ECOGAS (RPC 6) pad test

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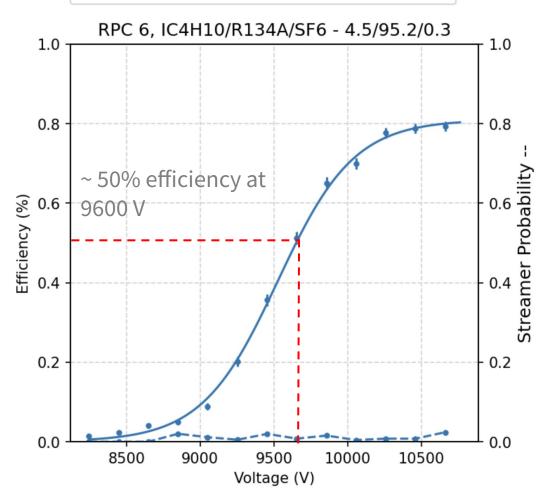
ECOGAS@GIF++ COLLABORATION





Detectors status

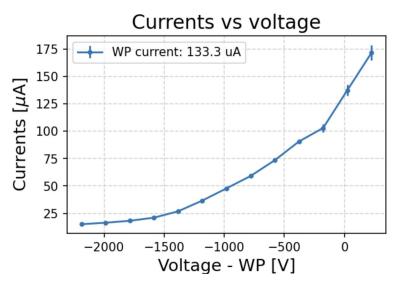
RPC 6, Eff: 80.99 %, SP: 0.76 %, WP: 10435 V



Integrated a total of 300 mC/cm²

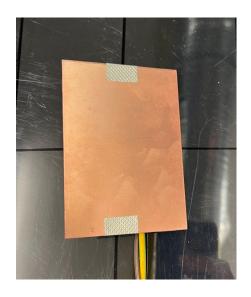
Detector dismounted and tested in the lab with cosmic muons

Data taken with STD gas mixture in April 2023

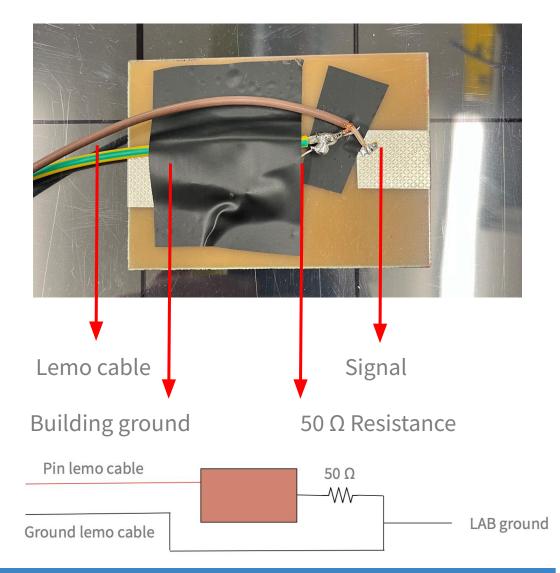




Set up



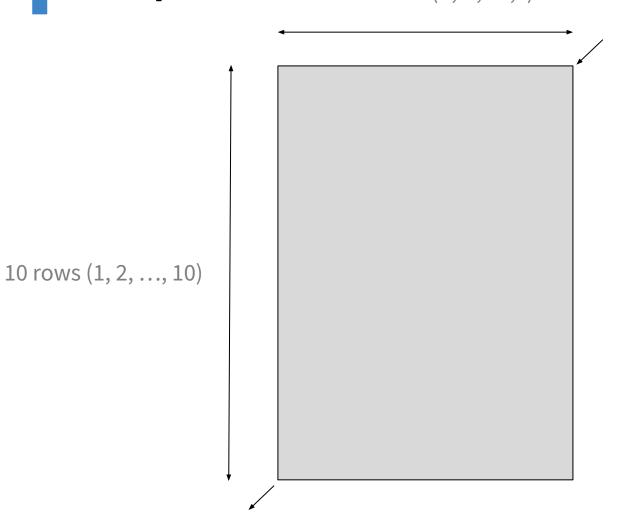
- RPC divided into 9x10 square
- Used digitizer 1730 Desktop for the acquisition



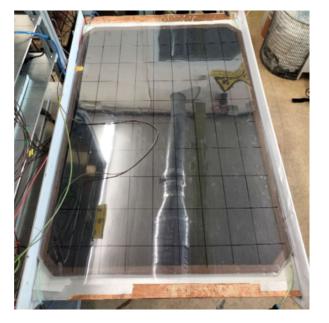


Set up

9 columns (A, B, ..., I)



Gas input



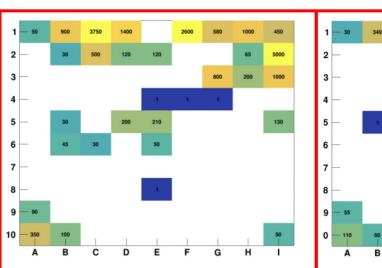
Plot available here

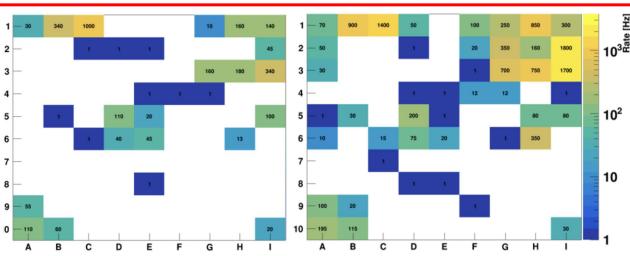
Data taking: Oscilloscope

- 1. Oscilloscope:
 - some spot where tested using only the oscilloscope.
 - -> see single signal

7.2 mv

- -> selection of the threshold
- -> rate from this data used to confirm the one from the digitizer





15.2 mv

Data taken by hand. Blue spot (= 1 Hz) are the one that sometimes shows some counting..



Data taking: Digitizer

2. Digitizer:

We selected a low threshold: 7.2 mV We selected two different HV: 9000 V and 9600 V

- -> the acquisition is taken in autotrigger with the threshold set in the wavedump config file
- -> we set 10000 events for each position
- -> for very low rate, the acquisition had been stopped before

Analysis:

- Computation of the rate



Comparison between 2 acquisitions

Threshold: 7.2 mV

High voltage: 9000 V and 9600 V

Rate gradient



Rate gradient



400

- 350

- 300

- 250

- 150

100

50

Rate: 96.4 Hz/cm2	Rate: 255.1 Hz/cm2	Rate: 429.6 Hz/cm2	Rate: 51.1 Hz/cm2	Rate: 15.2 Hz/cm2	Rate: 9.8 Hz/cm2	Rate: 83.7 Hz/cm2	Rate: 426.2 Hz/cm2	Rate: 293.4 Hz/cm2		42	late: 21.8 :/cm2	Rate: 340.9 Hz/cm2	Rate: 402.9 Hz/cm2	Rate: 281.2 Hz/cm2	Rate: 2.6 Hz/cm2	Rate: 6.8 Hz/cm2	Rate: 141.9 Hz/cm2	Rate: 328.2 Hz/cm2	Rate: 434.6 Hz/cm2
Rate: 438.2 Hz/cm2	Rate: 59.8 Hz/cm2	Rate: 234.9 Hz/cm2	Rate: 435.3 Hz/cm2	Rate: 437.2 Hz/cm2	Rate: 435.7 Hz/cm2	Rate: 432.1 Hz/cm2	Rate: 69.2 Hz/cm2	Rate: 422.8 Hz/cm2	- 40	2	ate: 29.8 c/cm2	Rate: 6.7 Hz/cm2	Rate: 409.7 Hz/cm2	Rate: 70.2 Hz/cm2	Rate: 44.9 Hz/cm2	Rate: 11.2 Hz/cm2	Rate: 12.5 Hz/cm2	Rate: 300.7 Hz/cm2	Rate: 433.1 Hz/cm2
Rate: 30.0 Hz/cm2	Rate: 0.1 Hz/cm2	Rate: 0.6 Hz/cm2	Rate: 1.9 Hz/cm2	Rate: 2.4 Hz/cm2	Rate: 4.8 Hz/cm2	Rate: 28.3 Hz/cm2	Rate: 286.0 Hz/cm2	Rate: 435.6 Hz/cm2	- 35	7	ate: 72.6 r/cm2	Rate: 0.1 Hz/cm2	Rate: 0.2 Hz/cm2	Rate: 0.5 Hz/cm2	Rate: 1.0 Hz/cm2	Rate: 436.3 Hz/cm2	Rate: 432.2 Hz/cm2	Rate: 434.0 Hz/cm2	Rate: 435.3 Hz/cm2
Rate: 4.8 Hz/cm2	Rate: 0.4 Hz/cm2	Rate: 0.8 Hz/cm2	Rate: 4.4 Hz/cm2	Rate: 4.2 Hz/cm2	Rate: 18.1 Hz/cm2	Rate: 4.2 Hz/cm2	Rate: 0.7 Hz/cm2	Rate: 1.8 Hz/cm2	- 30	5	ate: 5.1 :/cm2	Rate: 0.6 Hz/cm2	Rate: 0.2 Hz/cm2	Rate: 1.9 Hz/cm2	Rate: 11.7 Hz/cm2	Rate: 13.6 Hz/cm2	Rate: 9.5 Hz/cm2	Rate: 3.3 Hz/cm2	Rate: 71.8 Hz/cm2
Rate: 0.3 Hz/cm2	Rate: 12.5 Hz/cm2	Rate: 0.1 Hz/cm2	Rate: 34.7 Hz/cm2	Rate: nan Hz/cm2	Rate: 0.5 Hz/cm2	Rate: 0.3 Hz/cm2	Rate: 25.5 Hz/cm2	Rate: 60.7 Hz/cm2	- 25	30 1	ate: 1.0 :/cm2	Rate: 38.1 Hz/cm2	Rate: 25.7 Hz/cm2	Rate: 236.0 Hz/cm2	Rate: 145.5 Hz/cm2	Rate: 1.4 Hz/cm2	Rate: 2.7 Hz/cm2	Rate: 32.8 Hz/cm2	Rate: 117.0 Hz/cm2
Rate: 1.8 Hz/cm2	Rate: 47.6 Hz/cm2	Rate: 73.2 Hz/cm2	Rate: 6.6 Hz/cm2	Rate: 2.9 Hz/cm2	Rate: 6.6 Hz/cm2	Rate: 0.7 Hz/cm2	Rate: 121.6 Hz/cm2	Rate: 3.9 Hz/cm2	- 20	00	ate: 3.2 :/cm2	Rate: 3.2 Hz/cm2	Rate: 52.1 Hz/cm2	Rate: 5.1 Hz/cm2	Rate: 10.2 Hz/cm2	Rate: 36.4 Hz/cm2	Rate: 3.8 Hz/cm2	Rate: 91.1 Hz/cm2	Rate: 4.7 Hz/cm2
Rate: 3.9 Hz/cm2	Rate: 0.1 Hz/cm2	Rate: 2.3 Hz/cm2	Rate: 2.7 Hz/cm2	Rate: 4.1 Hz/cm2	Rate: 10.5 Hz/cm2	Rate: 1.5 Hz/cm2	Rate: 1.1 Hz/cm2	Rate: 2.9 Hz/cm2	- 15	50 4	ate: 4.7 c/cm2	Rate: 0.7 Hz/cm2	Rate: 22.5 Hz/cm2	Rate: 15.6 Hz/cm2	Rate: 5.1 Hz/cm2	Rate: 18.5 Hz/cm2	Rate: 3.8 Hz/cm2	Rate: 5.2 Hz/cm2	Rate: 10.0 Hz/cm2
Rate: 16.0 Hz/cm2	Rate: 1.0 Hz/cm2	Rate: 8.4 Hz/cm2	Rate: 38.1 Hz/cm2	Rate: 3.5 Hz/cm2	Rate: 9.4 Hz/cm2	Rate: 1.0 Hz/cm2	Rate: 0.3 Hz/cm2	Rate: 1.9 Hz/cm2	- 10	00 1	ate: 11.9 :/cm2	Rate: 1.3 Hz/cm2	Rate: 1.1 Hz/cm2	Rate: 3.0 Hz/cm2	Rate: 6.3 Hz/cm2	Rate: 3.1 Hz/cm2	Rate: 52.0 Hz/cm2	Rate: 1.3 Hz/cm2	Rate: 12.6 Hz/cm2
Rate: 60.4 Hz/cm2	Rate: 16.1 Hz/cm2	Rate: 0.2 Hz/cm2	Rate: 0.1 Hz/cm2	Rate: 0.3 Hz/cm2	Rate: 8.8 Hz/cm2	Rate: 3.6 Hz/cm2	Rate: 0.7 Hz/cm2	Rate: 5.3 Hz/cm2	- 50	0 4	late: 12.7 c/cm2	Rate: 26.1 Hz/cm2	Rate: 1.1 Hz/cm2	Rate: 0.6 Hz/cm2	Rate: 51.5 Hz/cm2	Rate: 36.7 Hz/cm2	Rate: 12.4 Hz/cm2	Rate: 2.9 Hz/cm2	Rate: 3.8 Hz/cm2
Rate: 54.2 Hz/cm2	Rate: 71.2 Hz/cm2	Rate: 1.5 Hz/cm2	Rate: 0.4 Hz/cm2	Rate: 1.0 Hz/cm2	Rate: 2.7 Hz/cm2	Rate: 8.8 Hz/cm2	Rate: 3.2 Hz/cm2	Rate: 11.1 Hz/cm2		8	ate: 35.1 :/cm2	Rate: 85.2 Hz/cm2	Rate: 16.4 Hz/cm2	Rate: 0.6 Hz/cm2	Rate: 1.2 Hz/cm2	Rate: 6.1 Hz/cm2	Rate: 1.5 Hz/cm2	Rate: 1.6 Hz/cm2	Rate: 13.1 Hz/cm2







Results

The analysis shows that the top part of the detector has higher local rate.

- -> This method could allow to find problematic gap spot, but it doesn't allow to fully understand the issue
- -> it can be useful to test the detector before the first irradiation, and then periodically

It is also needed a comparison with a working RPC.



Future tests

1. Can Ar help?

Let the detector 'on' with Ar for some weeks, then re-take the measurements

Once the detector will be opened:

- 1. Analyze different region where the rate was different
- 2. See if high rate correspond to some irregularities of the gap
- 3. See the position of the spacer