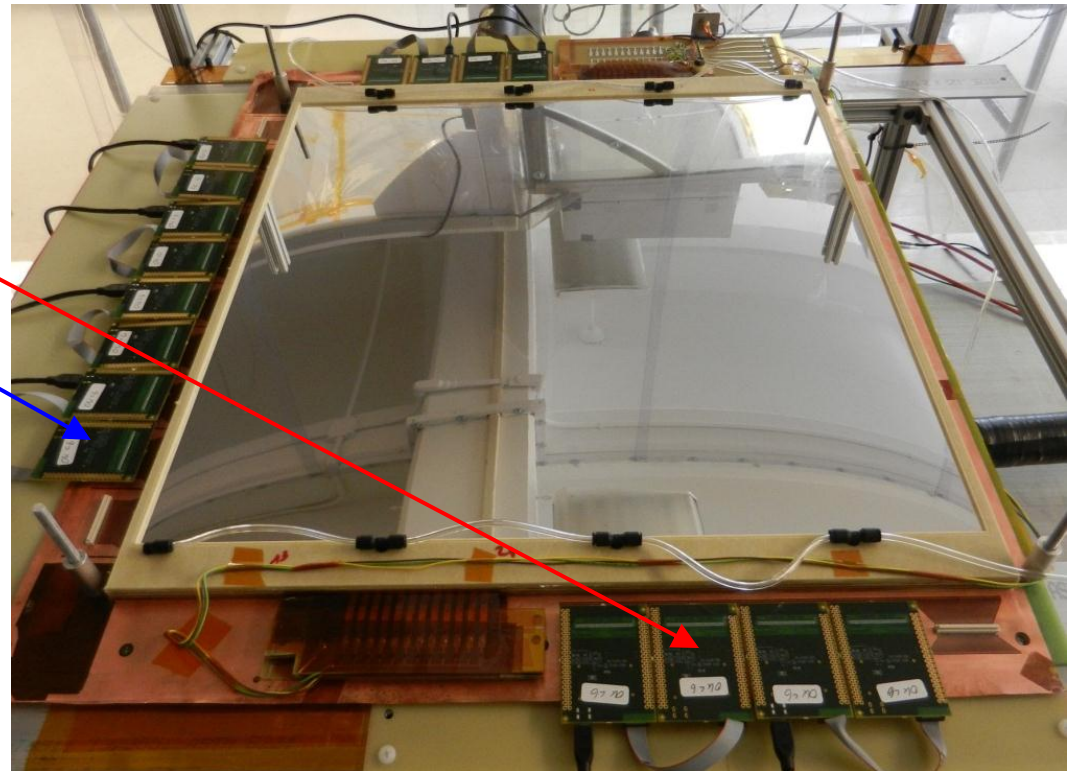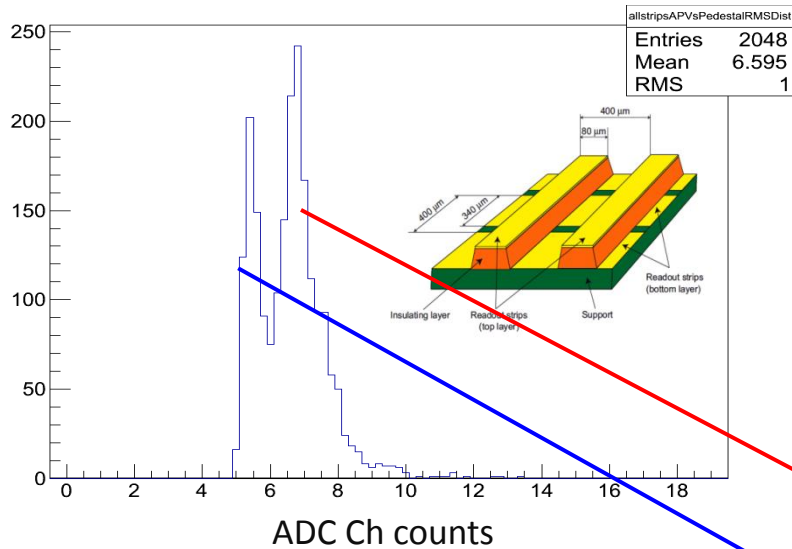# Update on SBS Back Tracker GEM @ UVa

K. Gnanvo, N. Liyanage, V Nelyubin, K. Saenboonruang, Seth Saher

- Cross Talk issues with APV25 Electronics

- Uniformity tests results with ^{90}Sr source

# SBS Back Tracker Proto1 with APV25-SRS FE cards

Pedestal RMS noise distribution over 16 APV

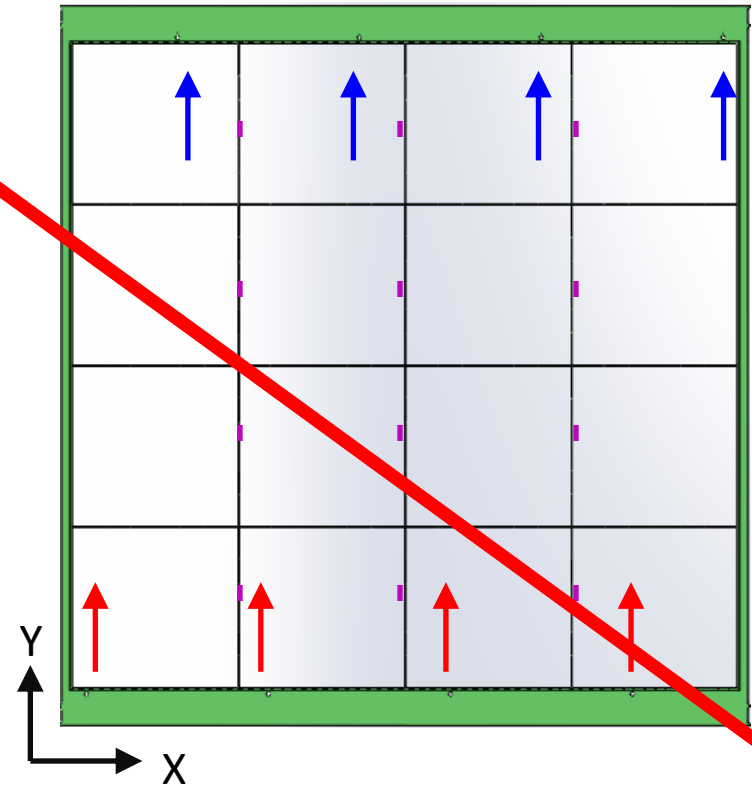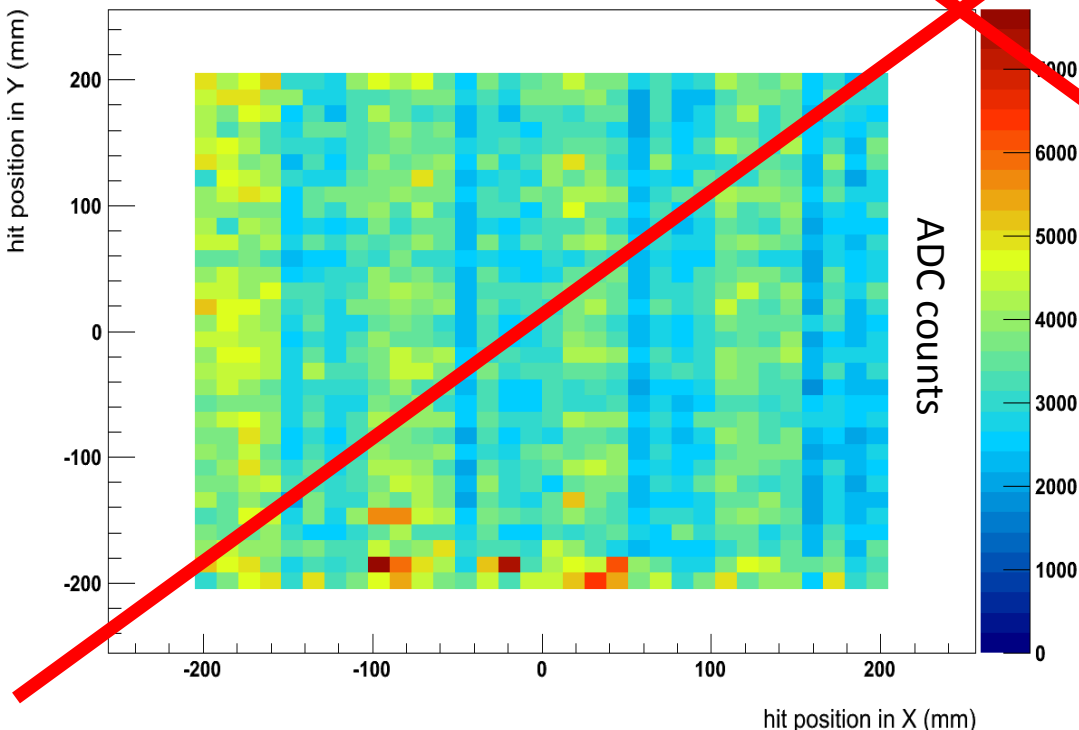| allstripsAPVsPedestalRMSDist	
Entries	2048
Mean	6.595
RMS	1

ADC Ch counts

- For 50 × 50 cm2 COMPASS-like readout, typical rms after common mode correction of the baseline is on average of 6-7 adc counts for apv25-SRS

  - @ 230 e-/adc ➔ ~ 1200 to 1500 ENC
  - a cut at 5 sigma for zero suppression ➔ ~ 6000 e-

Gain (non) uniformity of the chamber

- Gas flow uniform in Y direction ➔ gas inlet and outlet

- We suspects a non uniformity of the gain due to the gas flow in the X direction

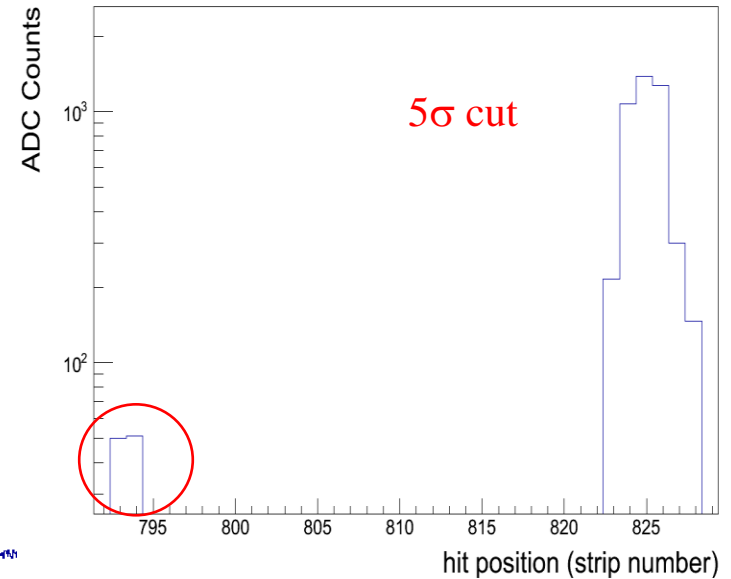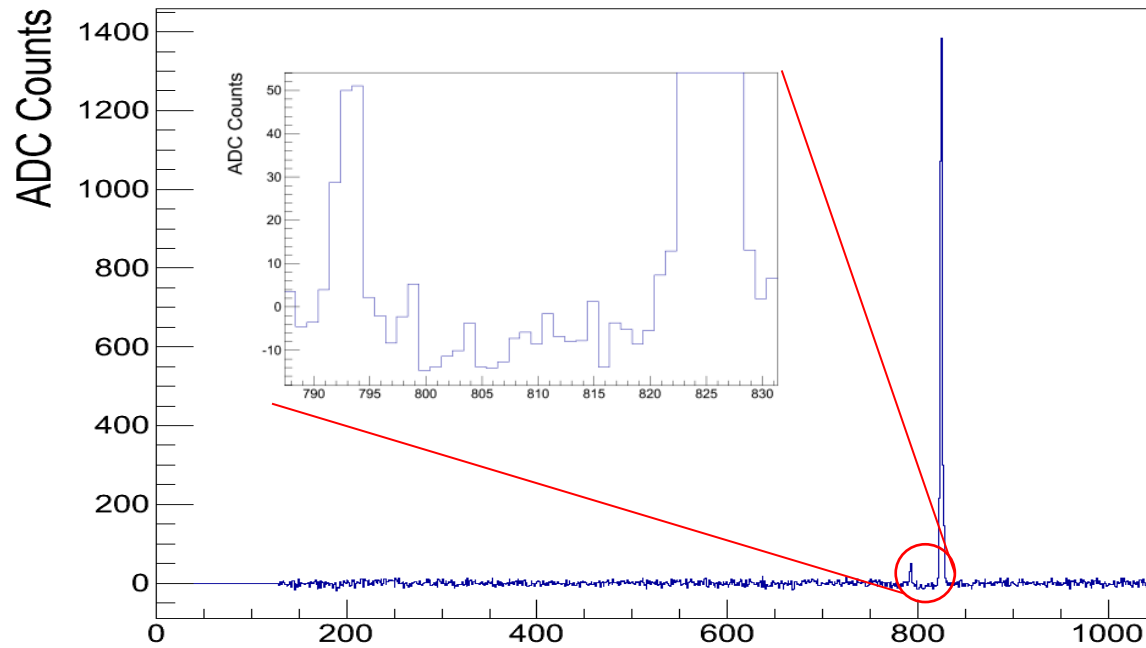- The gas flow in X is facilitated by groove in the spacer but not sure if it is

X
⊙ ➔ Y

window

Drift cathode

GEM foil 1

GEM foil 2

GEM foil 3
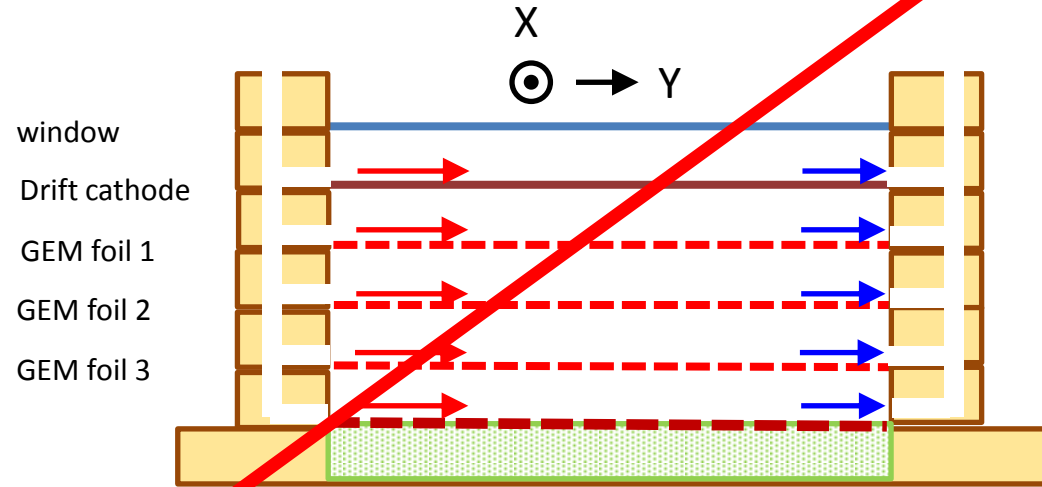
Mean cluster adc counts 2D map

hit position in Y (mm)

hit position in X (mm)

ADC counts

Cross Talk in APV25 Electronics

SBS 50 x 50 cm2 GEM1 Hit in X [TriggerNo# 80 / Event# 80]

5σ cut

Current version of the analysis (AMORE) code:

- Only single cluster event used for 2D hit maps, X-Y charges correlation etc … and minimal cluster size = 2hits

- For high amplitude hits, cross talk cluster survives a 5σ zero suppression cut ➔ Event seen with 2 clusters and rejected

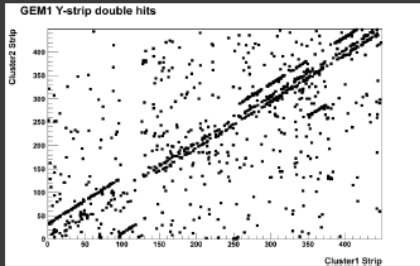- Cross talk is suppressed at 7σ here in this example

7σ cut
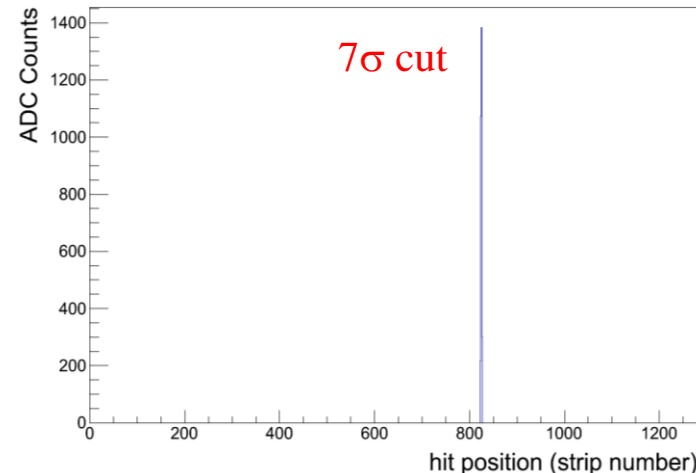
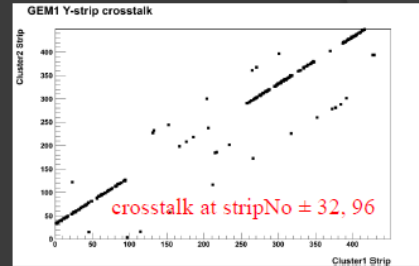# Cross talk effect previously reported at RD51 Coll. meetings 2011
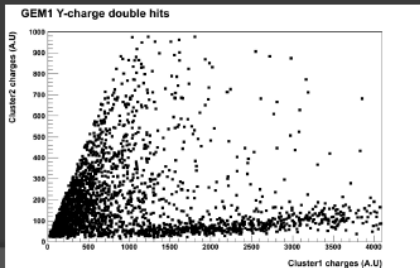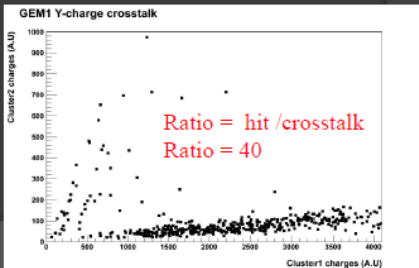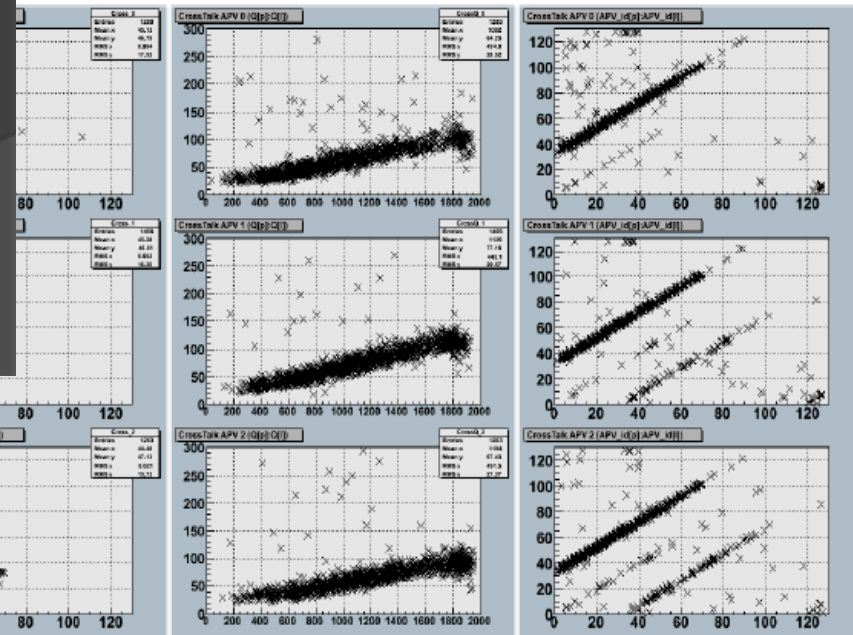
K. Gnanvo, *GEM R&D Muon Tomography, Florida Tech*
RD51 Coll. Meeting April 2011

M. Byzsewsky, *Micromegas for ATLAS Muon chamber Upgrade*
RD51 mini week January 201111

Distribution of the relative position $(X_{cluster1} - X_{cluster2})$ of two clusters in 2-clusters events

# Distribution of ADC counts ratio $(ADC_{cluster1} / ADC_{cluster2})$ of two clusters in 2-clusters events

SBS Proto 1 50 x 50 Cross Talk: relative position of 2 clusters in X [TriggerNo# 54000 / Event# 24531]
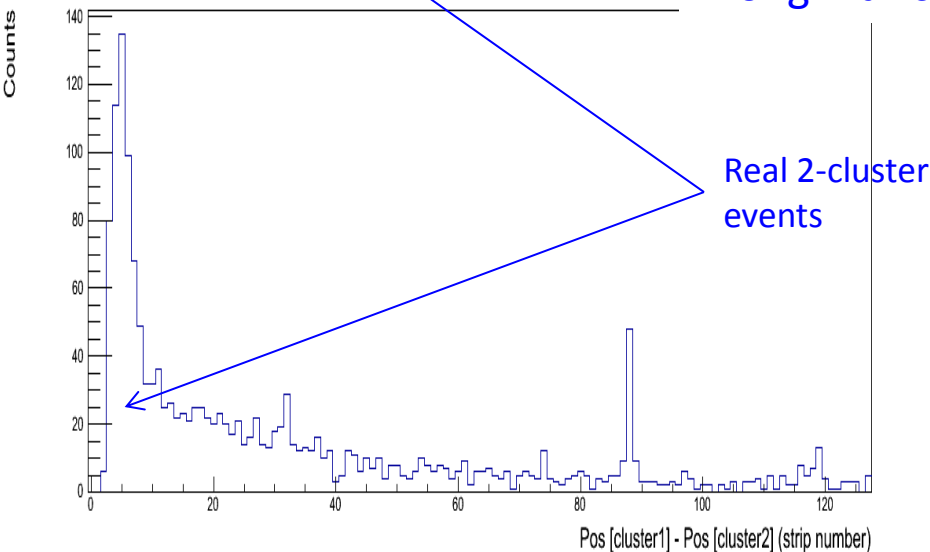
Along X-axis

Pics at 32, 88 and 120 ➔ cross talk effect

Pos [cluster1] - Pos [cluster2] (strip number)
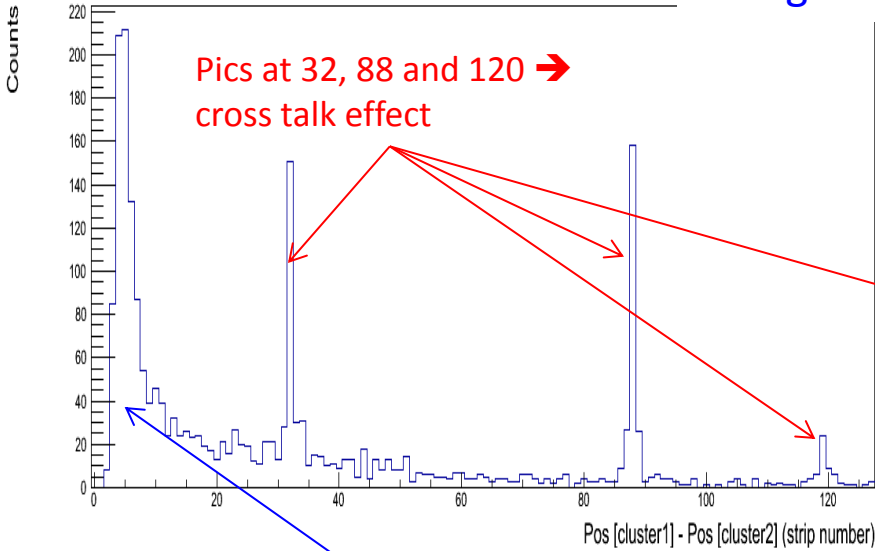
SBS Proto1 (50 x 50) Cross Talk: ratio of the ADC counts of 2 clusters in X [TriggerNo# 55499 / Event# 25229]

Along X-axis

Large ratio > 20 correlated to the cross talk pics

(ADC count [cluster1]) / (ADC count [Cluster2])
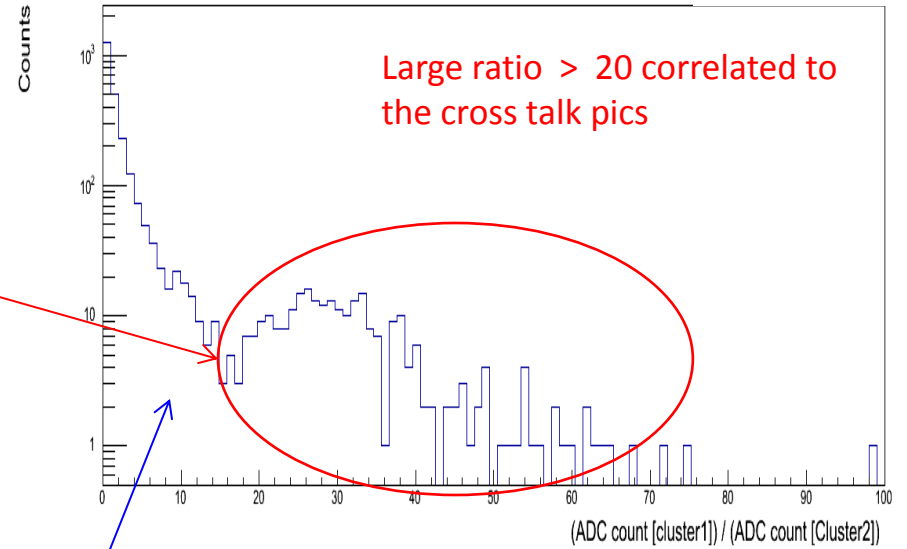
SBS Proto 1 50 x 50 Cross Talk: relative position of 2 clusters in Y

Along Y-axis

Real 2-cluster events

Pos [cluster1] - Pos [cluster2] (strip number)

SBS Proto1 (50 x 50) Cross Talk: ratio of the ADC counts of 2 clusters in Y [TriggerNo# 55499 / Event# 25229]
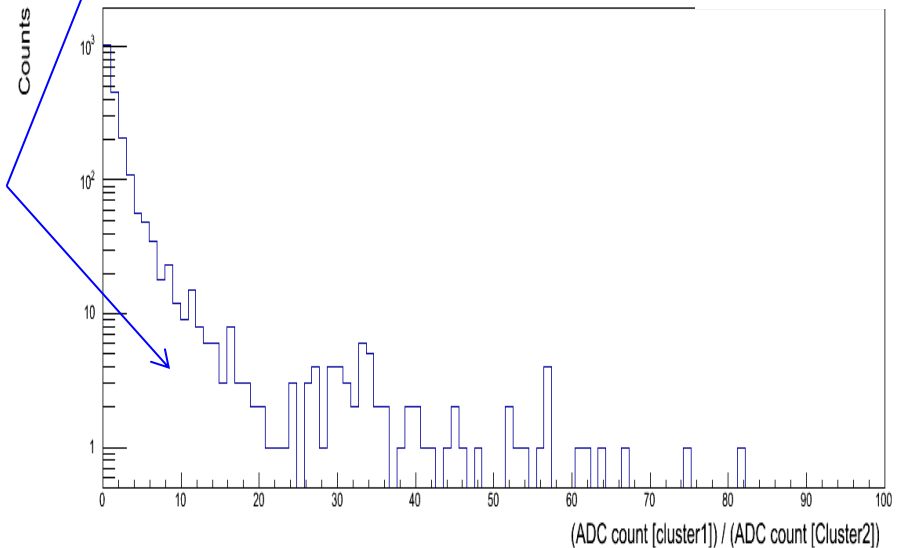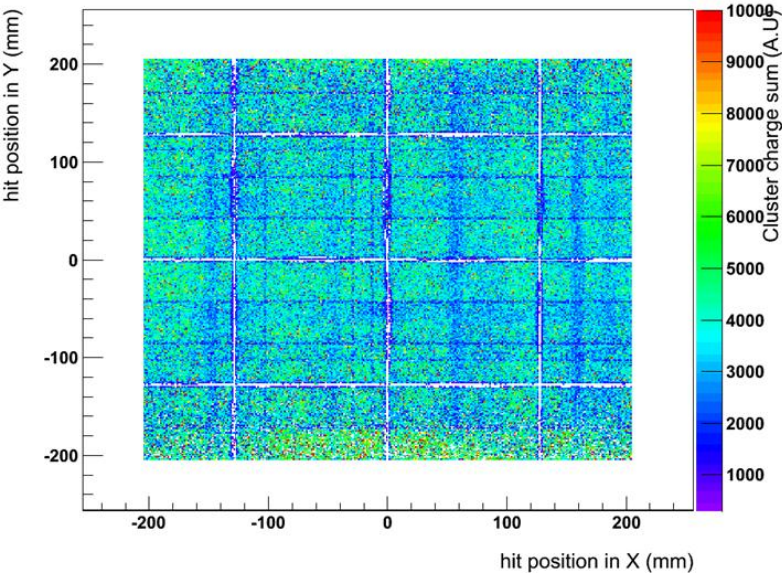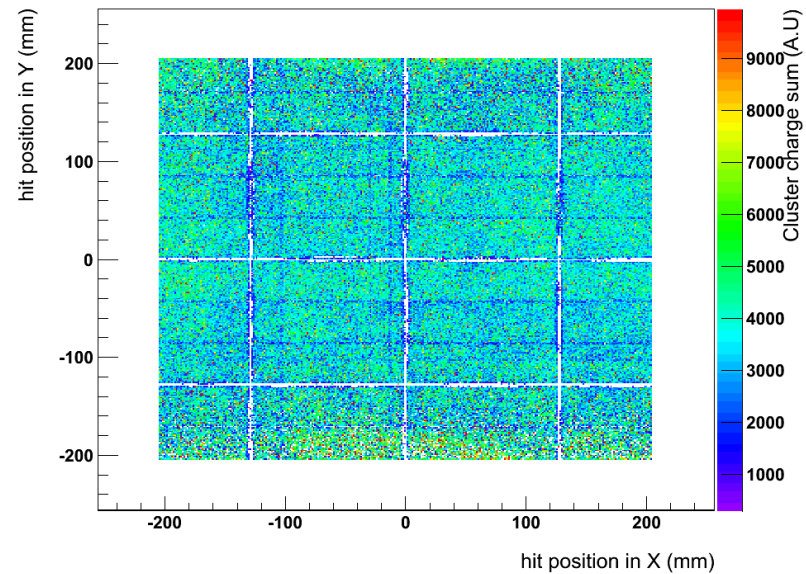
Along Y-axis

(ADC count [cluster1]) / (ADC count [Cluster2])

2D Map of "mean" ADC: Gain uniformity

@ 5σ pedestal cut
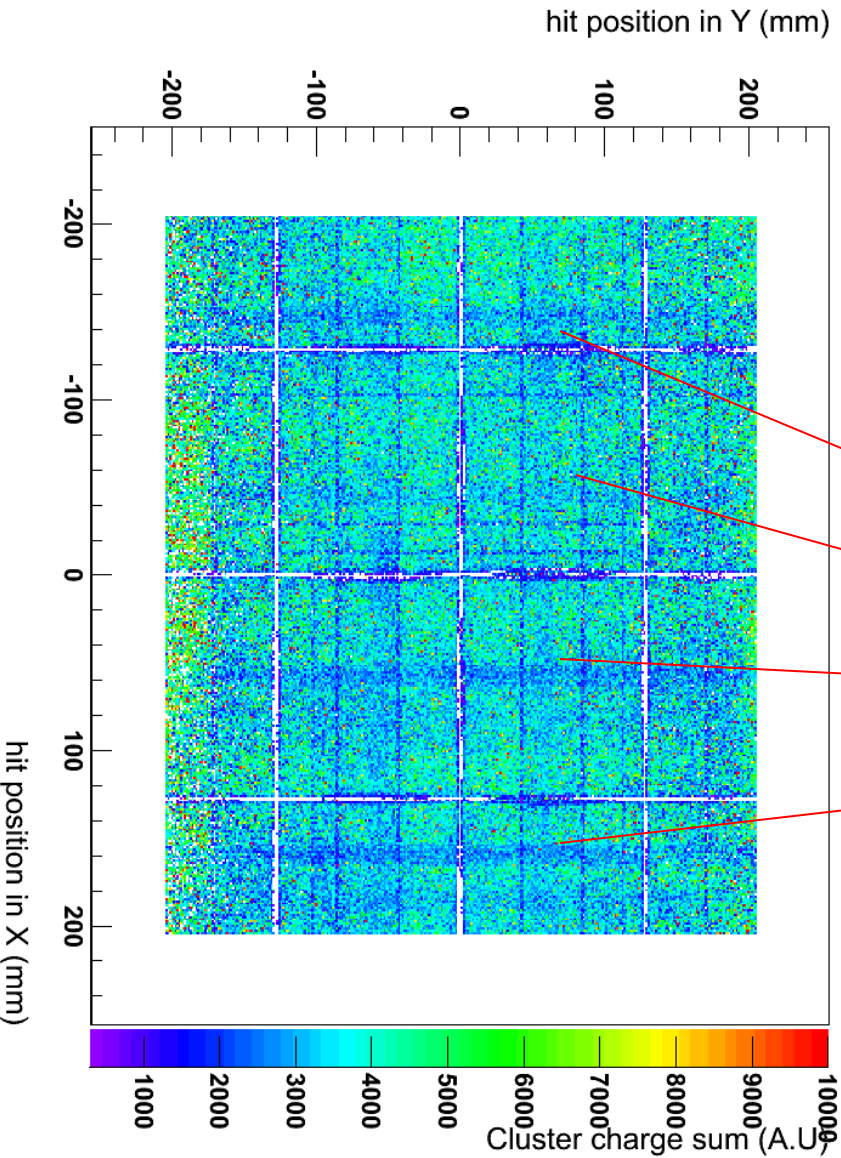

"mean" ADC
=
Σ_N ADC / N_{Hits}

@ 10σ pedestal cut

Cross talk effect more pronounced for X than for Y ➔ non equal charge sharing ➔ Cross talk cluster suppressed at 5σ cut
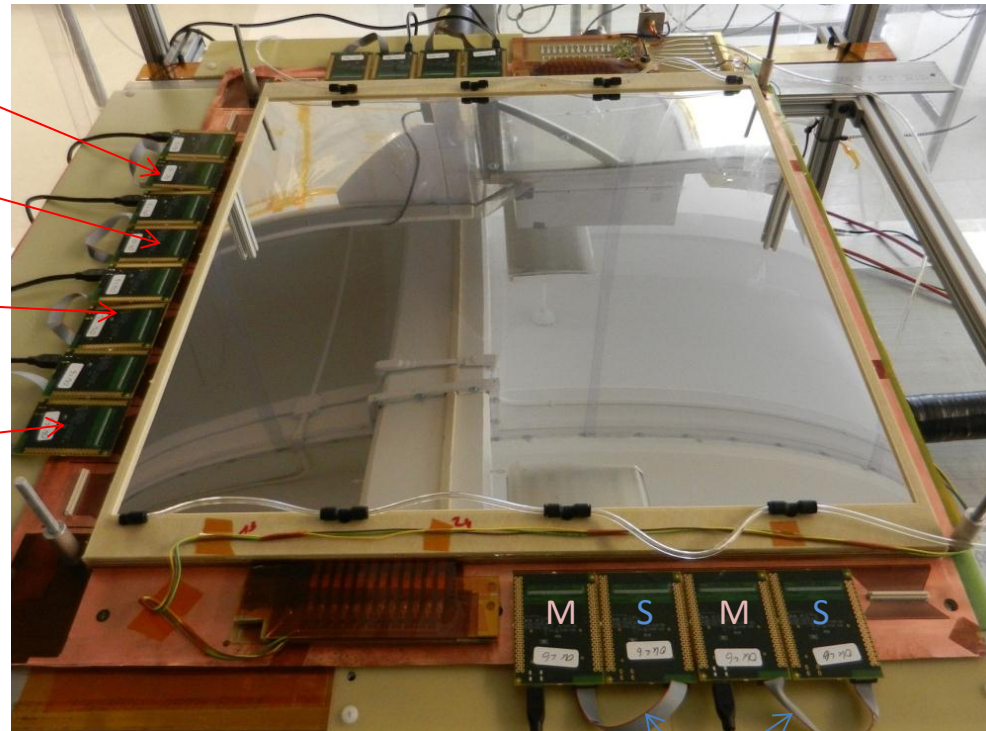

SBS 50 x 50 cm2 GEM1 2D Charge Sharing

ADC(X) / ADC (Y) = 1.34

Along X-axis

Along Y-axis
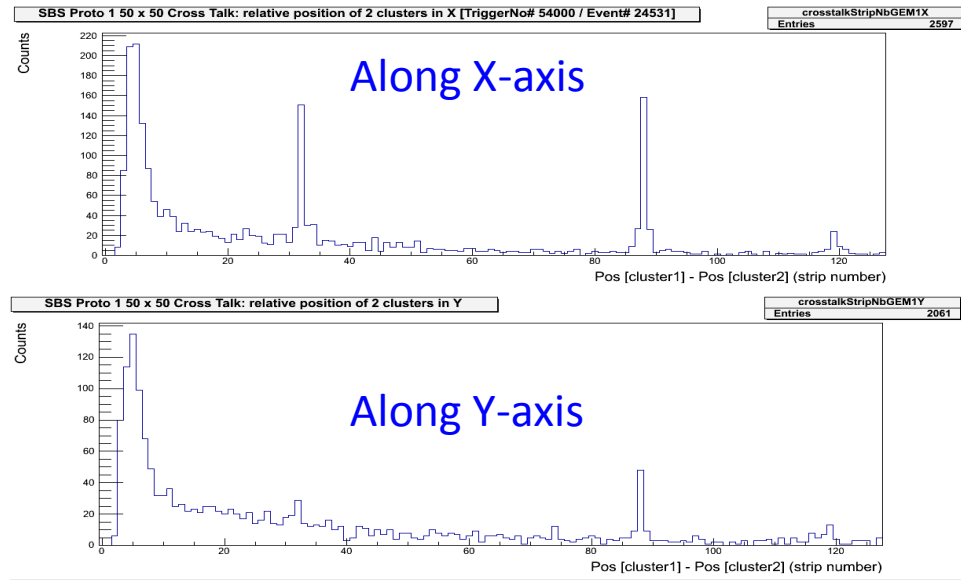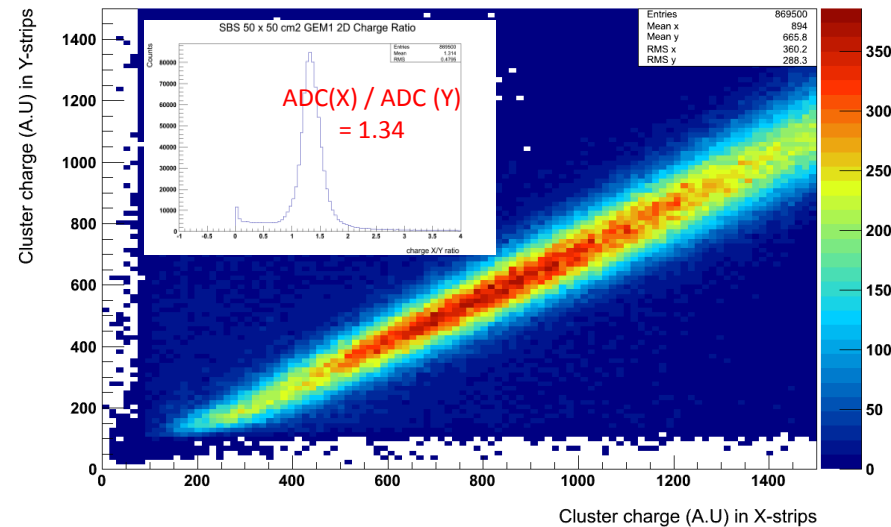
Cross talk only for APV25-slaves ➜ Effect of SAMTEC flat cable?

hit position in Y (mm)

hit position in X (mm)

SBS 50 x 50 cm2 GEM1 2D adc charges Map [TriggerNo# 1600000 / Event# 1600000]
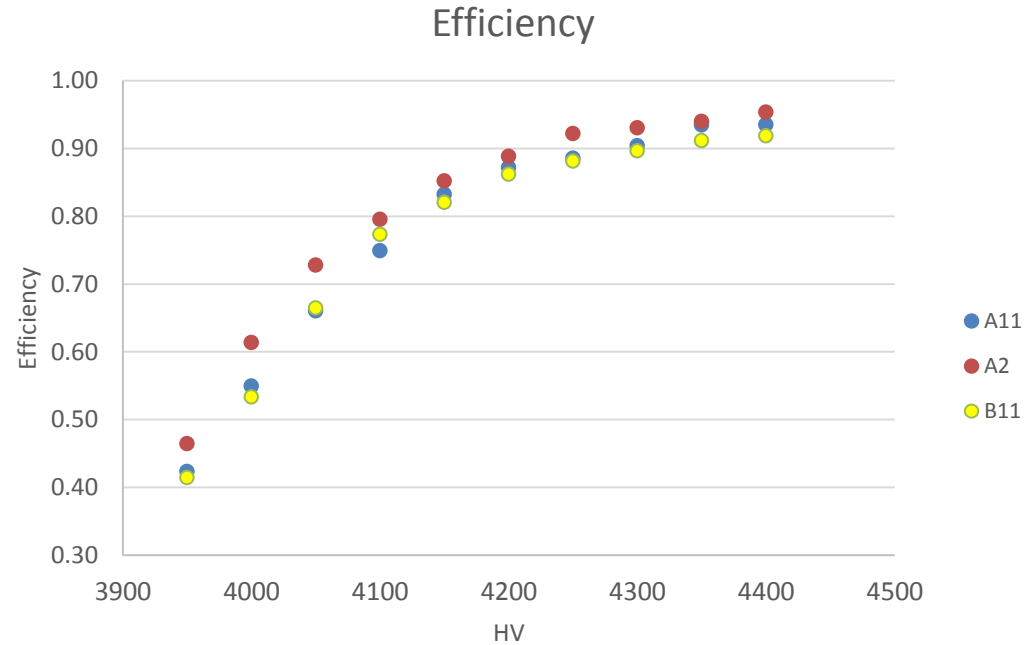
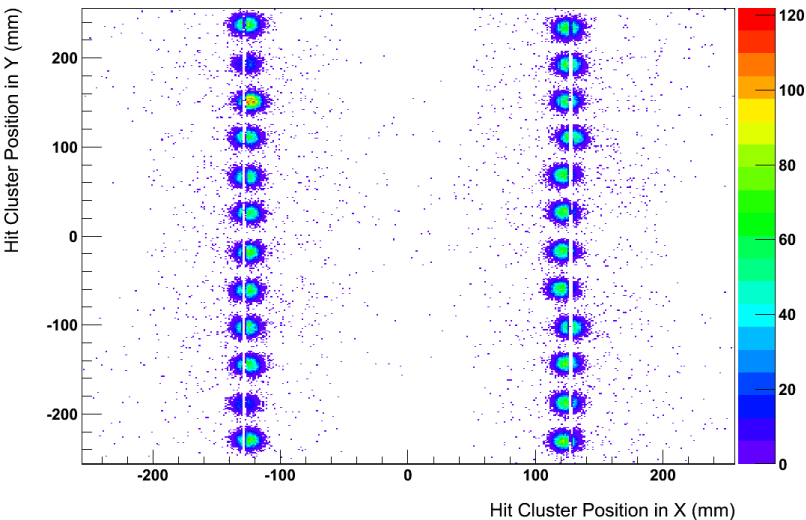Cluster charge sum (A.U.)

M S M S

SAMTEC flat cable

Test with ^{90}Sr source

Efficiency measurement with ^{90}Sr

- About 92% at 4400 V

- ^{90}Sr Source just on top of the spacer along Y axis ➔ few % drop in the efficiency of the chamber expected

- Results consistent with the > 95% efficiency expected for the Triple-GEM

Efficiency

A11
A2
B11

Hit map (N_{Hits} / bin)

"mean" ADC
=
Σ_N ADC / N_{Hits}

"mean" ADC (gain uniformity)