# Production for Zero Field Low Luminosity Runs

1) Working directory
/star/u/dongx/lbl/hft/Run14/LowLumi_ZeroField

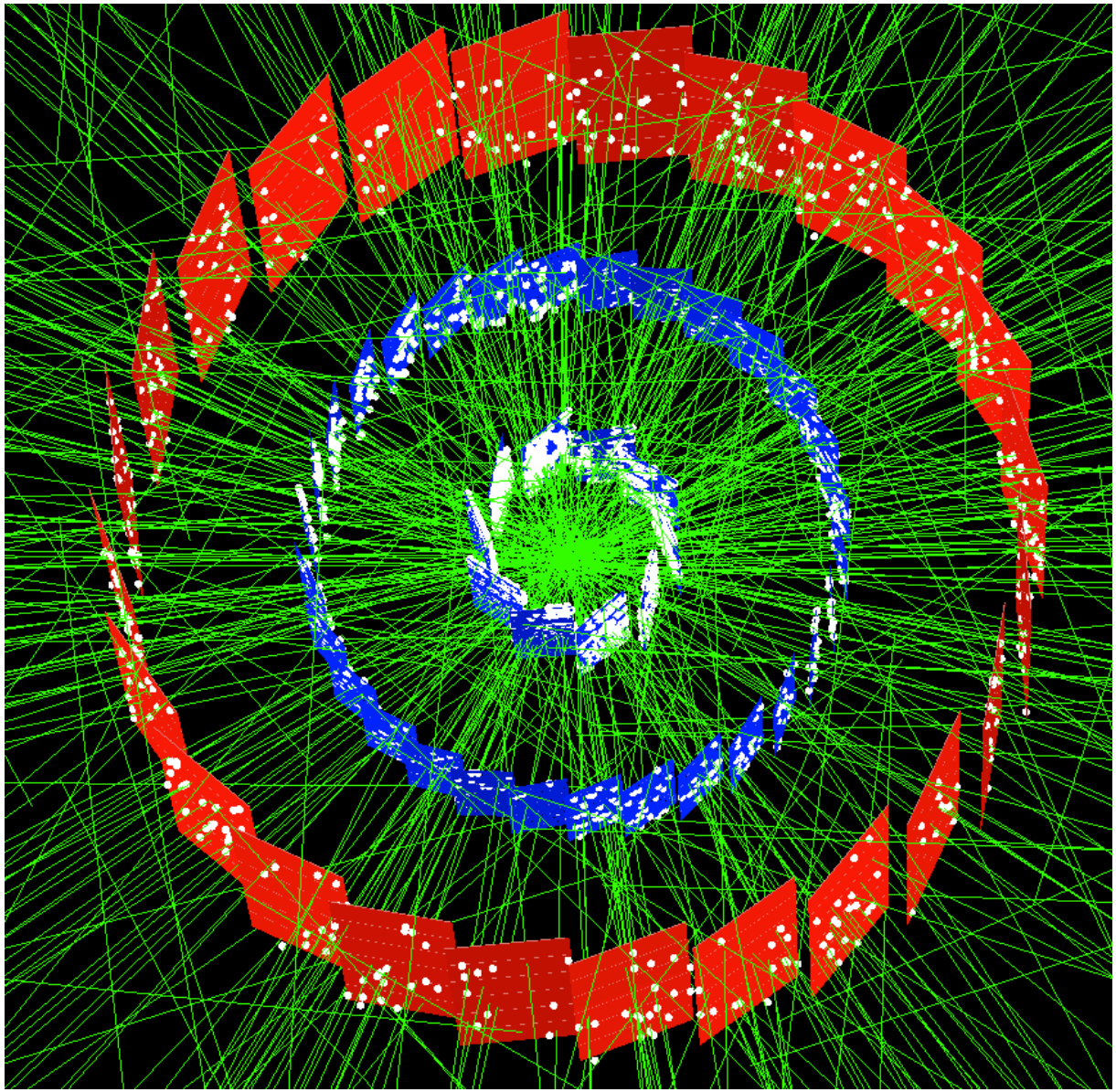
2) PXL status tables from Michael (generated online automatically)
Backup here: http://portal.nersc.gov/project/star/sss/PXL_QA_2014/

3) No local reference geometry tables used (means latest tables from DB)

4) Chain options:
“P2014a,mtd,btof,BEmcChkStat,Corr4,OSpaceZ2,OGridLeak3D,-hitfilt,
pxlRaw,pxlDb,pxlCluster,pxlHit,istRaw,istDb,istCluster,istHit,HftMatTree,-tags,-CMuDST”

5) Output directory
/star/u/dongx/lbl/hft/Run14/LowLumi_ZeroField/output/[YYDDDRRR]
*.event.root and Event_*.root (my own HftMatTree output) stored

# An Event-display for Zero Field Au+Au 200 GeV Data



# Inter-sector Alignment with Vtx Reconstruction Method

• Developed with last year data. The method is described in the following write-up
http://www.star.bnl.gov/protected/heavy/dongx/hft/doc/align_vtx.pdf
Including source code locations.

• Tested with zero-field simulation, field on simulation and Run13 field on data

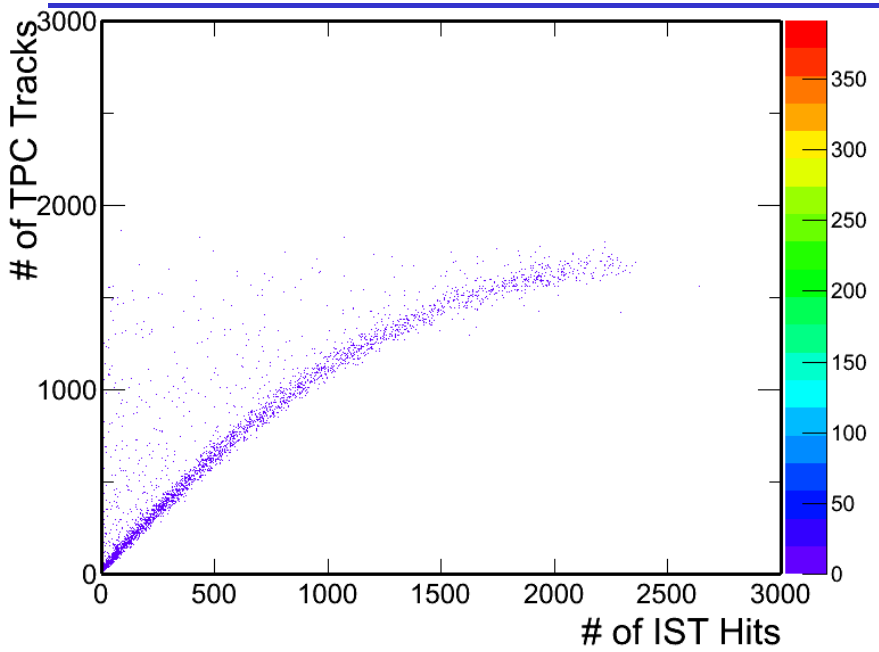
$$\Delta V_x = x_0 + V_z \times dx/dz = x_0 + V_z \times \beta \quad (1)$$
$$\Delta V_y = y_0 + V_z \times dy/dz = y_0 + V_z \times (-\alpha) \quad (2)$$
$$\Delta V_z = z_0 \quad (3)$$

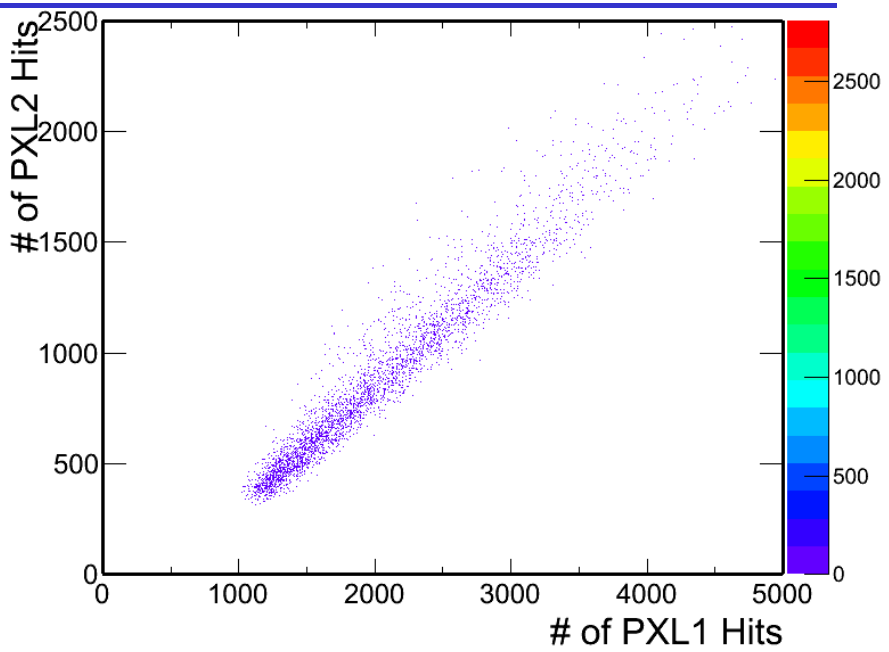
Sensitive to 5 mis-alignment parameters except for the gamma angle.

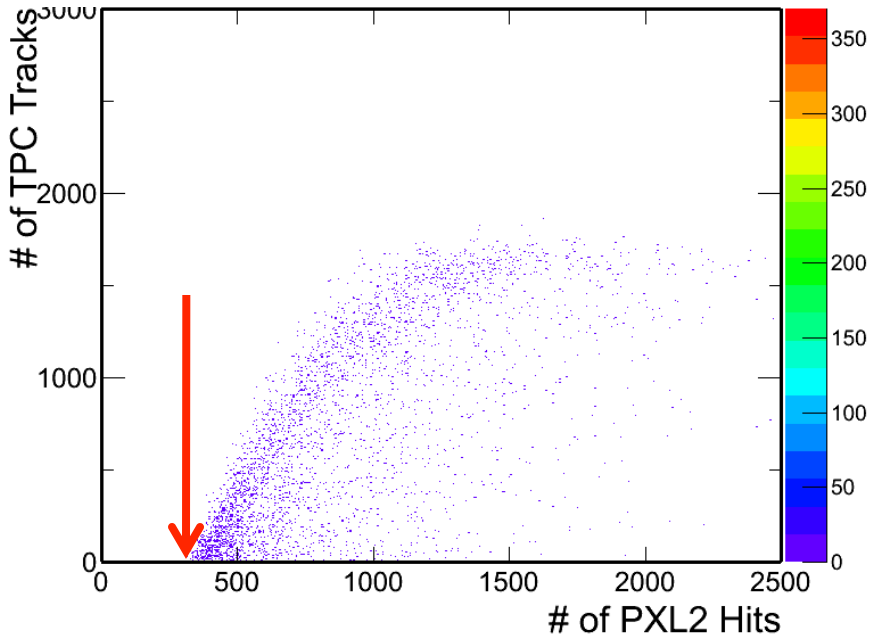
Planned procedure for the zero-field low luminosity data

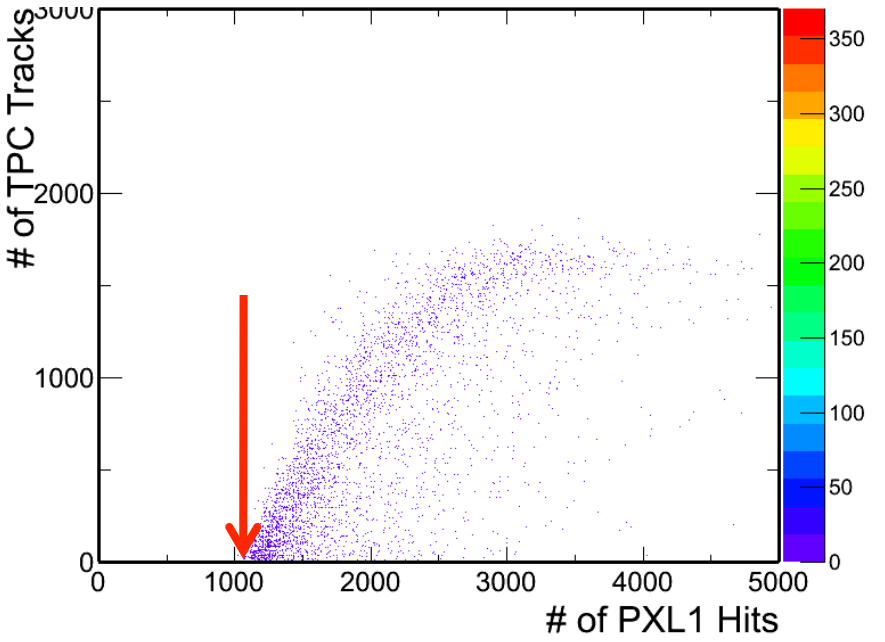
• Find straight-line track candidates with hits with all three layers
• Find the event vertex
• Find the vertices with candidate tracks from each sector and then align them together

# Correlations between different layers



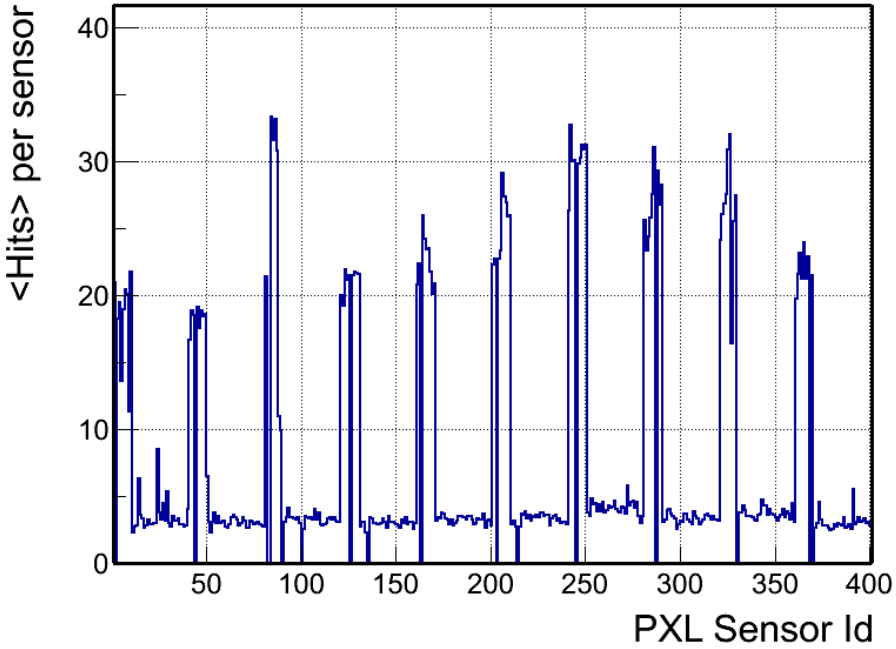



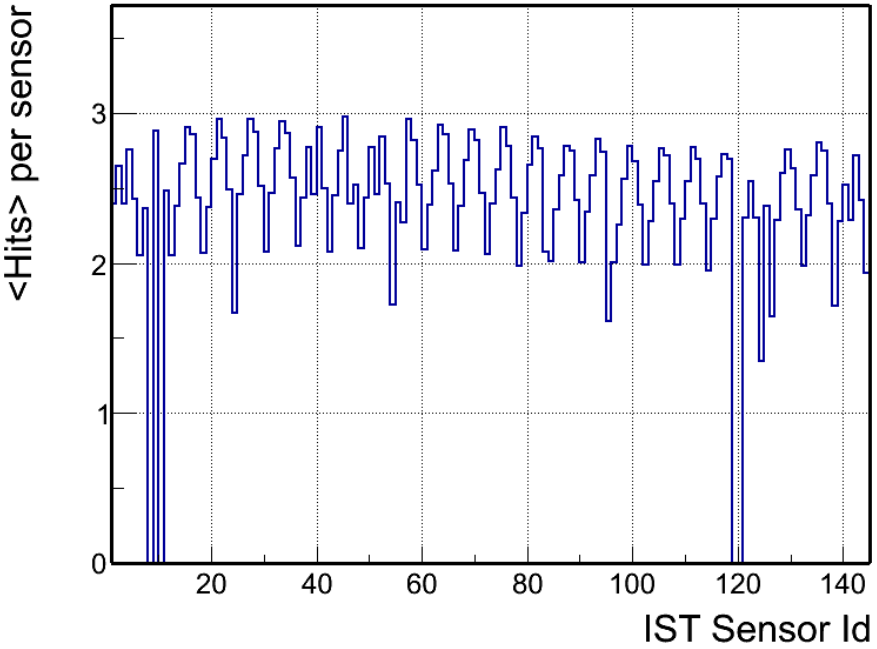



# Hit Rate Estimate

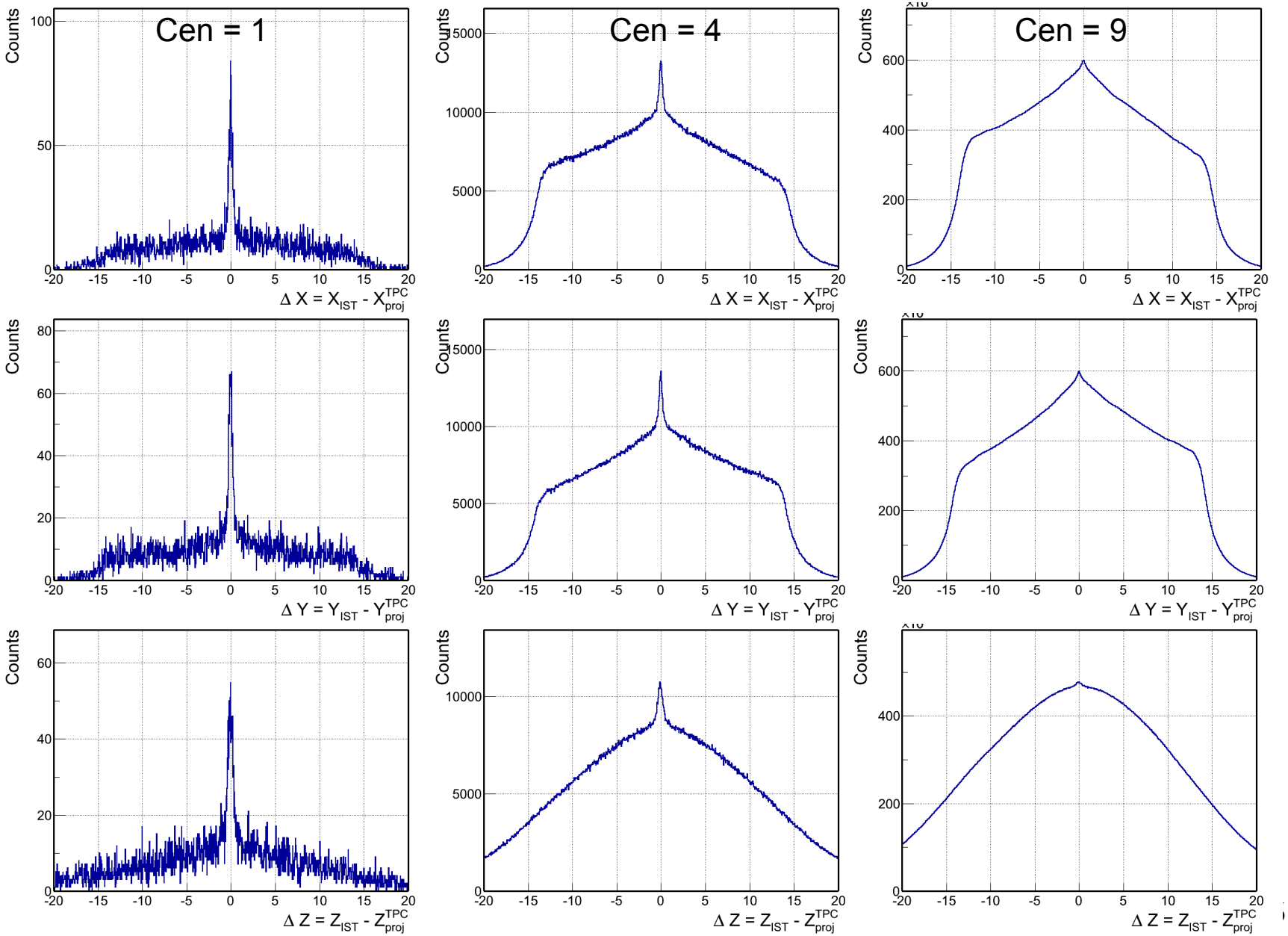
Daniel's zero field simulation with STARlight
https://drupal.star.bnl.gov/STAR/system/files/UpcEle_ZeroMagField_2013-12-30.pdf
With 500Hz collision rate, PXL1, <UPC-e> = 0.22 / cm^2 -> 0.88 hit / sensor
PXL2, <UPC-e> = 0.04 / cm^2 -> 0.16 hit / sensor

Data: run 15100093, ZDCx = 5.7kHz
expected, PXL1, <UPC-e> = 10.2 hit / sensor
PXL2, <UPC-e> = 1.9 hit / sensor
<pileup event> ~ 1 at 5.7kHz

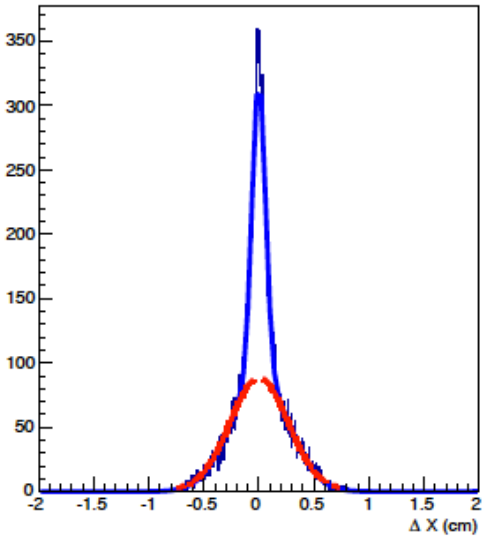


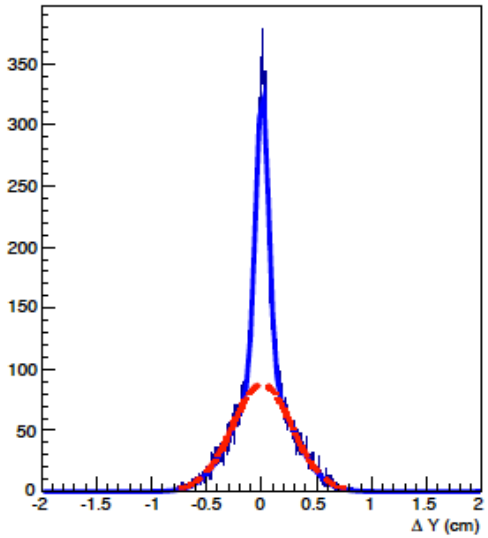



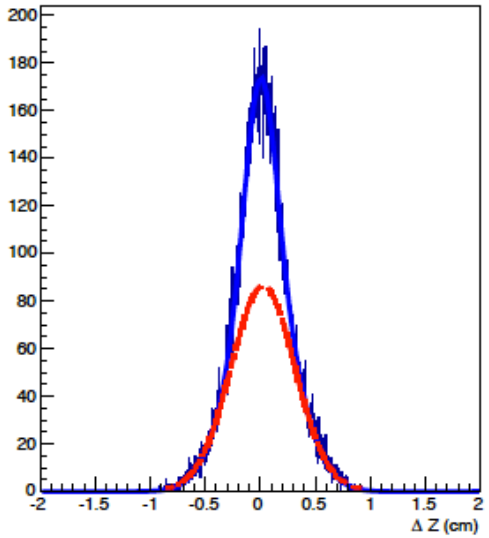
# IST Residuals w.r.t TPC Track Projection



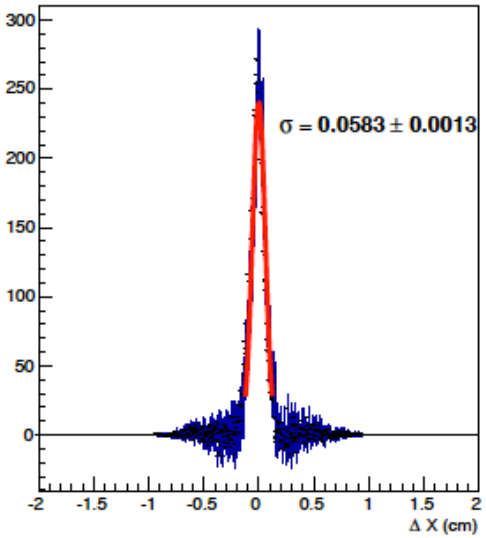
# PXL2 Residuals with TPC+IST Projection

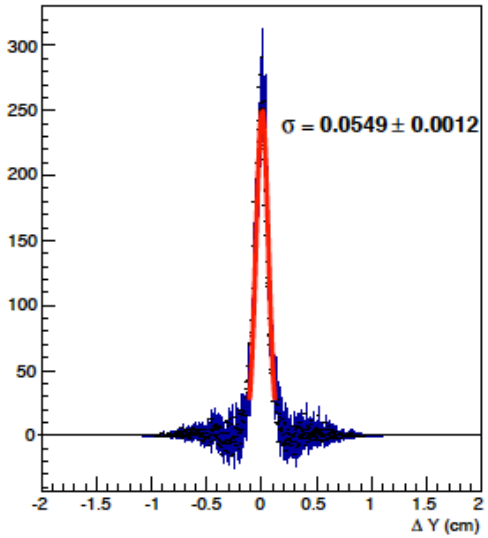


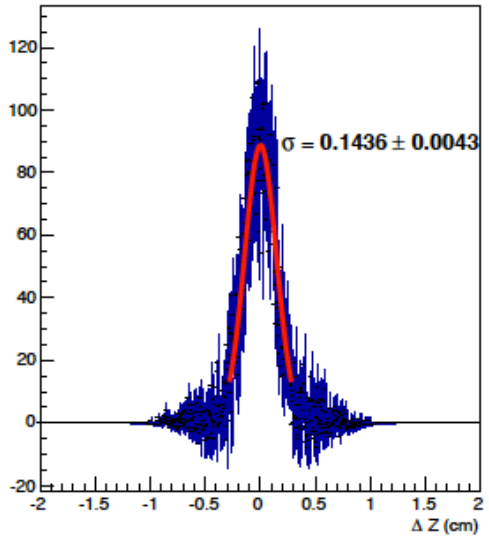



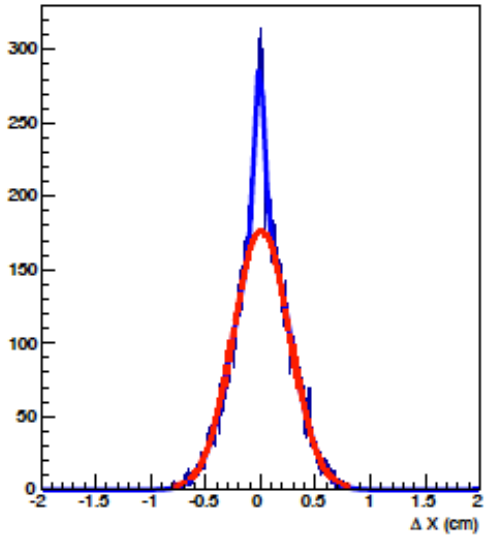

run# 15100093 cen=4

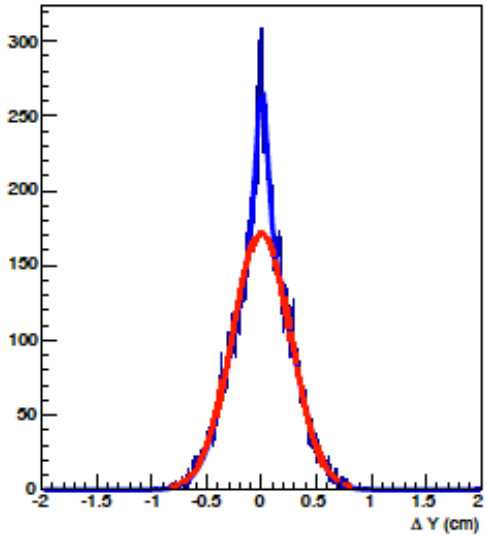


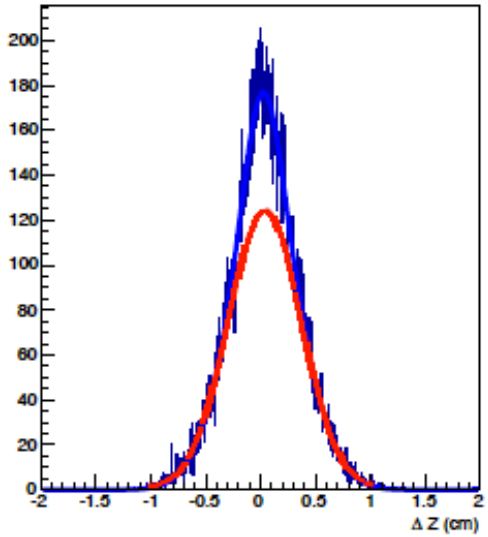



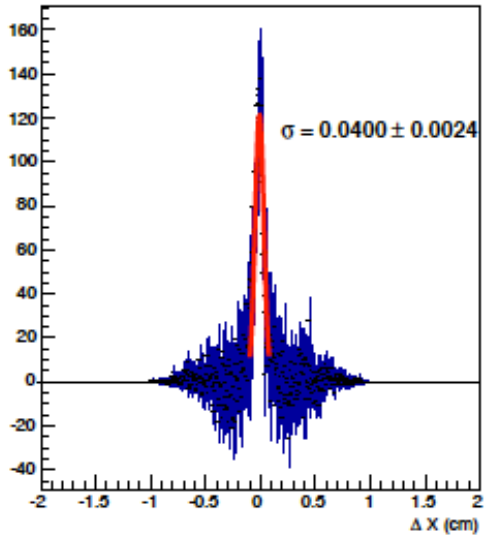
# PXL1 Residuals with IST+PXL2 Projection

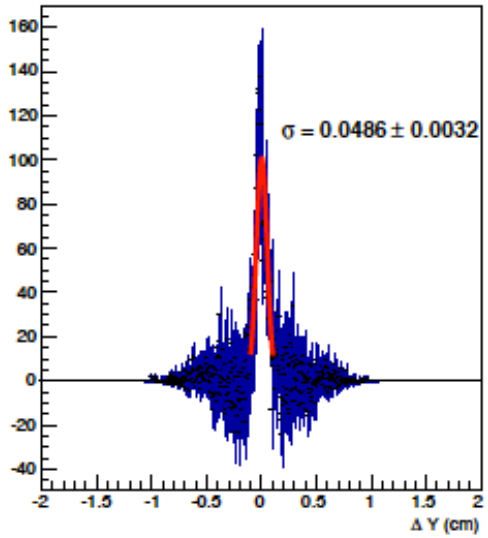


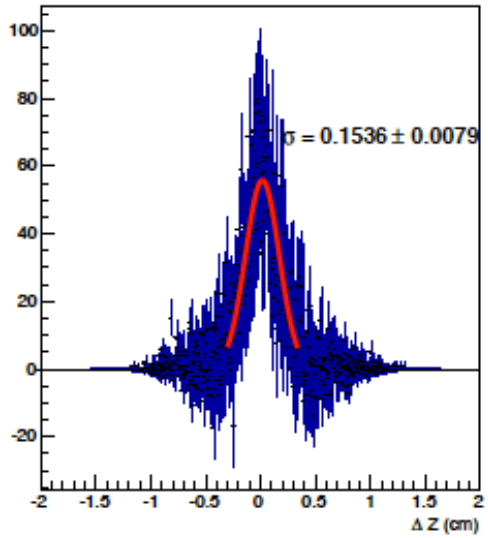




run# 15100093 cen=4



# Resolution Estimate

Straightline from two hits on PXL1 and PXL2, projecting to IST layer

MCS material, one layer of PXL2 material, ~0.5%X0 (0 deg incident angle)
Pathlength = 14-8 = 6cm

MCS resolution, assuming 300 MeV particles

$$\frac{13.6}{p\beta c}\sqrt{x/X0}\times L \qquad = 192\ \mu m$$

IST hit resolution (X,Y) including alignment precision 240-340 μm

Total expected resolution: 300-400 μm

# Finding the Event Vertex

Two-step vertex seed finding

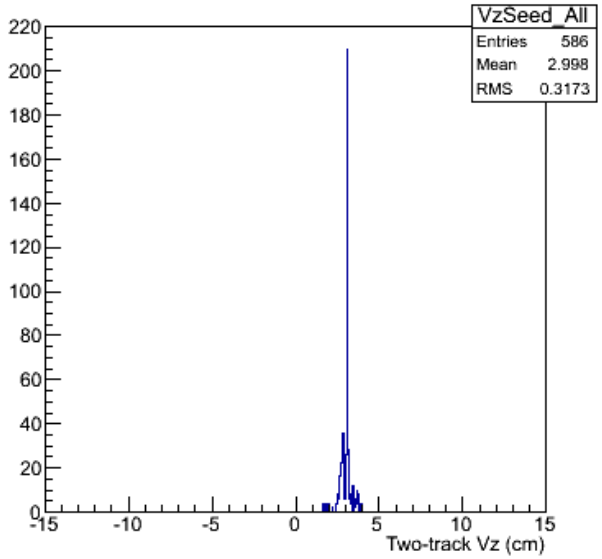
Vertex positions of
any two-track combinations

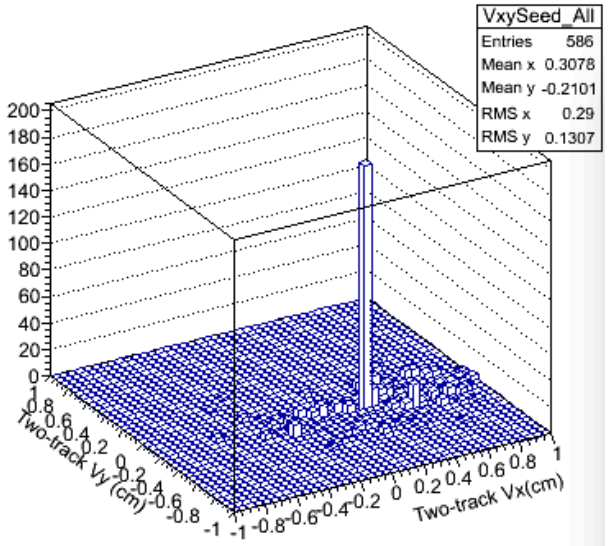
Find the beam line seeds (vx, vy)

Dca positions of all tracks
w.r.t. the seeded beam line

Find the vertex seed (vx, vy, vz)

Vertex positions of
any two-track combinations

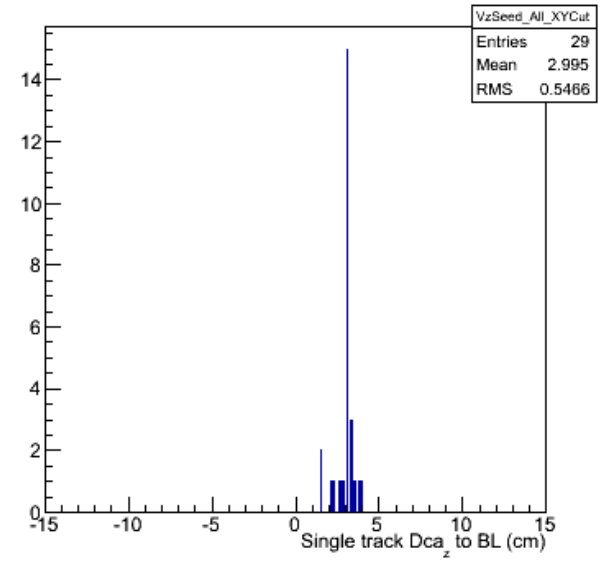


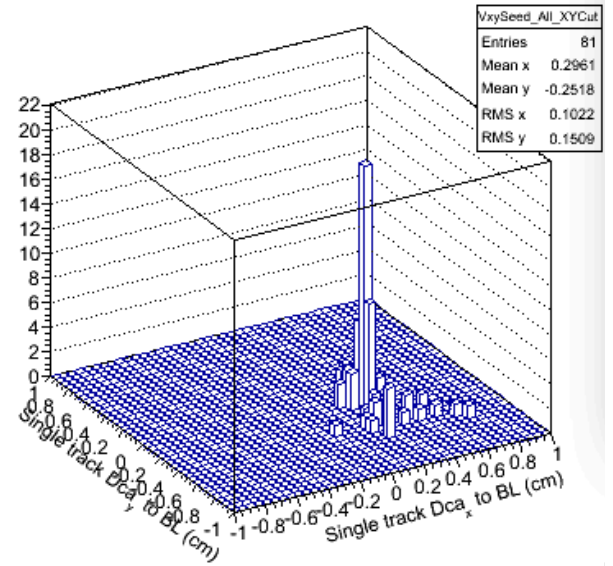




Find the beam line seed (vx, vy)

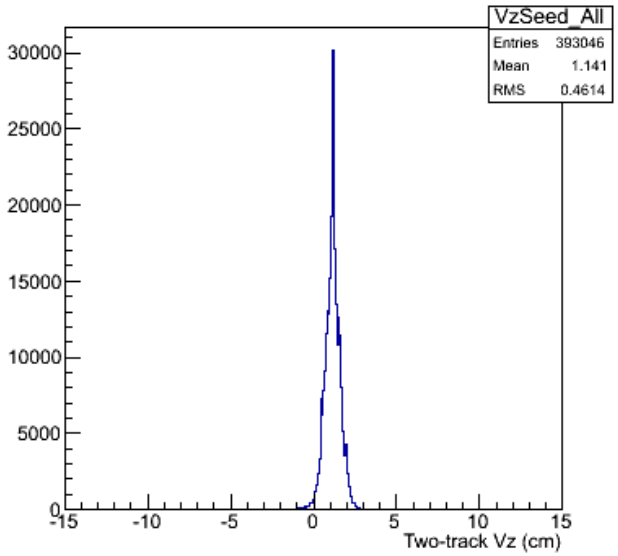
run# 15100093 evt# 406 cen = 4

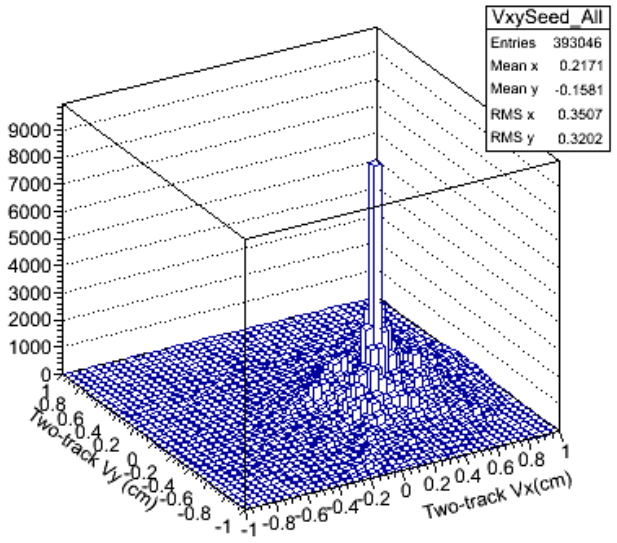
Dca positions of all tracks
w.r.t. the seeded beam line



Vertex positions of
any two-track combinations

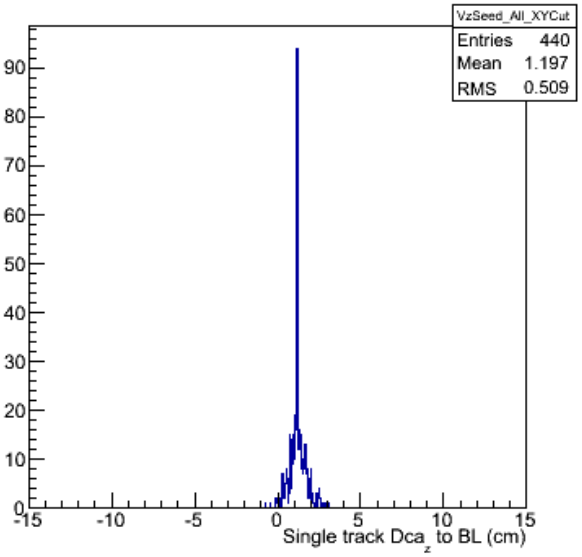


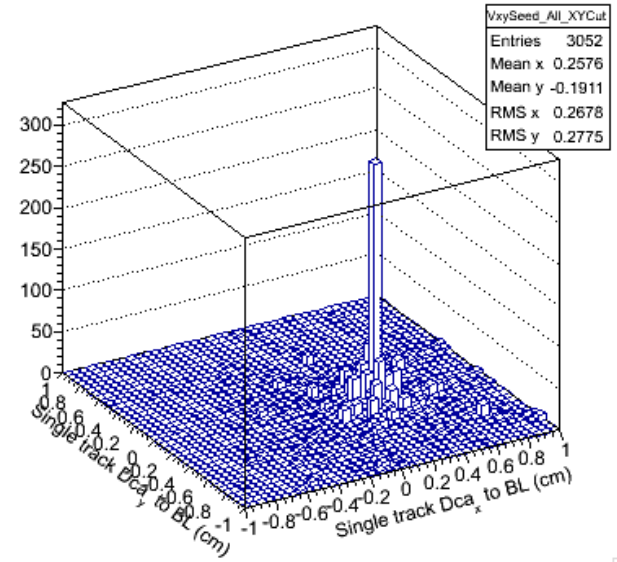




Find the beam line seed (vx, vy)

run# 15100093 evt# 266 cen = 9

Dca positions of all tracks
w.r.t. the seeded beam line



# Summary and To-Do

Hit densities from the zero field runs look reasonable compared to early simulations
- although the beam luminosities not the best optimal case

Track candidate finder and vertex finder work reasonably well

To-do
- implement vertex fitting
- separate different PXL sectors, carry out the alignment