Short Status of TB Analyses in SDHCAL

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Progress in the SDHCAL analysis

- Mini-SDHCAL

  Standard GRPC

  High-Rate GRPC
- 1m^2 performance study

Mini-SDHCAL

(2008-2009)

4+1 GRPCs

Each equipped with 4 HR1 (4x8X8 =256 ch)

→4 standard GRPCs

(Float glass, graphite painting)

→1 GRPC :

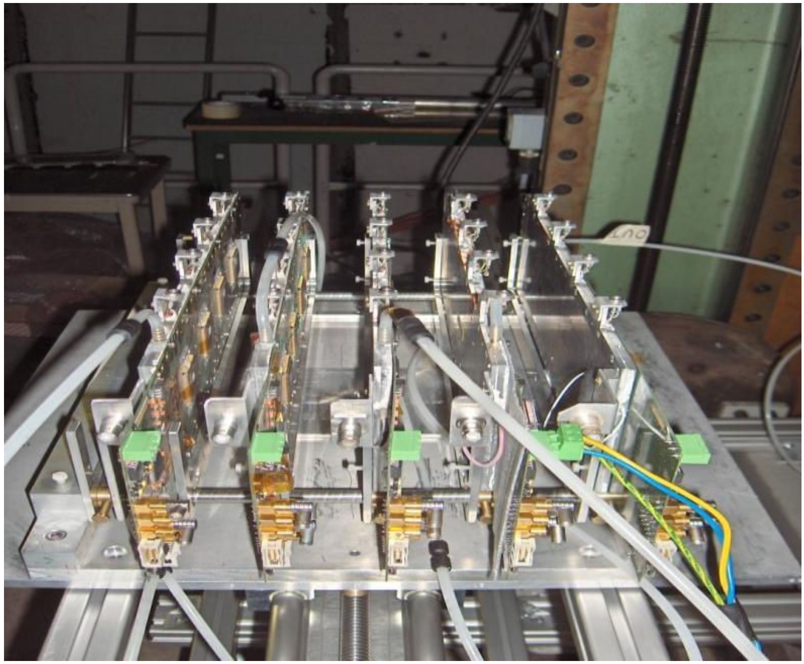
*Different paintings

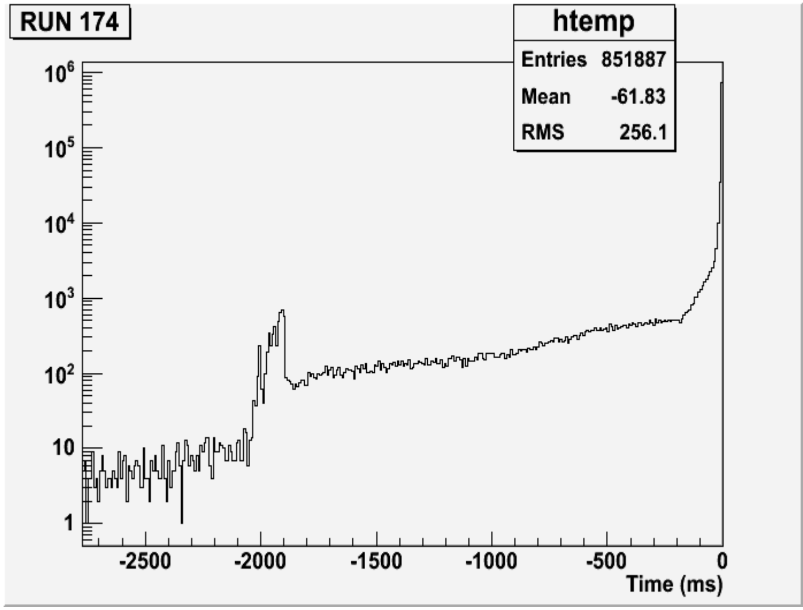
* Semi-conductive glass

→Trigger system :

2 PM-scintillators

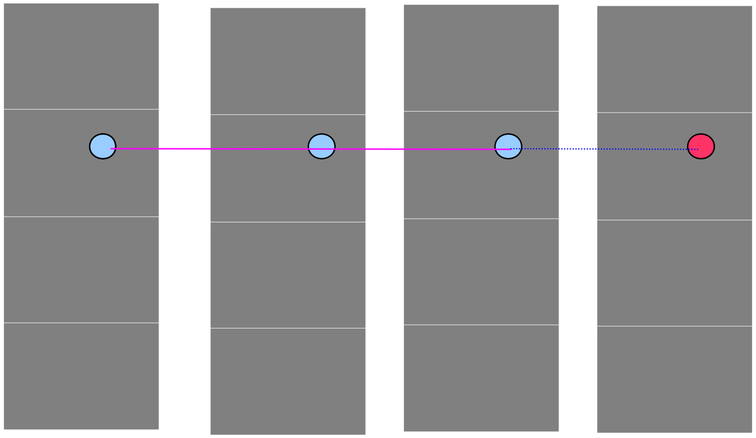
External trigger → read recorded events and sort them out according to their time stamp % trigger



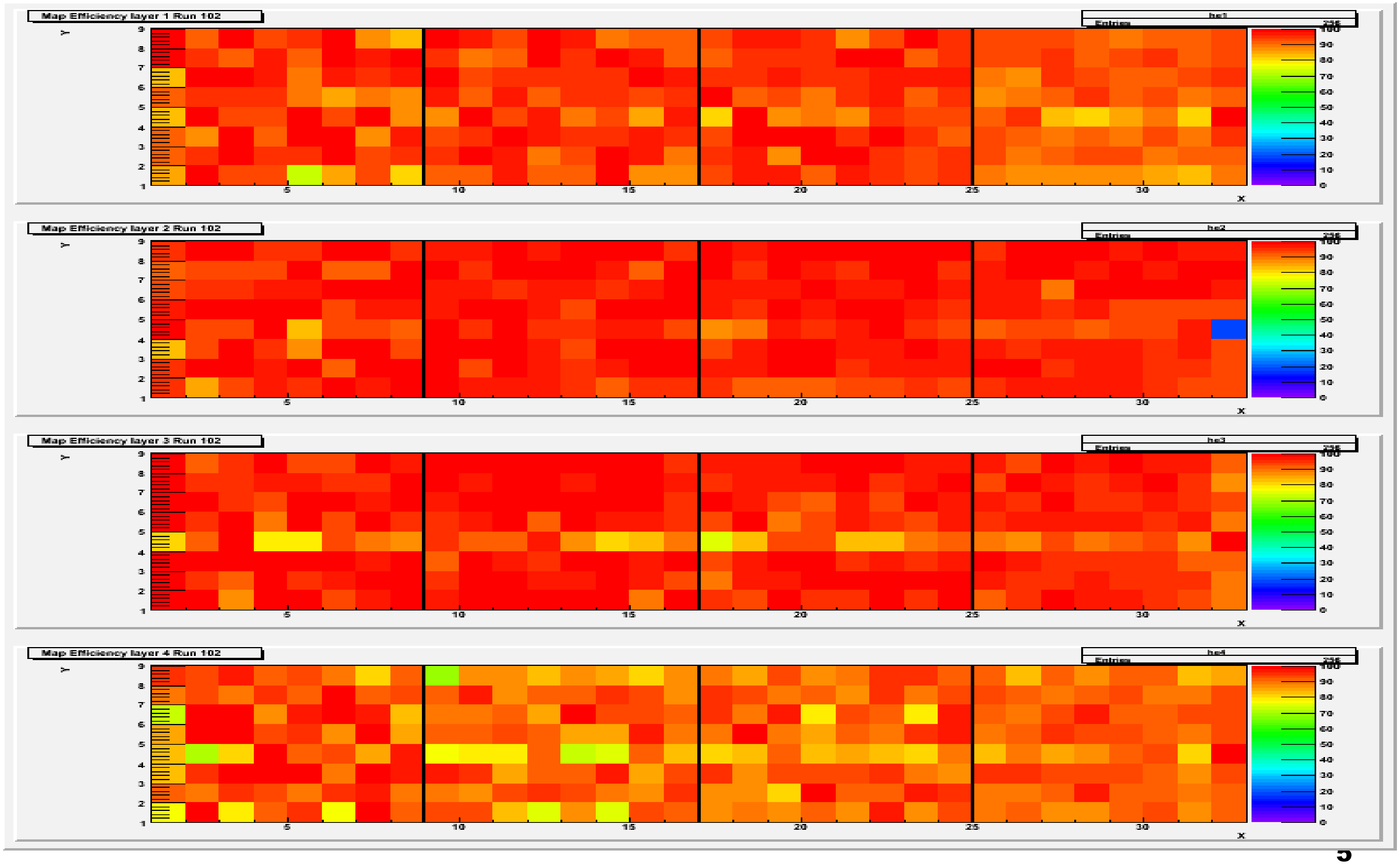


Principle :

To study one of the GRPCs, tracks are made of the hits belonging to the other GRPCs are built and projected on the studied one → efficiency and multiplicity



Uniformity of the GRPCs response (RUN 102, HV =7;4 kV)

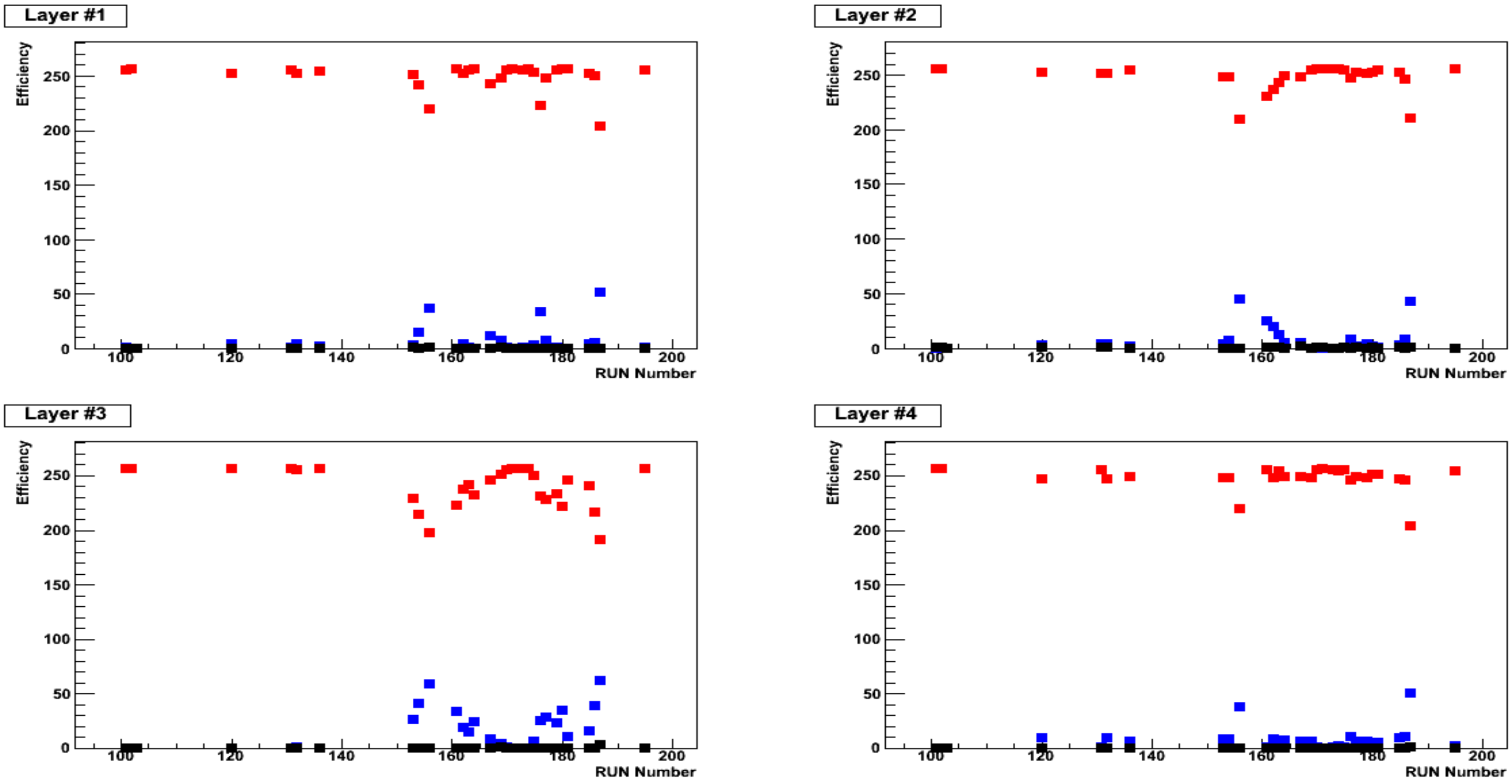


Stability of Efficiency in time

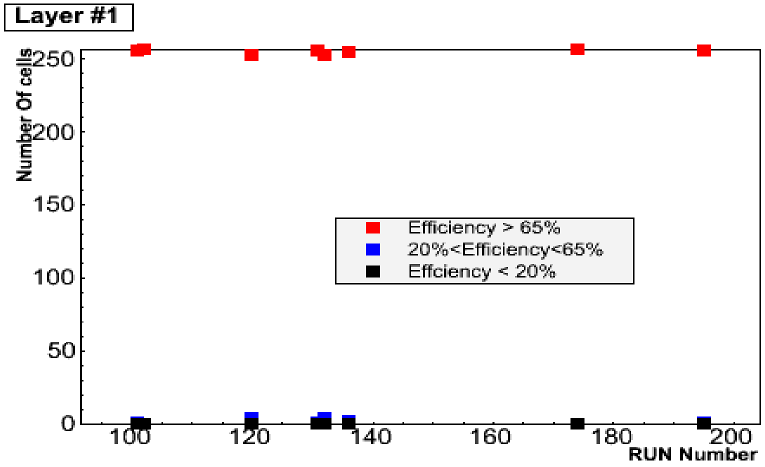
Efficient cells: Eff > 65%

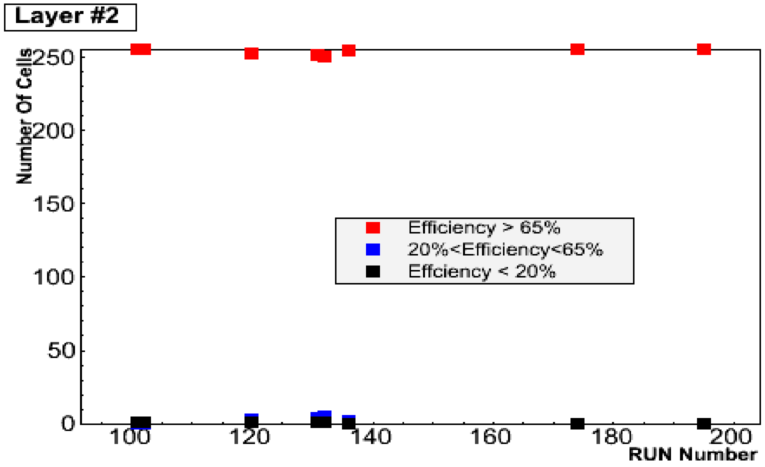
Medium cells: 20% < Eff < 65%

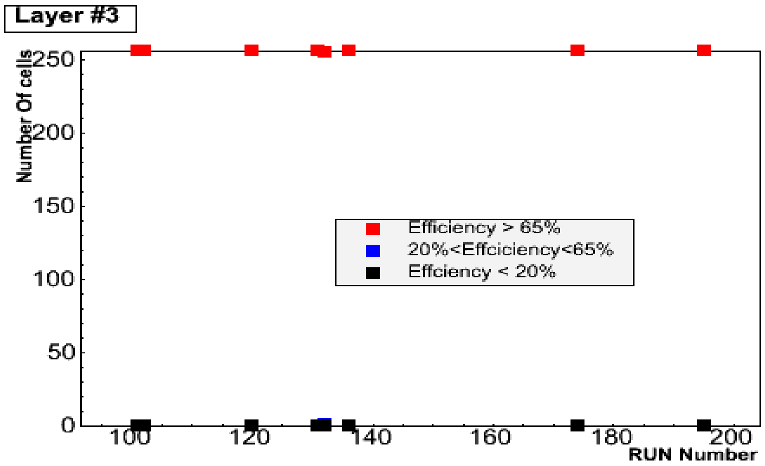
Dead cells: Eff < 20%

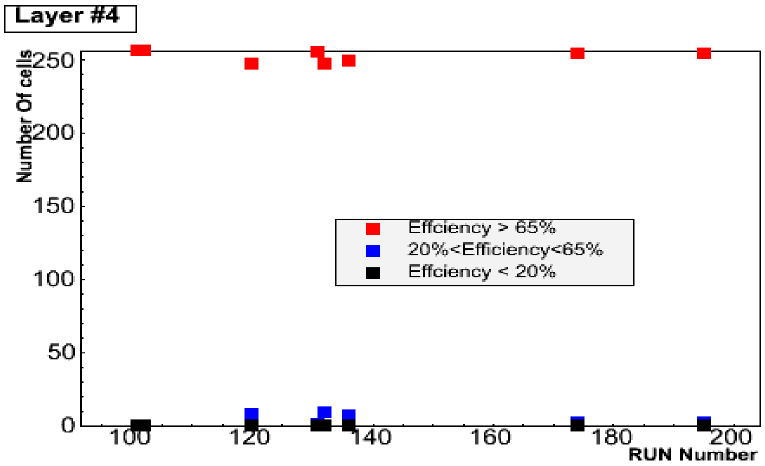


All high-voltage values


Layer #1
Number Of cells
250
200
150
100
50
0
100
120
140
160
180
200
RUN Number
🟥 Efficiency > 65%
🟦 20%<Efficiency<65%
⬛ Effciency < 20%

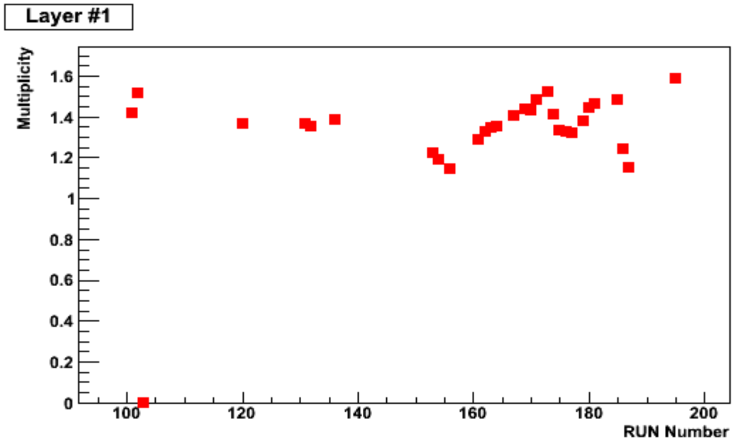

Layer #2
Number Of Cells
250
200
150
100
50
0
100
120
140
160
180
200
RUN Number
🟥 Efficiency > 65%
🟦 20%<Efficiency<65%
⬛ Effciency < 20%

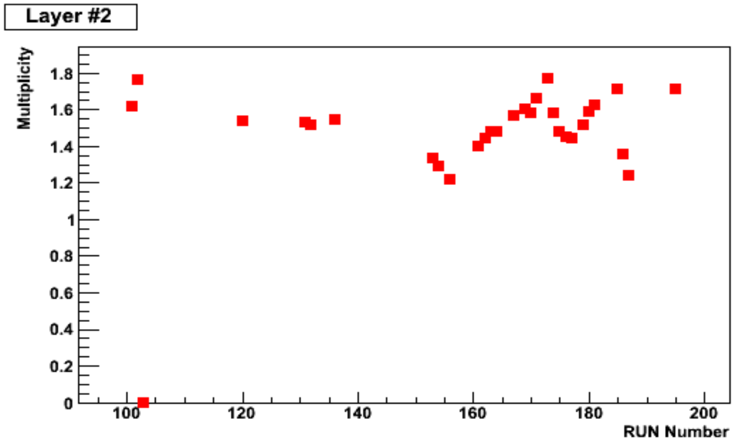

Layer #3
Number Of cells
250
200
150
100
50
0
100
120
140
160
180
200
RUN Number
🟥 Efficiency > 65%
🟦 20%<Effciciency<65%
⬛ Effciency < 20%

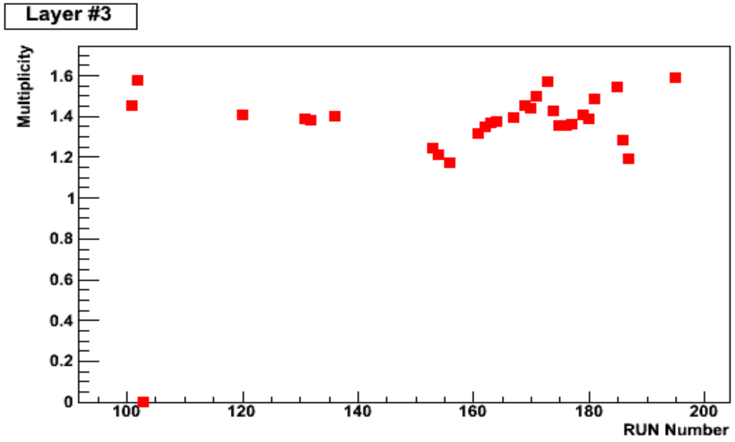

Layer #4
Number Of cells
250
200
150
100
50
0
100
120
140
160
180
200
RUN Number
🟥 Effciency > 65%
🟦 20%<Efficiency<65%
⬛ Effciency < 20%

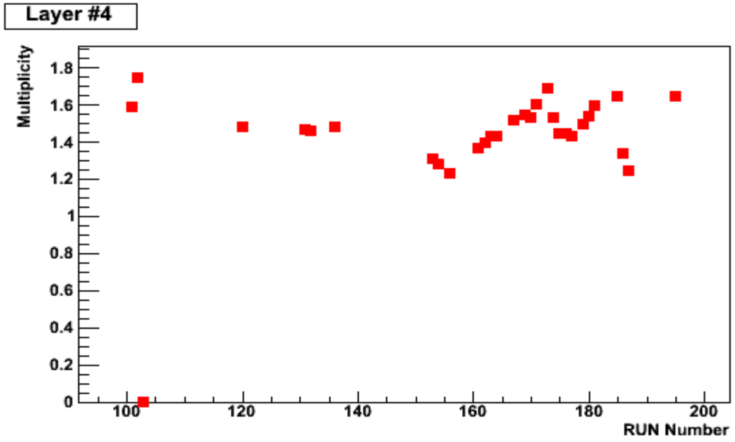
Only 7.4 kV

Stability of Multiplicity in time

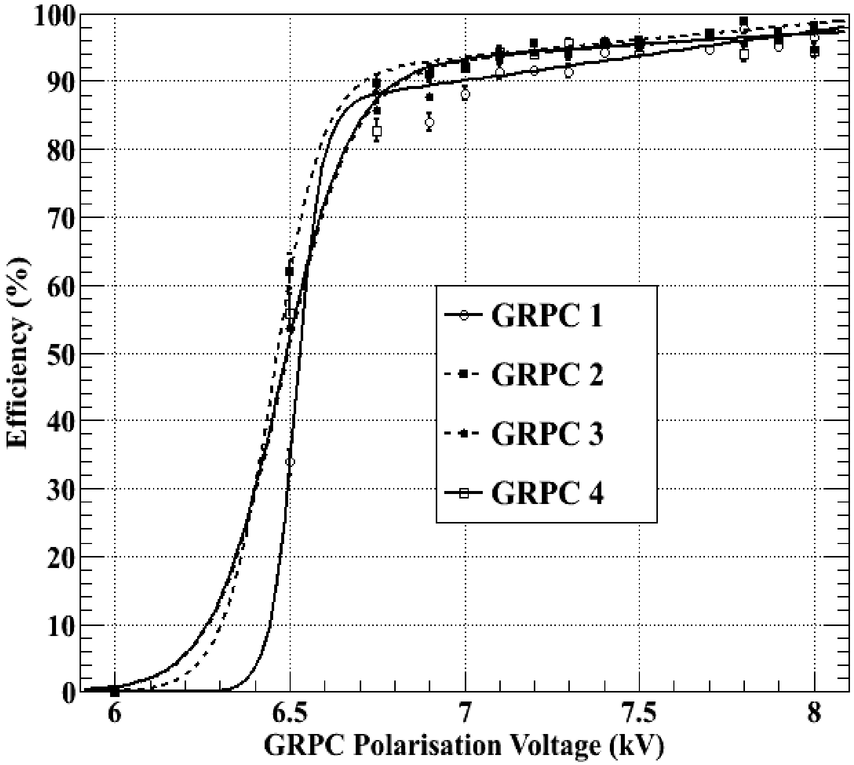


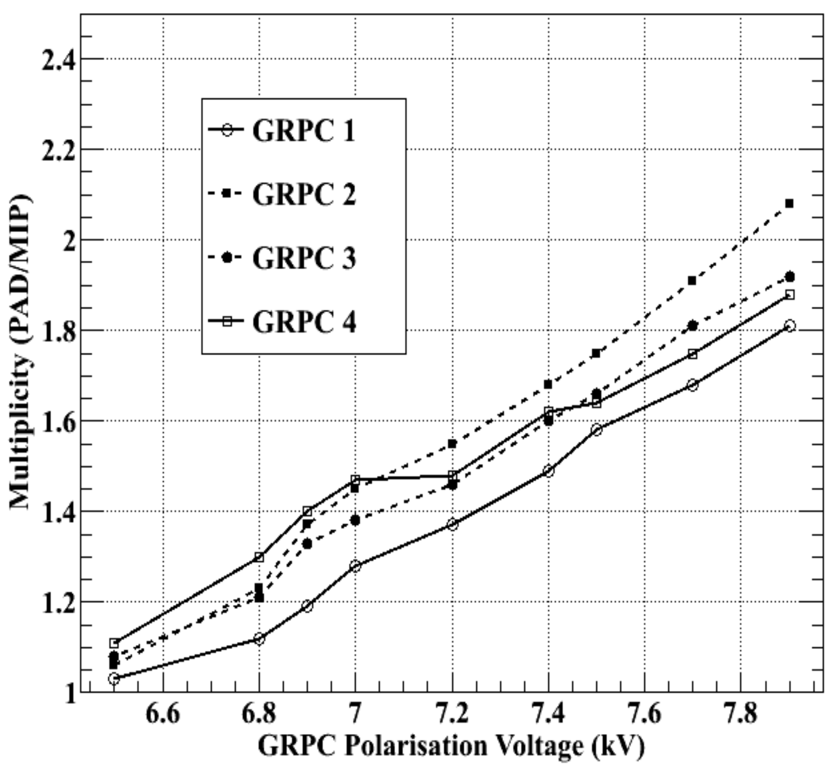




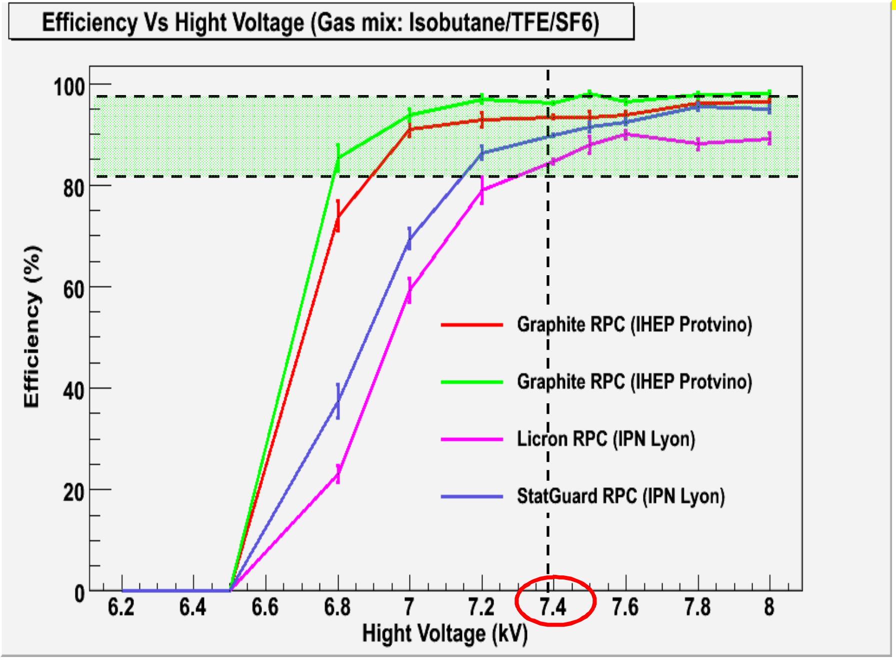


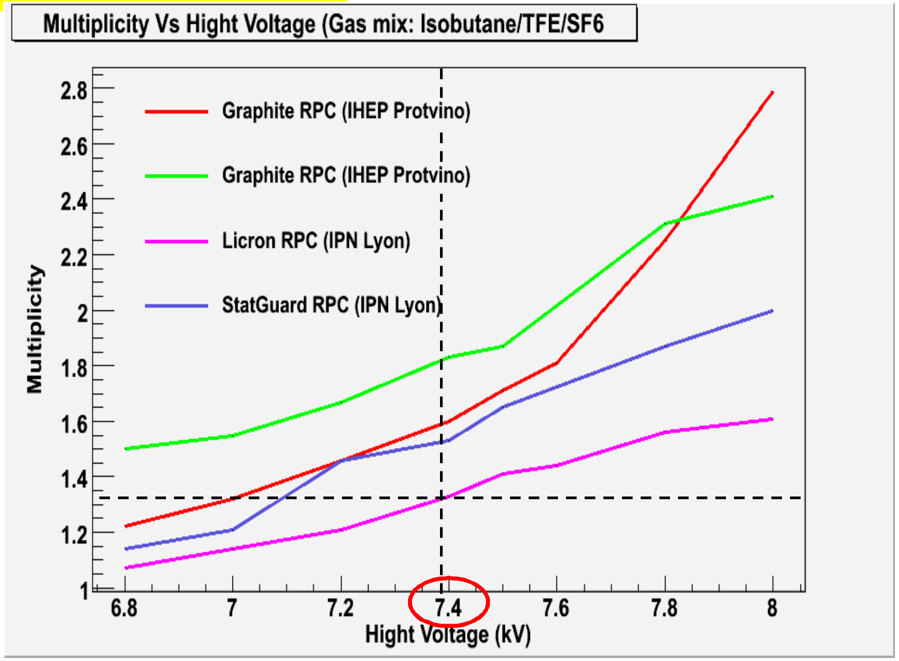
Results with standard GRPCs

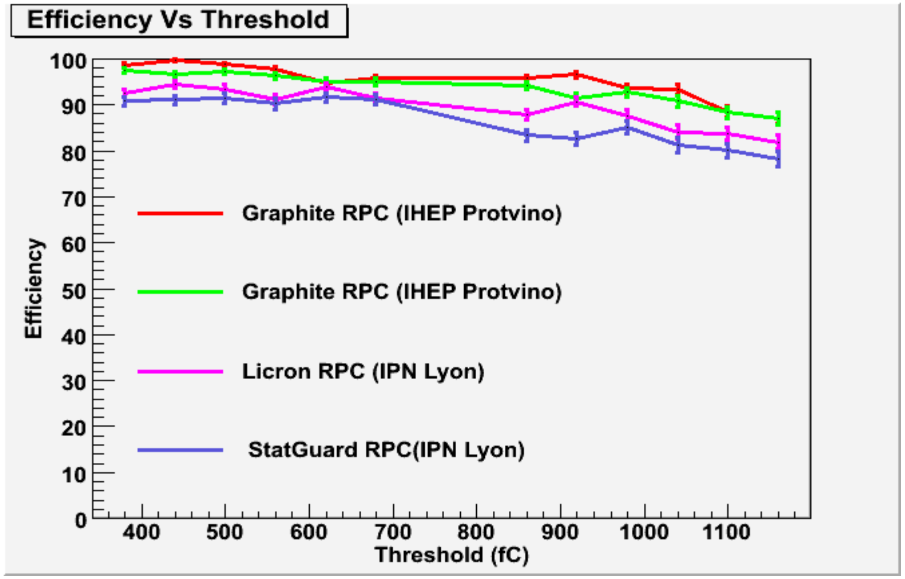


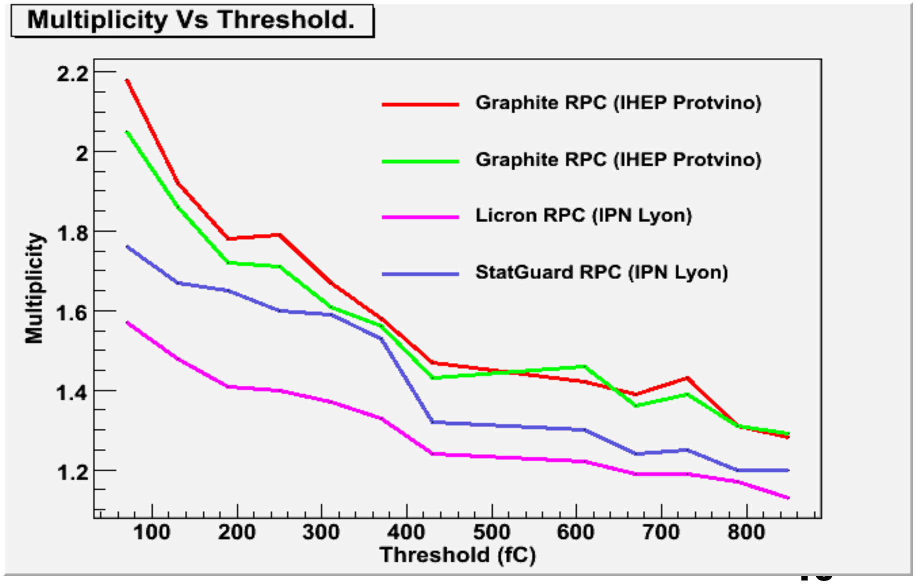


GRPCs Comparison





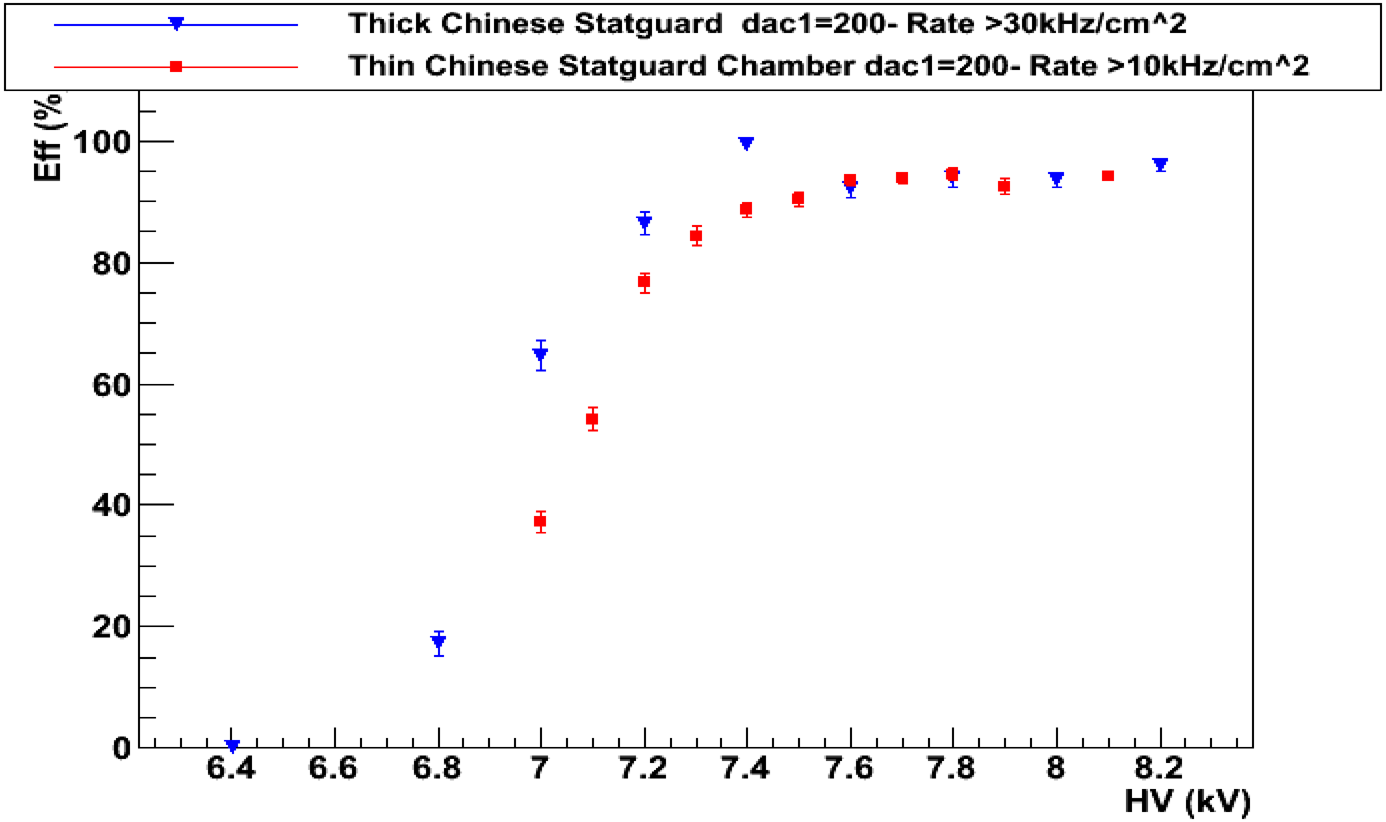




GRPCs Comparison

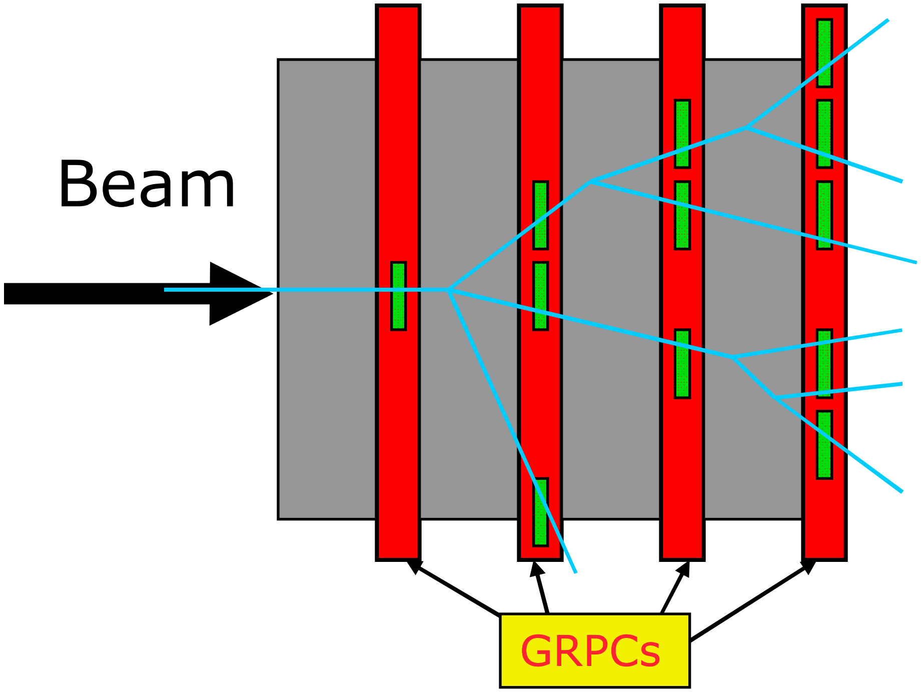
Performance of high rate GRPC

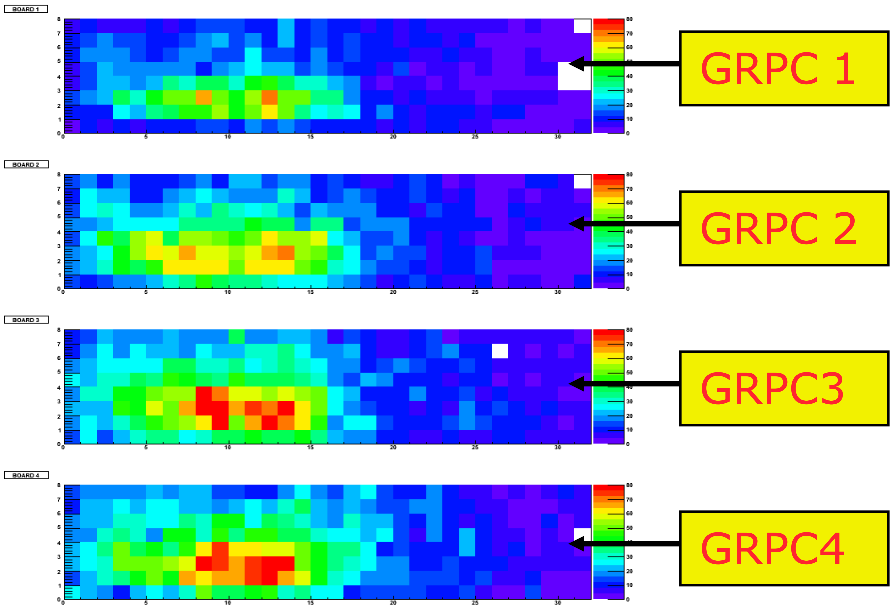
Semi-conductive glass resistivity 10^{10} Ω.cm to be compared with 10^{13} Ω.cm for float (standard) glass



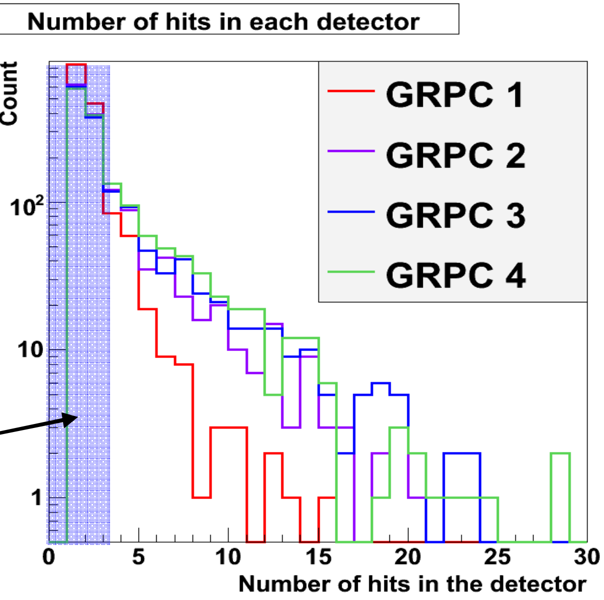
50X50 cm^2 glass plates are being produced for SDHCAL

Hadronic showers



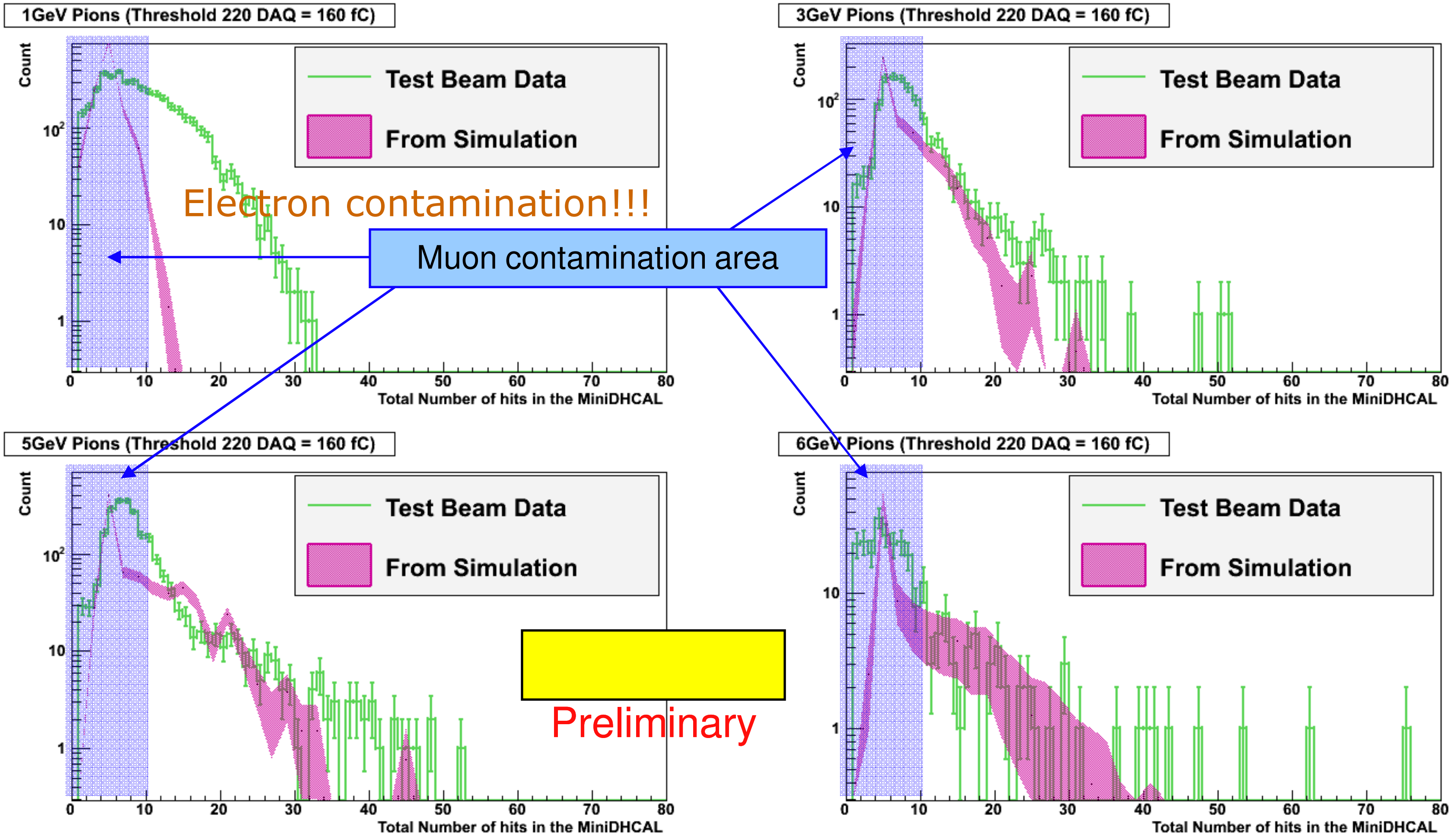


Comparison data/simulation of shower development, and energy deposition in the mini SDHCAL



Muon contamination area

Hadronic showers Vs Simulation



Electron contamination!!!

Muon contamination area

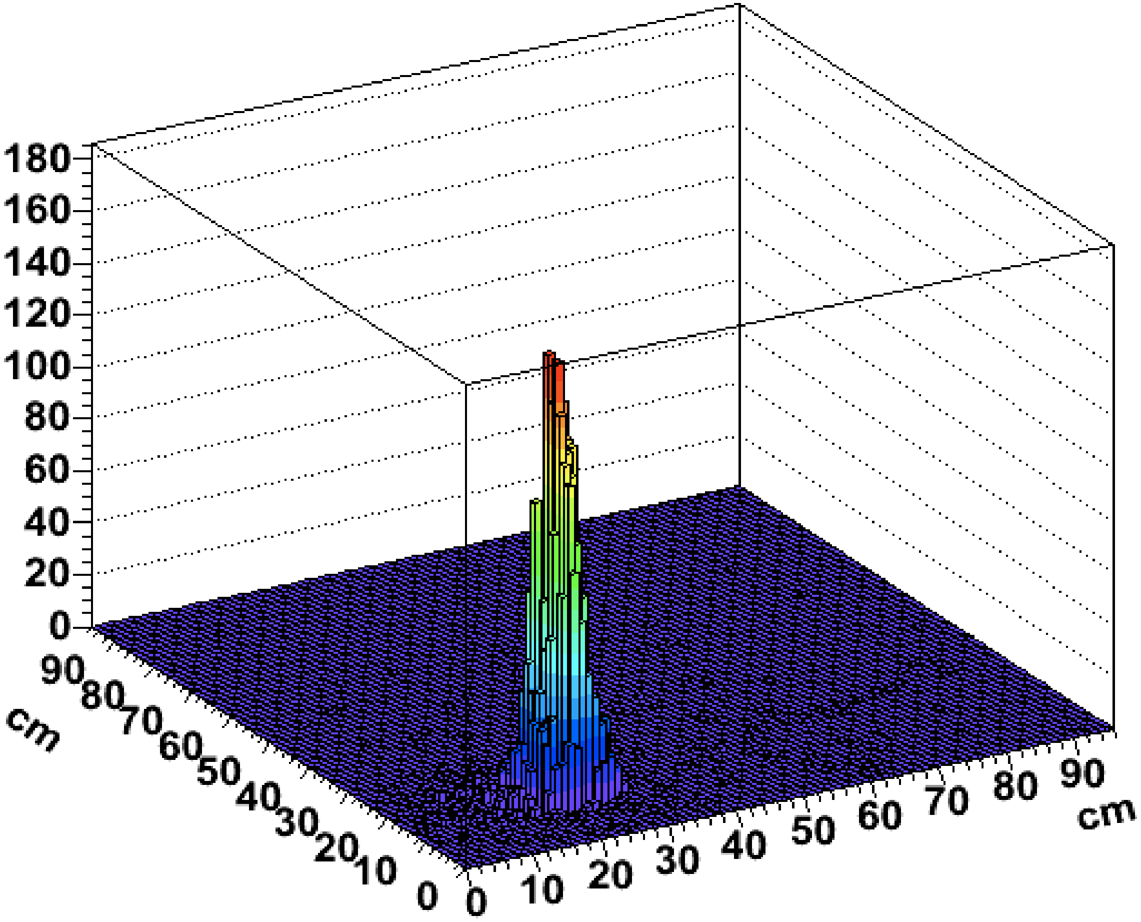
Preliminary

Distribution of **hit’s total number** in mini SDHCAL for test beam data and geant4 simulated data.

$1M^2$ study

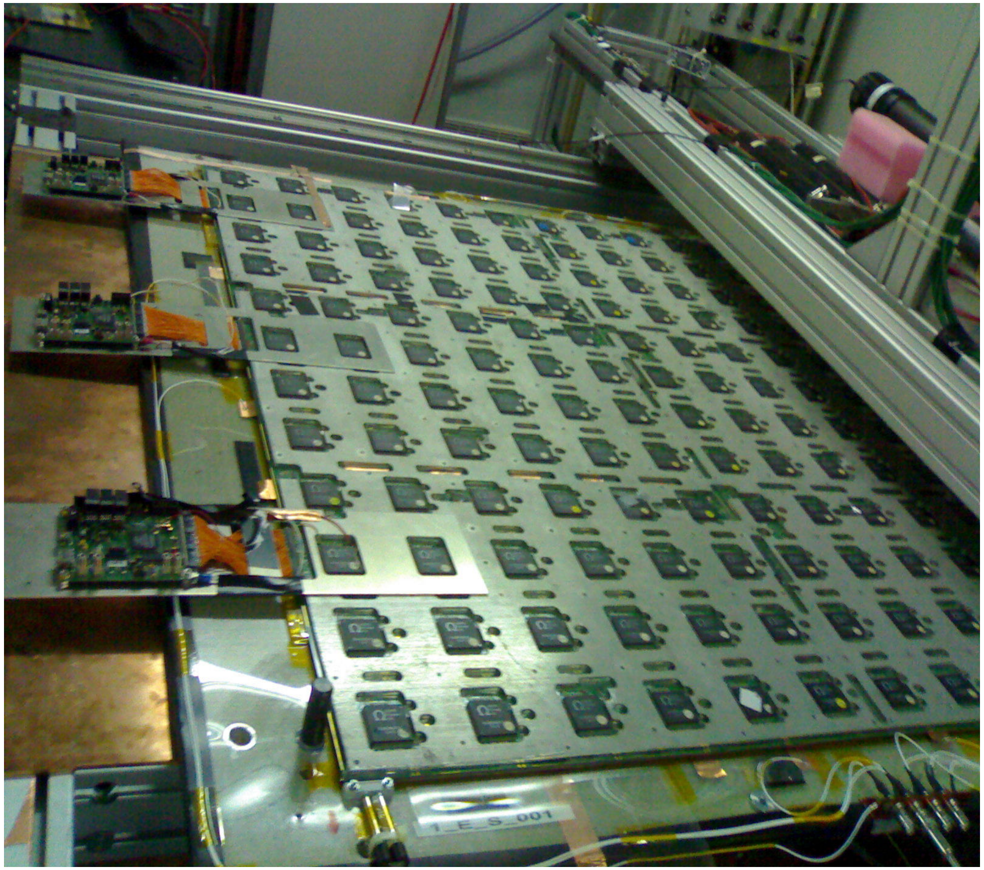
Although the whole system (Detector+ Electronics + DAQ) worked perfectly well the first two days of the TB@SPS (2009)

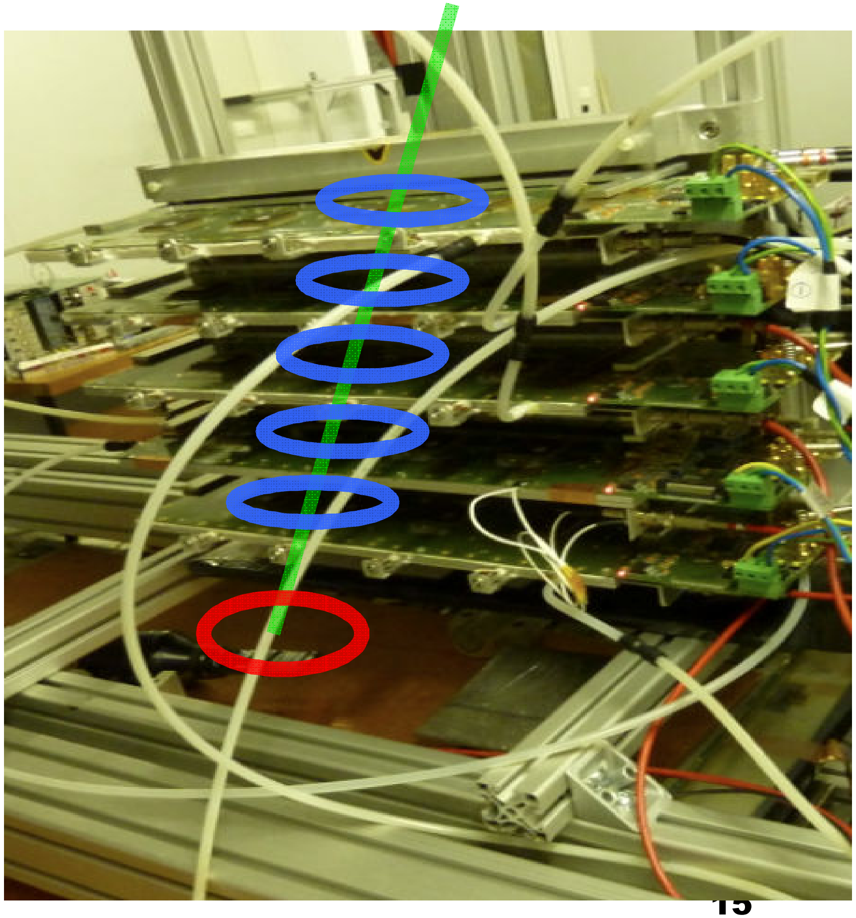
The problem with connectors made it difficult to exploit data taken afterwards.



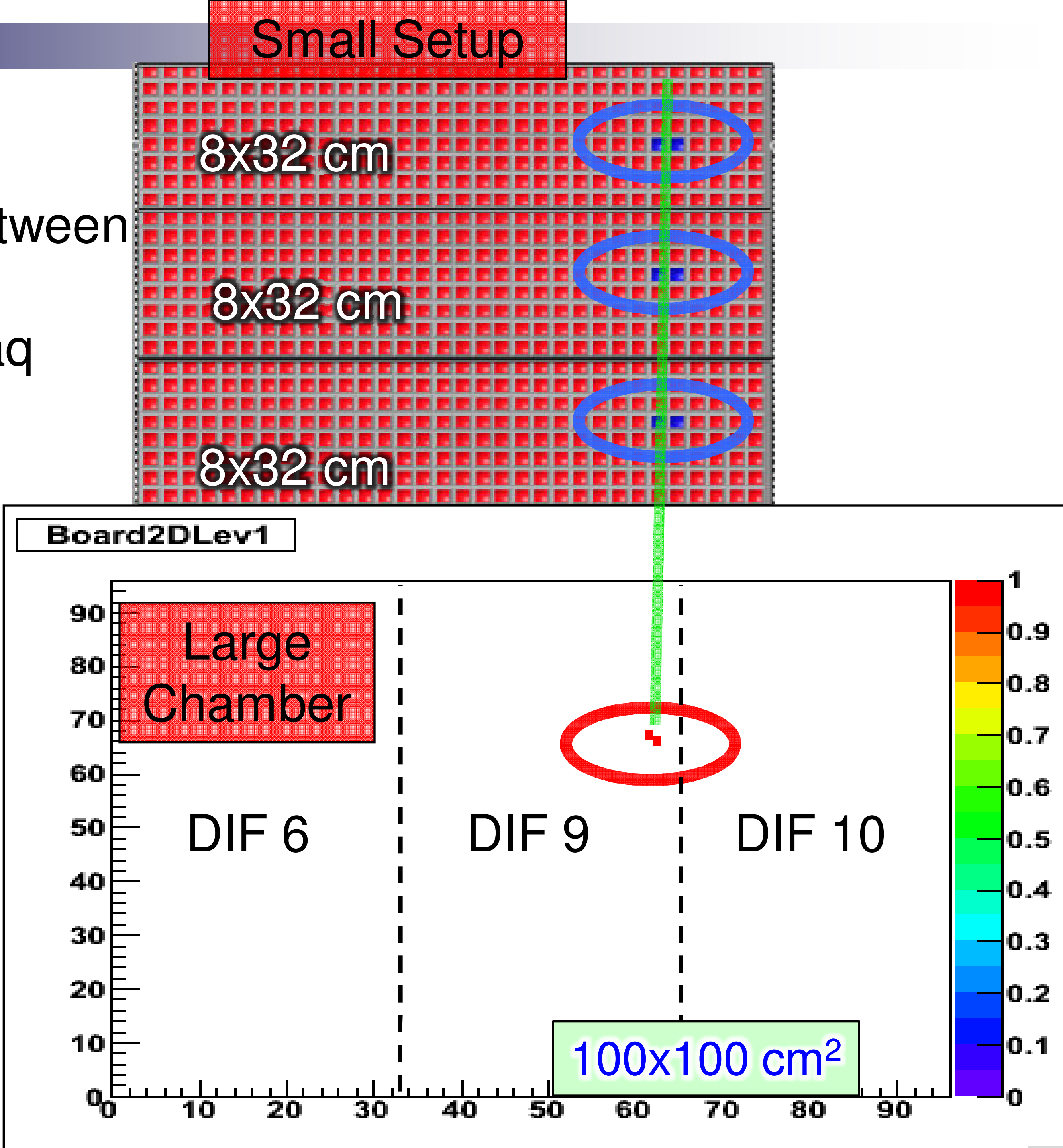
After replacing connectors: a new system was conceived in Lab.

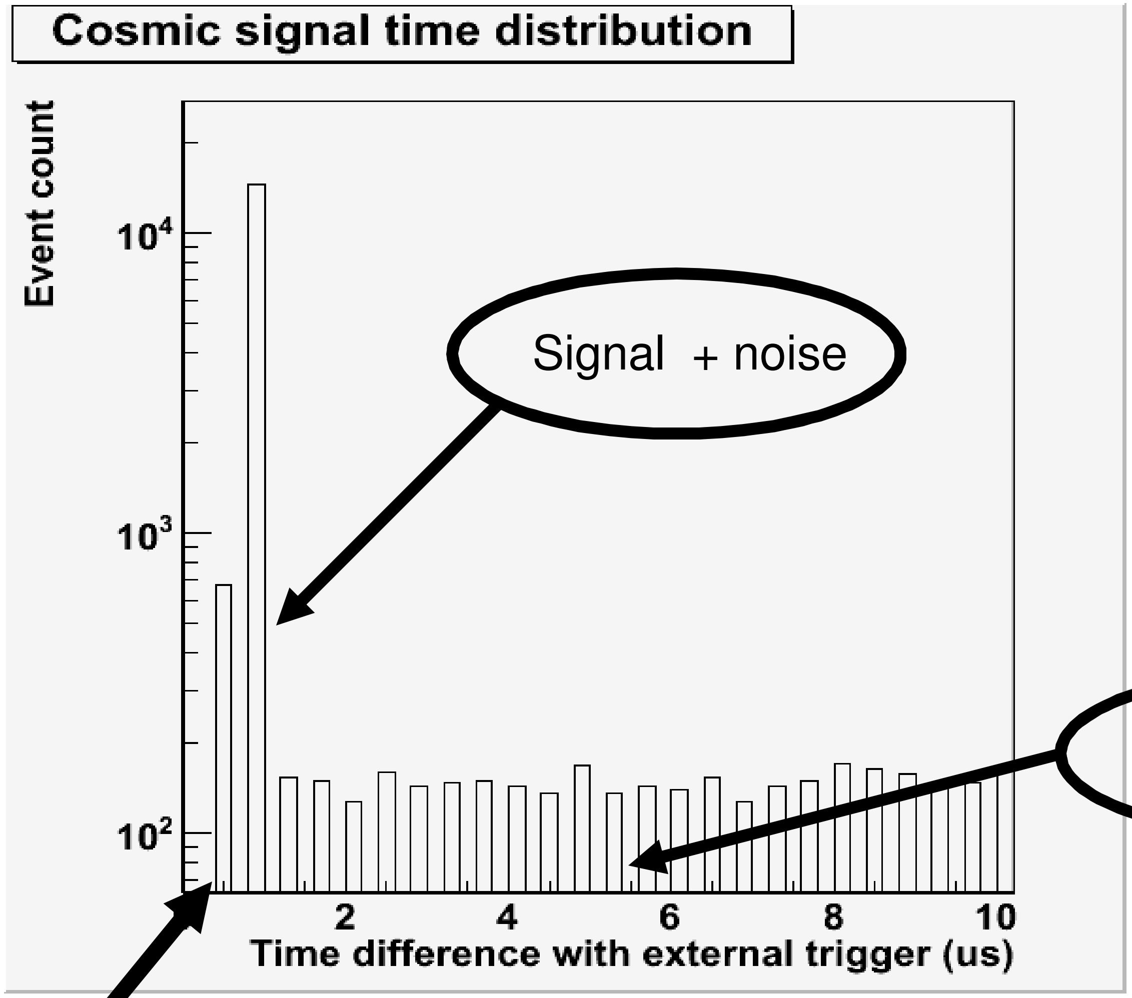
→ PM-scintillator trigger
→Build tracks from associated hits from mini-SDHCAL
→ Project on the big chamber and look if any hits





Synchronization between the two systems is guaranteed by Xdaq



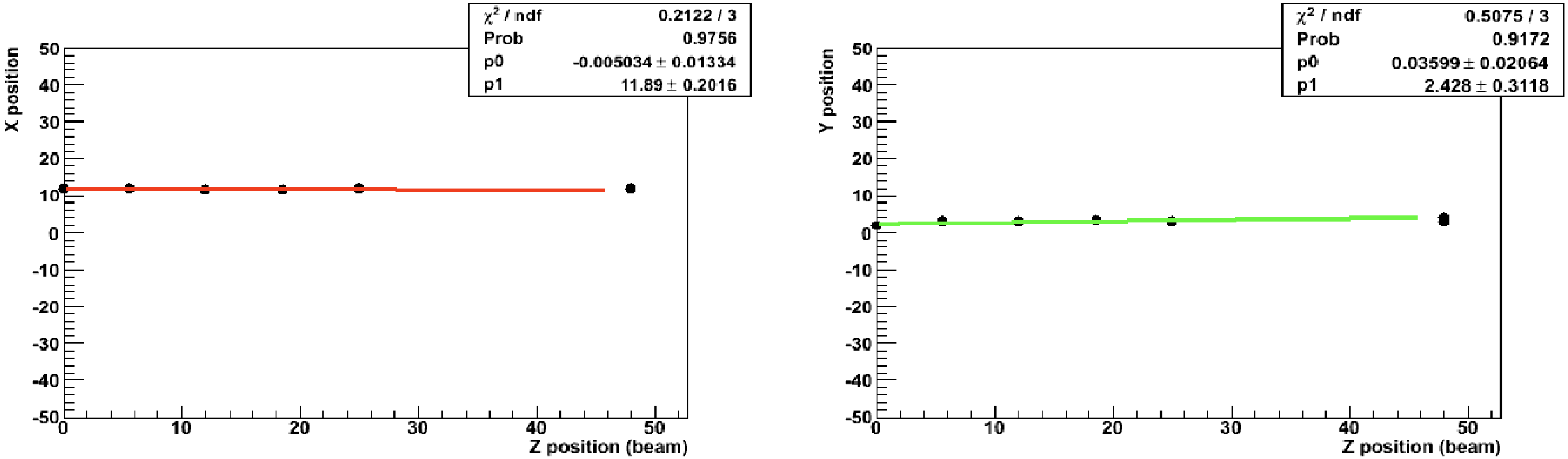


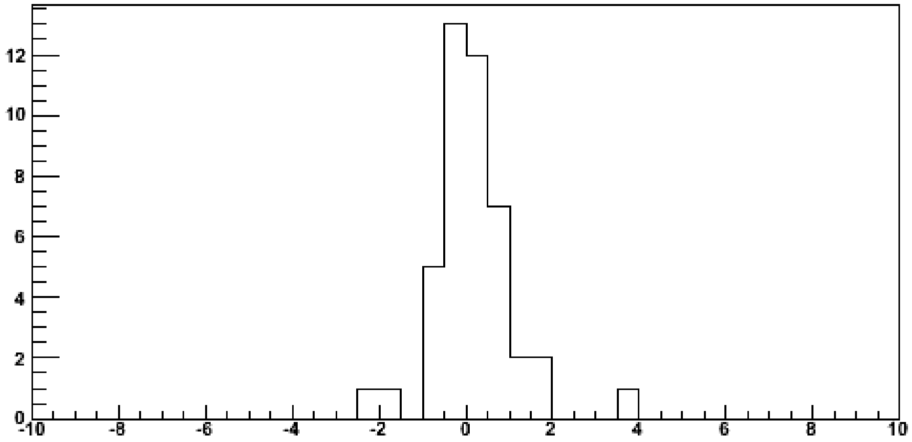
Signal + noise

noise

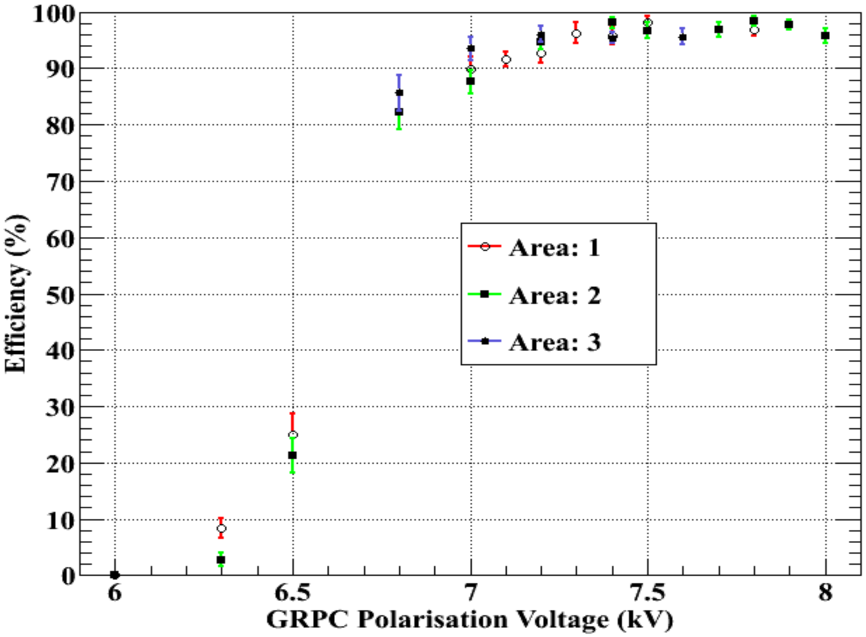
Trigger time ref.

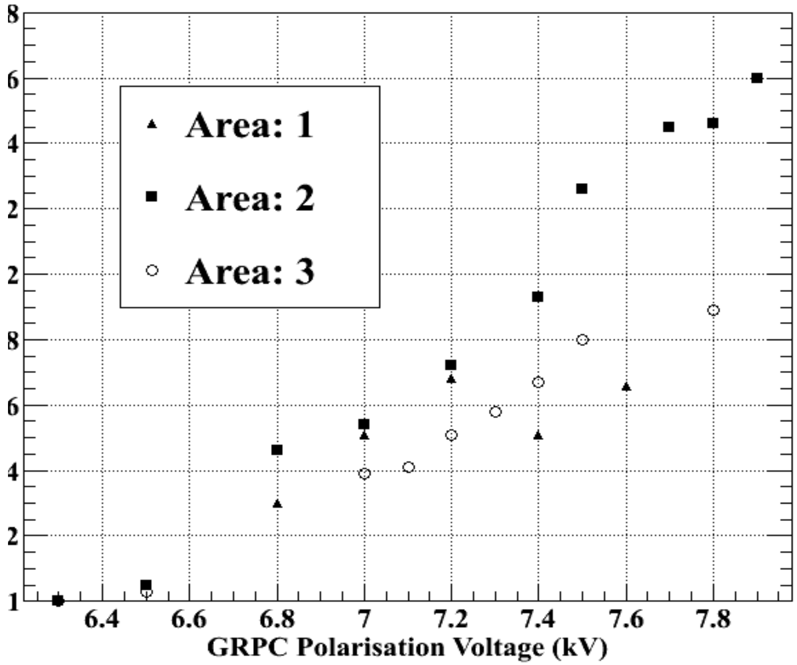
Measured noise at 7.4 kV is < 1.5 Hz/cm^2
but should be improved when the gain correction is applied
and the detector inserted in the metallic cassette

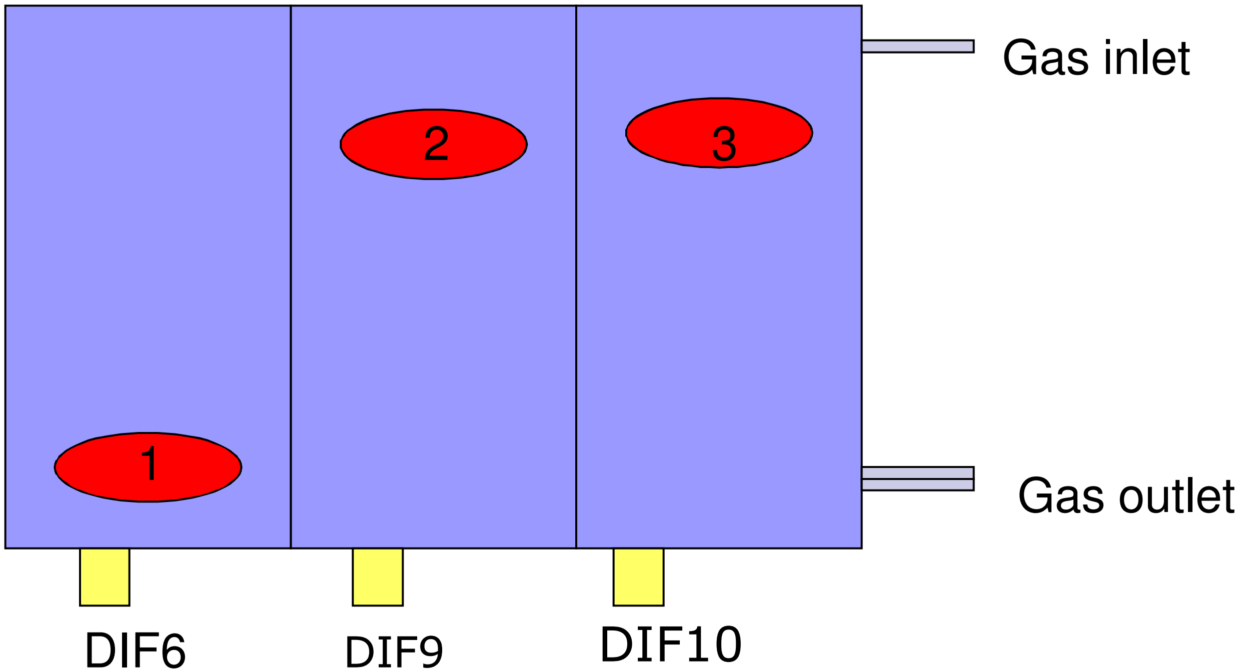




Distance between expected and found clusters


Efficiency (%)
100
90
80
70
60
50
40
30
20
10
0
6
6.5
7
7.5
8
GRPC Polarisation Voltage (kV)
Area: 1
Area: 2
Area: 3


8
6
4
2
2
8
6
4
2
1
6.4
6.6
6.8
7
7.2
7.4
7.6
7.8
GRPC Polarisation Voltage (kV)
Area: 1
Area: 2
Area: 3

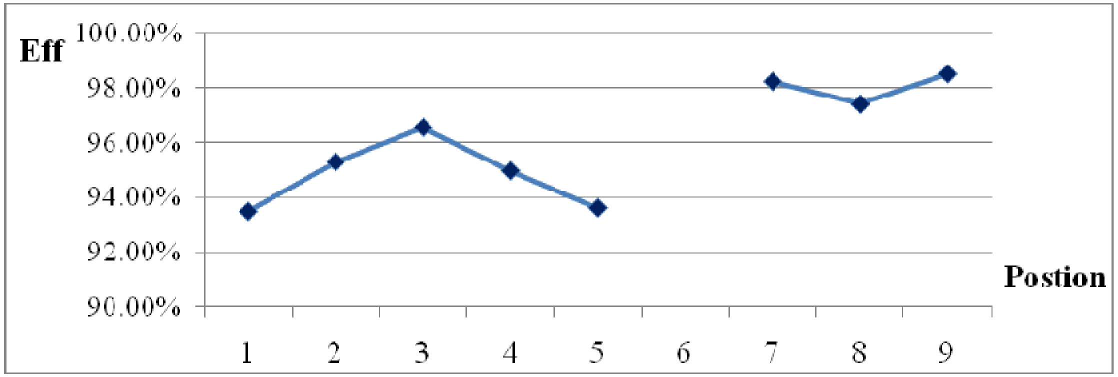

Gas inlet
2
3
1
Gas outlet
DIF6
DIF9
DIF10

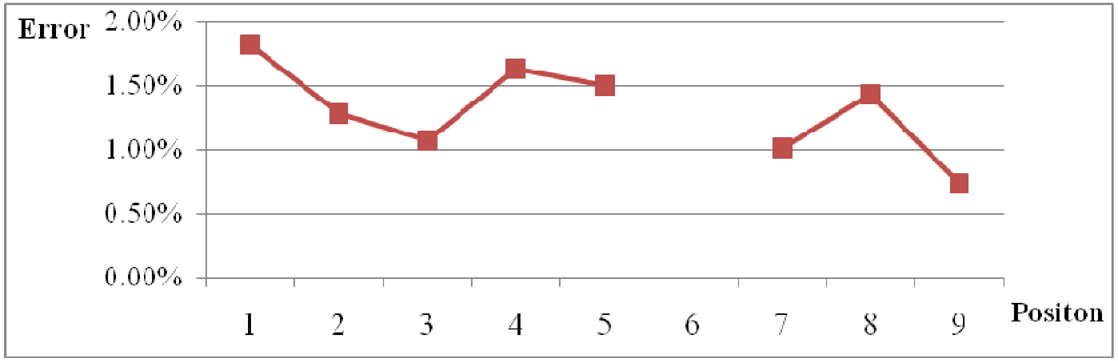
Ongoing measurements…..

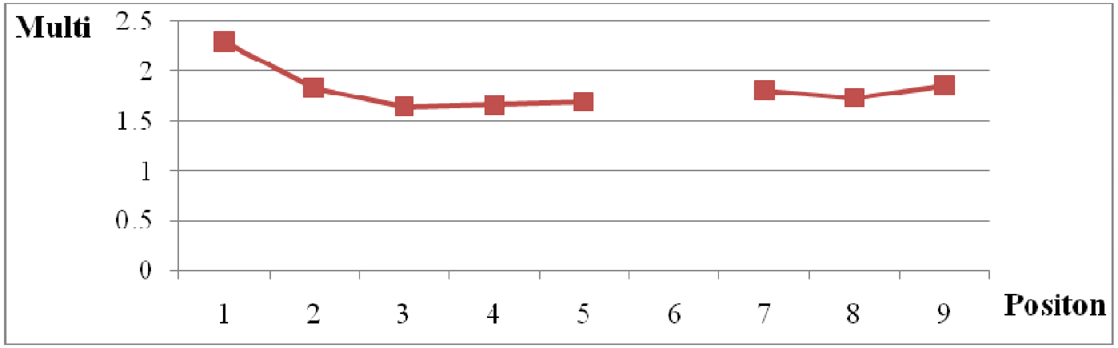
Those results are obtained **without gain correction** and at different moments (different T,P,H…)

DIF6_3 1	DIF9_3 2	DIF10_3 3
DIF6_2 4	DIF9_2 5	DIF10_2 6
DIF6_1 7	DIF9_1 8	DIF10_1 9

The study is currently ongoing with gain correction.
T,P,H are also being measured







Conclusion

Test Beam with mini-SDHCAL was very fruitful and an important part of data was analyzed.

Test Beam with large GRPC was very useful. This allowed to understand real life problems.

New setup combining both small GRPCs and large one allows to study efficiently the characteristics of the large detector system.

Online acquisition system enables one to follow the evolution of data taking and understand the problem.

Two additional large GRPCs, fully equipped are being assembled and will be exposed to TB in May. This is going to be an exciting moment