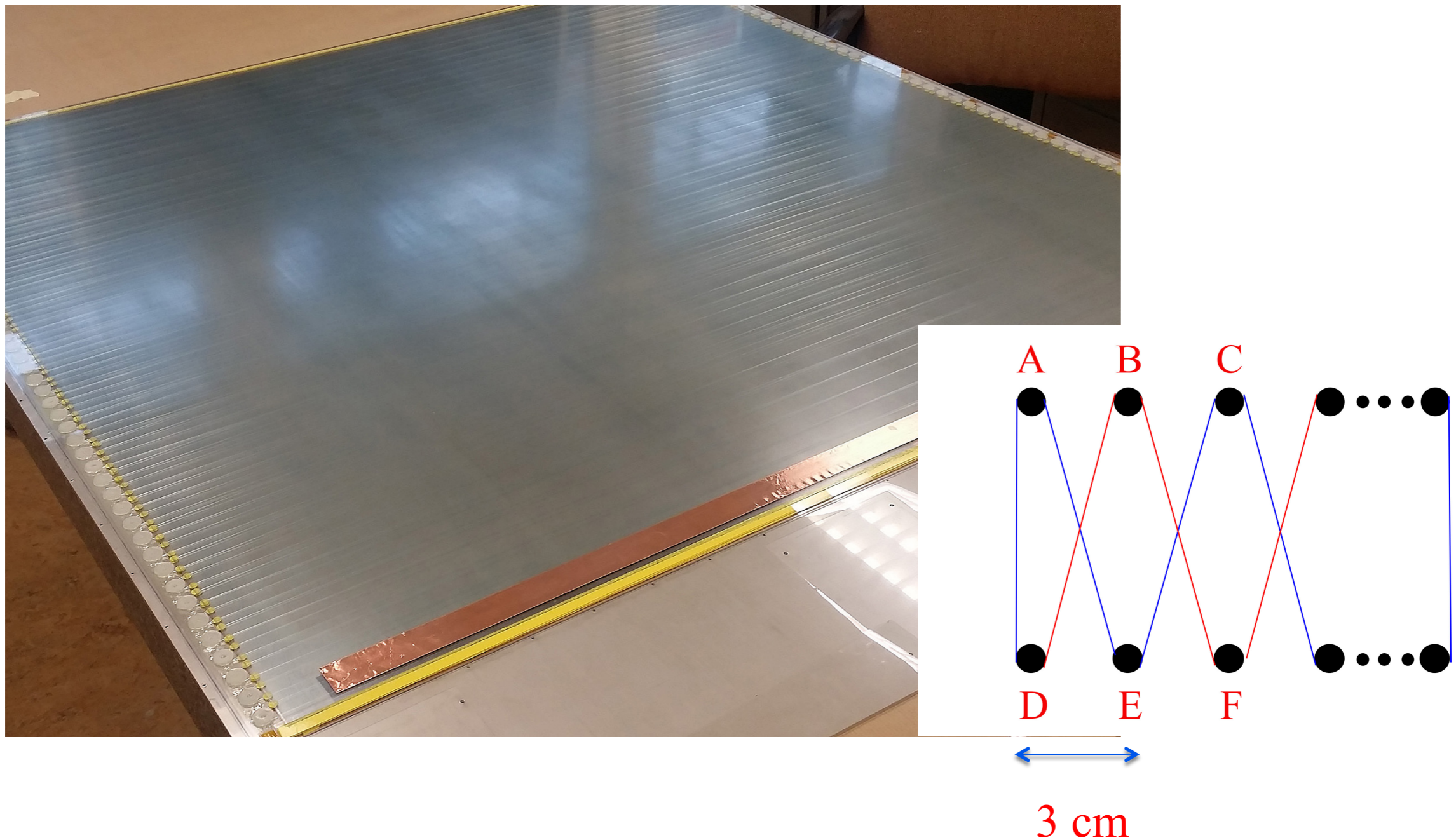
First prototype of 4 gas gaps MRPC

Large fishing line distance created a pattern and high noise
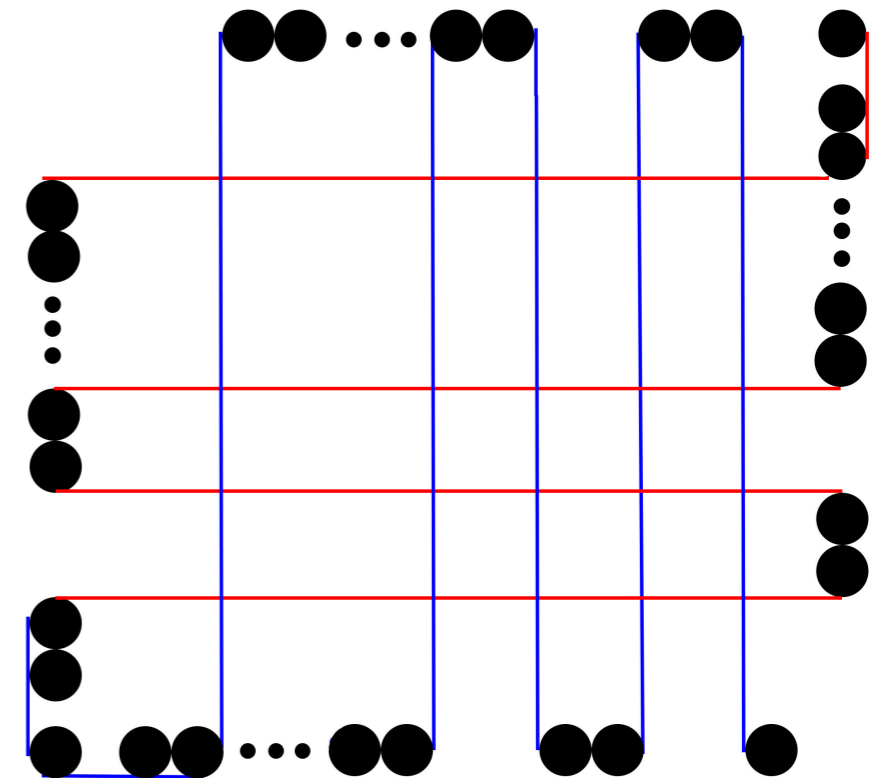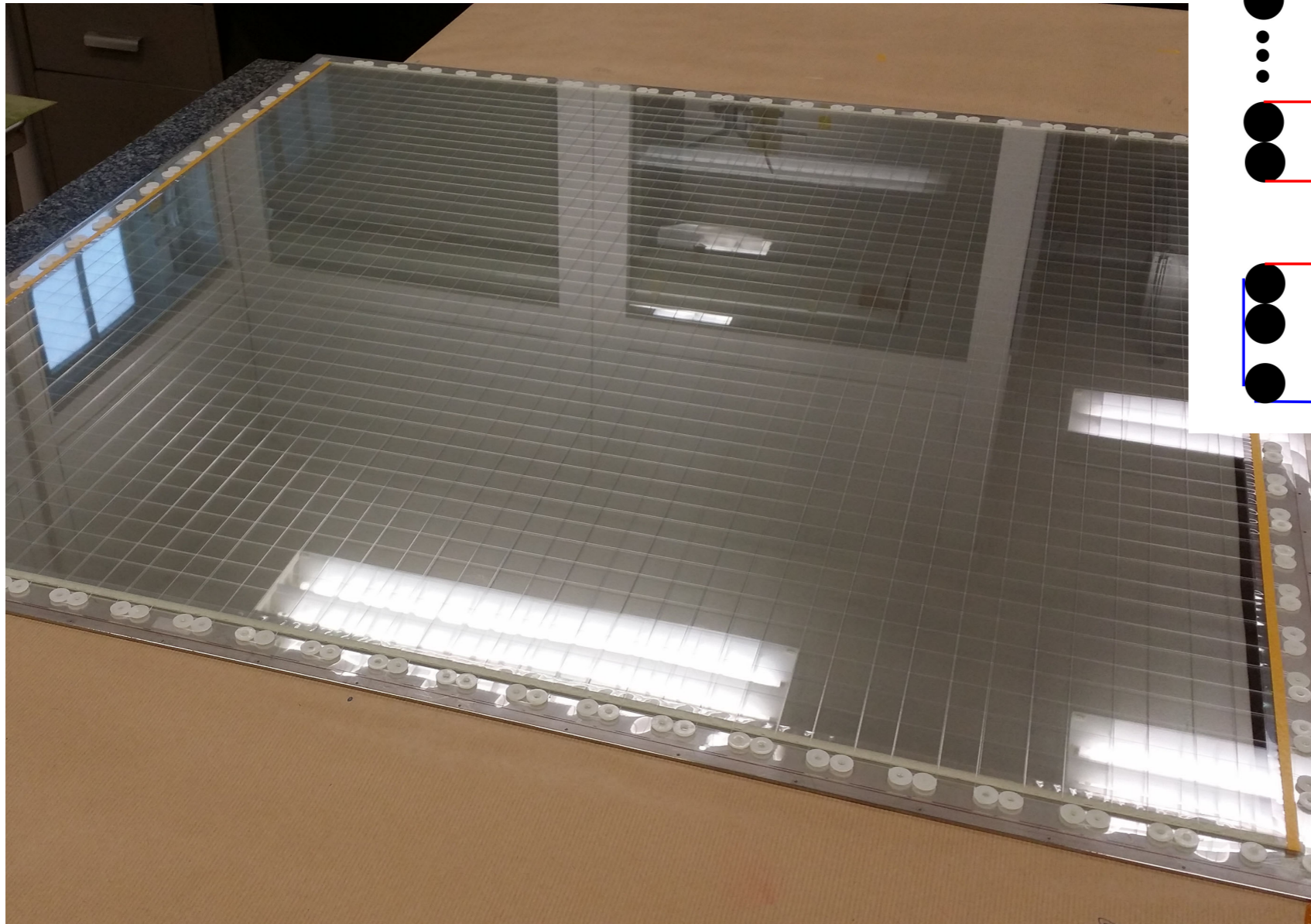
4 gas gaps MRPC

Fishing line (blue) crosses different Teflon washers in the odd number layers from the fishing line (red) on the even number layers,
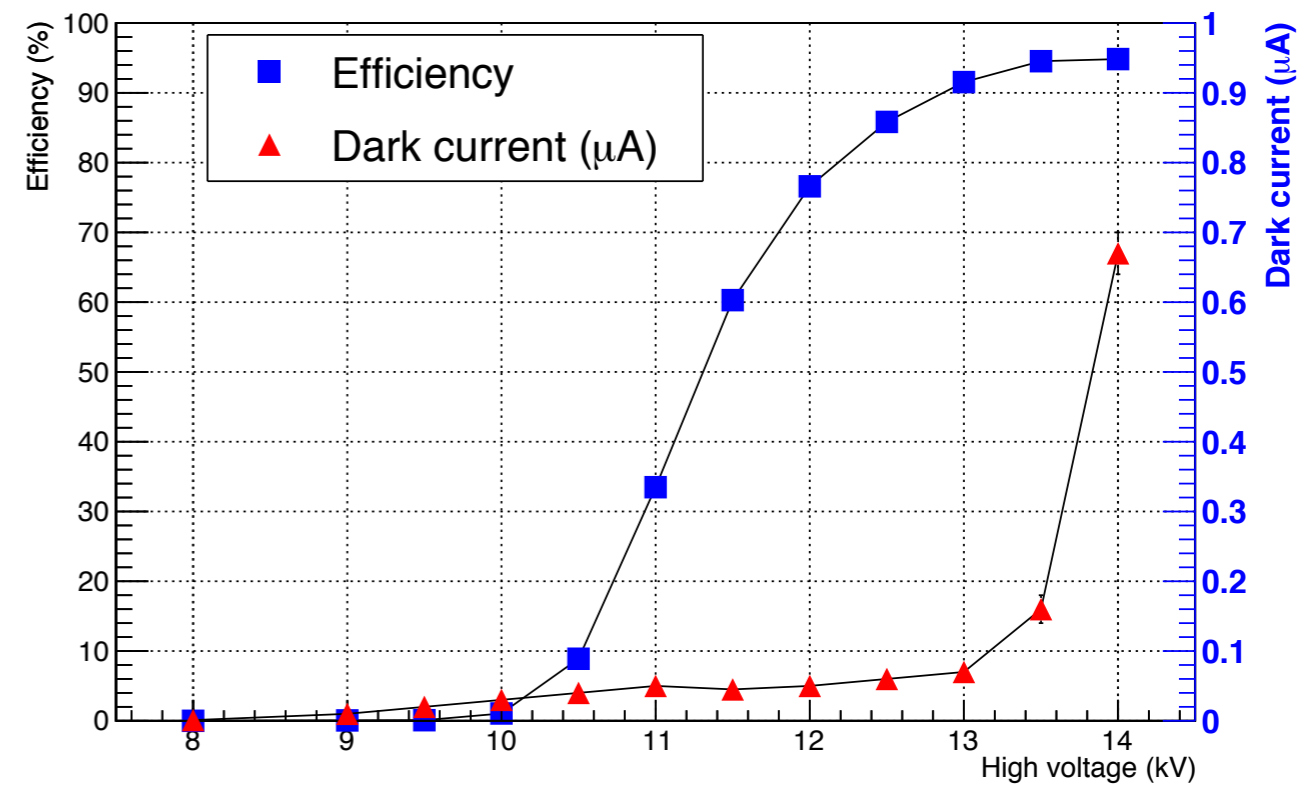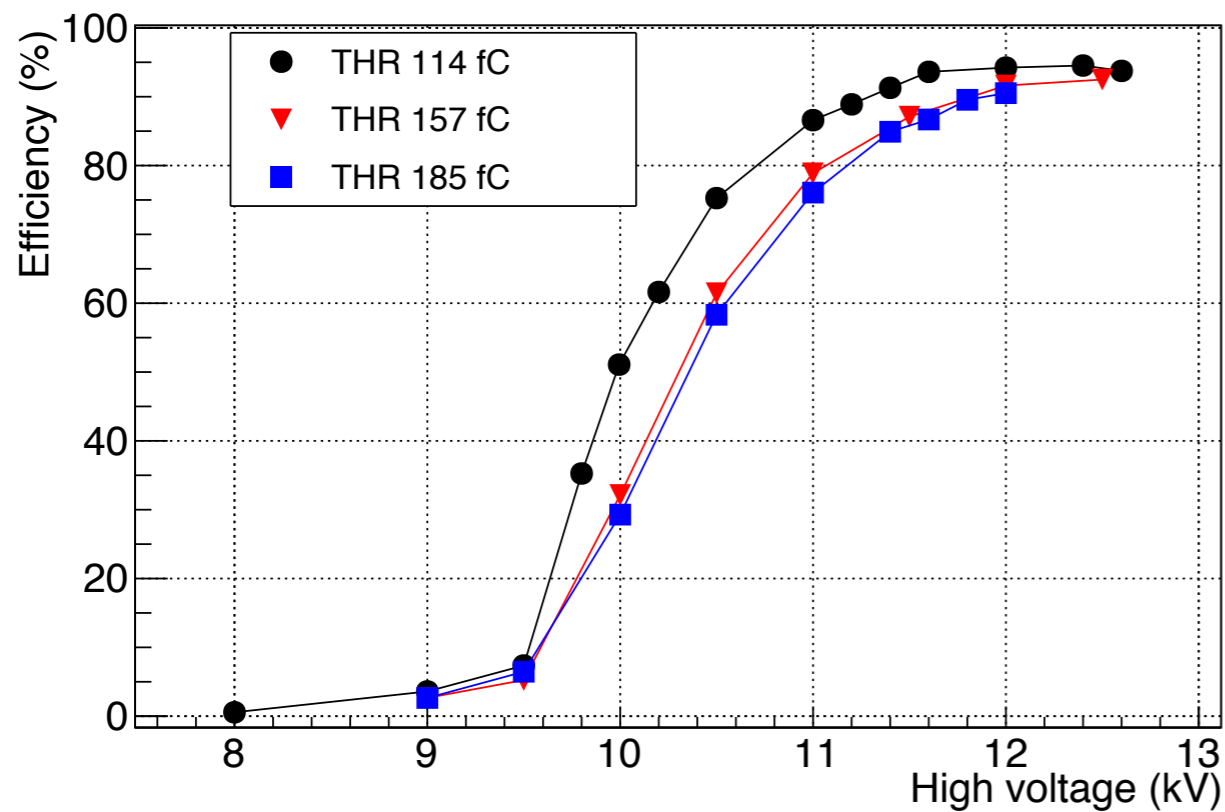
5 gas gaps MRPC

The width of a Teflon washer group is 2.1 cm and the distance between two groups is 1.9 cm.
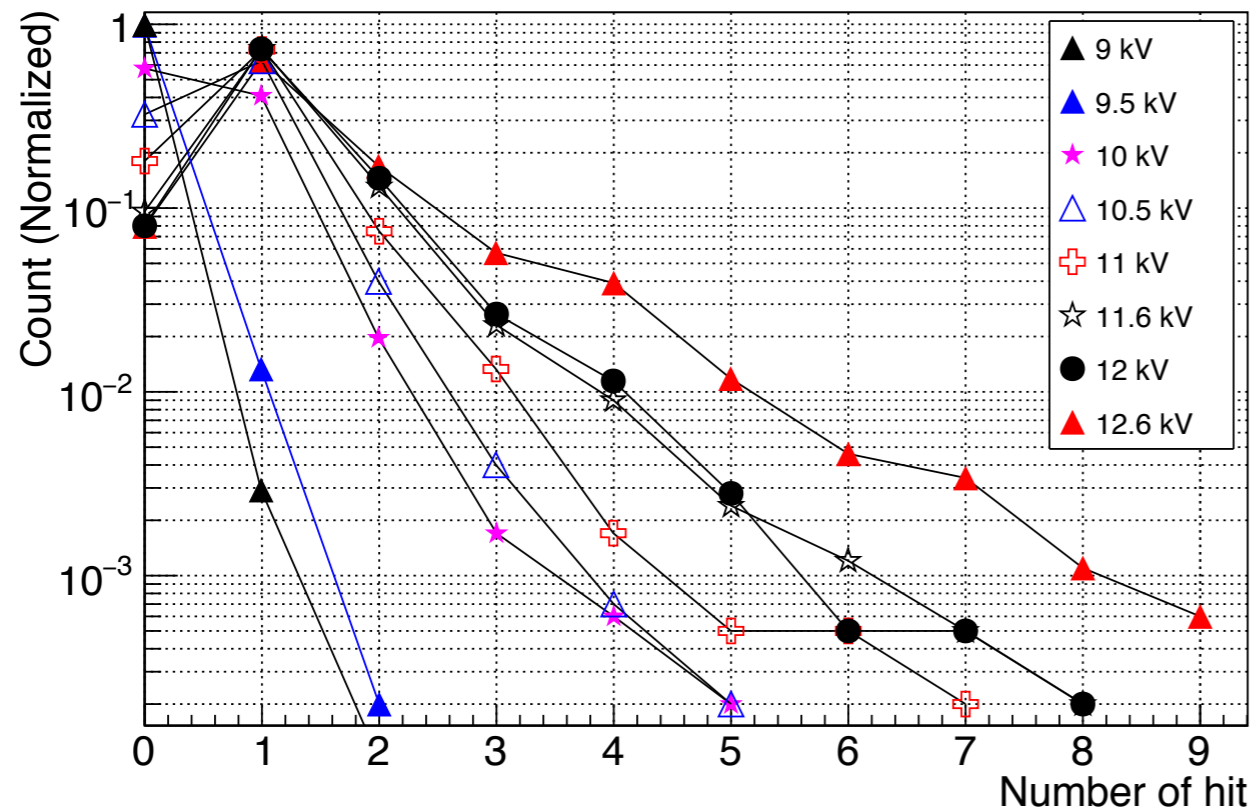
Efficiency

- The efficiency reached 94% at 12 kV for 4 gas gaps MRPC.
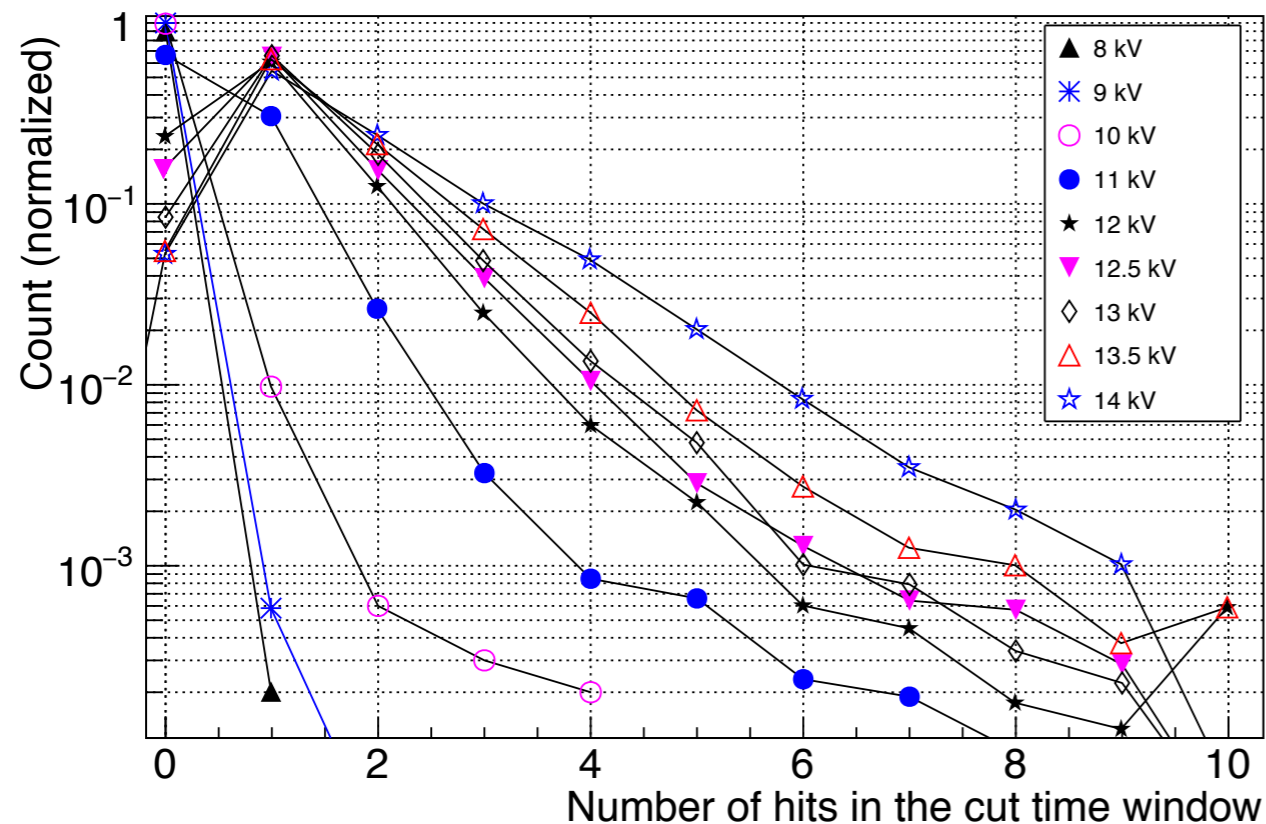- The efficiency reached 94.5% at 13.5 kV for 5 gas gaps MRPC.


Threshold sets at 114 fC

Multiplicity

For 4 gas gaps MRPC at 12 kV, around 75% of the events recording a single hit. About 19% of the events exhibited more than one hit

For 5 gas gaps MRPC at 13.5 kV, around 62.5% of the events registered single hit, and the fraction of events with more than one hit is about 32%
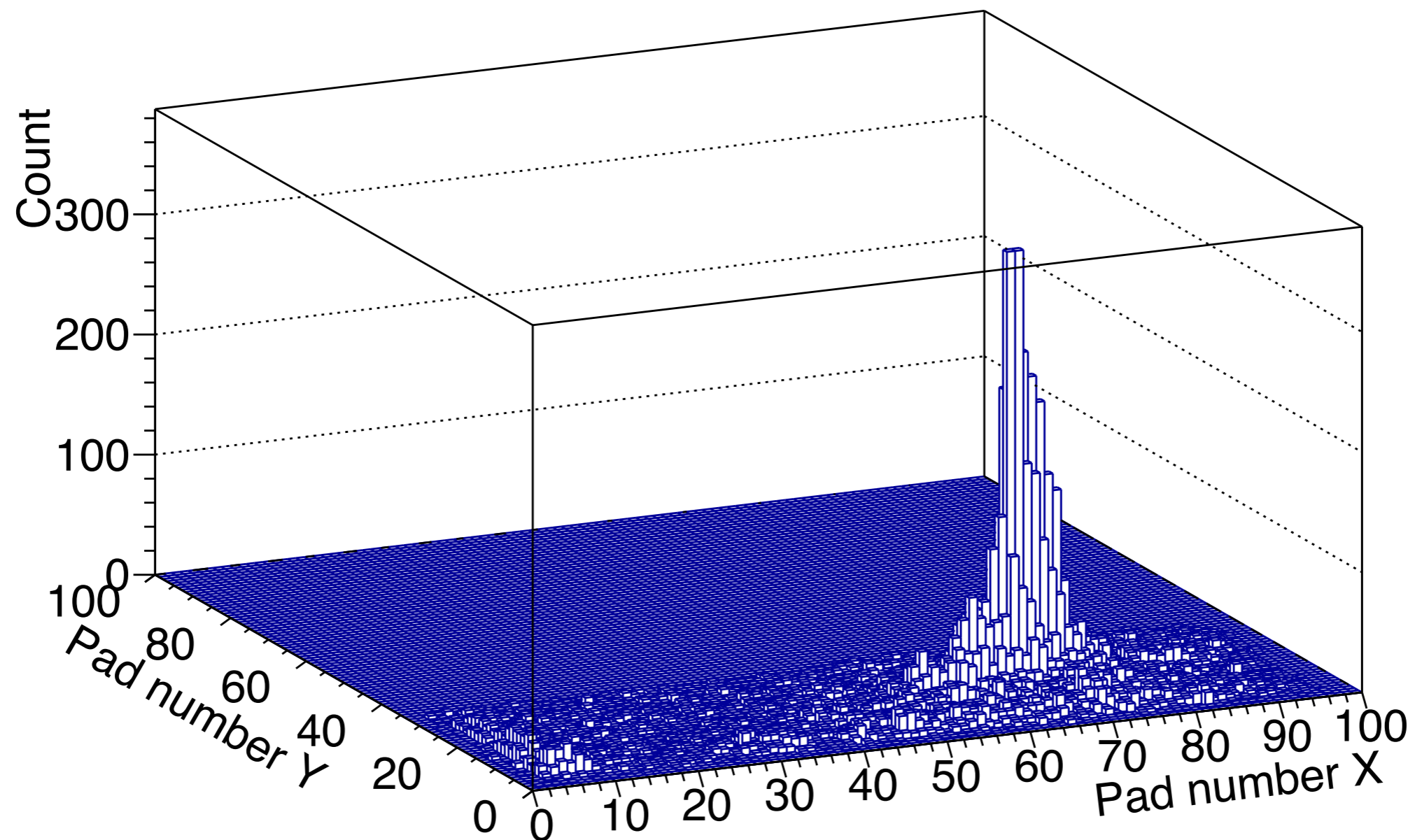
Hit map of 4 gaps MRPC

Previous fishing line pattern was not found, but it seems like there was repeated identical noise from pad line 33 to 64 in Y axis.
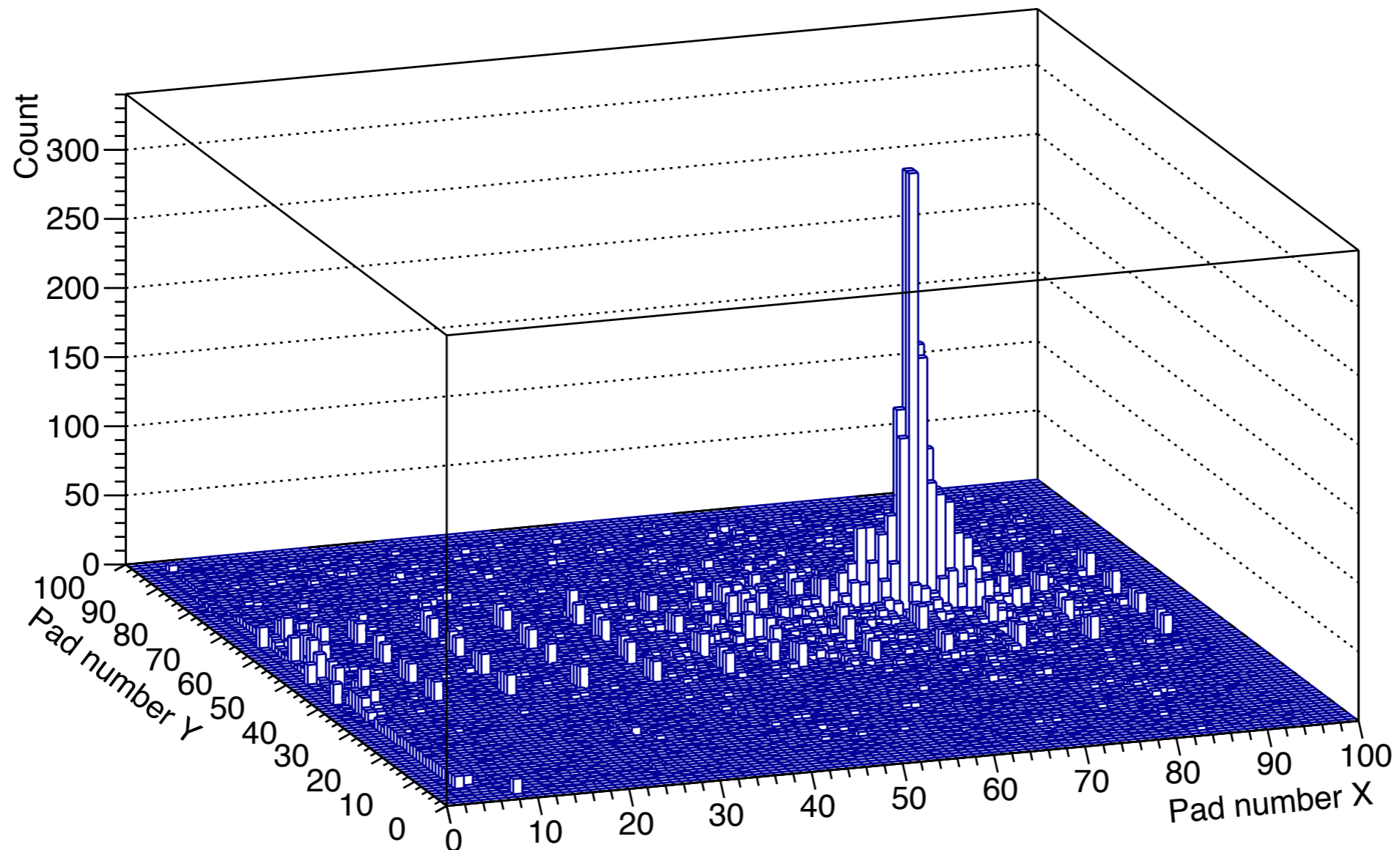
Hit map of 5 gaps MRPC

Only 1/3 of the chamber are measured due to electronics problem.
The background of the noise is quite homogeneous and no pattern was found.

Thanks!

Especially to Imad for his essential help (electronics and boxes are from Lyon)