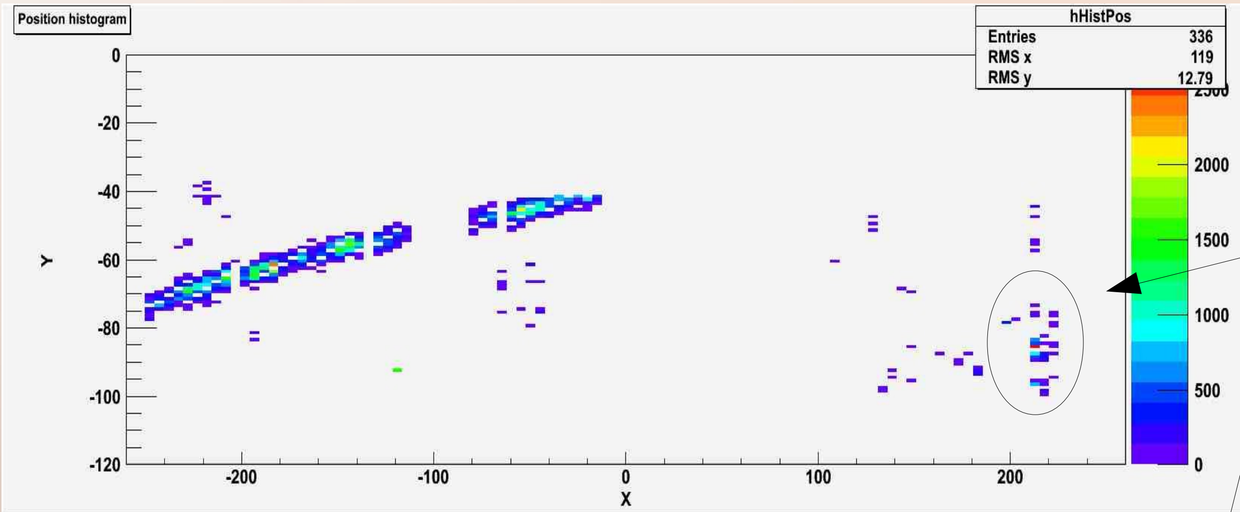
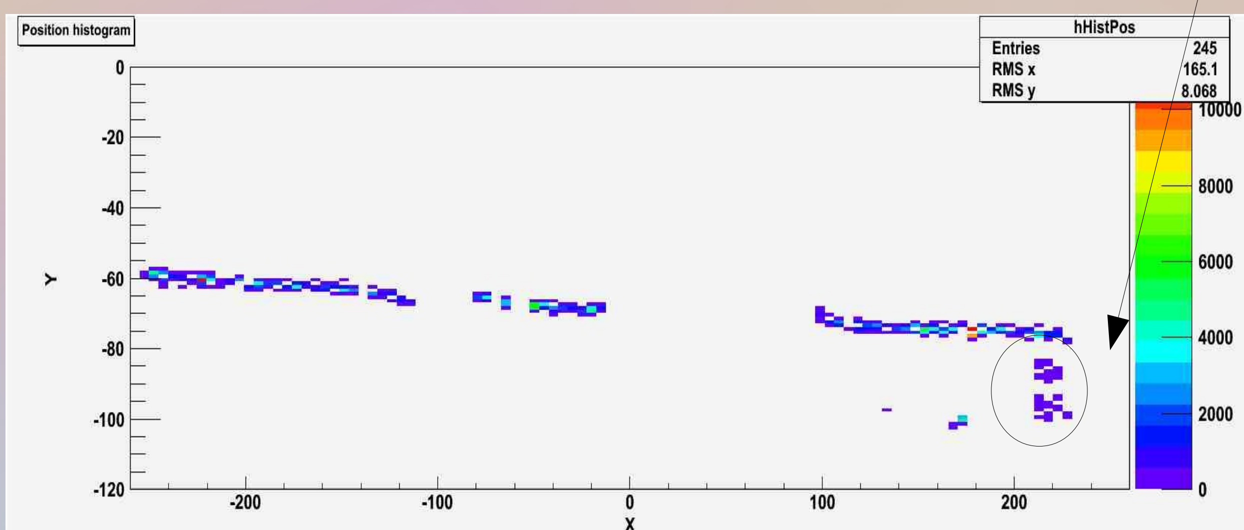
Position of beam track (TPC in wrong position) without magnetic field, Gain=0, charge (ADCch) in color:



-The noise can be cut away by constructing a time window which do not include the time when the noise puses are registered

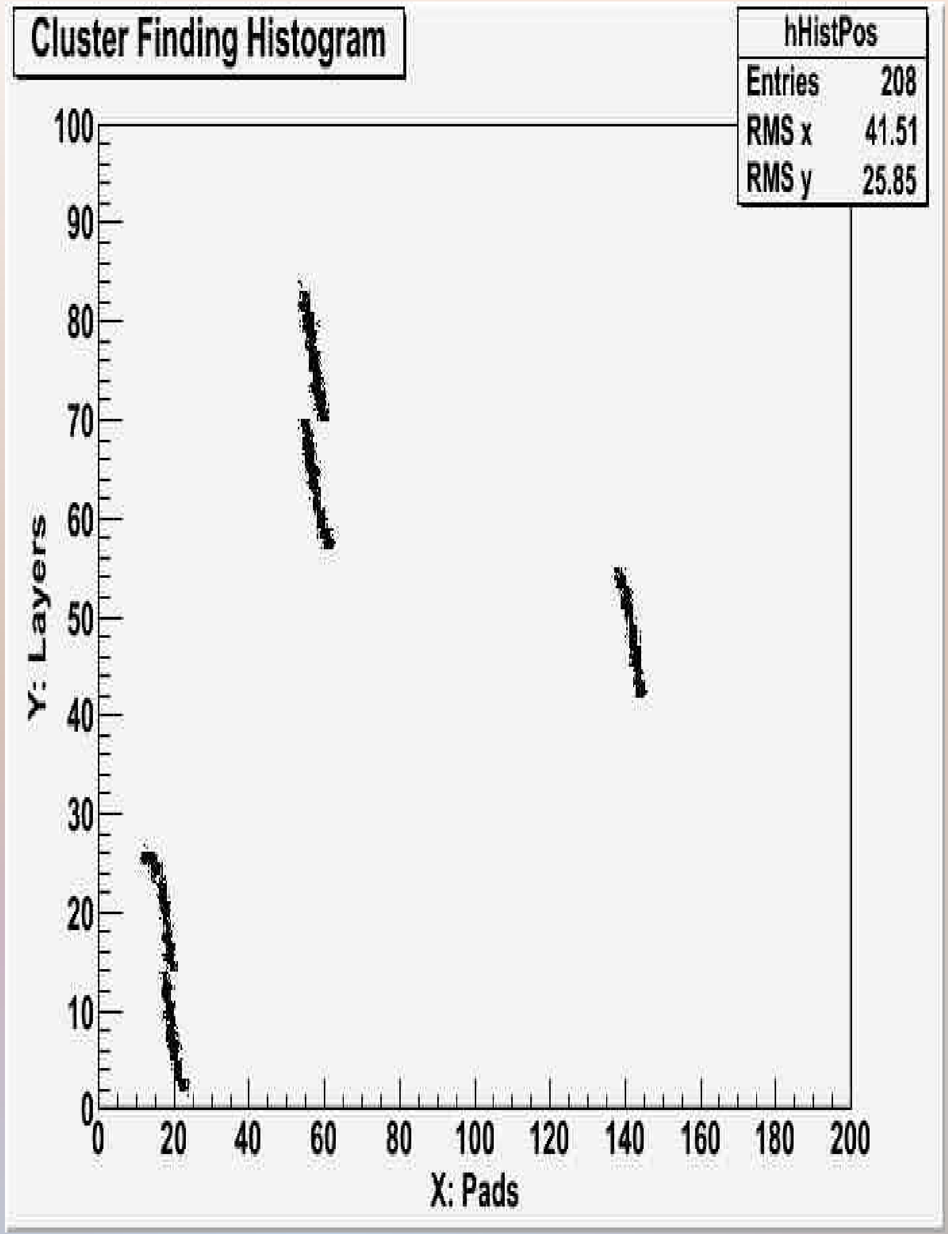
-Broader track without magnetic field

Track position, B=1, Gain=0:



-Deviations close to module edge when the magnetic field is on
→ B-field not parallel to E-field

-Cluster finding on tracks



-How have you dealt with the displacements and the difficult pad geometry?

Cluster finding:

- Cluster finding in the raw mapping

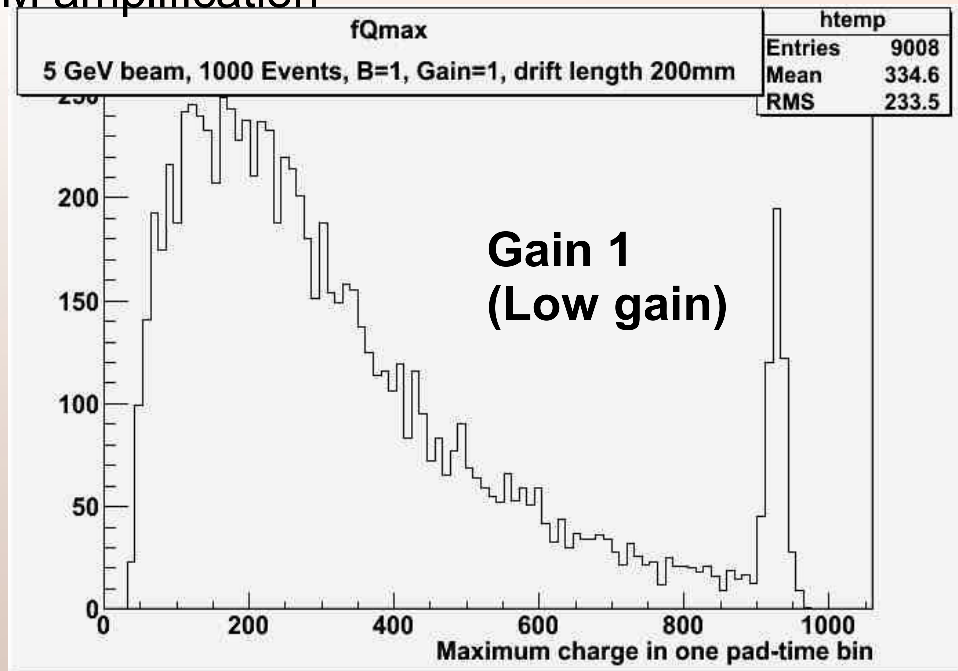
- Search for a charge peak in x direction (perpendicular to the track)

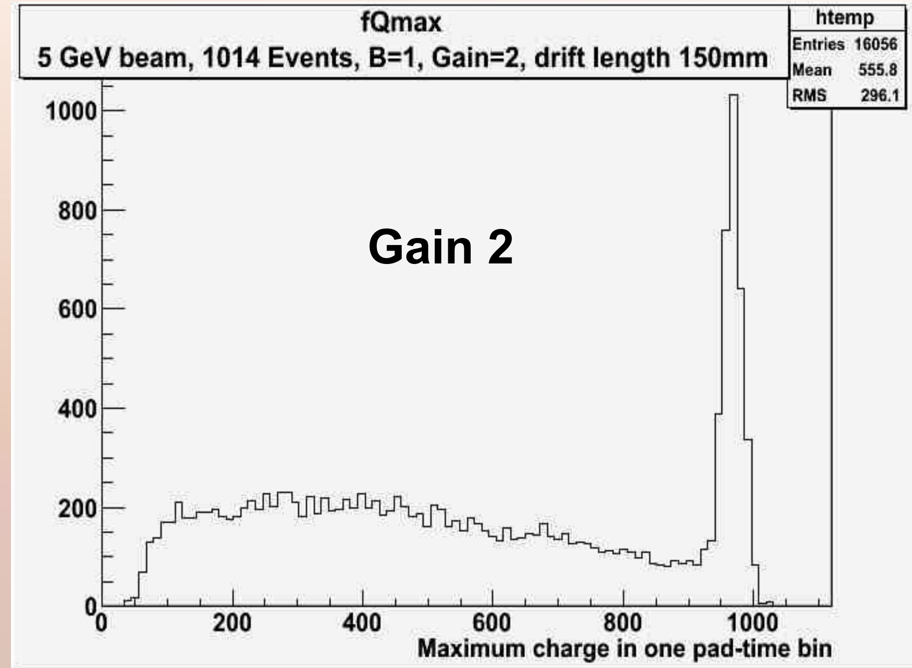
- Find the cluster by searching for charges<peak charge in a surrounding of the peak in x direction

-Take the weighted mean of cluster position and translate that position to x and y coordinates in space (mm)

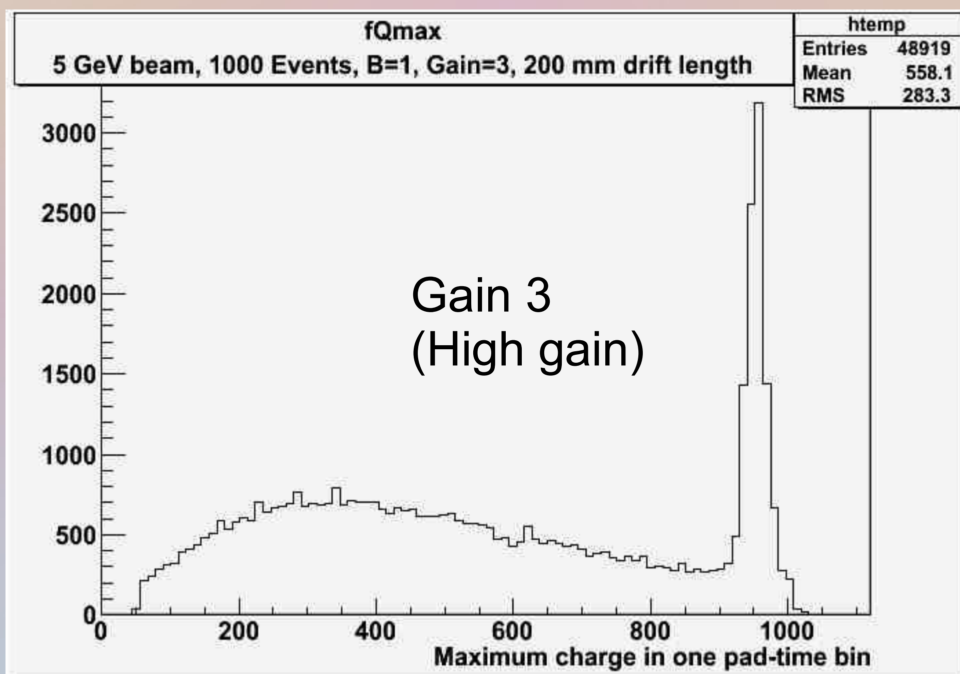
-Repeat for every event in a run-file

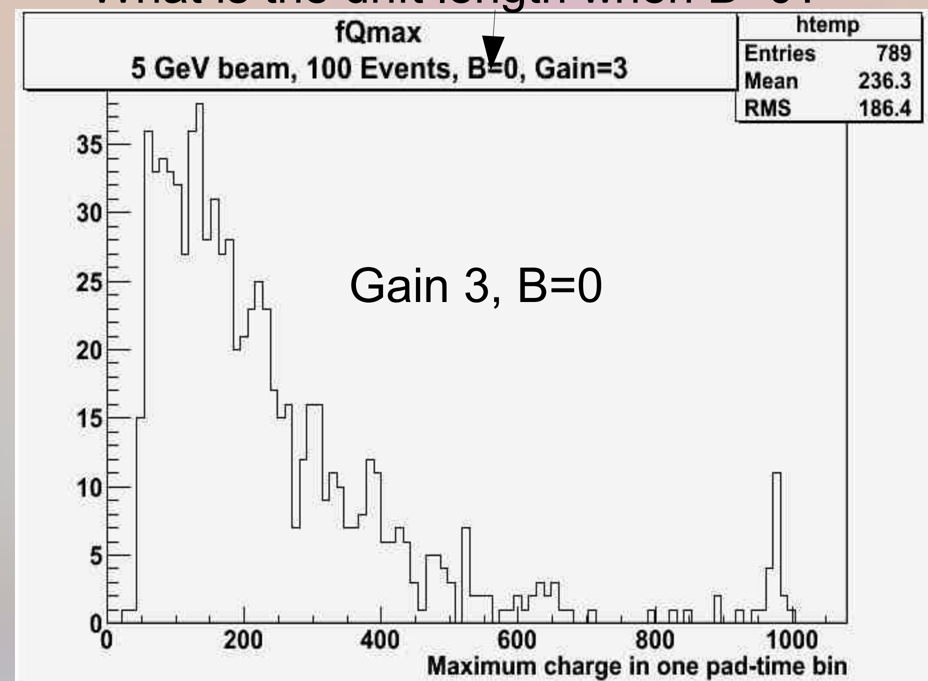
The maximum charge is saturated for high gains (gain 2 and 3) → to high gain for that specific GEM amplification

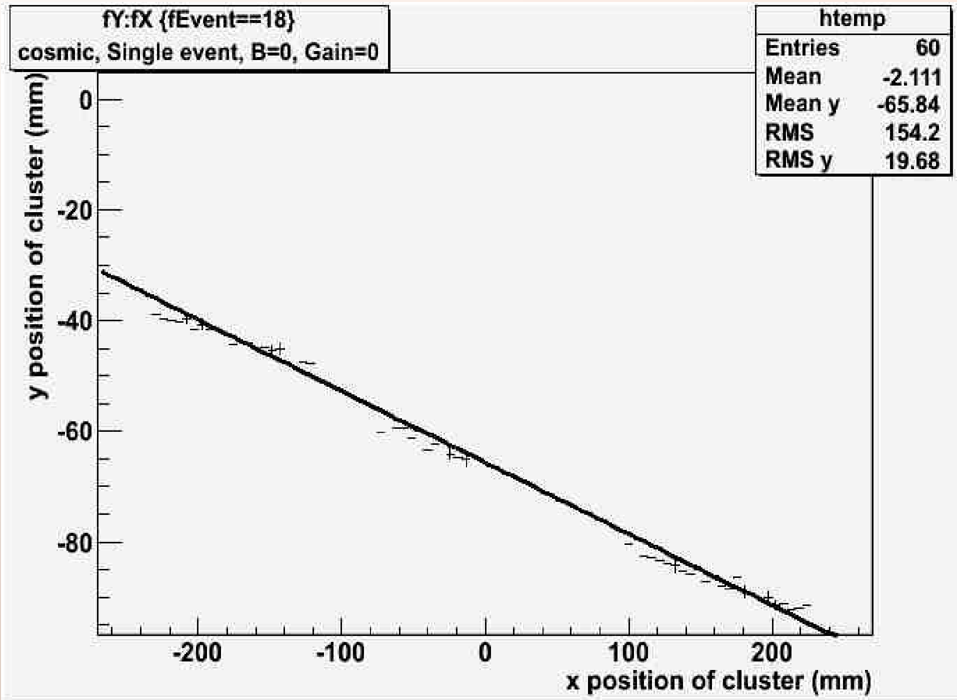


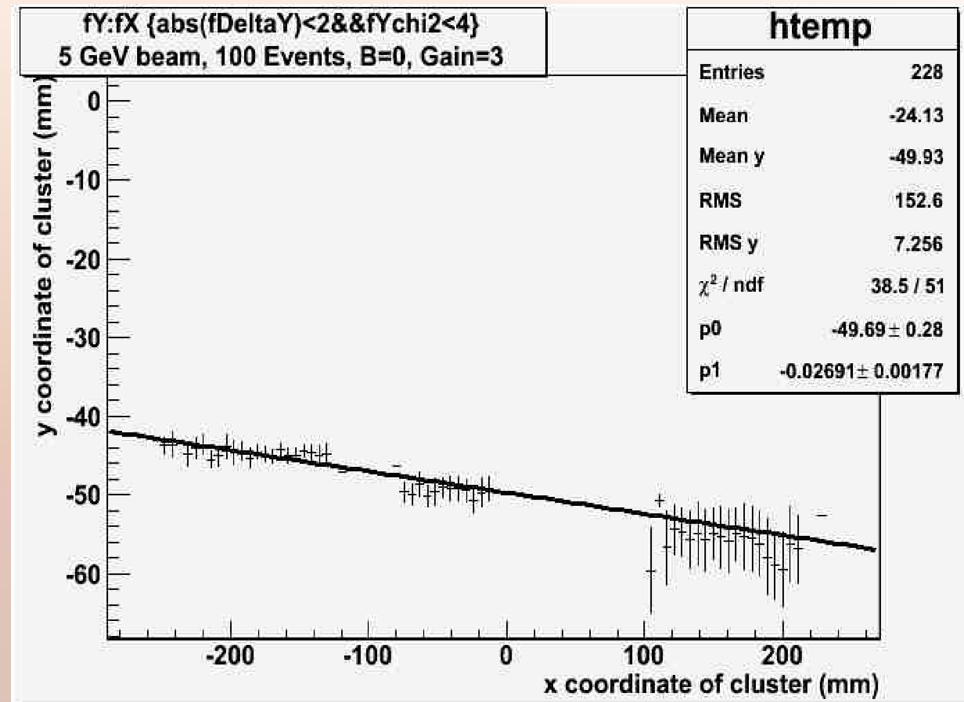


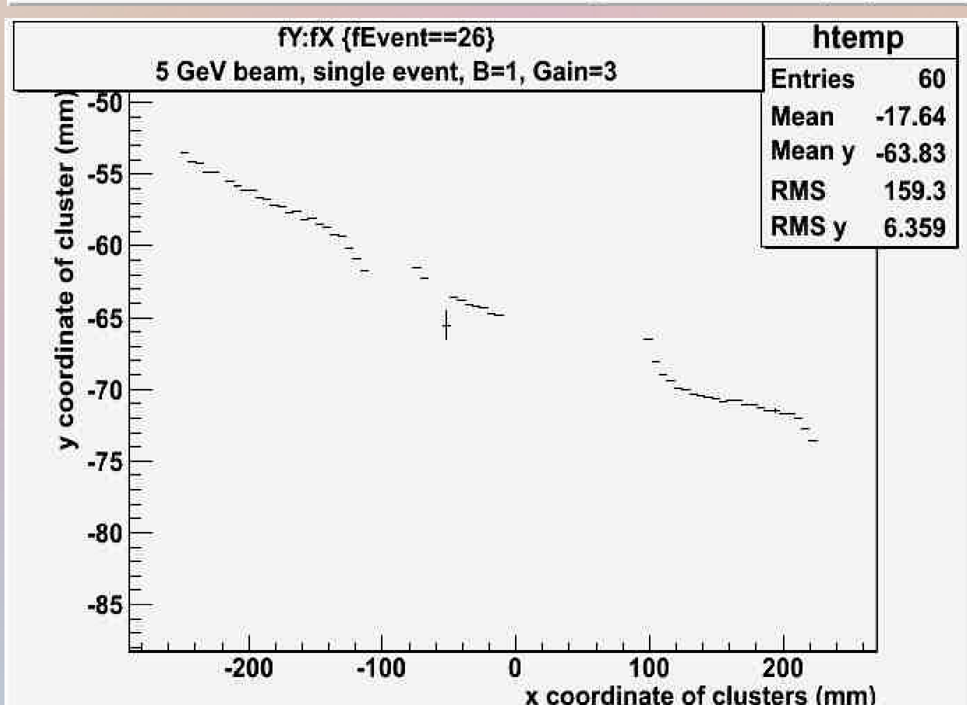
What is the drift length when B=0?











Two different problems:

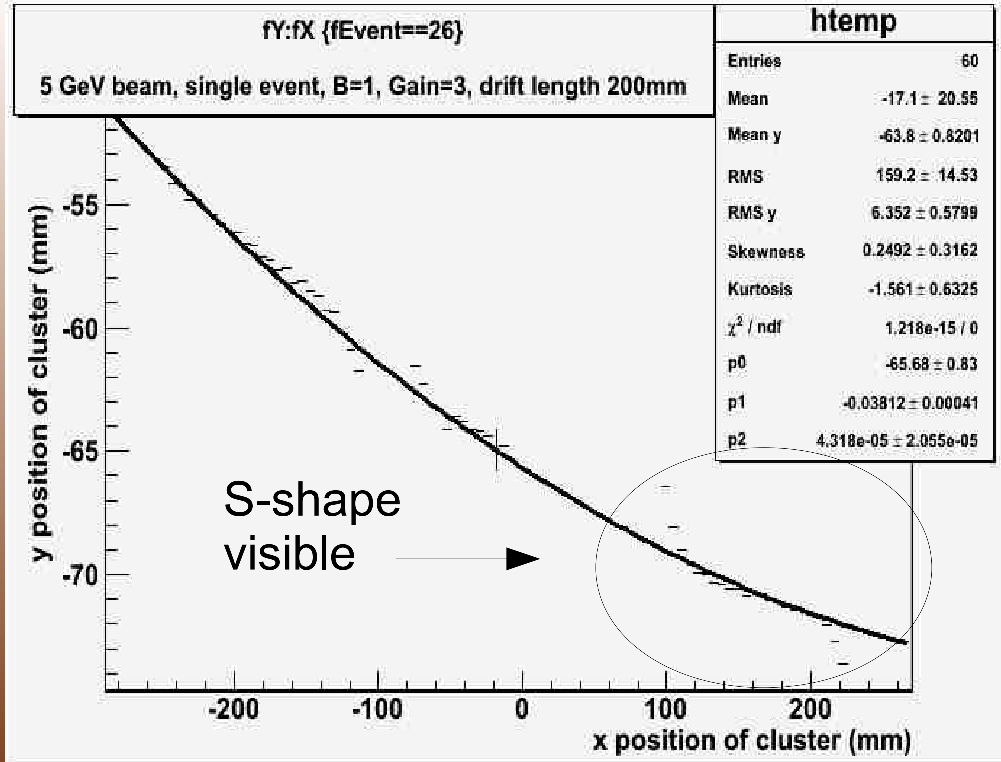
- Systematic residual-problem with both B=1 and B=0.
  - *Mapping problem
  - *pad geometry problem
  - *E-field distortion (gap between modules and termination plate)

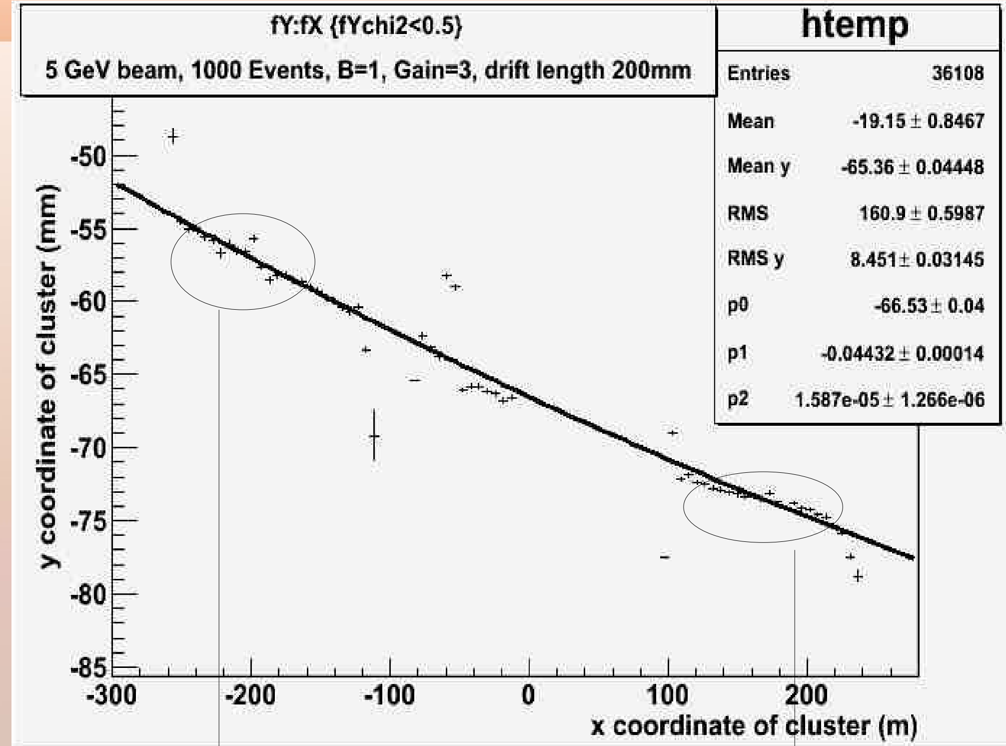
- No module edge deviations for B=0

- Edge deviations when B=1
  → Arises when B-field not parallel to E-field?

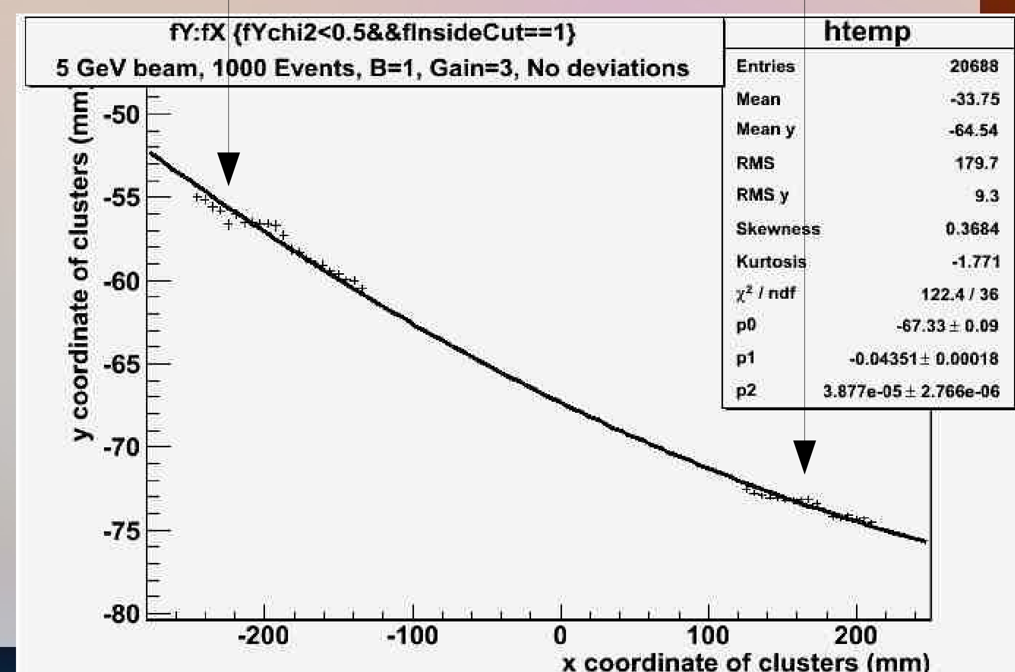
- Reason for making a cut when calculating the space point resolution and curvature of track (when B=1) for estimation of beam momentum

- Beam incoming from right



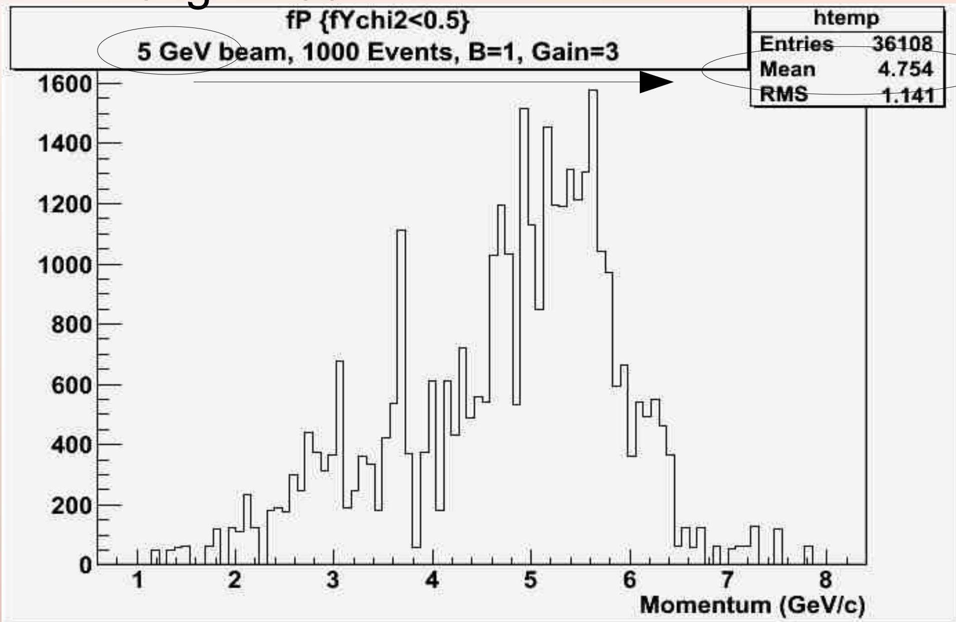


Make a cut in x coordinate

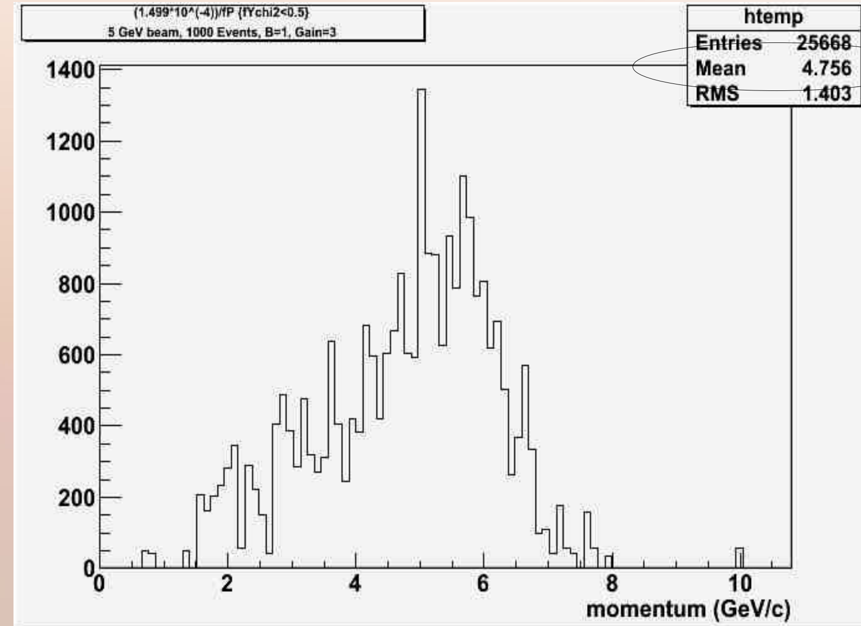


- Space coordinates for cluster position
- With (lower figure) and without (upper figure) cuts
- Second degree polynomial fit
- Note: second degree coefficient is 3.877*10^-5

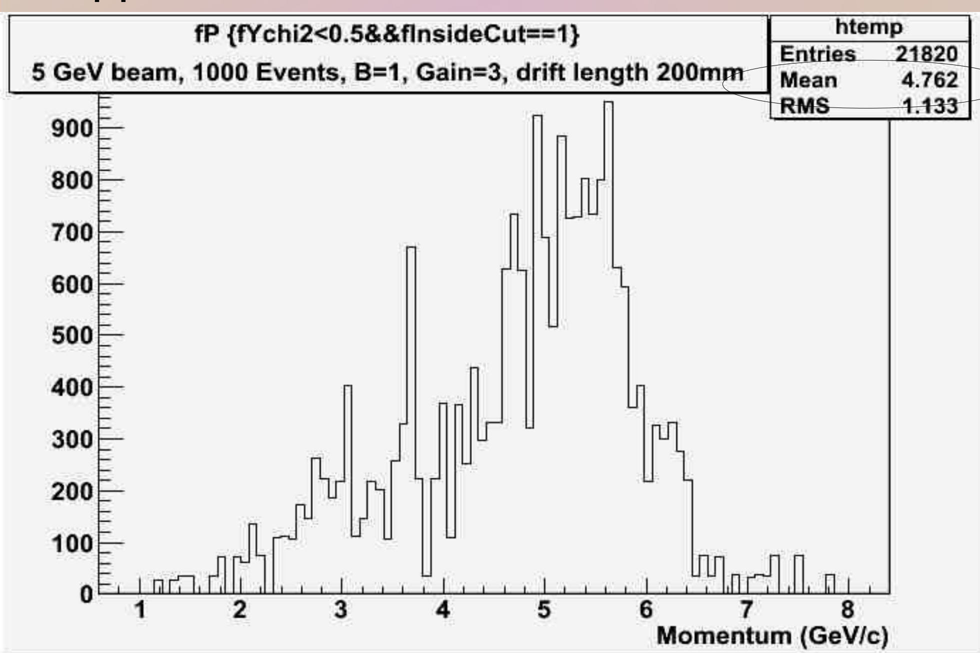
Drift length 200 mm



Drift length 70mm, with deviations



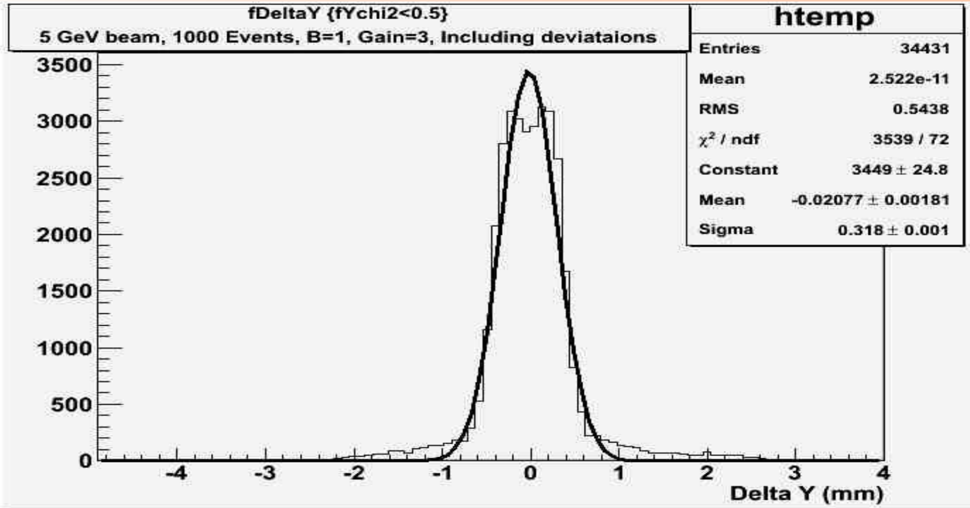
Upper: with deviations, Lower:with cuts

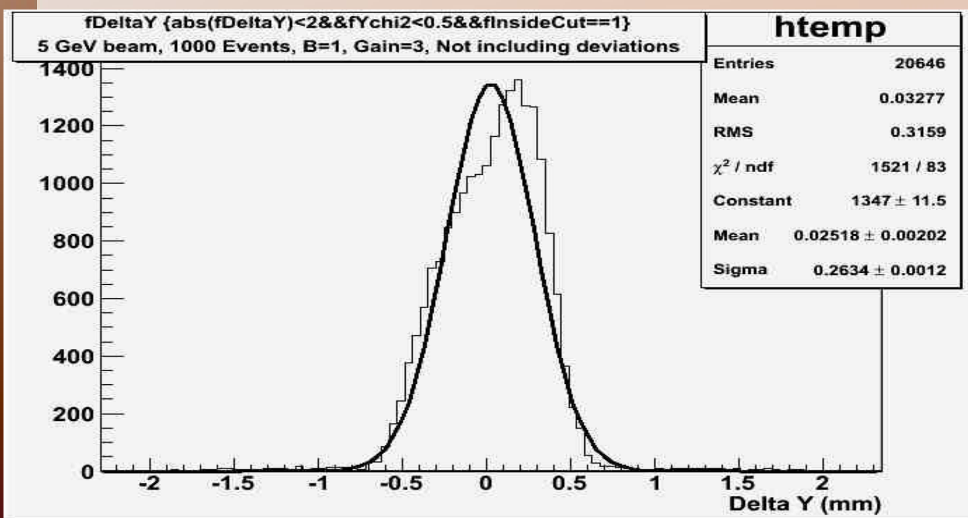


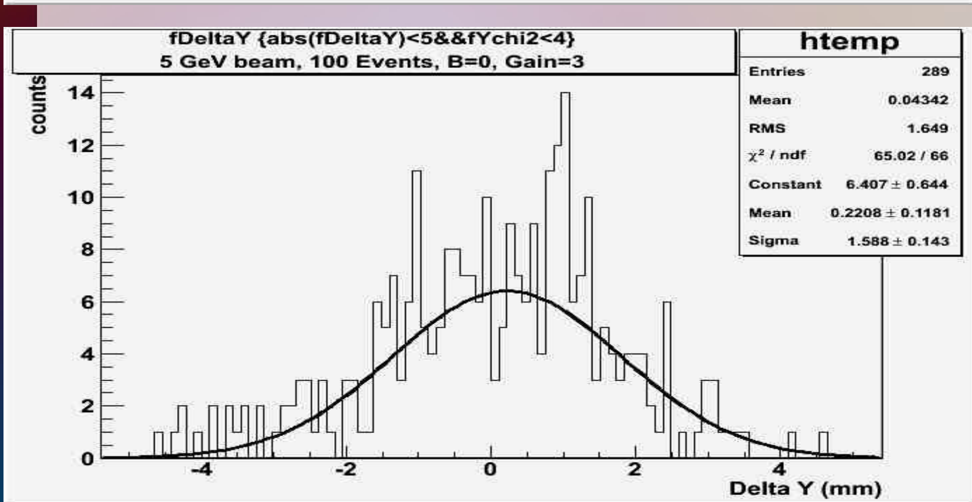
→ The deviations does not make a difference to the momentum resolution since the second degree coefficients are almost the same with and without cuts (the deviations “even up”)

(but it make a difference for space point resolution)

-Do you know the accuracy of the momentum 5 GeV/c? Have you similar plots?







Drift length 200 mm

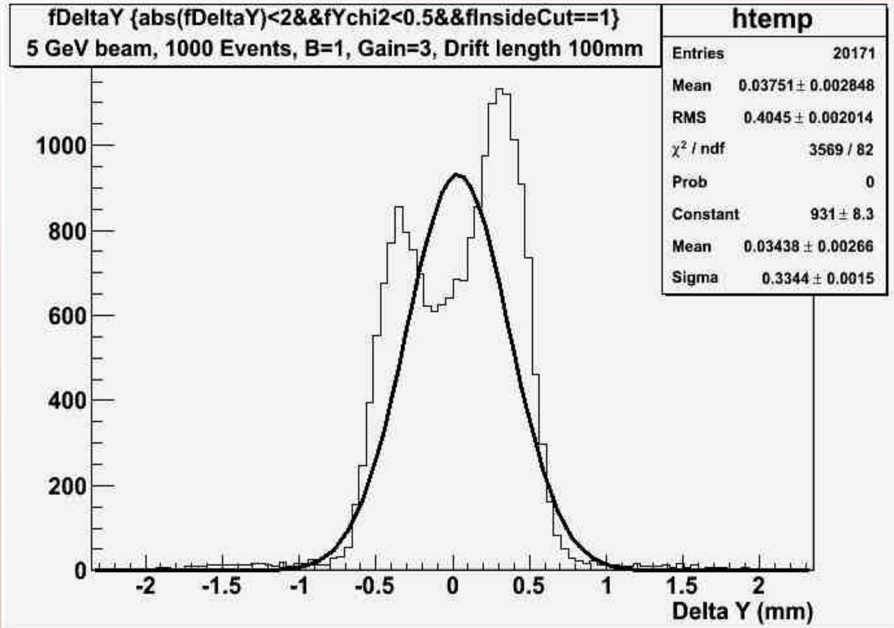
Space point resolution

-Narrower distribution of distance from fitted line (delta Y) when cutting off deviations due to non parallel magnetic field

For drift length 200 mm:
- With deviations: ~300 microns
- Without deviations (but with the systematic residual problem): ~260 microns

- Single events can obtain space point resolution of ~100 microns with magnetic field and drift length 200 mm

- Resolution decreases without magnetic field as predicted



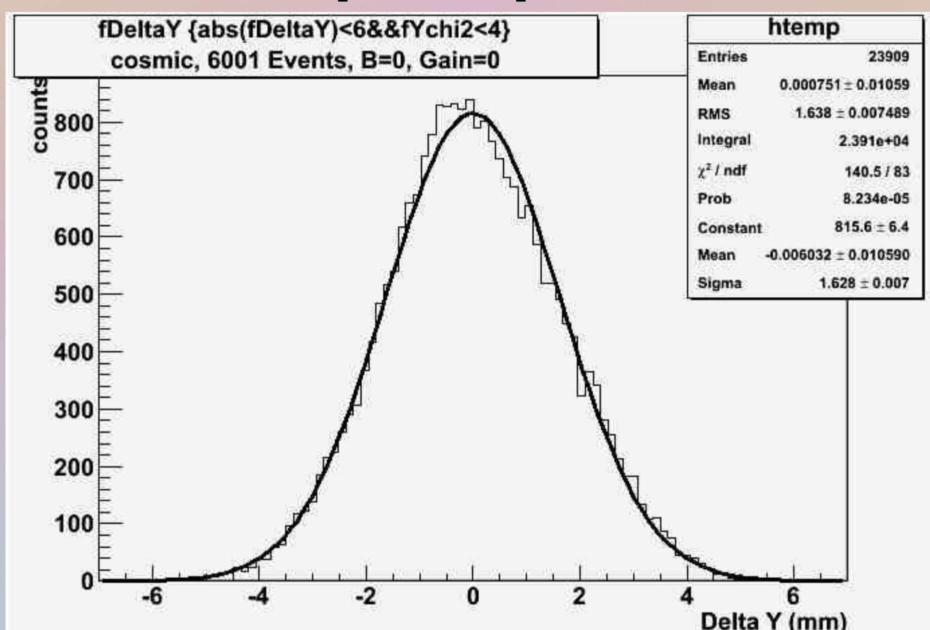
- With cuts

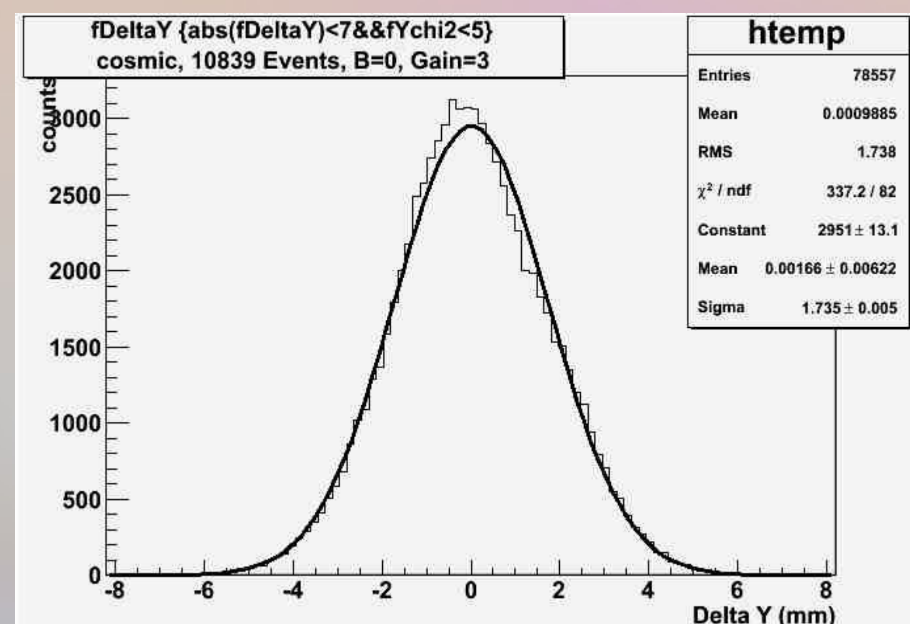
- The resolution is not better for drift length 100 mm than for 200 mm due to systematic residual problem

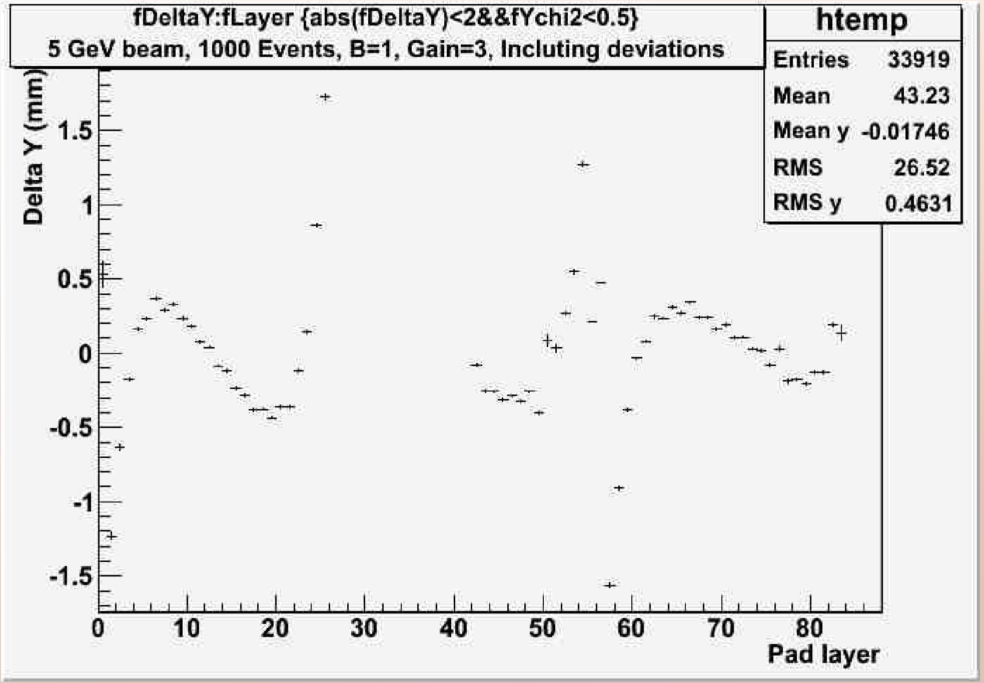
- The systematic residual problem is clear since there is a dip at Delta Y = 0

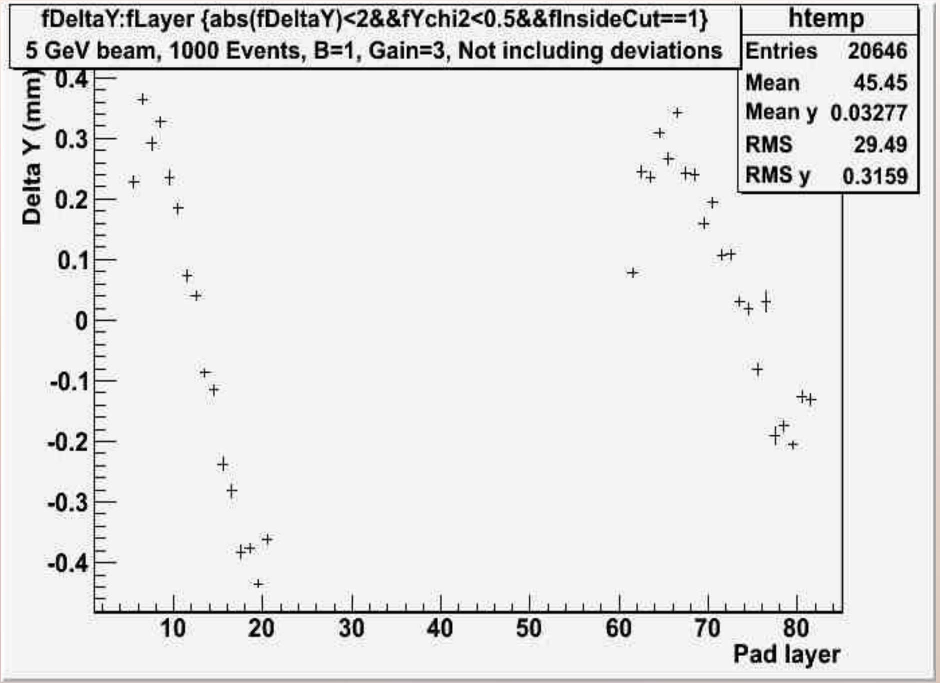
- Try with a modified software that “aligns” the cluster positions by fitting only the local area inside the cut

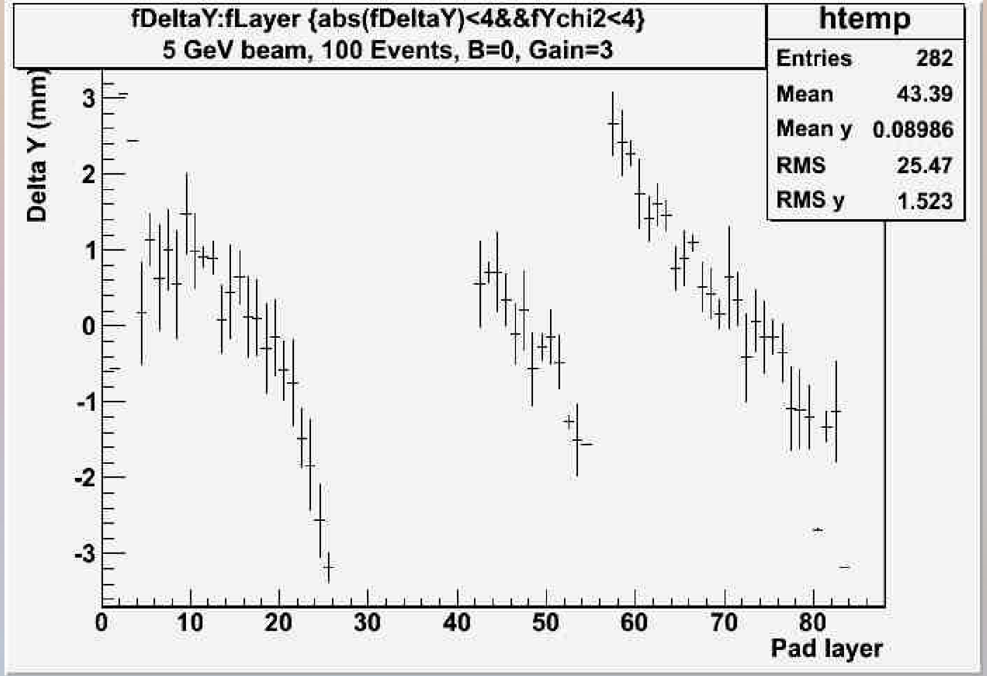
Space point resolution for cosmic rays:











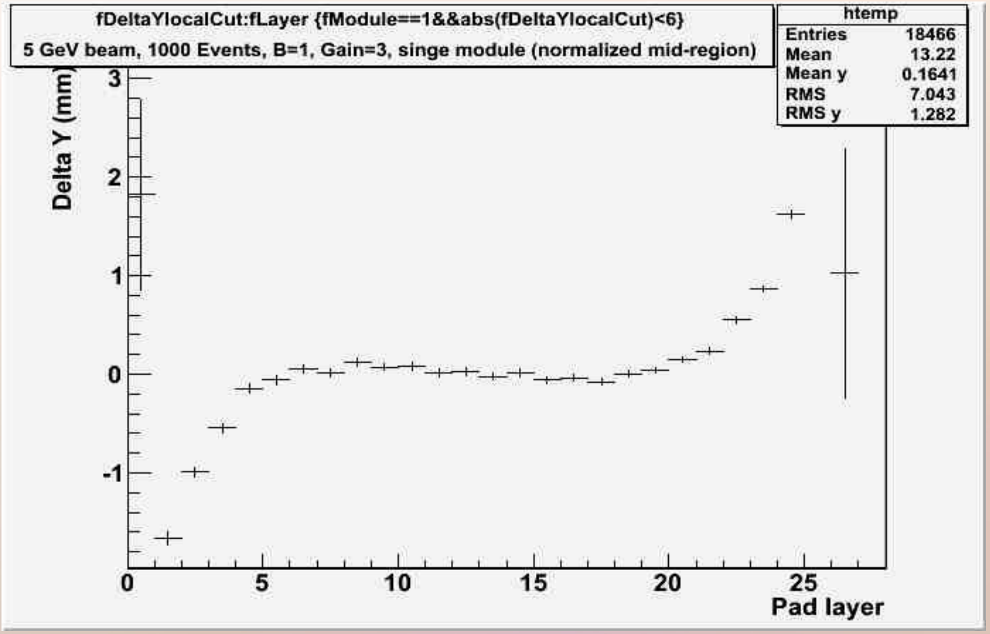
Distance from fit on y-axis

-Upper left: Including deviations

-Upper right: With cuts (no mid-module)
→ systematic residual problem ~+/- 0.4 mm
Why?

-Lower left: No B-field (hence no cuts)
→ systematic residual problem ~+/- 3 mm

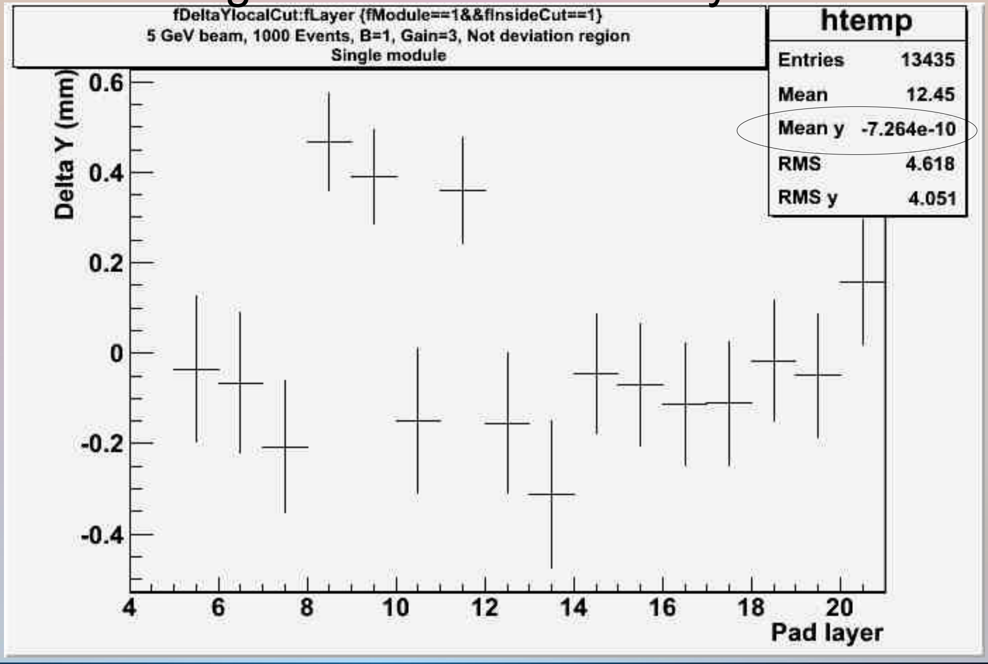
“Aligned” mid-region: (fit only local area inside cut)

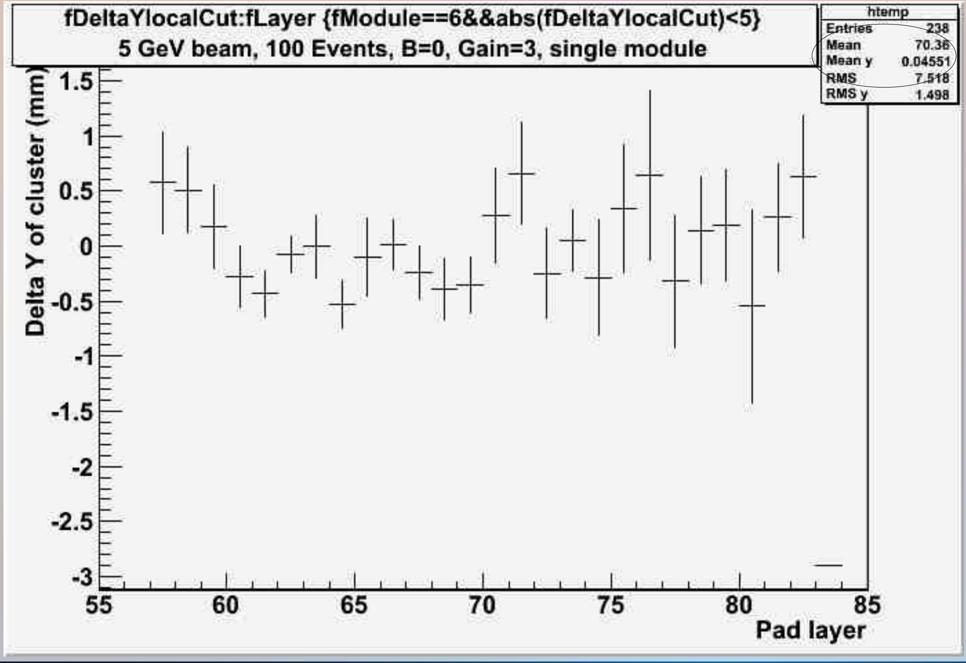


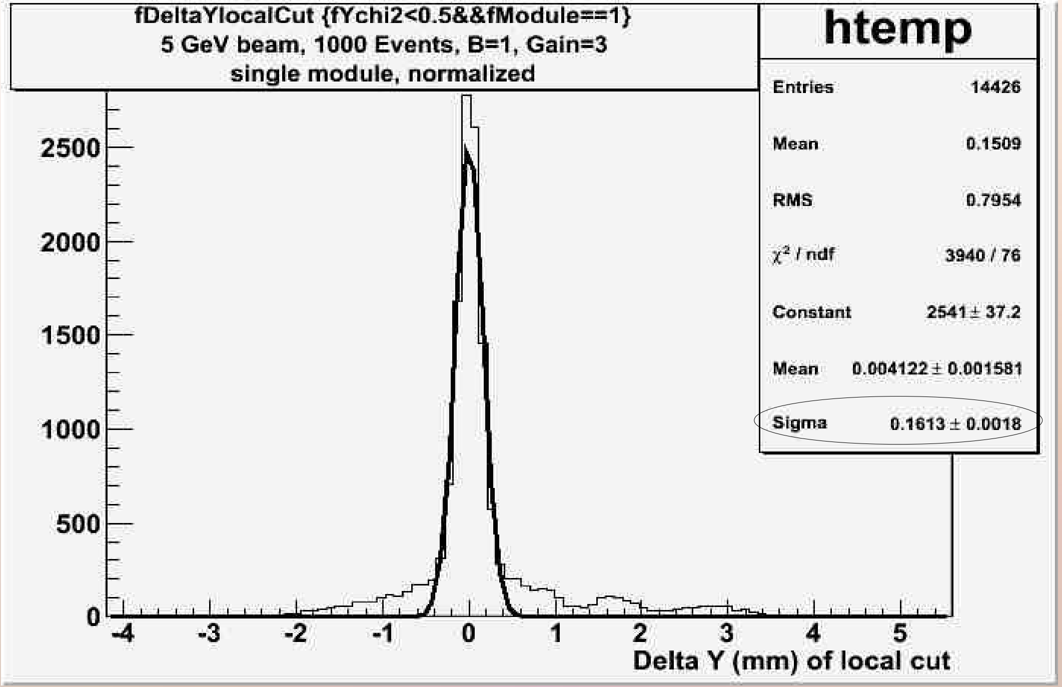
Single module study

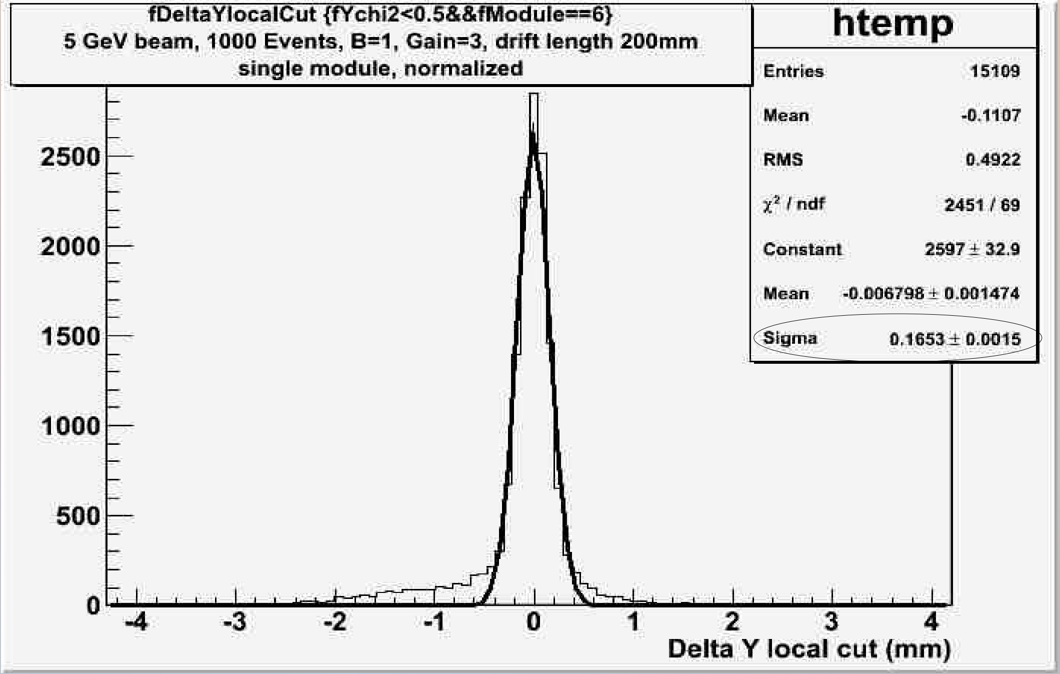
Upper left: with B-field, no cuts
Bottom left: with B-field, cuts
Bottom right: without B-field, cuts

→ Mid-region residuals randomly distributed:









Single module study with aligned residuals

I have not looked at the mid-module where the lower GEMs does not work

→ Better space point resolution (~160 microns)

Space point resolution for different drift lengths → no big difference, why?