

# RPC test @ CERN

(Stefano Dusini)

## Outline:

- Long term stability test
- Uniformity test with Dario's telescope
  - Setup
  - Preliminary results
  - Conclusion & future plan

## People:

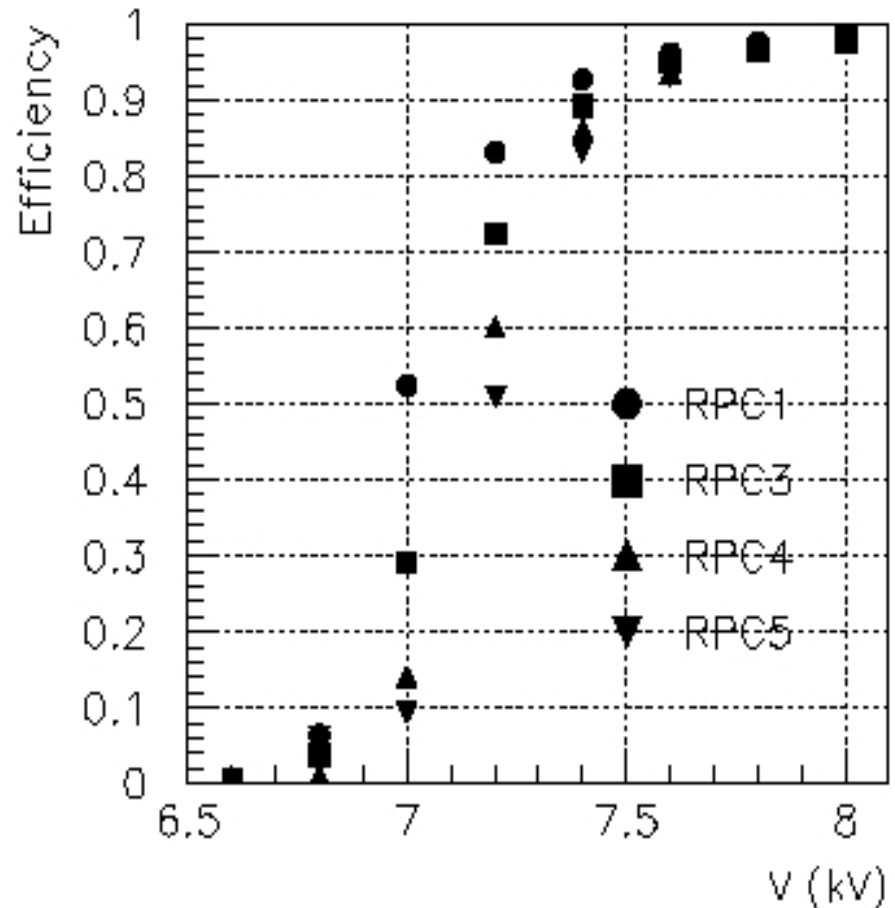
**CERN:** (idea, setup, data taking and analysis)

D.Autiero, L.Camilleri, J.Dupraz, A.Sharma, D.Bourillot

**LNF & Padova:** (data taking and analysis) A.Paoloni, S.Dusini

# Long term stability test

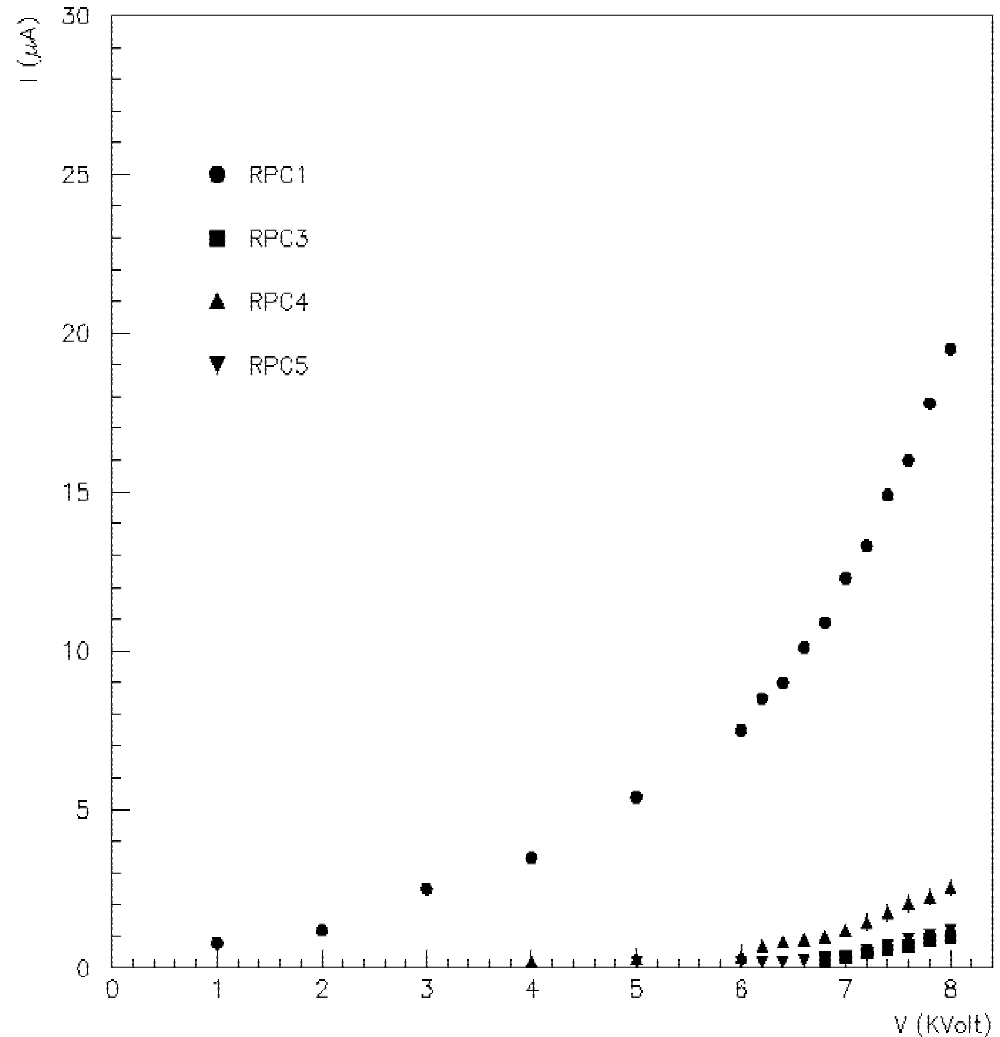
- At CERN 4 OPERA RPC chamber **ON** almost continuously **May till September**
- 4 months on surface equiv. 6 year underground
- gas mixture: 48% Ar 48%,  $C_2H_2F_4$  4%  $IC_4H_{10}$
- operating voltage 8kV
- **After 4 months no loss of efficiency**



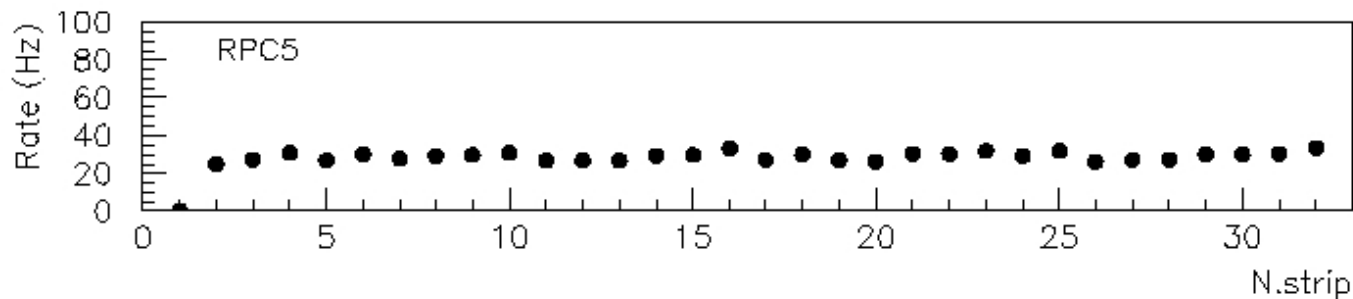
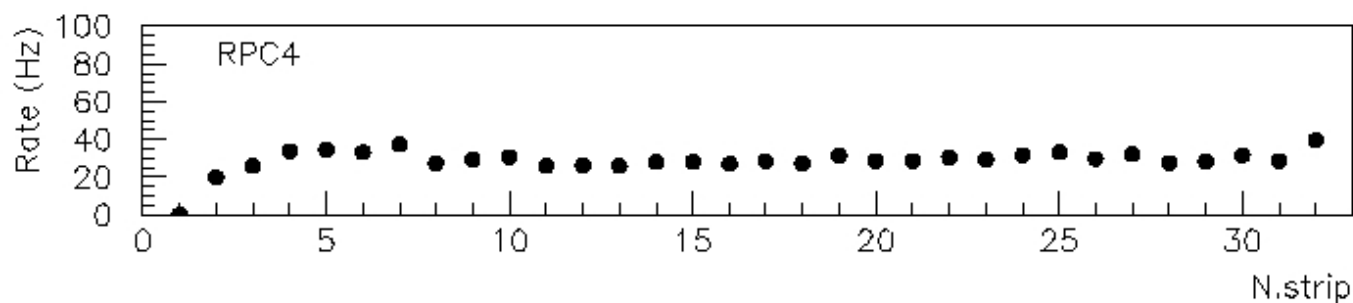
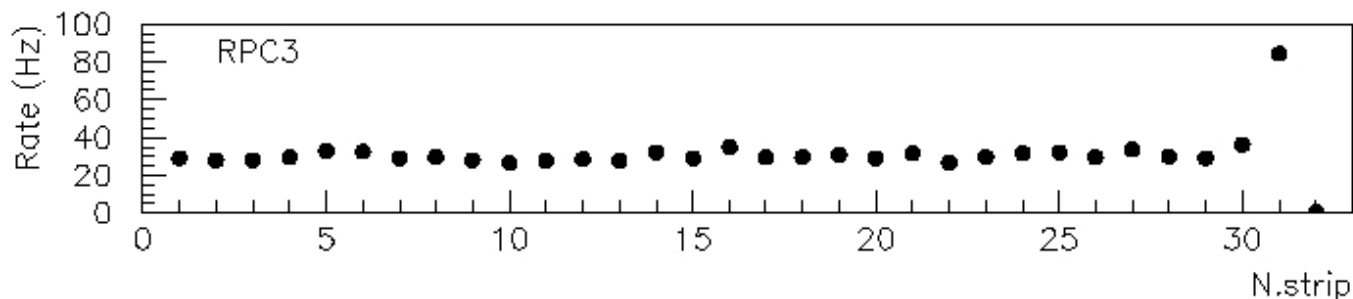
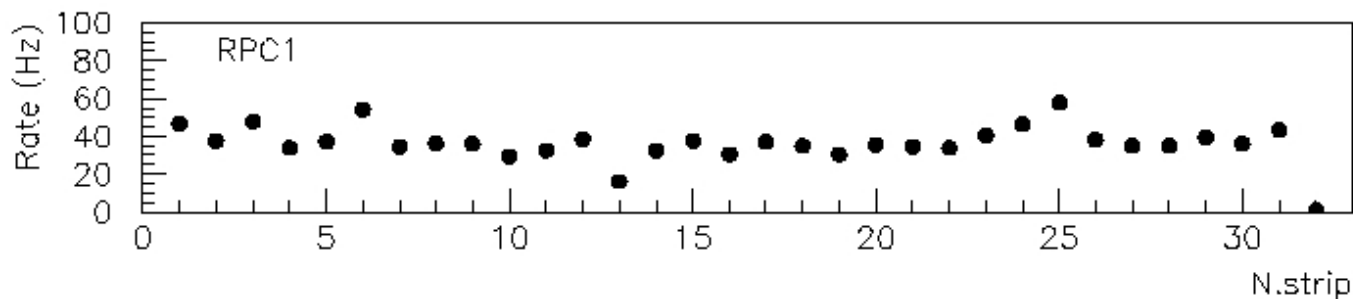
Efficiency curve taken end of August (P=964mbar T=26 C)

# Long term stability test

- In August after 20 days shutdown RPC1 start to draw high current
- We investigate carefully the reason and after having open the RPC we found a problem with oil coating near the chamber border
- The oiling of RPC changed since the production of theses RPC
- We think these problem will not show up in the final production
- The analysis is still going on and full report will be done



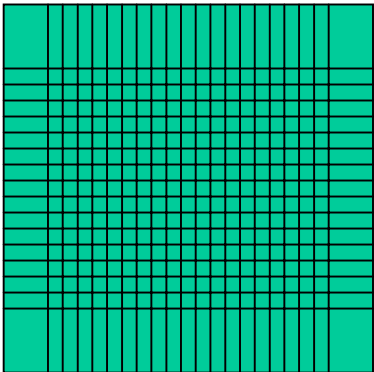
# Single rate



# Uniformity test: Setup

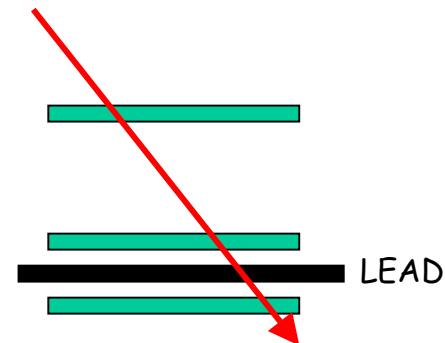
Idea: Make a radiography of entire OPERA-RPC surface (290x112 cm<sup>2</sup>) using cosmic ray with a resolution ~ 1mm

Integrate a large area trigger system with the tracking system by using a telescope of small size (60x70 cm<sup>2</sup>) RPC readout with 1cm strips + ADCs (1mm resolution already obtained in the past)



Cover the small size RPC with 48 + 48 strips  
In order to get a central region of 50x50 cm<sup>2</sup>  
To be used for trigger+tracking (x,y views)

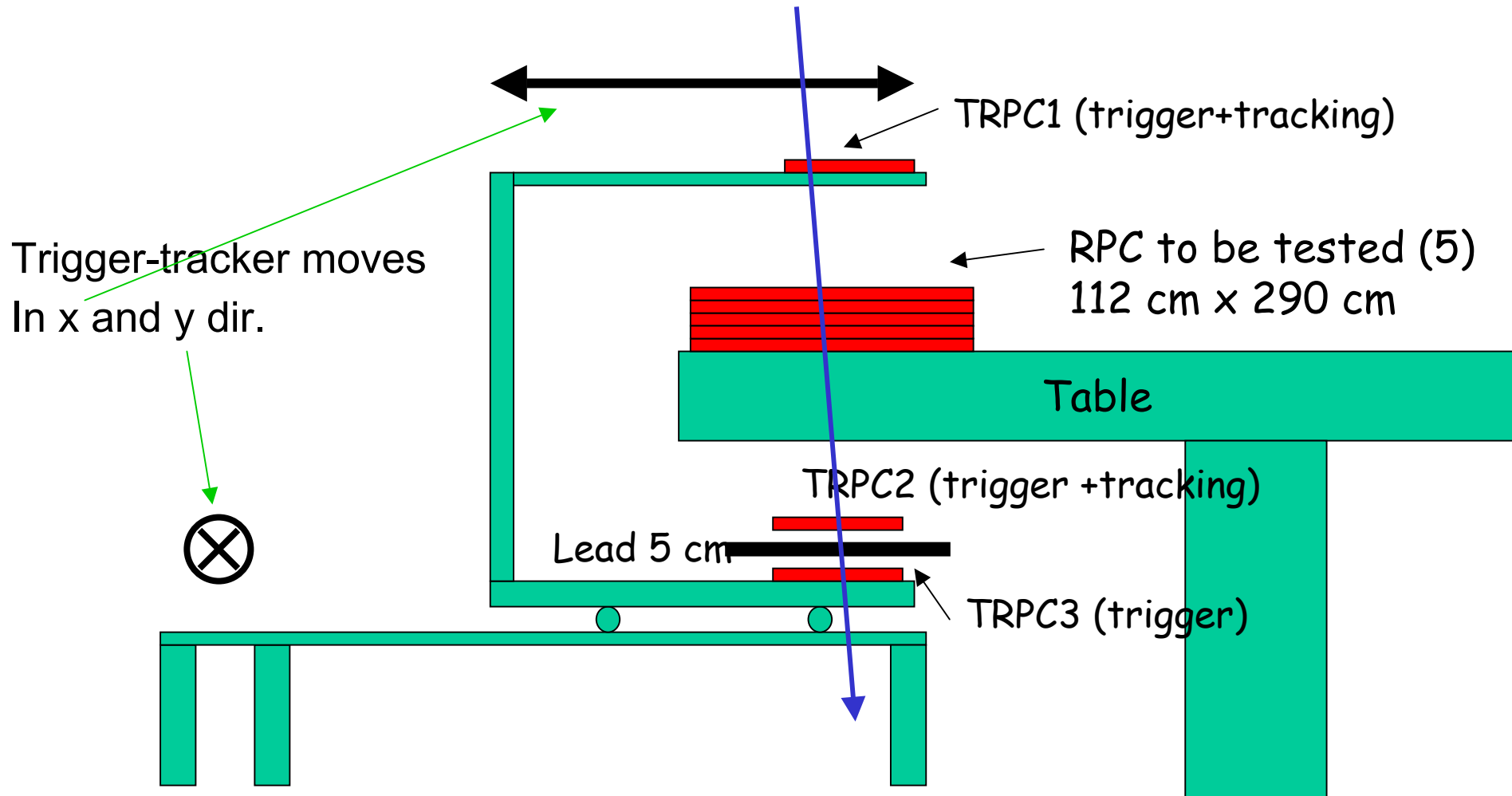
Build a telescope of 3 of these RPC (TRPC) to be put in coincidence for the trigger and measure the muons impact points and angles.  
5 cm thick lead filter to suppress the soft component



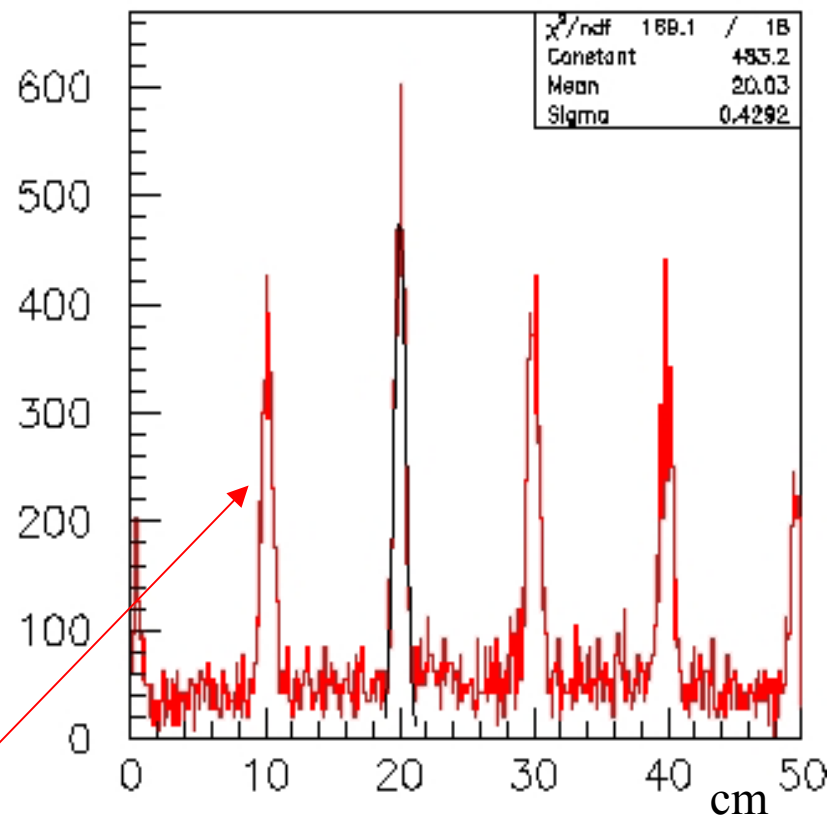
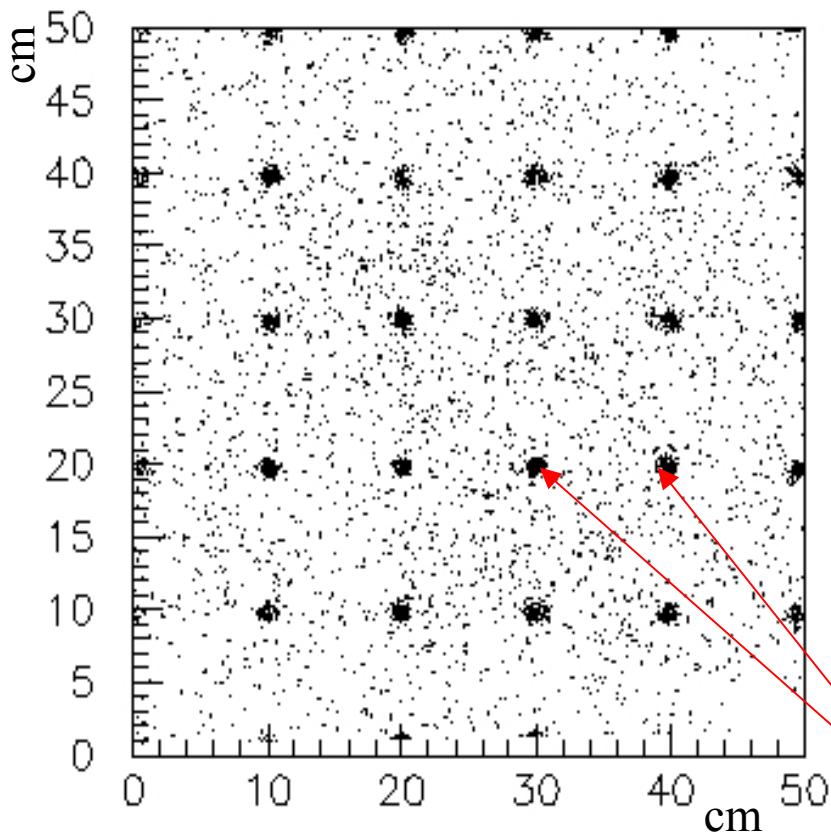
# Schematic view of the telescope and the X-Y system (not in scale)

Trigger-tracker: 3 RPC (60x70 cm<sup>2</sup>) with 2x48 strips of 1cm read by 6 ADC - total of 196 channels. Trigger rate 20 Hz.

Test RPC: 5 RPC (290x112 cm<sup>2</sup>) equipped with 32 strip of 3.5 cm read by ADC - total of 128 channels



# Inefficiency distribution



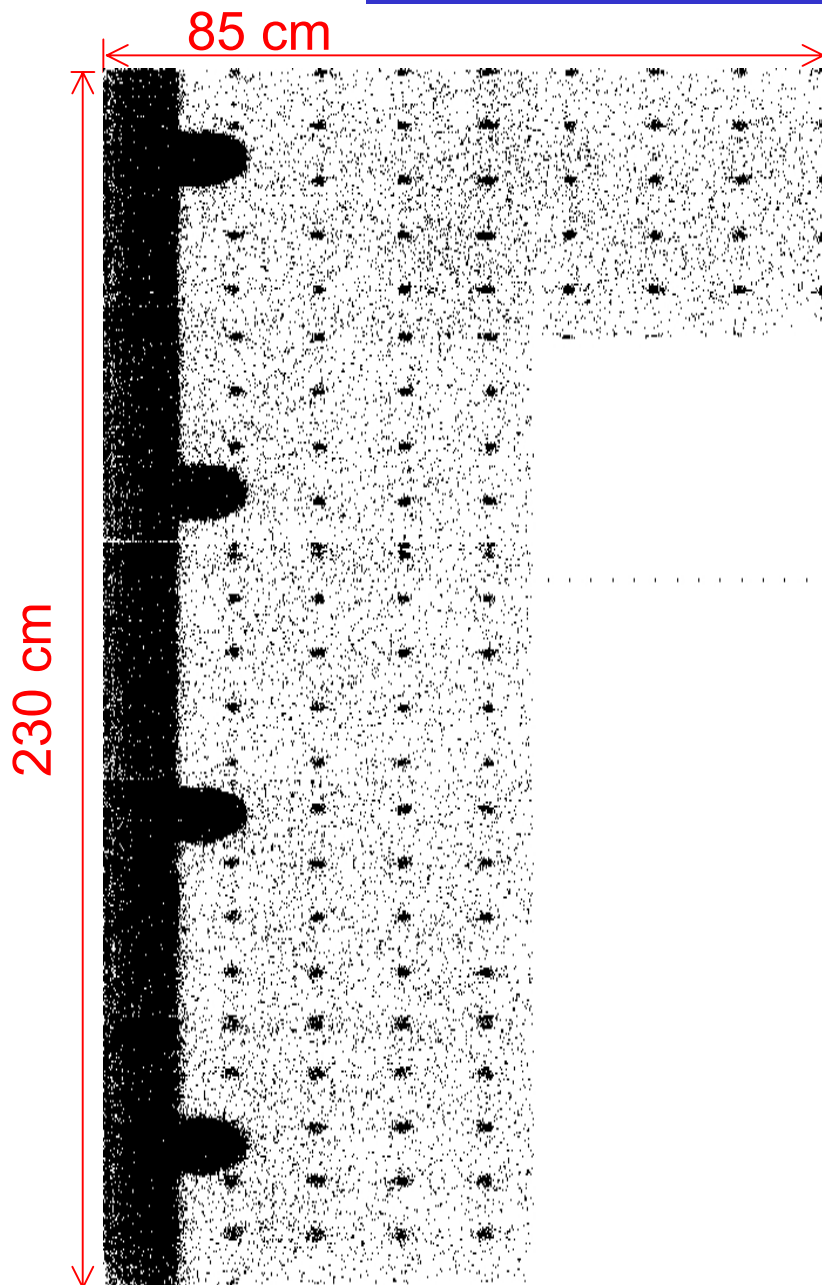
Spacer

## Inefficiency plot:

- Point represent coordinates of particle not giving signals in the large RPC
- 360k events (6 hour data taking with 20 Hz trigger rate)

Projecting on the one axis and fitting  
Effective radius of the spacer 0.43 cm

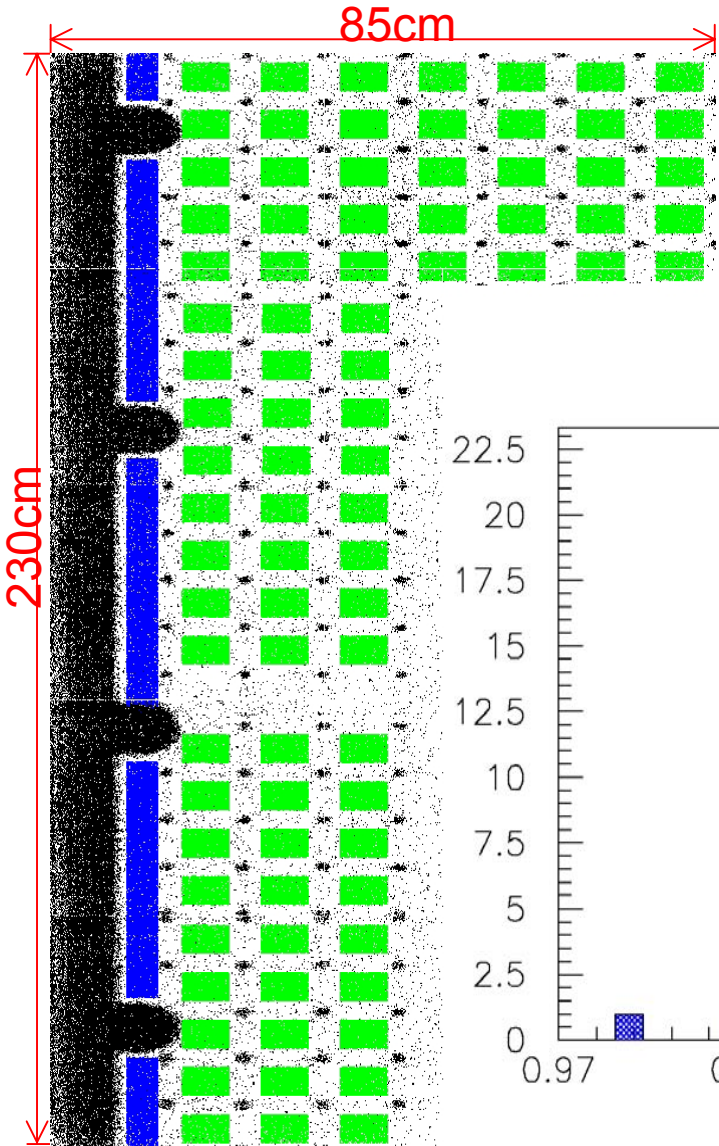
# Uniformity test



- The entire surface of all RPCs has been scan.  $\sim 6 \cdot 10^6$  events recorded in 7 day with 24 hour running
- Part of the data are already on CASTOR ( $\sim 6$  Gbyte)
- The full analysis of the data is in progress and the results will report in the future
- Here I present preliminary results on a small sub sample of the radiography of RPC5

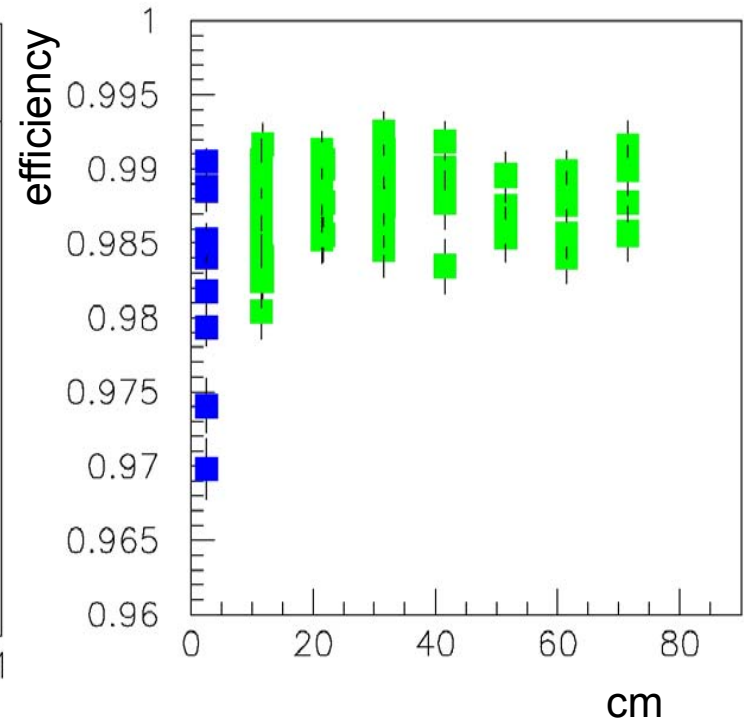
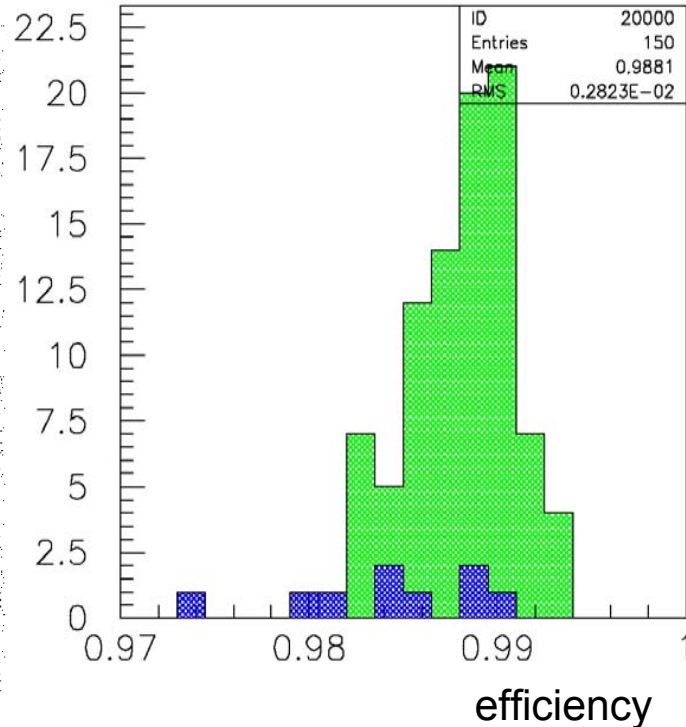


# Uniformity test *cont.*



Efficiency in a box  $6 \times 6 \text{ cm}^2$  between spacer and box of 4 cm width close to the border

Intrinsic efficiency  $0.988 \pm 0.003$



# Conclusion & Future

- A cosmic ray telescope with 1mm resolution and capability to scan the entire RPC surface has been setup and run by the CERN group.
- Precise efficiency and uniformity measurement on 4 OPERA RPC done
- The analysis to the data collected this summer is in progress and the final results will be presented as soon as they will be ready
- Due to the withdraw of CERN we can not keep in operation the telescope at CERN and has to be move to Gran Sasso (November)
- The facility will be use for long term monitoring of the performance of a sample of RPC produced for OPERA and more in general to perform a cosmic-rays Muonscopy of any kind of detector

