

Tracker Status Update

D Adey

CM27 Detector Session

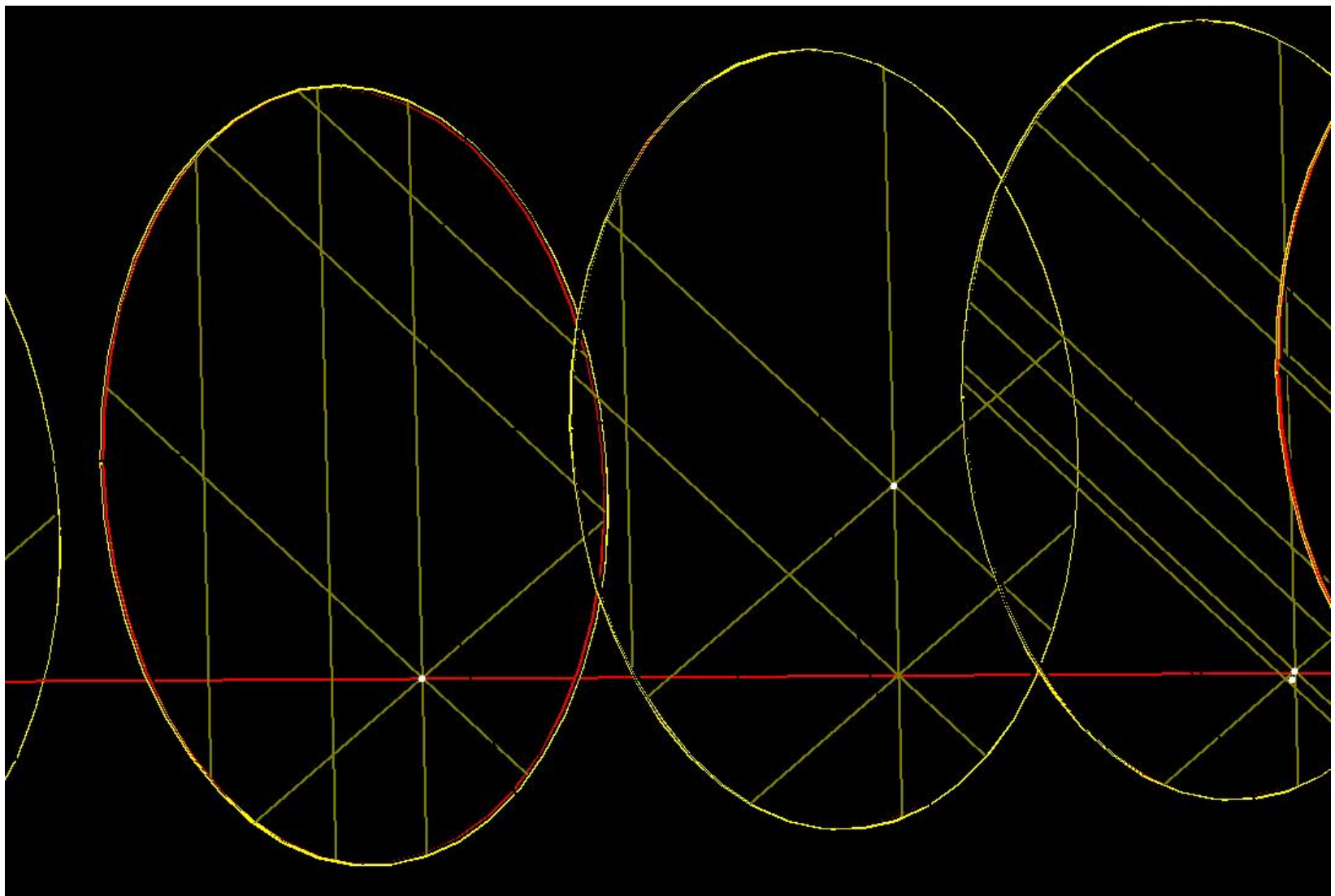
7/7/10

Status

- Reconstruction de-bugging
- Results of cosmic ray tests
- Controls and DAQ
- Plan for cool-down and tests
- Storage

Reconstruction Issues

- Difference between x and y track residuals
- Poor agreement with MC
- Low valued and inconstant efficiencies
- Presence of clusters not associated with cosmic ray track



Station 1 = 98.2 \pm 0.1 %

Station 2 = 96.4 \pm 0.2 %

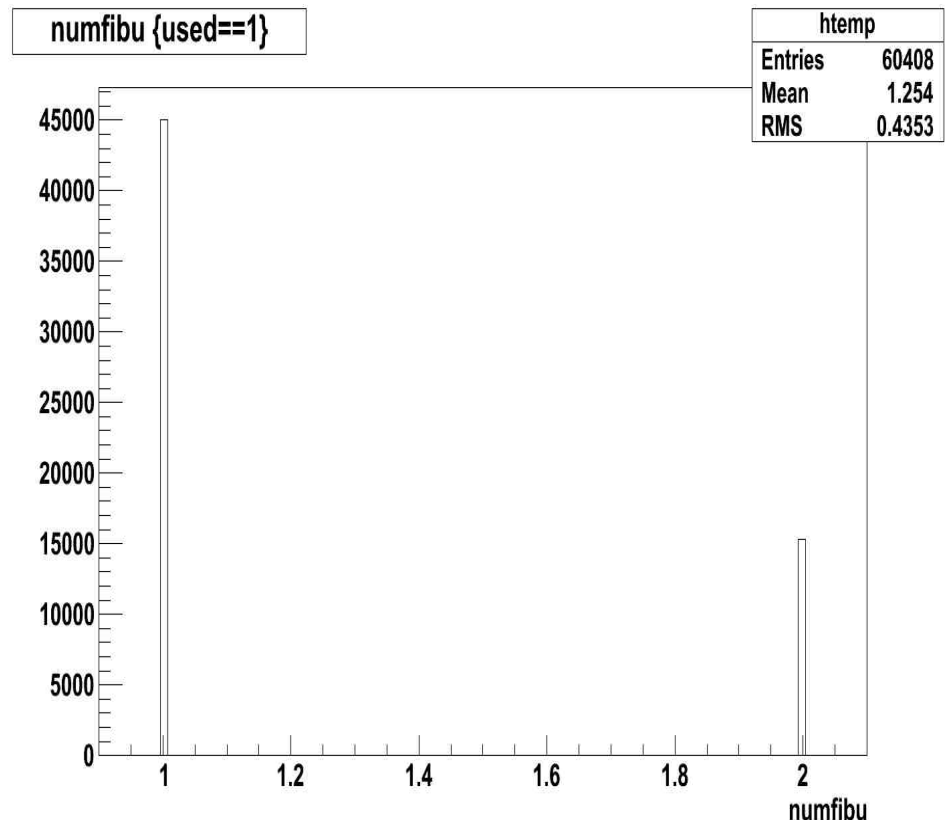
Station 3 = 96.3 \pm 0.2 %

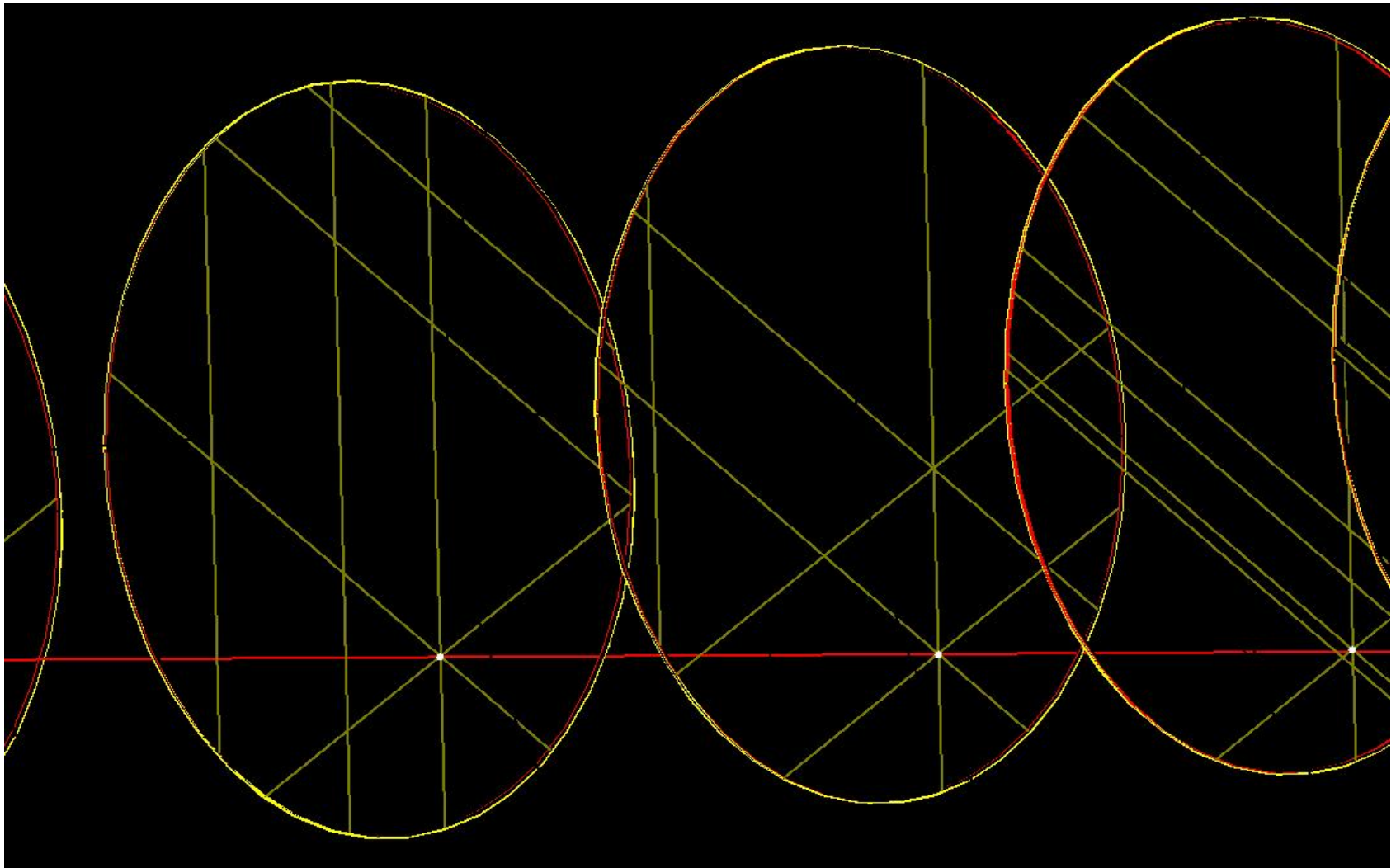
Station 4 = 99.8 \pm 0.1 %

Station 5 = 97.4 \pm 0.2 %

Cause of Inefficiency

- Clusters unrelated to tracks creating “ghost” space points
- Noise? Shower?
- Used clusters behave as expected
- Need to analyse cosmic + calibration data
- Requirement made on minimum light yield of each cluster in triplet ($>5\text{PE}$). Doublets still $> 2.5\text{PE}$
- Timing calibration





Station 1 = 99.8 +/- 0.1 %

Station 2 = 99.9 +/- 0.1 %

Station 3 = 99.7 +/- 0.1 %

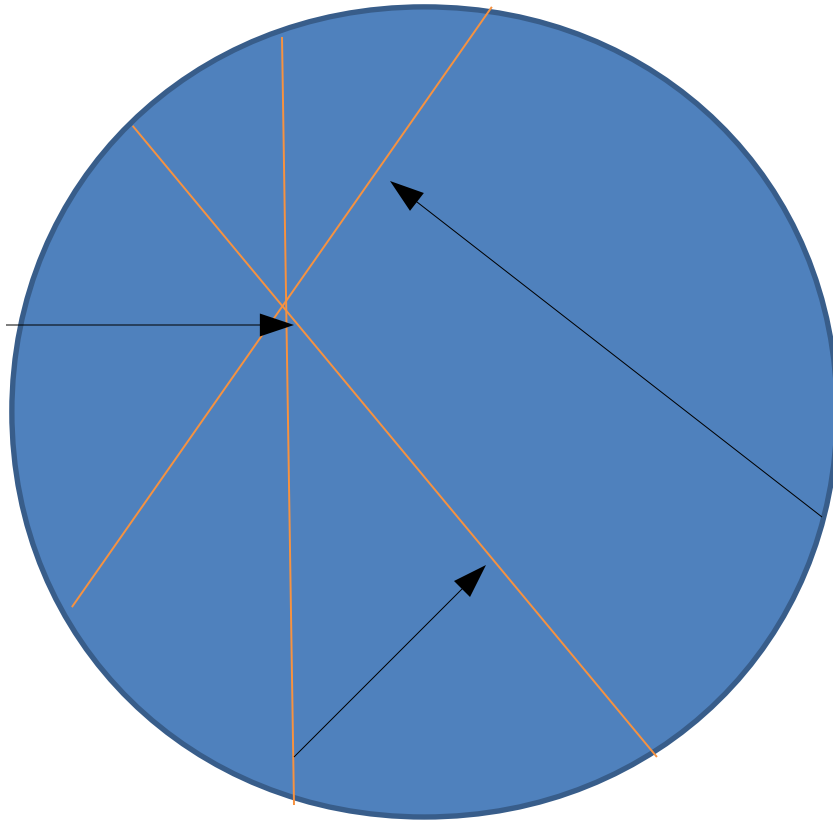
Station 4 = 99.9 +/- 0.1 %

Station 5 = 99.8 +/- 0.1 %

Efficiency “should” be $> 99.9\%$.

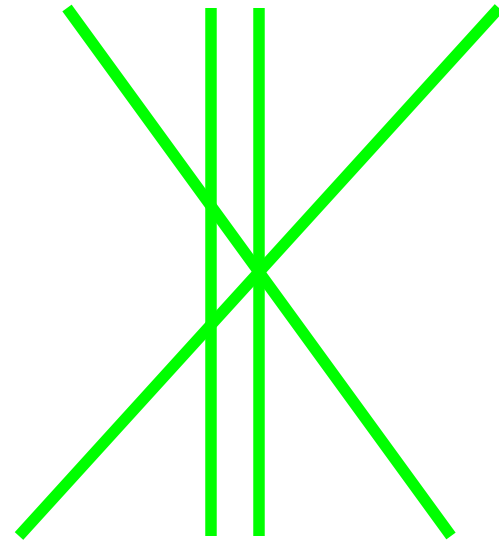
Working on an improved space point search

Triplet Residual



Geometry and channel ordering
mean sum of channel numbers
always equal to sum of central
channel numbers (318.5)

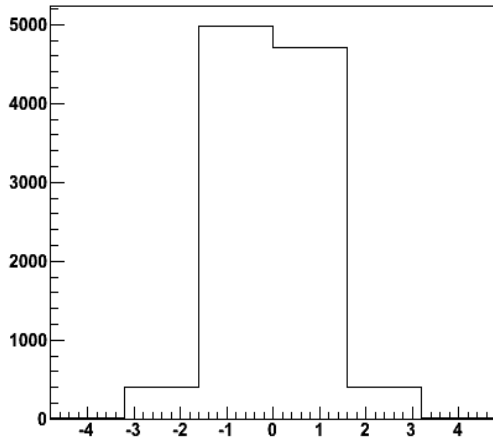
Summing integers gives 318/319



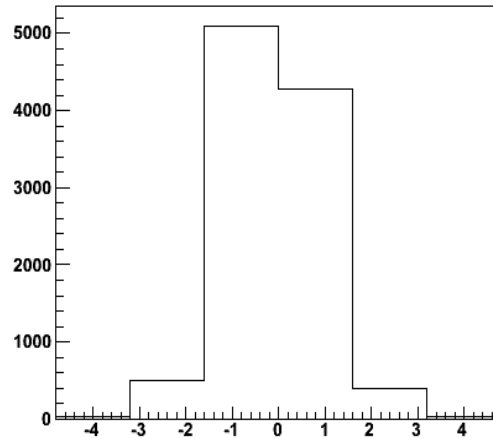
2 channel cluster – if seed cluster
has highest light yield sum of channel numbers
could be different from expected – plan to weight

Tracker 1 Triplet Residual

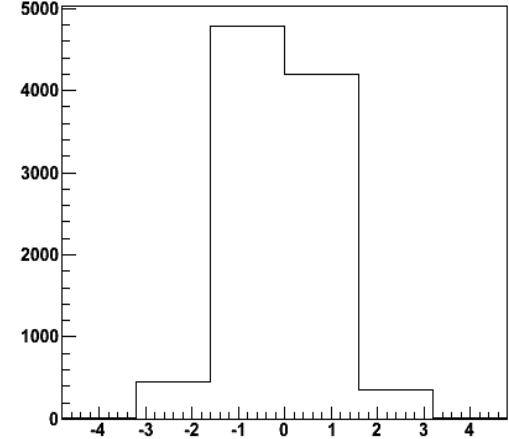
S1



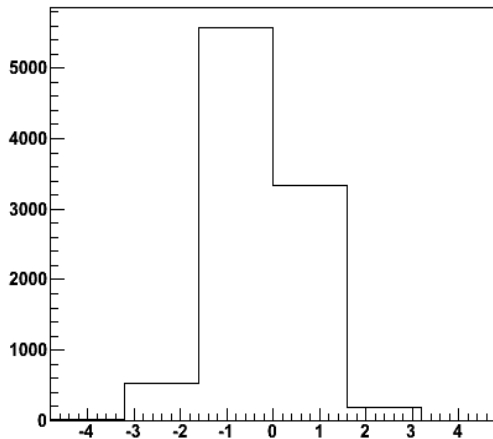
S2



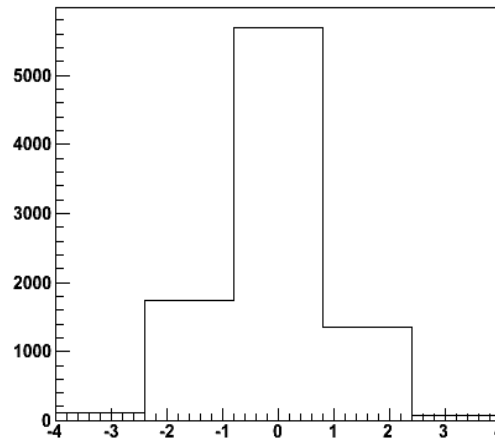
S3



S4

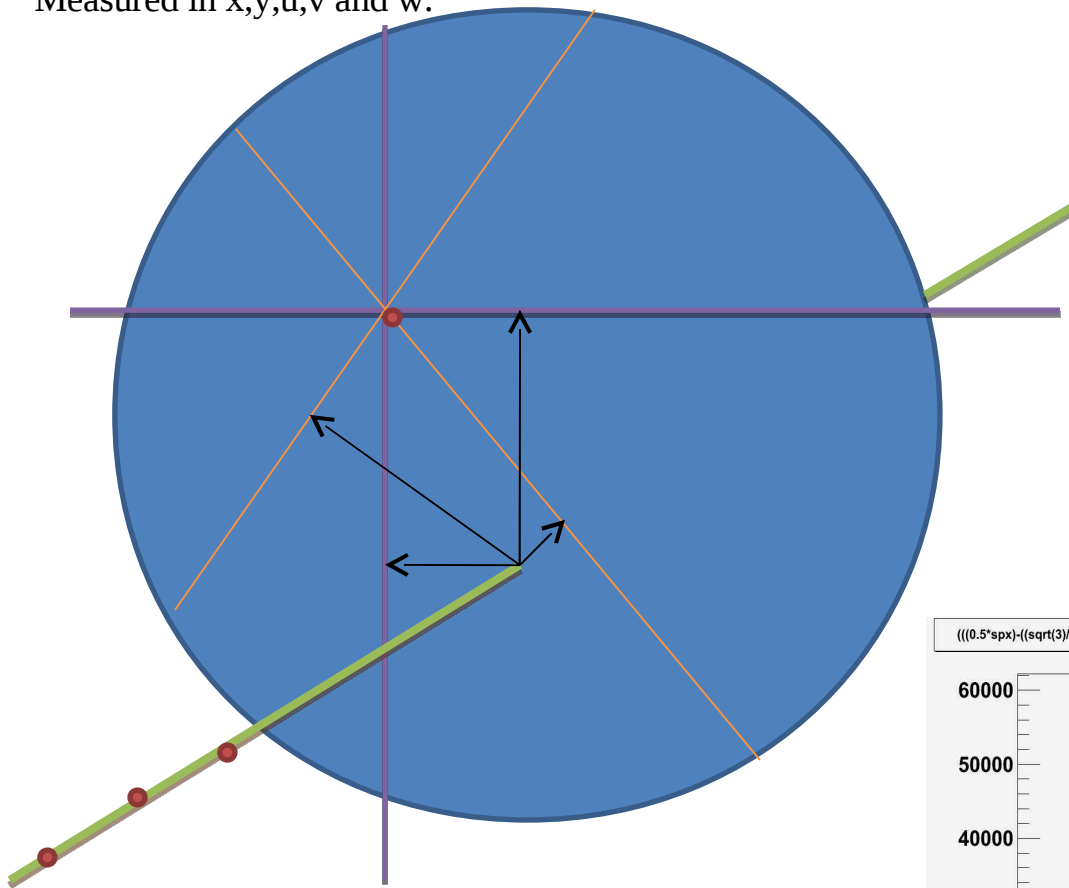


S5



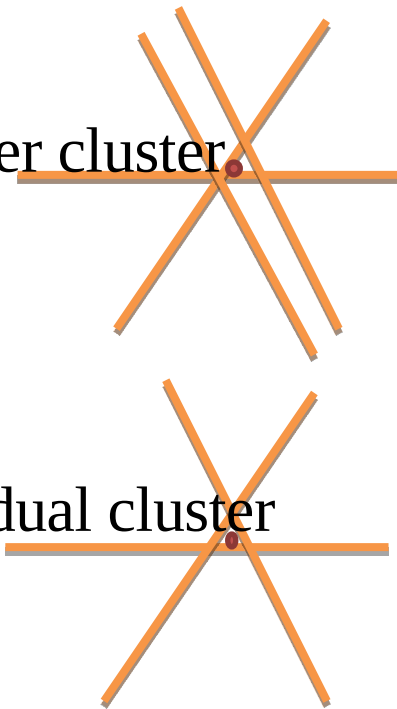
Station 5 different –
as expected from geometry

Perpendicular distance between sub-track
(made from points not including station under question)
and space point (or channel)
Measured in x,y,u,v and w.

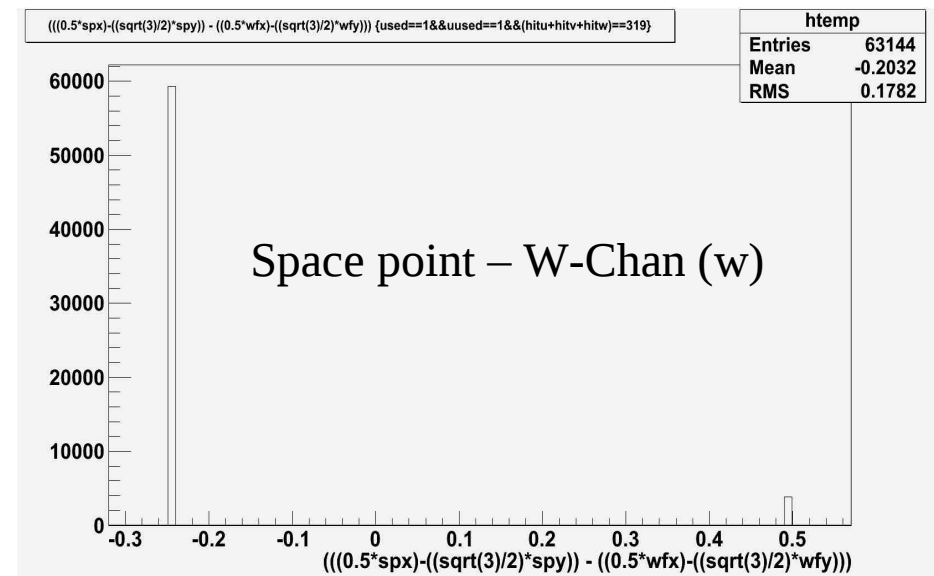


Difference between Space Point and
individual channel numbers. SP defined as
sum of crossing points of channels

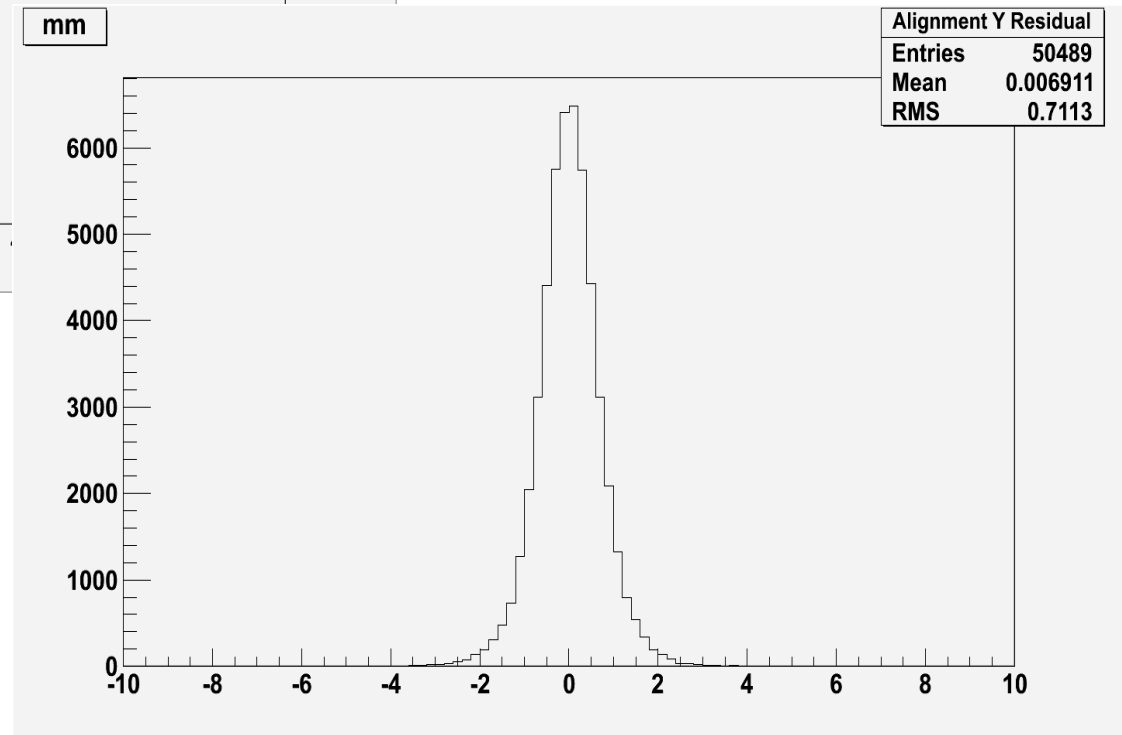
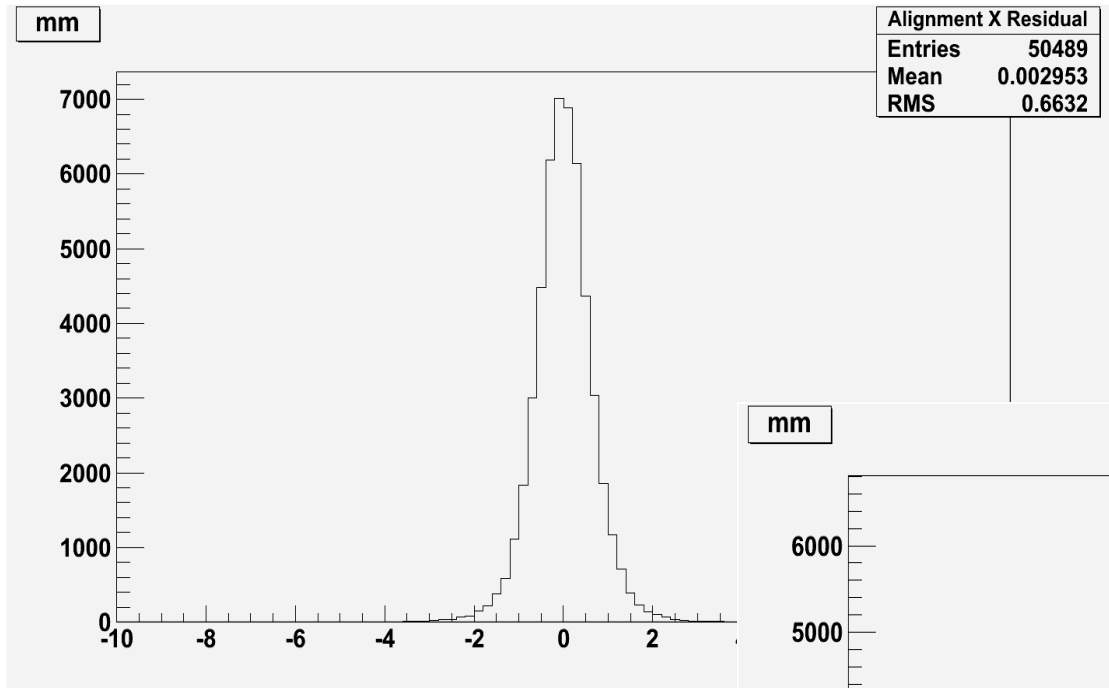
2 channels per cluster



High residual cluster



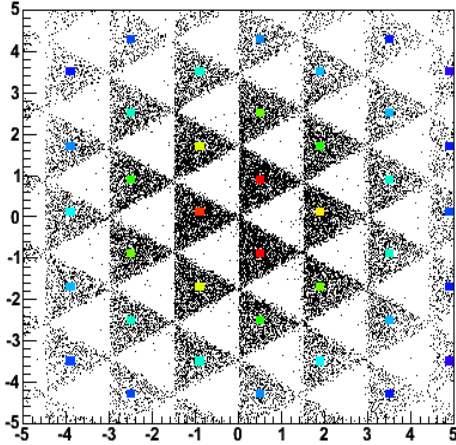
Track X-Y Residuals



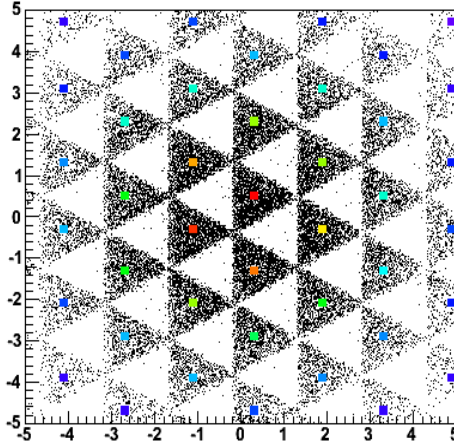
Widths of distributions seem likely, but difference between x and y

Tracker 1 Active Regions

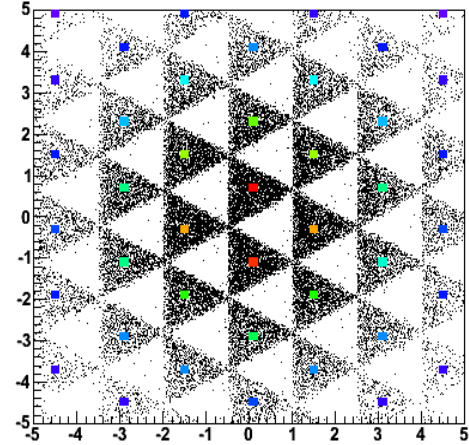
s1



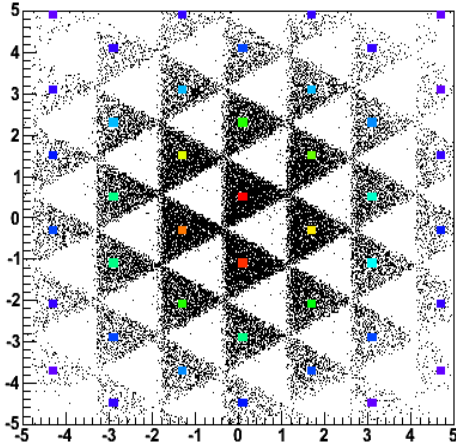
s2



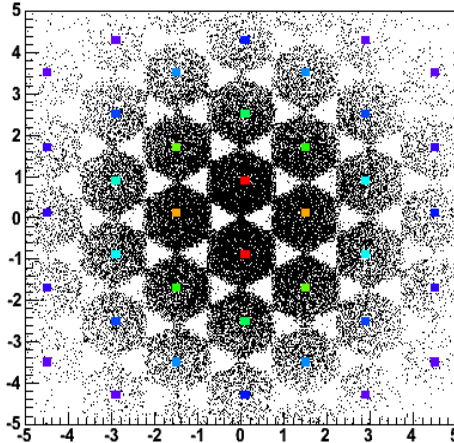
s3



s4

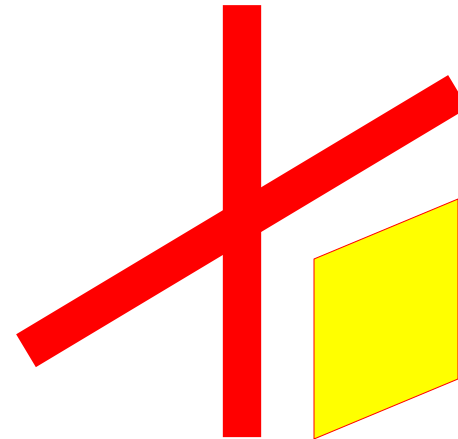
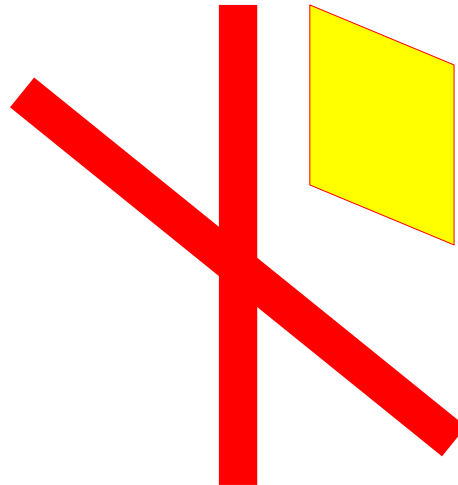
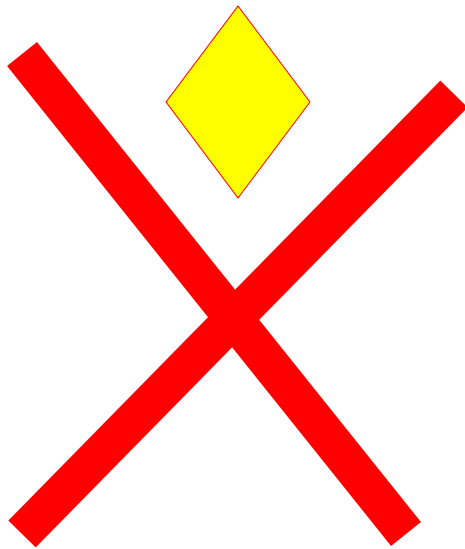


s5a

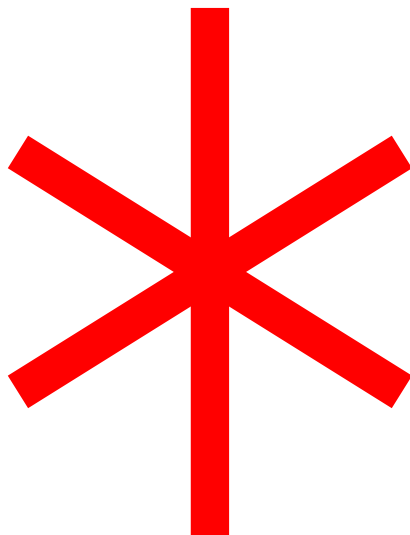


Analysis of geometry
and multiple scattering.
Pre-existing space point
Errors not correct.

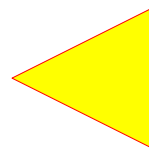
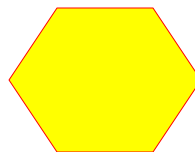
Space Point Geometry



Doublets

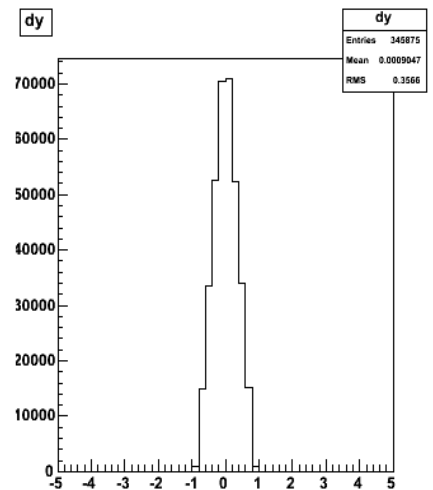
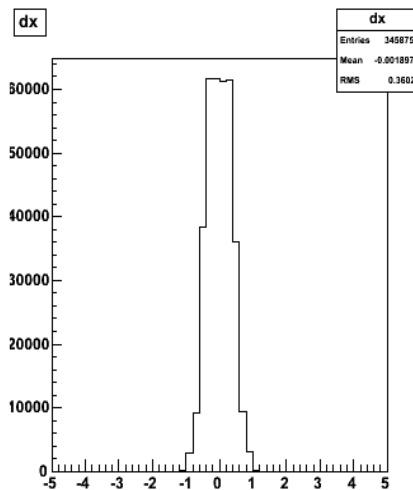
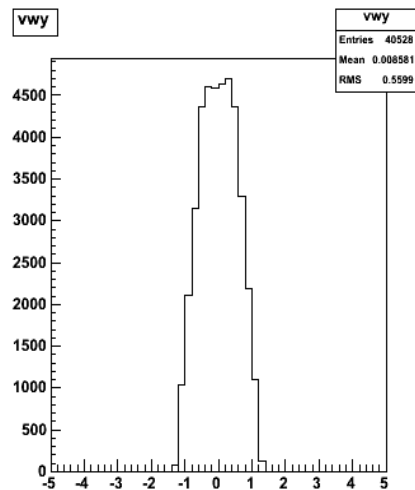
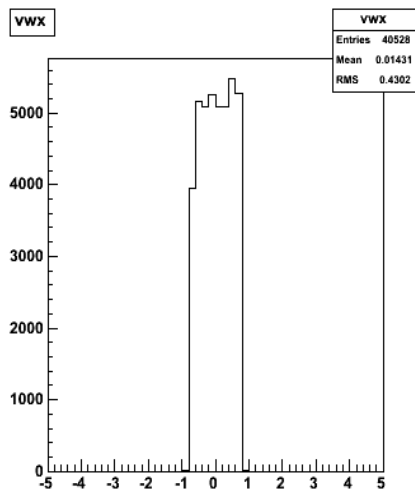
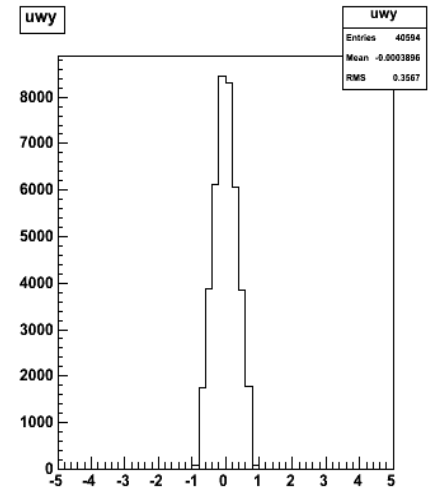
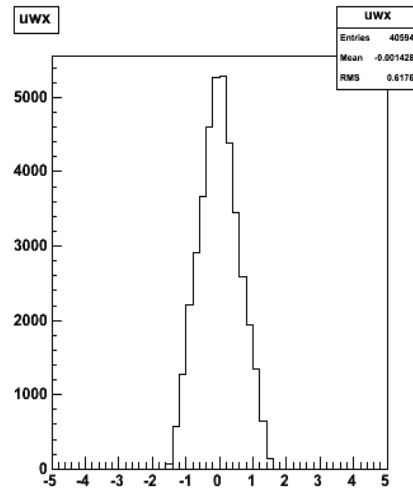
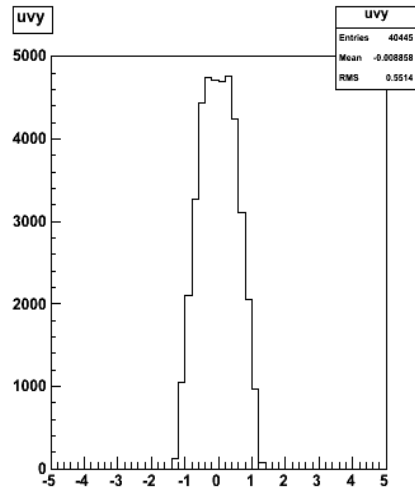
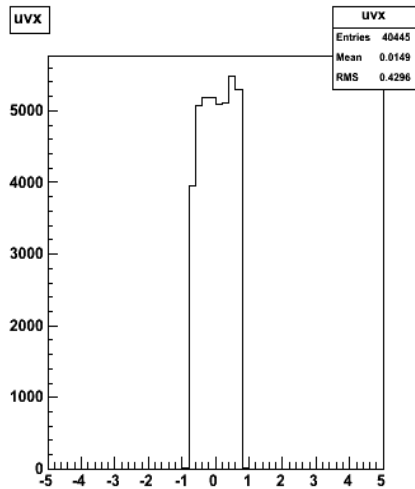


Triplet

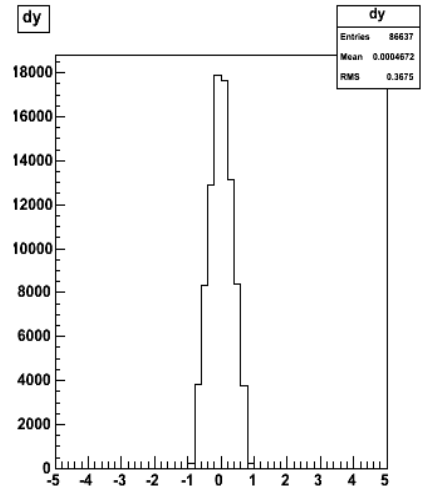
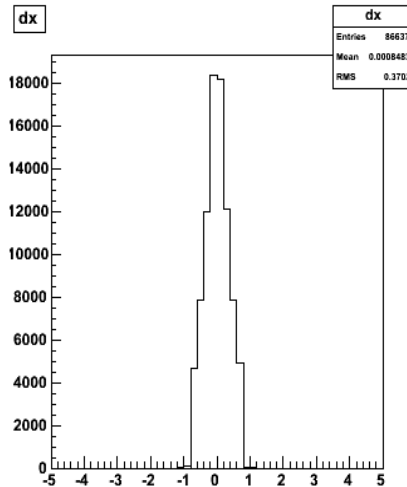
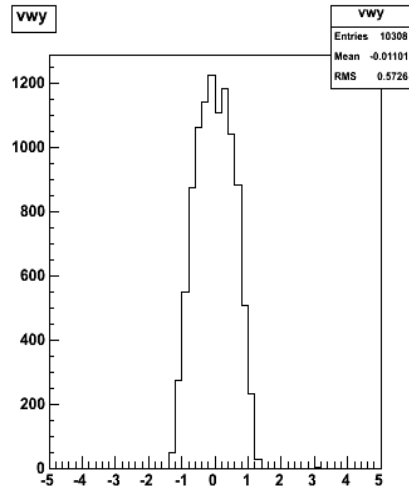
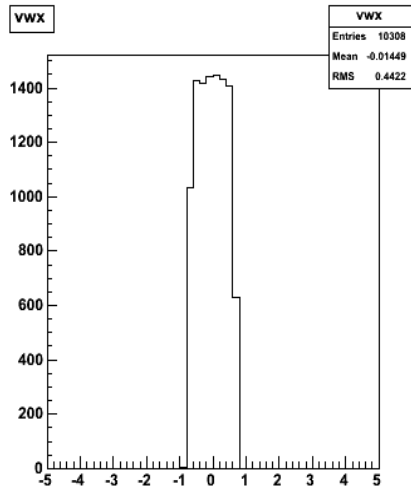
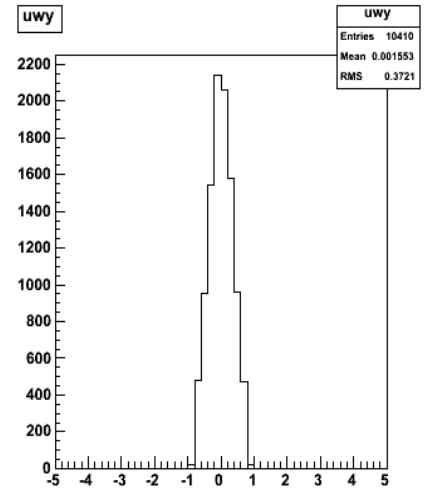
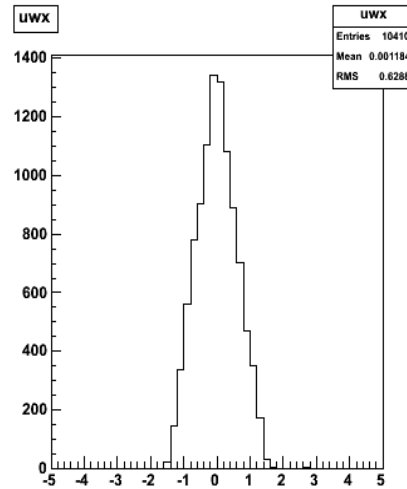
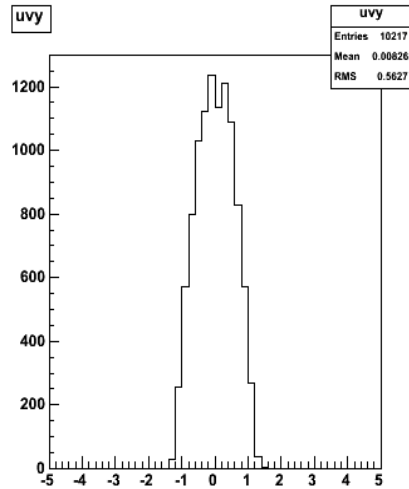
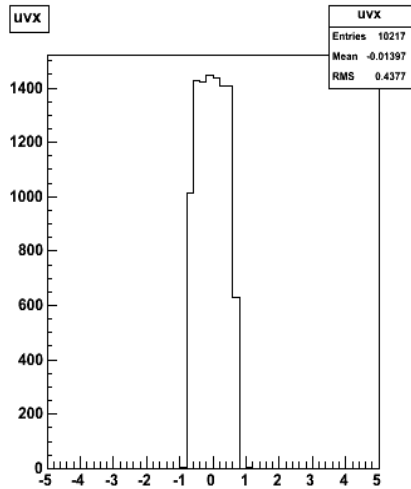


Different x and y
position errors for each
space point type

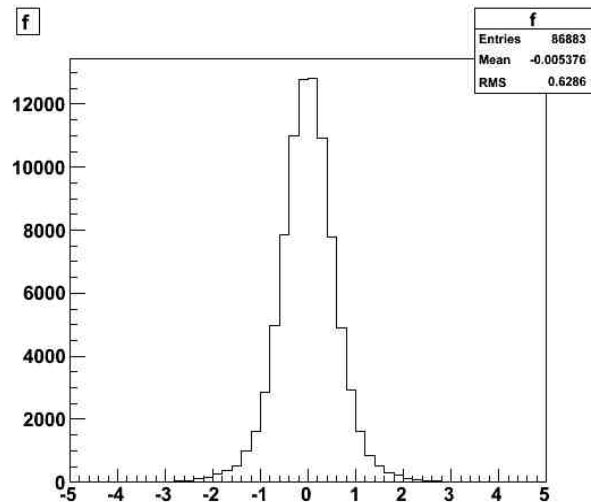
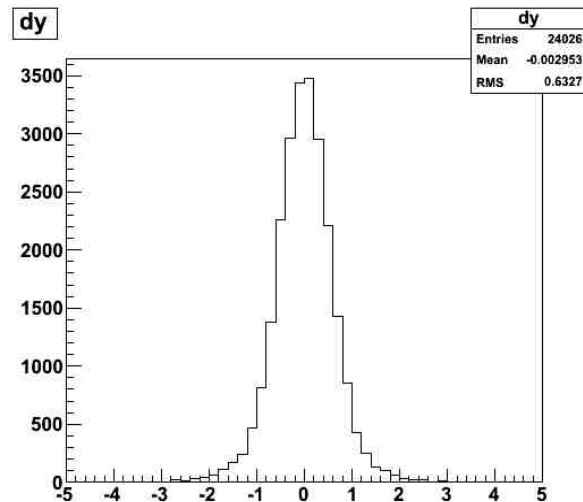
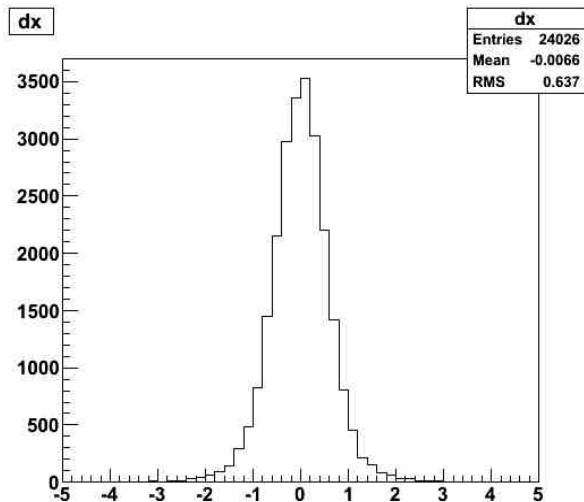
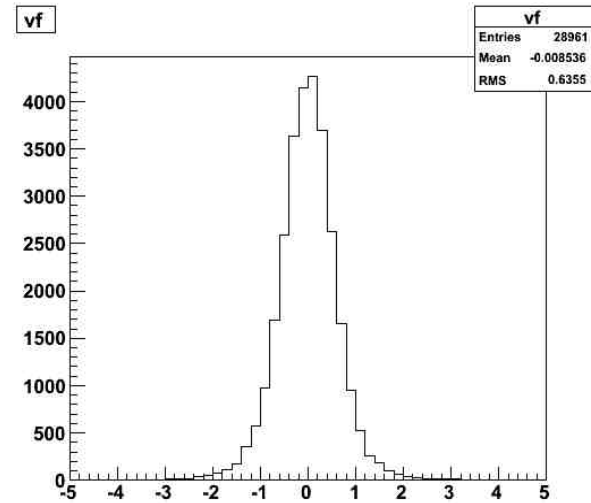
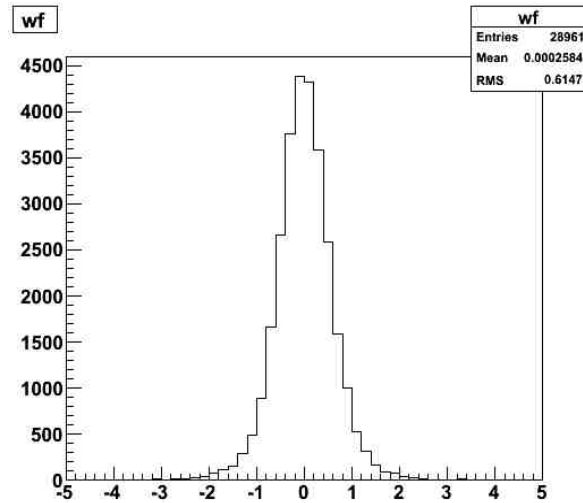
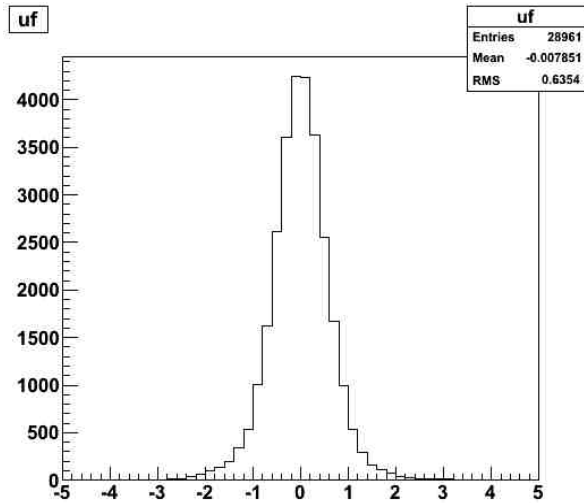
Space Point Errors



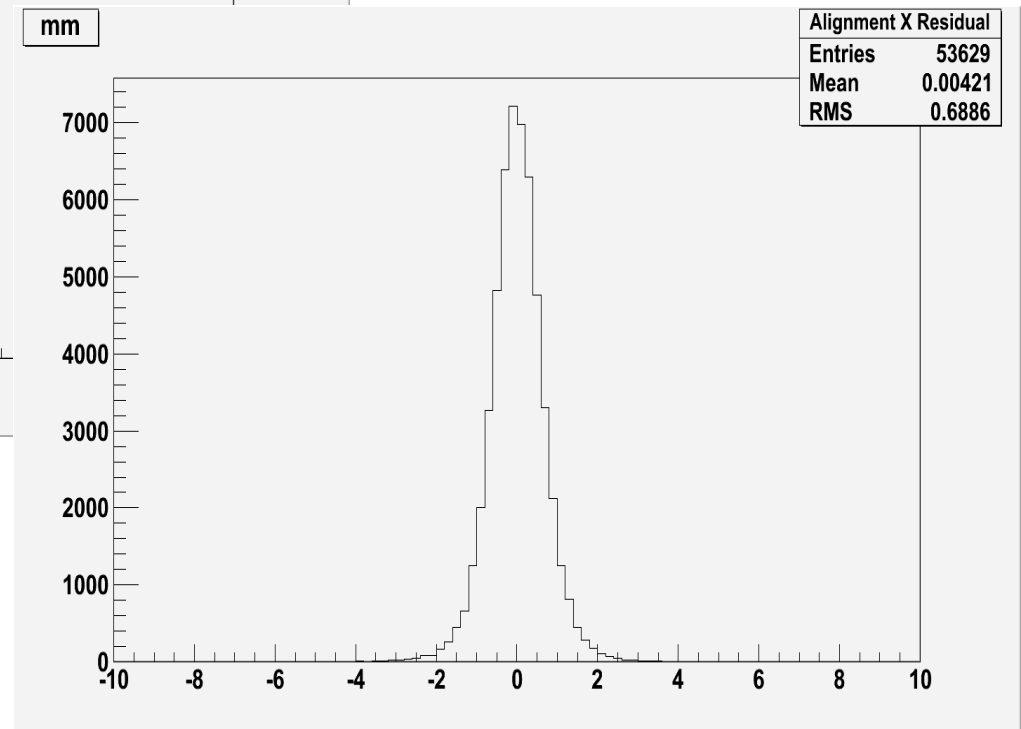
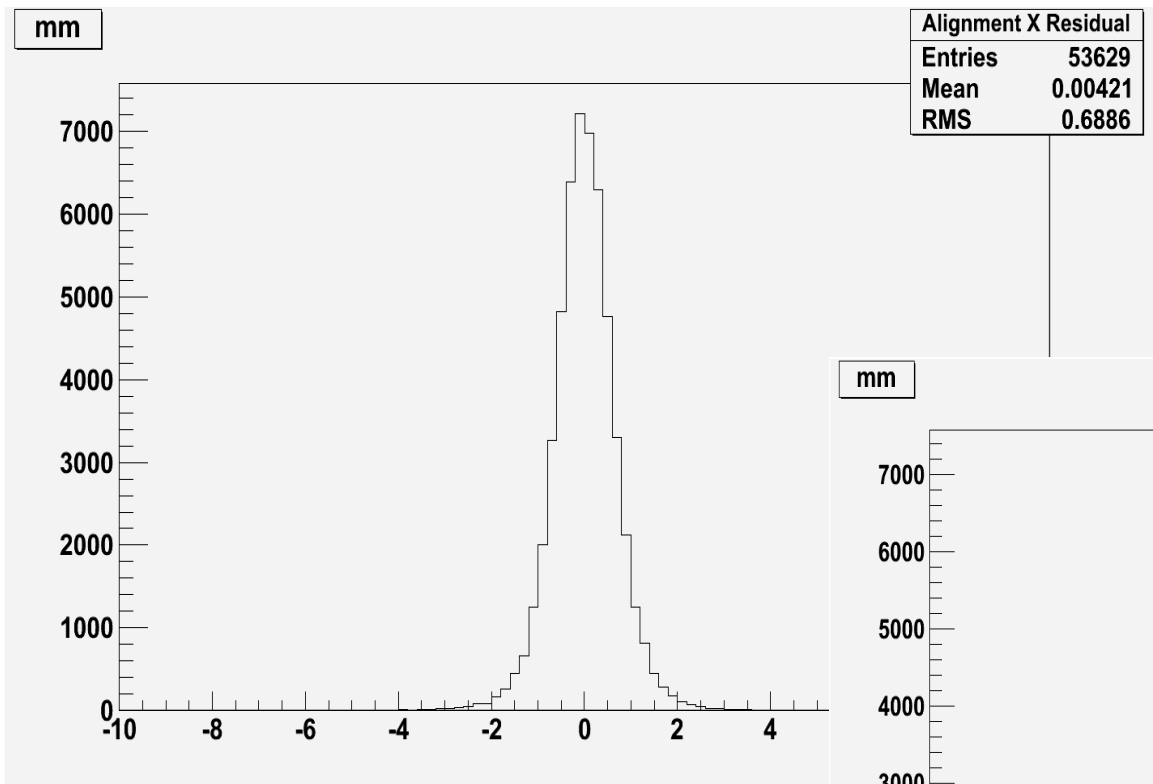
Space Point Errors (T1 S5)



SubTrack – Space Point (Real – Tracker 1)



Track X-Y Modified

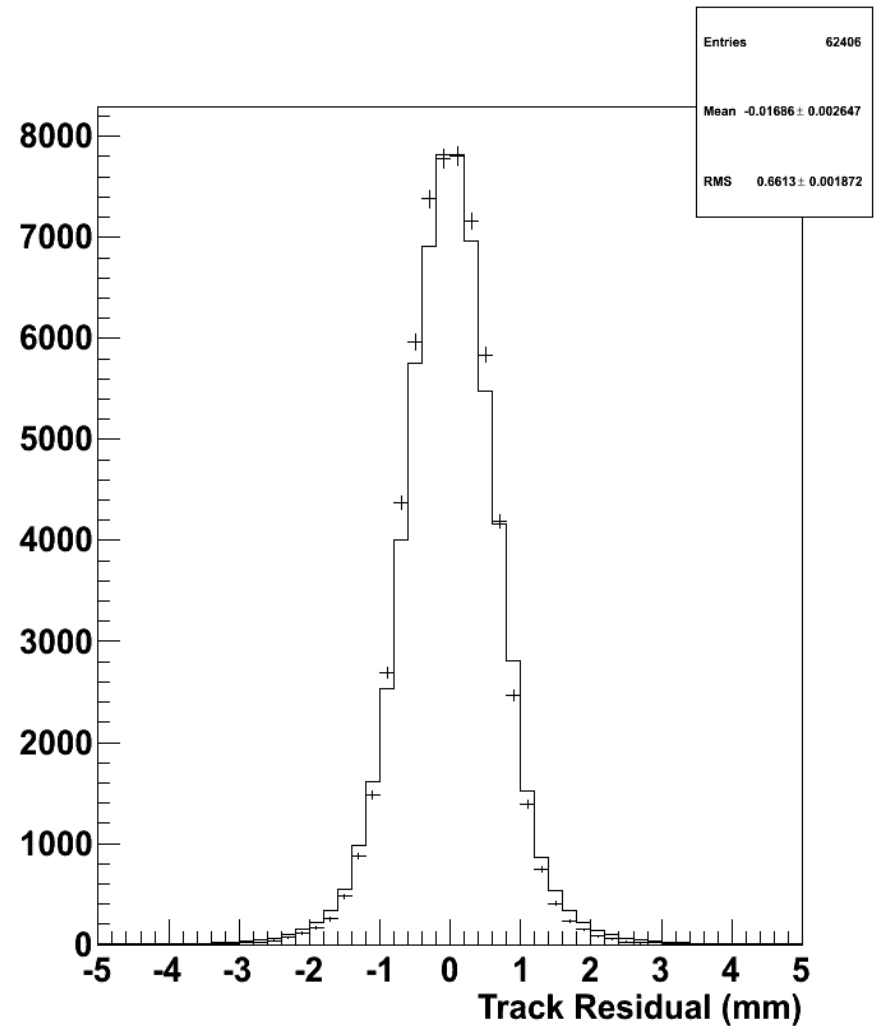
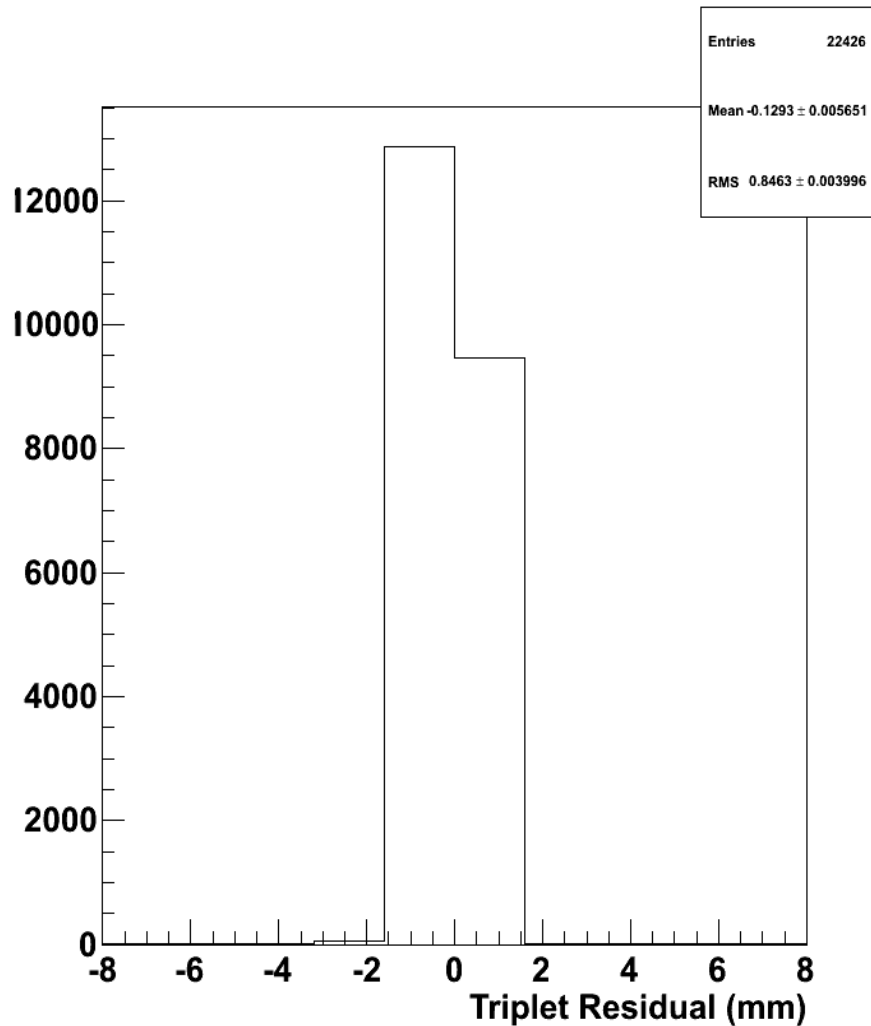


Better agreement between x
and y, though not identical.
Have avoided channel #
specific errors

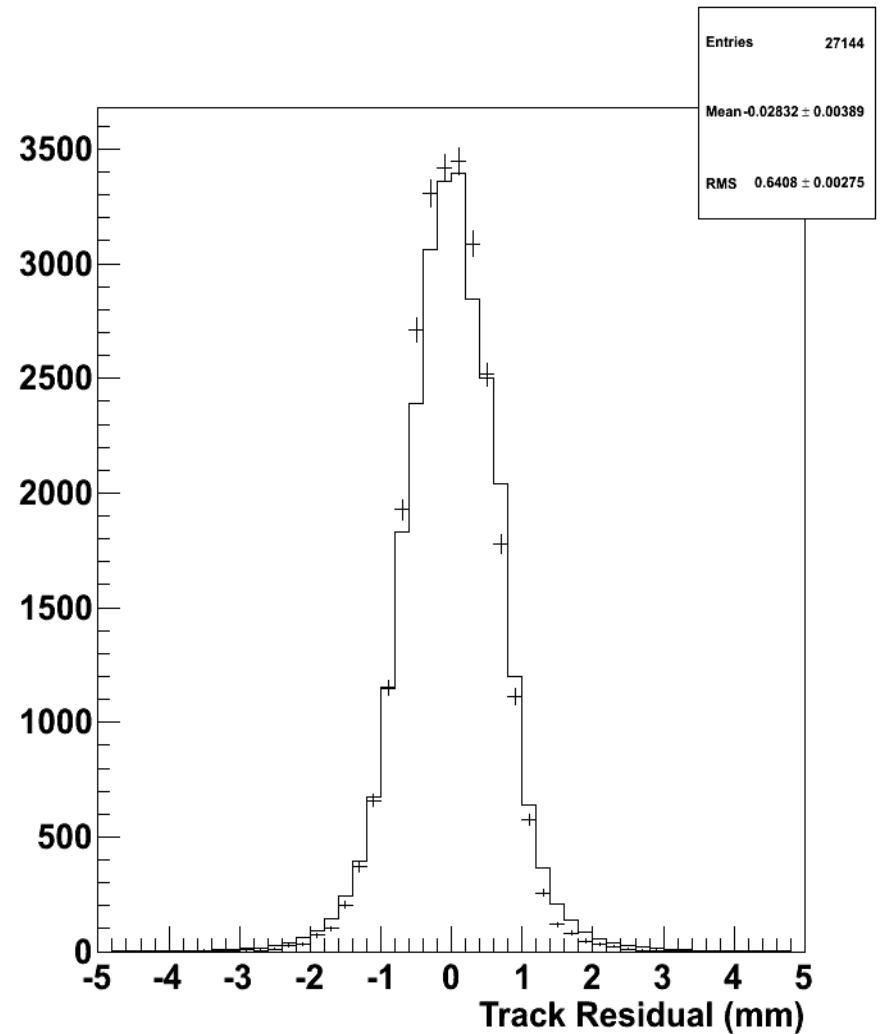
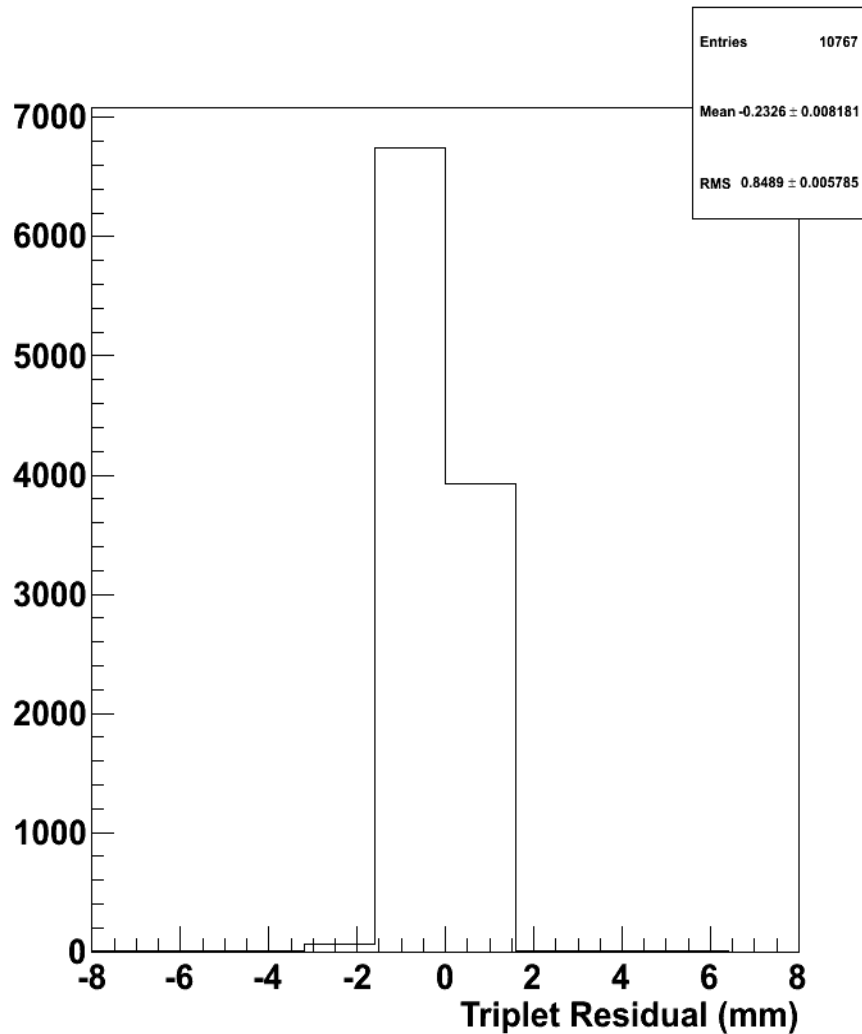
Comparison with MC

- Investigated MCS in G4MICE
- Used cosmic ray-like momentum distribution
- Agreement with separate analysis and non-G4MICE Geant4 simulation (Hideyuki)

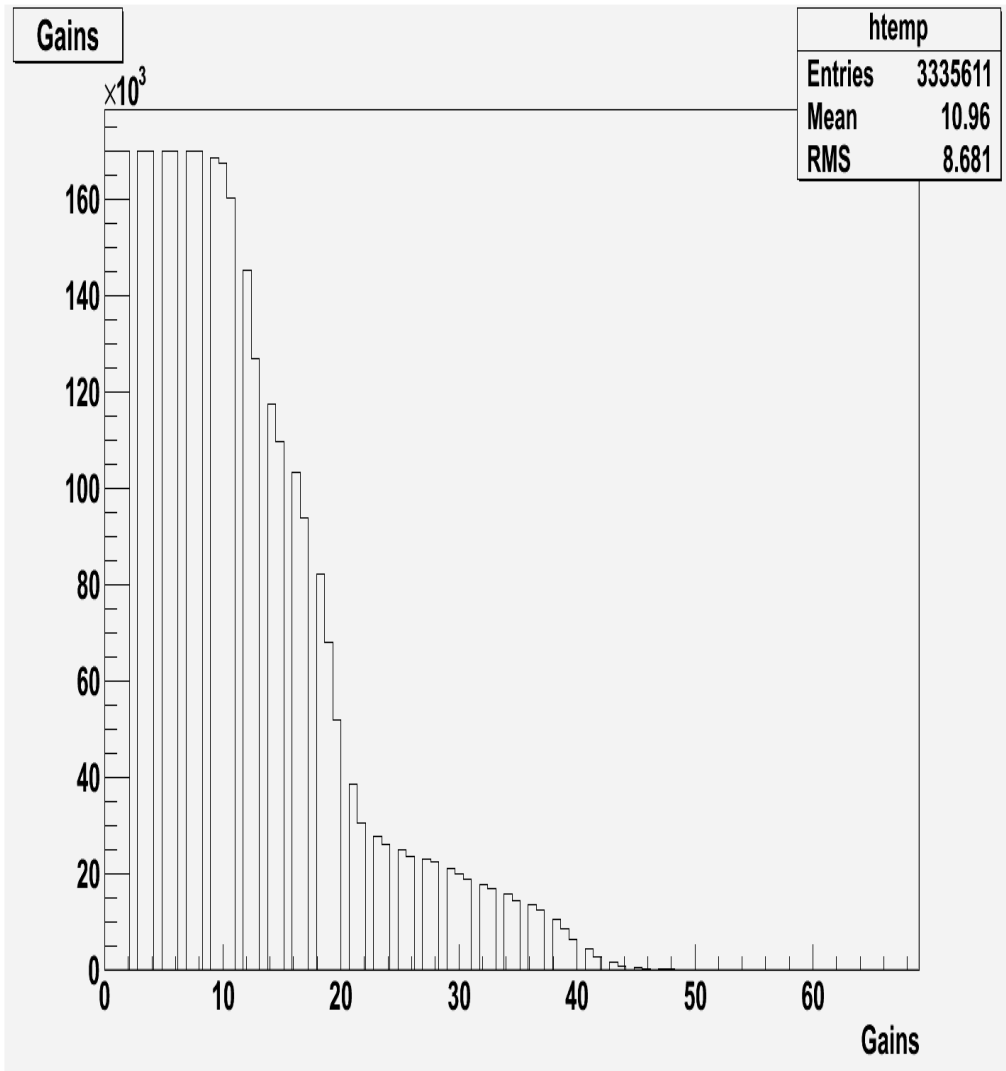
Tracker 1 Residuals



Tracker 2 Residuals

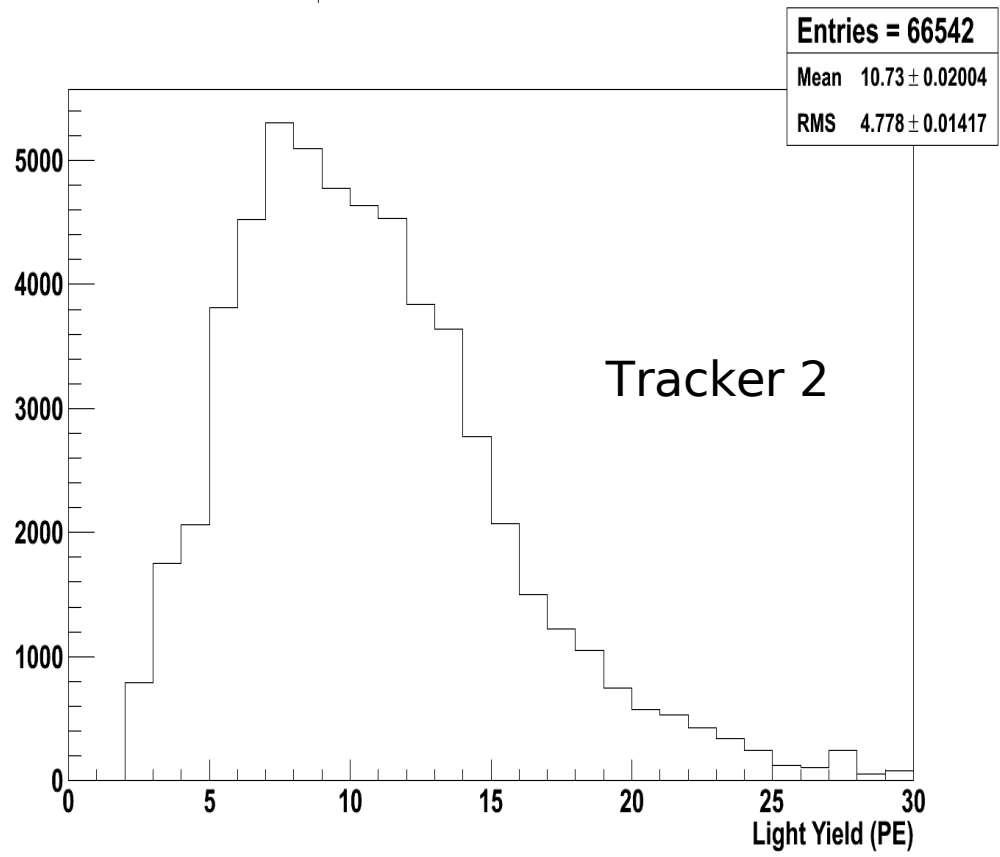
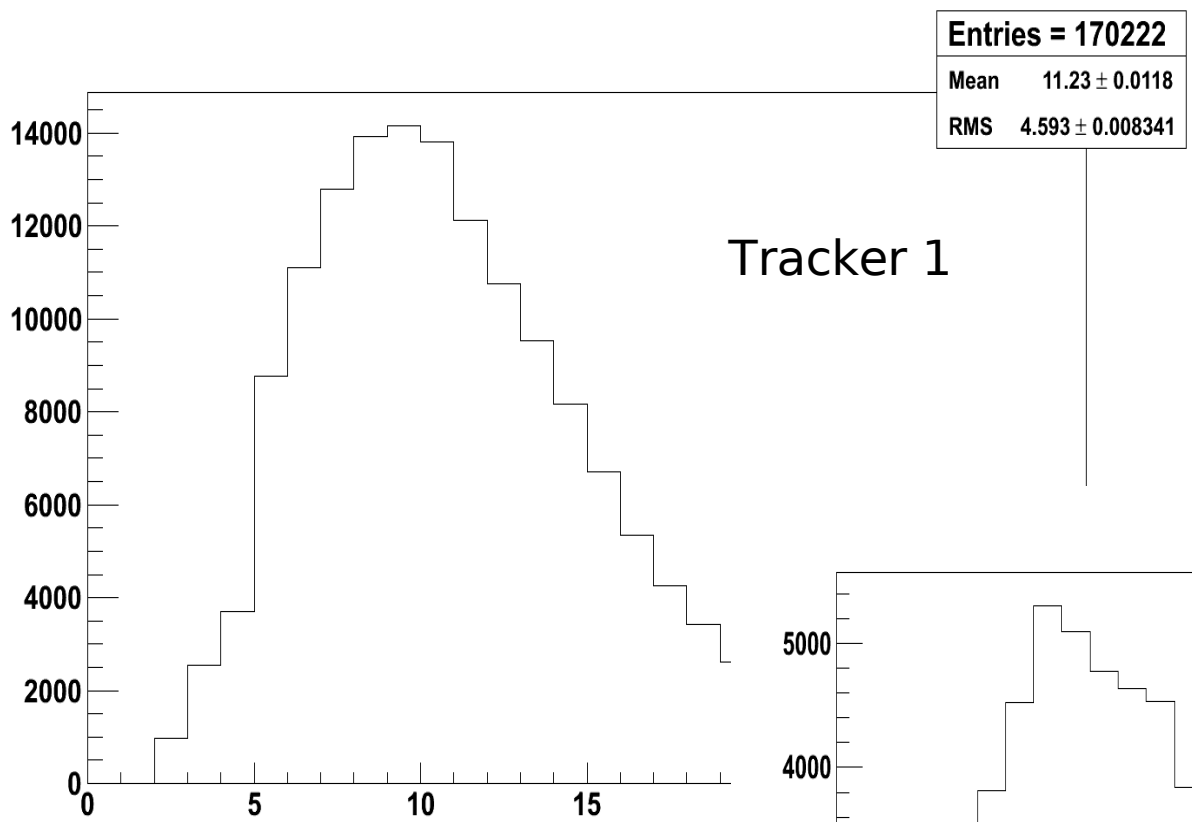


Light Yields



- 8-bit ADCs mean any high light yield hits saturate and are therefore not included in light yield plot.
- Calculated probability of acceptance as function of light yield, and divided original light yield by histogram of probabilities.

Adjusted Light Yields



Cosmic Summary and Plans

	Track Residual (μm)	Light Yield (PE)	Efficiency (%)
Tracker 1	661	11.23	99.8
Tracker 2	643	10.73	99.6

- “noise” clusters under investigation
- Re-simulation of performance in solenoid – including noise/background clusters in required

Controls and DAQ

- Lab 7 PCs set-up to control room spec
- DATE & EPICS installed
- DATE problems with secondary PC – possible network issue connecting to primary PC database
- Calibration files all checked. Initialisation of 1 tracker prior to upgrades
- DATE code completed for some time – needs integration with control room

Plans

- Possible requirement for third VME crate/PC – 1 each for tracker VLSBs/readout, 1 for controls and monitoring
- Planned cool-down check, testing of DATE-DAQ, controls etc.
- Additional cosmic data and cold calibration to check “noise”
- Storage – light-tight tents, aircon, heating