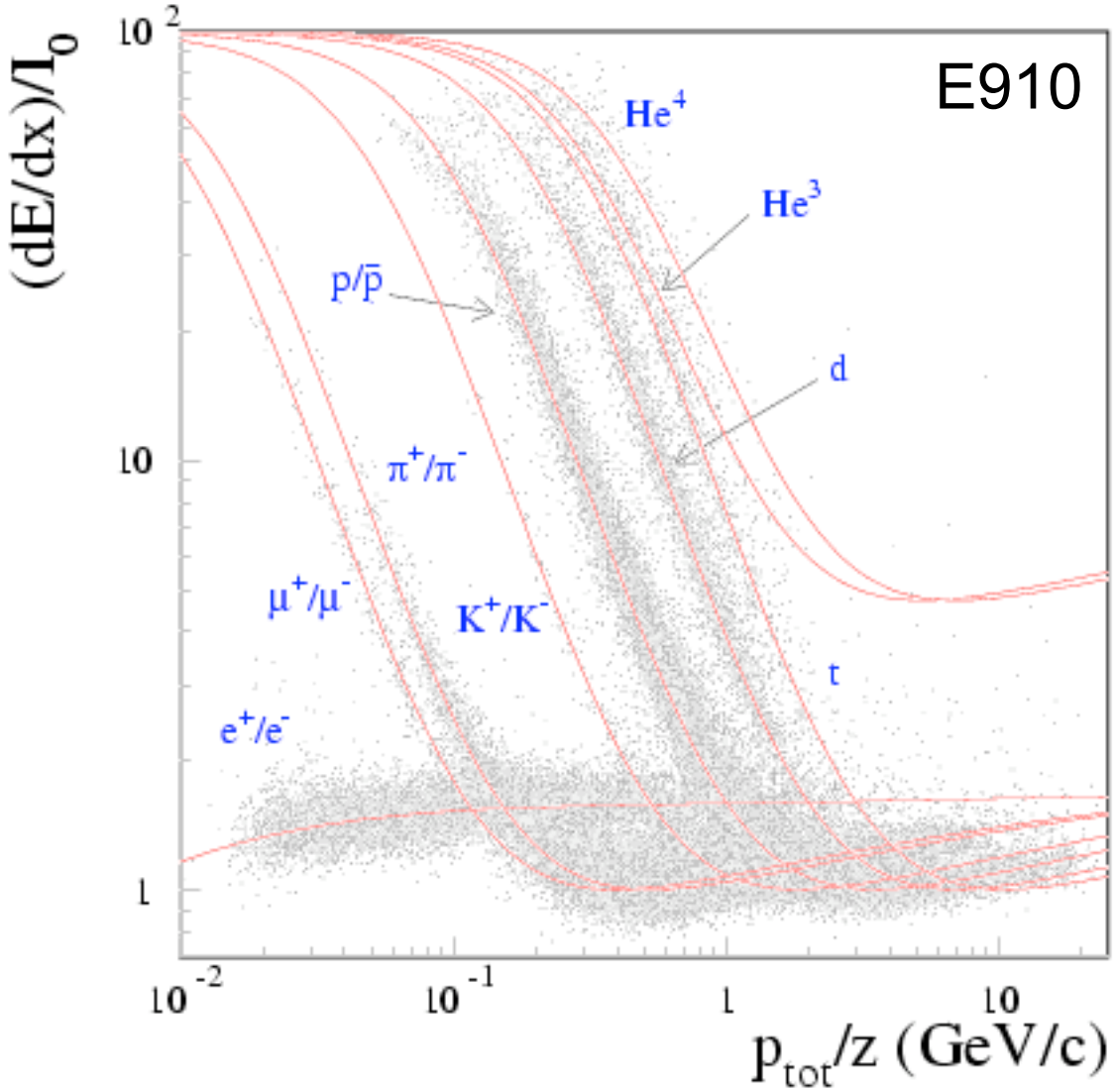
TPC Gain Calibrations

…toward a beautiful <dE/dx> vs p

Status

Contributions to gain variations

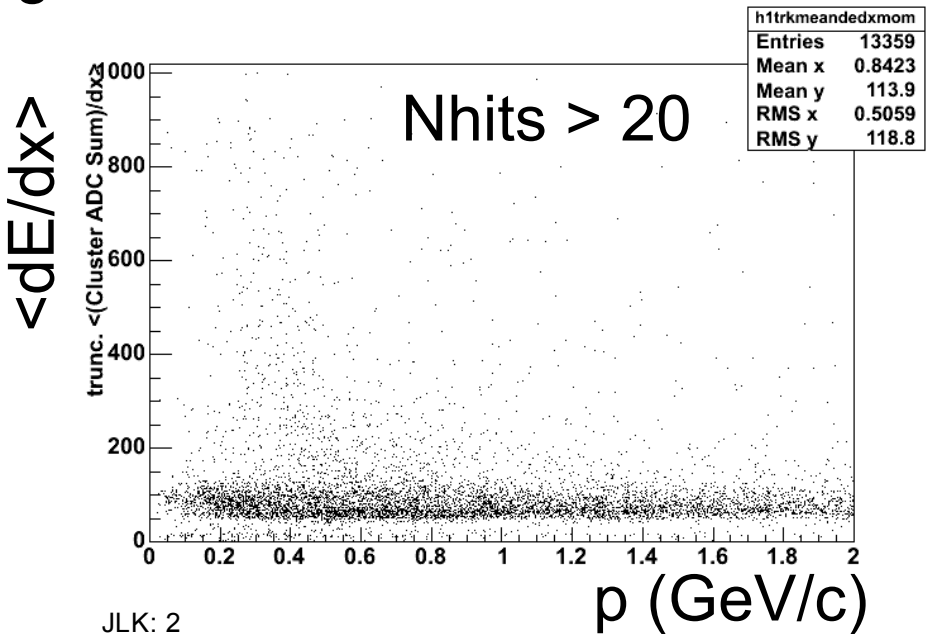
To-do



MIPP TPC dE/dx Status

- Code is in CVS to calculate dEdx for tracks in TPC:
  - TPCRecoJP/TPCRTrackFind.h
    - void TPCRTrackFind::CalcDedx(TPCRTrack* trk)
  - TPCRecoJP/TPCRTrack.h
    - const double GetDedx()
- Cluster ADC Sum currently used for “dE”, track slope parameters and pad length gives “dx”

Needs some work…

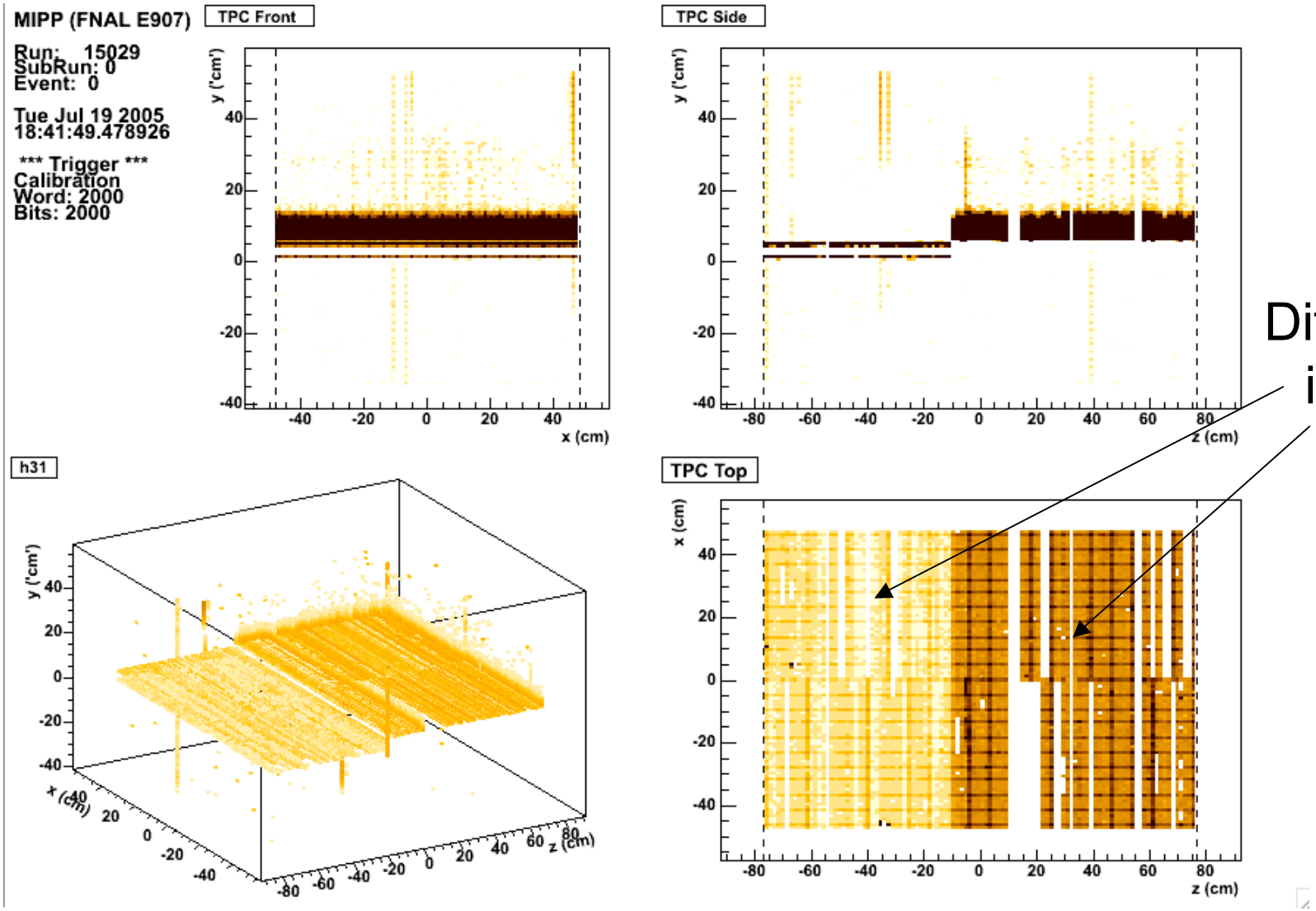


Gain Calibrations…

Mike and I came up with a list of potential sources to explore and looked for ways to address them

- Gating Grid Transparency Variations
- Anode voltage Variations
- Drift Attenuation

GG Pulser Runs

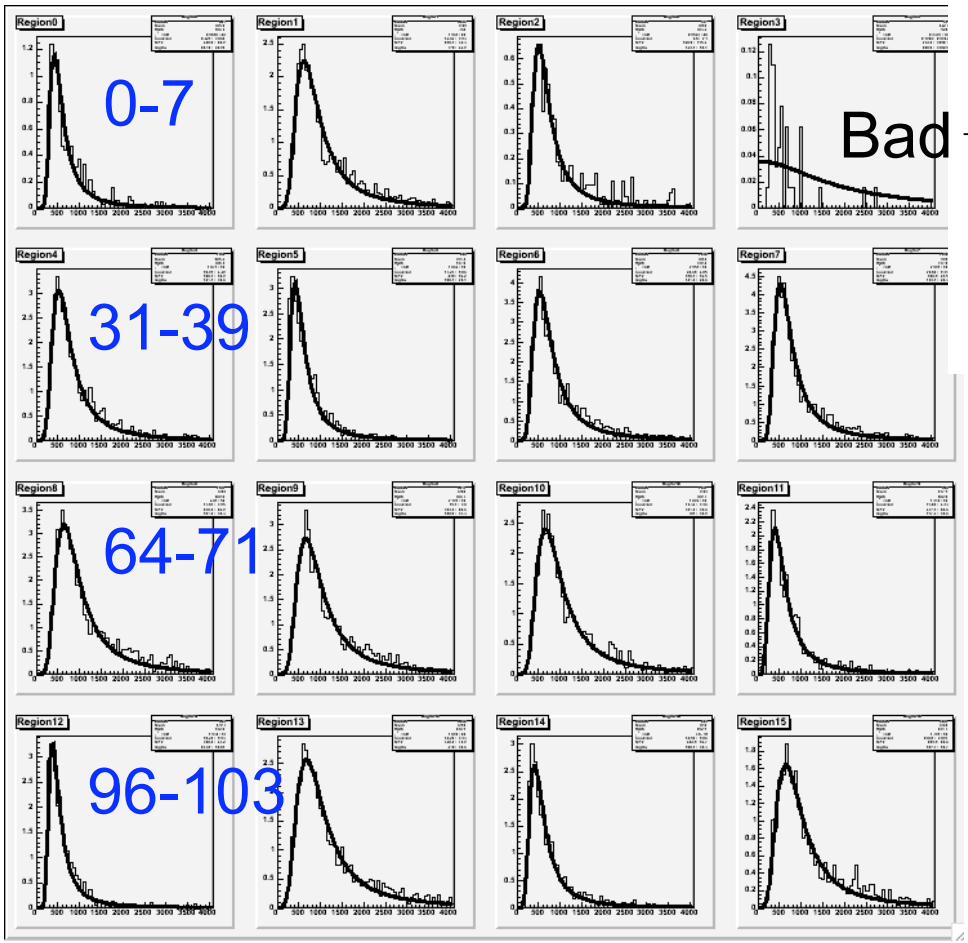


Differences in the GG Drivers

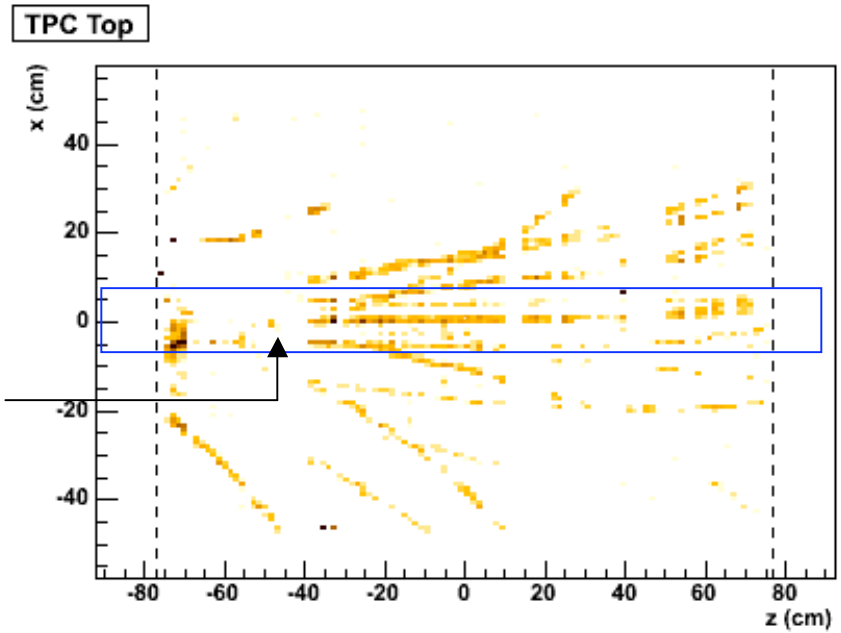
We will use these runs to look at pad to pad variations

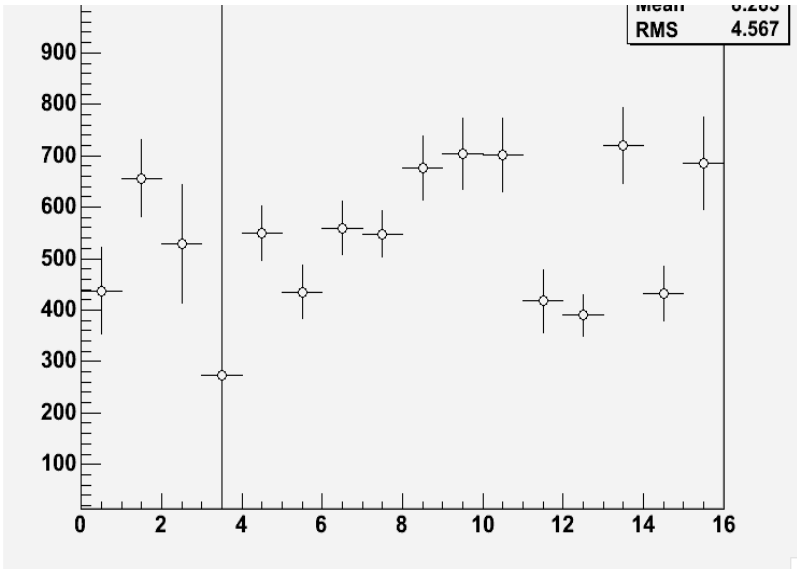
Anode Voltage Variation

Fit beam track ADCs with Landau, grouping by anode voltage region (8 padrows each)

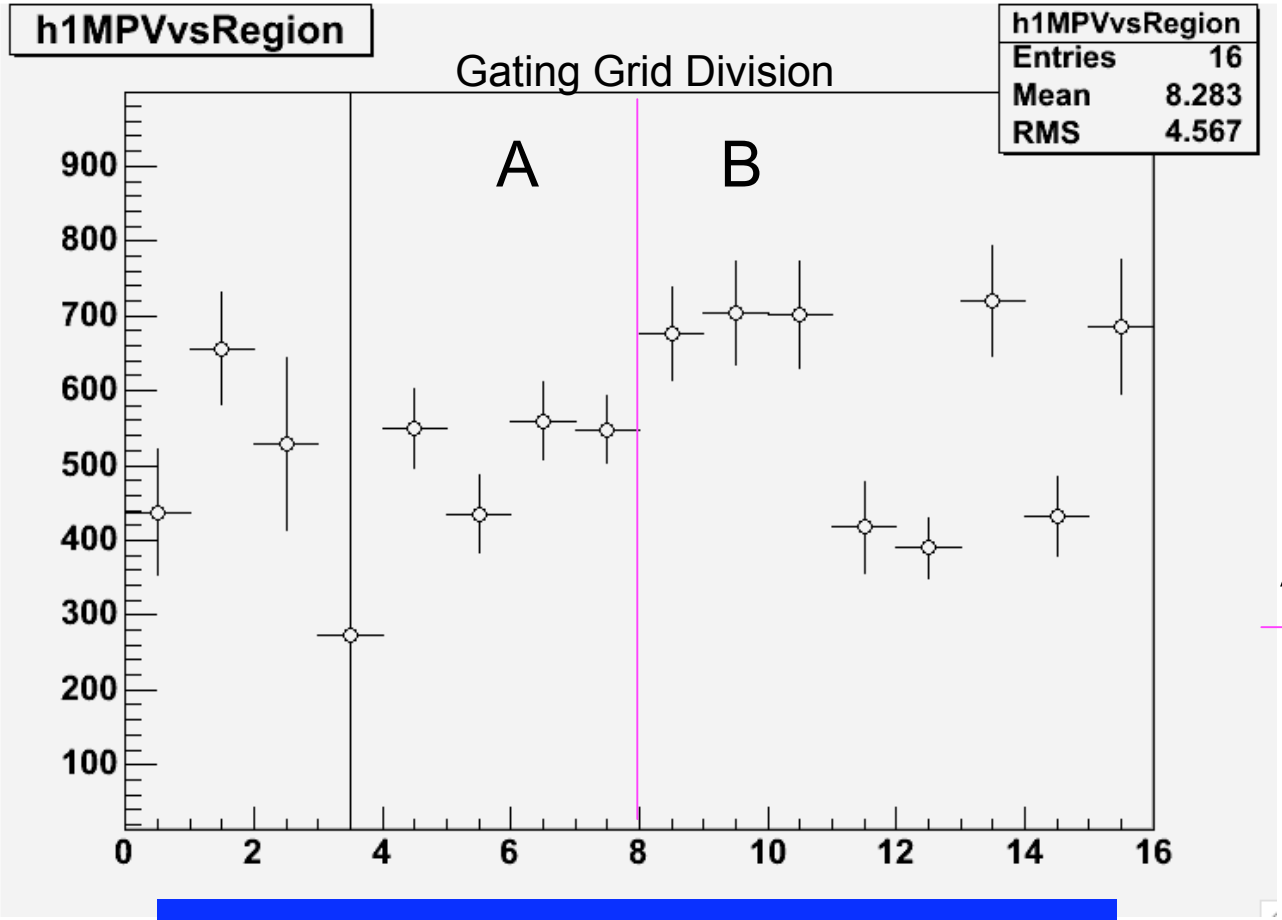


Bad





Anode variation in detail



	Voltage	MPV
A	1250	436
	1100	656
	950	529
	1250	272
	1250	548
	1250	434
	1250	559
	1250	548
B	1250	676
	1250	703
	1250	701
	1150	417
	1150	389
	1250	720
	1150	432
	1250	685

This looks as we expect.
Decent 0th order correction

Should also take care of GG division variation, but there are a few anomalies...

overlapping clusters near vertex? high angle tracks?

Rule of thumb:
100 V ~ 2x Gain

Drift Attenuation

Ionization electrons attach themselves to O2 molecules in the gas as the clouds drift toward the MWPC

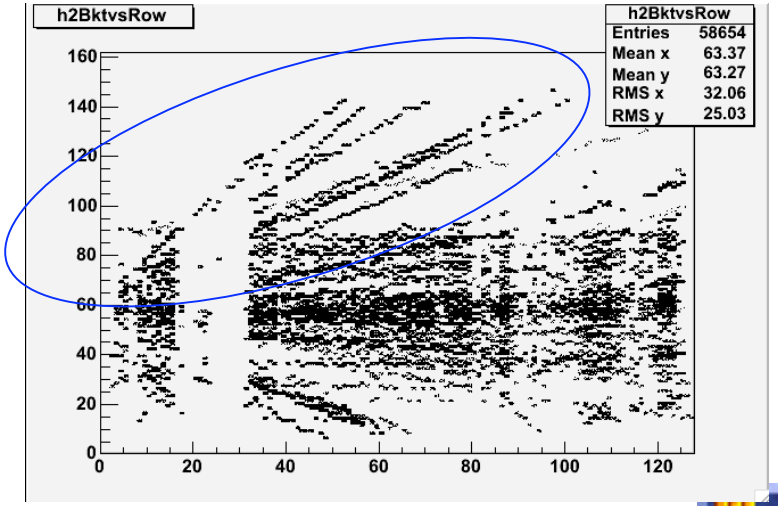
Attenuation $\propto 1-e^{-\lambda y}$

Magboltz calculation for P10 with 300 PPM O2 gives $\lambda=0.04\ cm^{-1}$

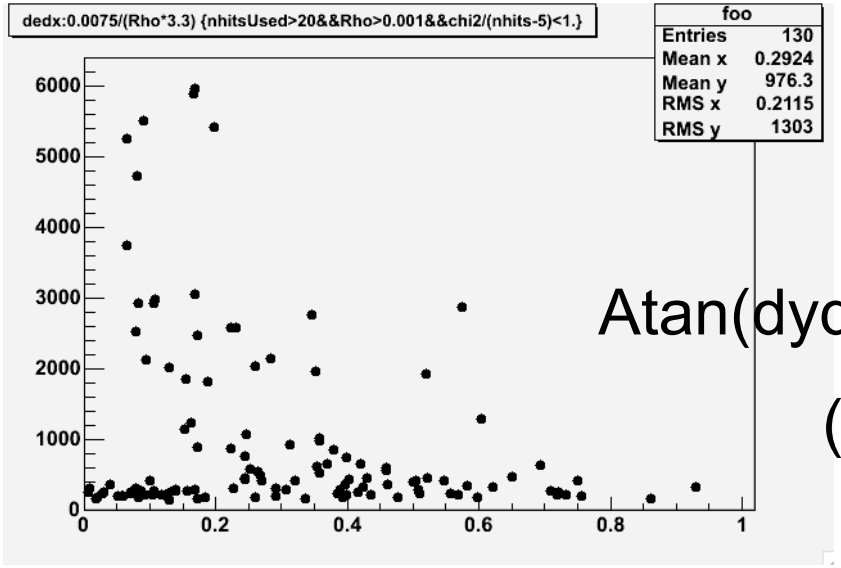
For 75cm drift only 5% of ionization remains

Look at MIP tracks (p>1GeV/c) which have large theta angle in the TPC

Modulo ionization fluctuations, the gain-corrected ADC samples should show an exponential dependence on drift distance (get λ from data)



Drift attenuation II



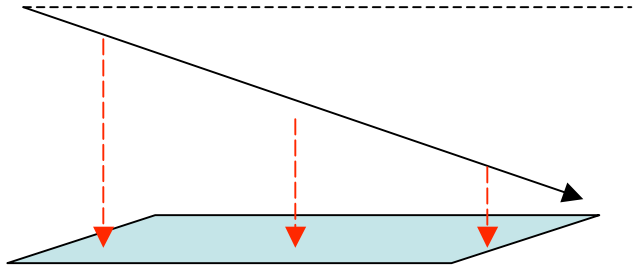
Atan(dydz) < -0.2

(~11º)

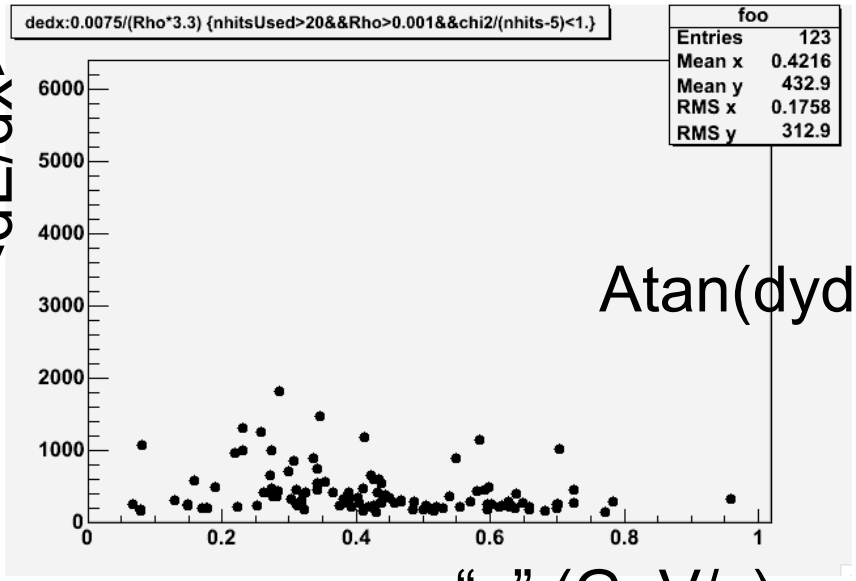
After correction for anode voltage variation

Nhits>20

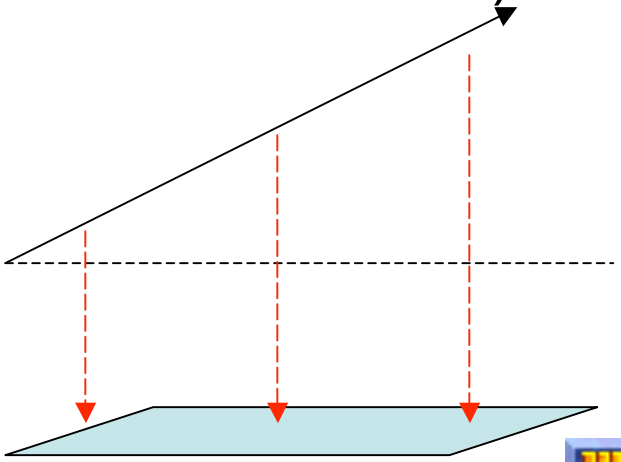
Chi2/dof < 1



Track heading down has larger signal (smaller drift distance)



Atan(dydz) > 0.2



Other progress this week

- Exterminated a few bugs…
  - <dE/dx> calculation divided by wrong number of samples
  - Trigger selection
- Determined some new cuts for cleaning up <dE/dx> vs. p…
  - chi2 on track, angle

The horizon

- Repeat these exercises with larger statistics
- Focus on large <dE/dx> tracks and look at attenuation as a function of drift distance (compare to Magboltz estimates)
- Analyze pad-to-pad variations with GG pulser runs
- Incorporate these corrections as 1st order gain and proceed with refinements

Cluster distributions