

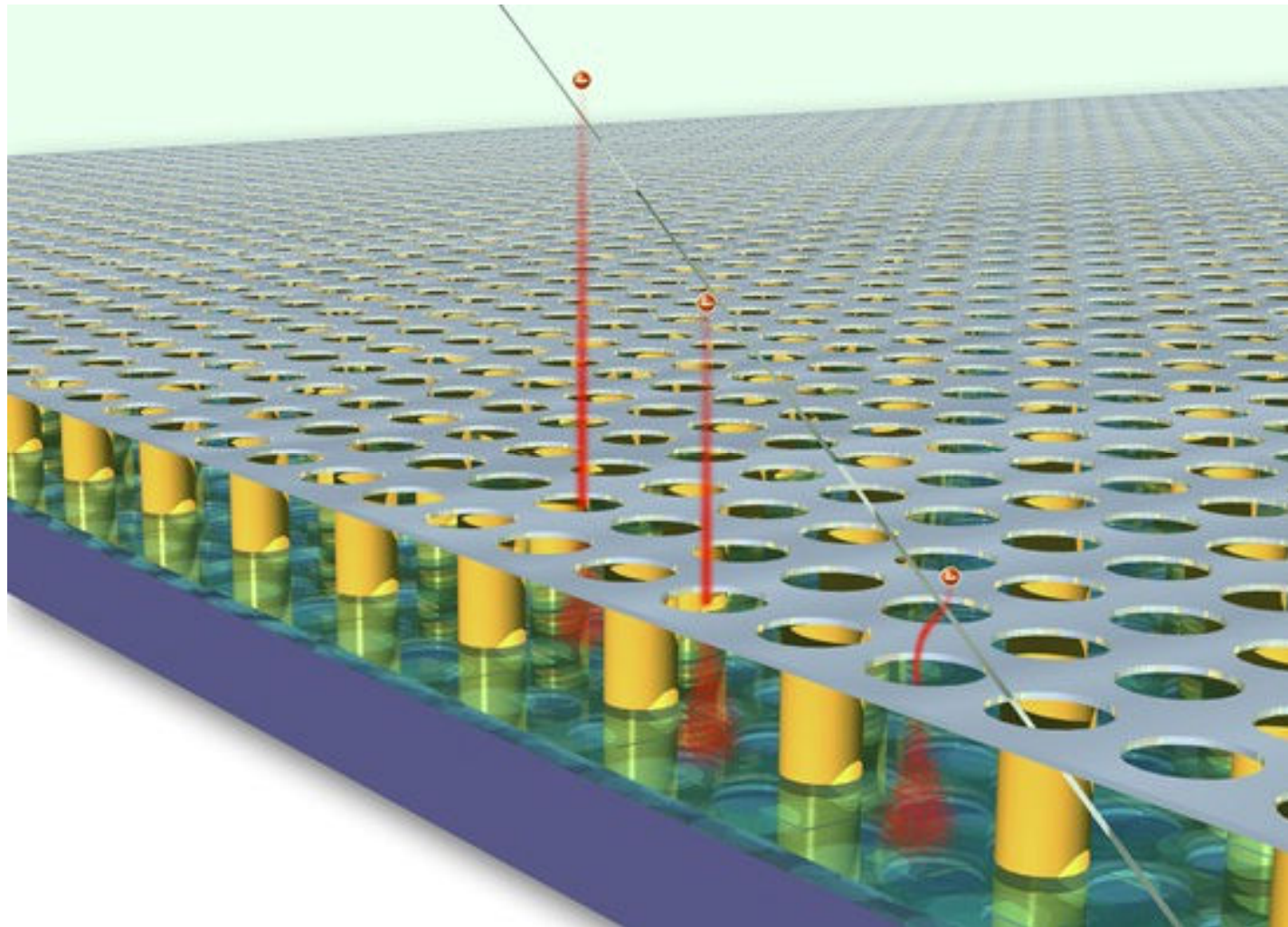
Gossip Simulations and Testbeam Data Analysis

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Introduction



Configuration

- GARFIELD for Drift Gap
- HEED (gas parameters)
- CO₂ (50%), DME (50%), T= 293K, P= 1atm
- Drift Gap 1 mm, Avalanche Gap 50 μm
- Diffusion 98.5 $\mu\text{m}/\sqrt{\text{cm}}$ (L), 114.5 $\mu\text{m}/\sqrt{\text{cm}}$ (T)
- Sample: 1000 muons (1 GeV Garfield)
- Drift voltage -1300 V
- Grid -400 V
- Chip ground
- No Chip MC used (yet)
- Drift velocity: 55,6 $\mu\text{m}/\text{ns}$

XY-Resolutions

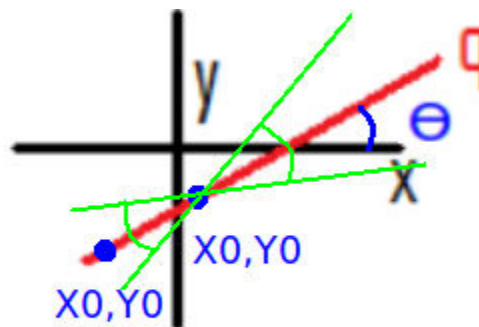
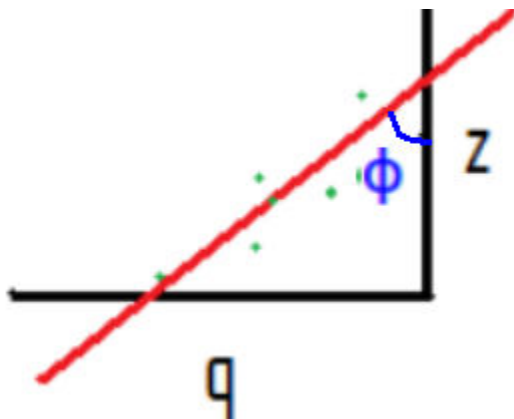
Fit through points (minuit) $\rightarrow X_0, Y_0, \phi$ and θ

New definition of resolution:

-Before: the resolution was defined as the deviation of the fitted X_0, Y_0 value from real track in the $Z=0$ plane (the chip)

-Now: the same but now $Z= 300 \mu\text{m}$

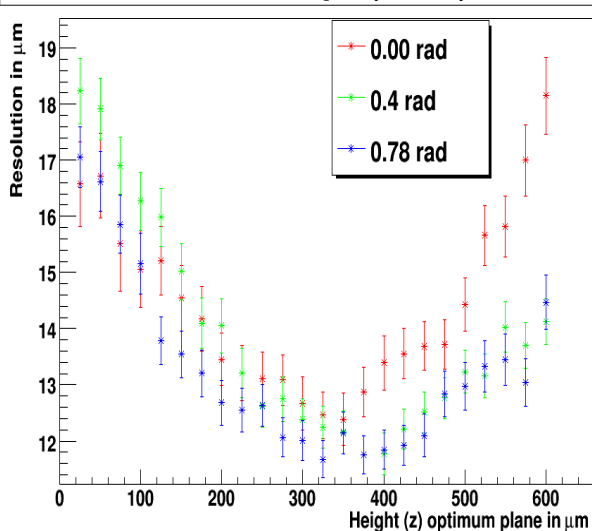
Why? Because extrapolating fit to X_0, Y_0 gives rise to larger errors.



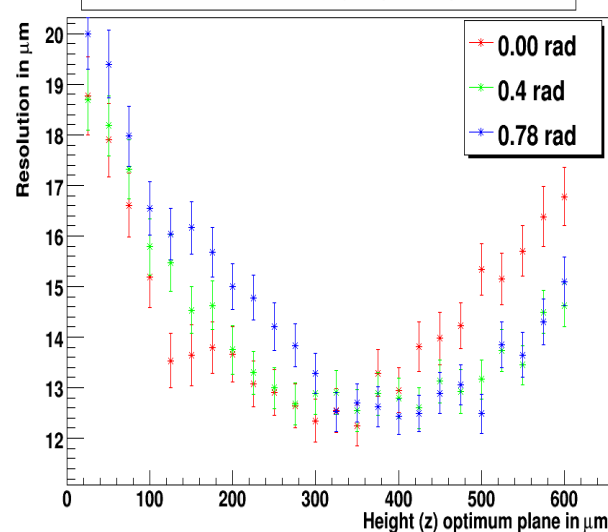
XY-Resolutions

- Why 300 μm ? The optimum plane differs for different time resolutions, pitch sizes and angles (due to pixelizing, and weights applied that are z dependent)
- 300 μm is more or less the average for the different angles @ pitch=55 μm and timebin =10 ns.

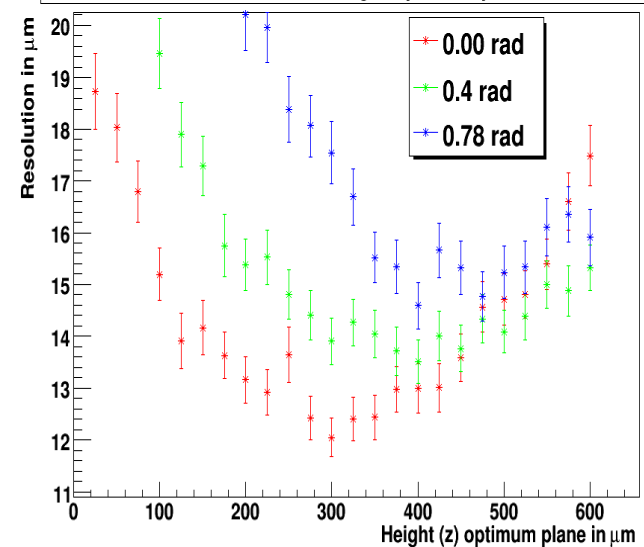
Resolution as function of height optimum plane time01



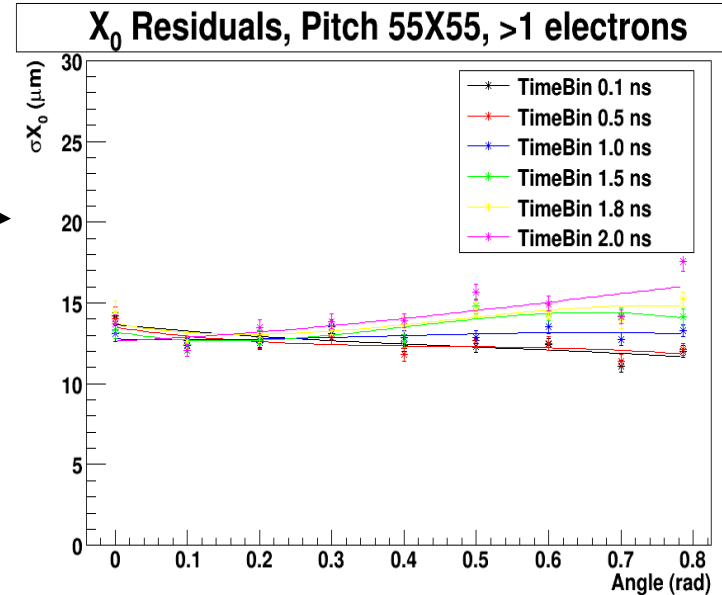
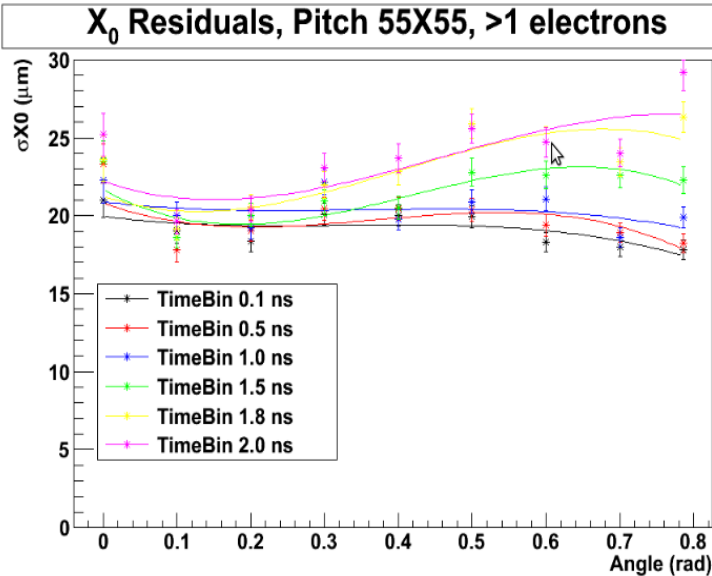
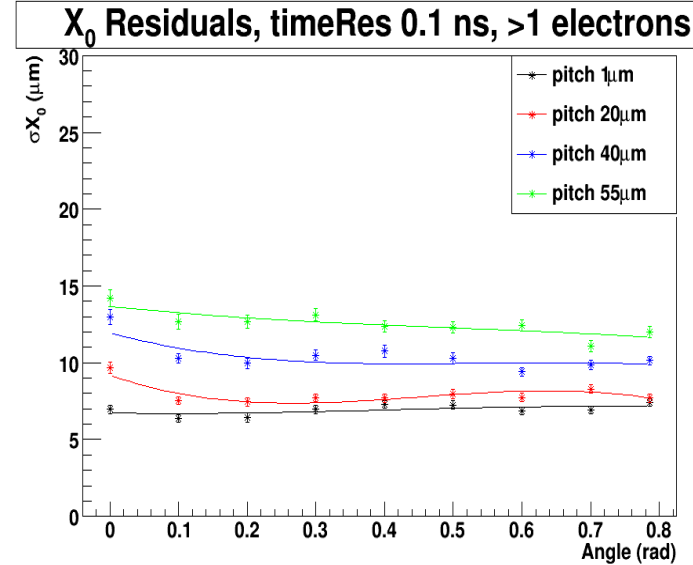
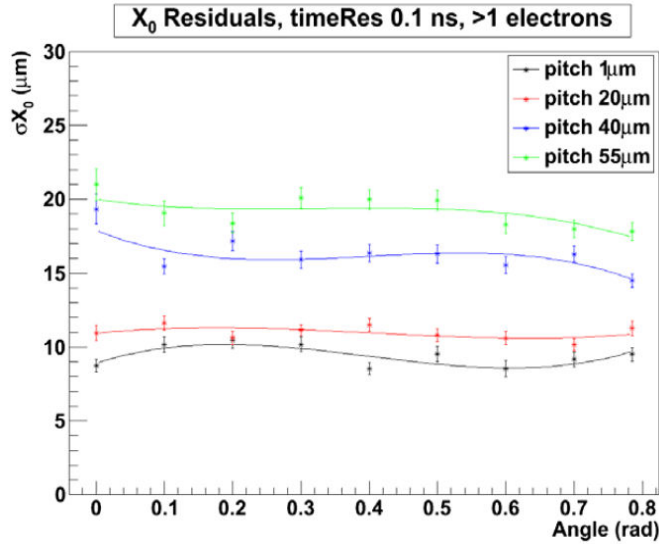
Resolution as function of height optimum plane time10



Resolution as function of height optimum plane time20



Effect on Resolutions



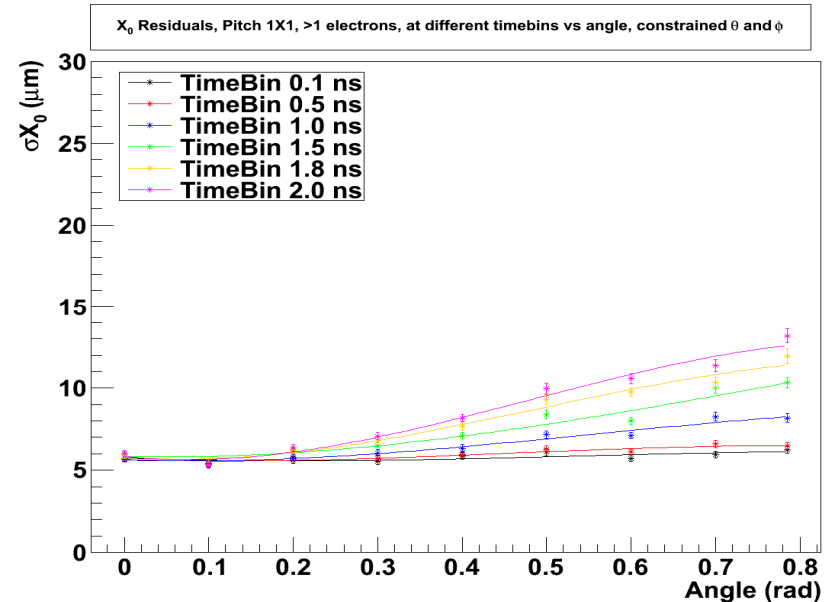
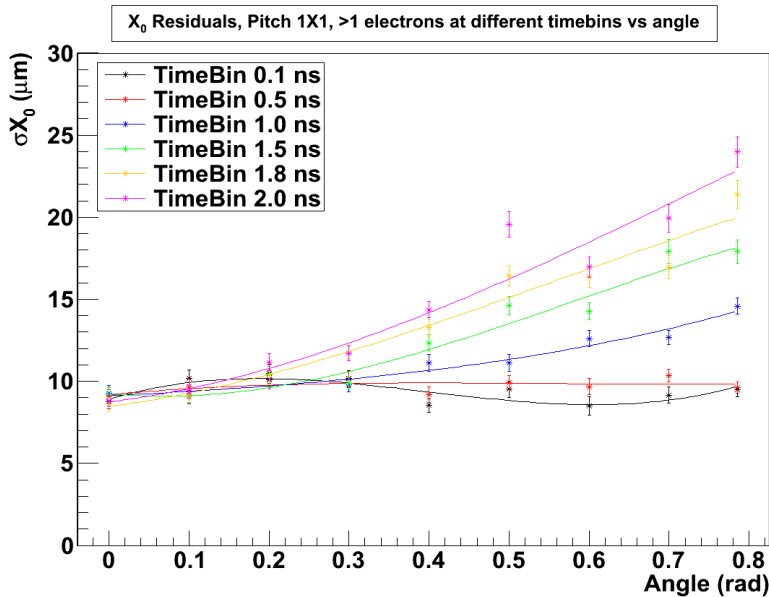
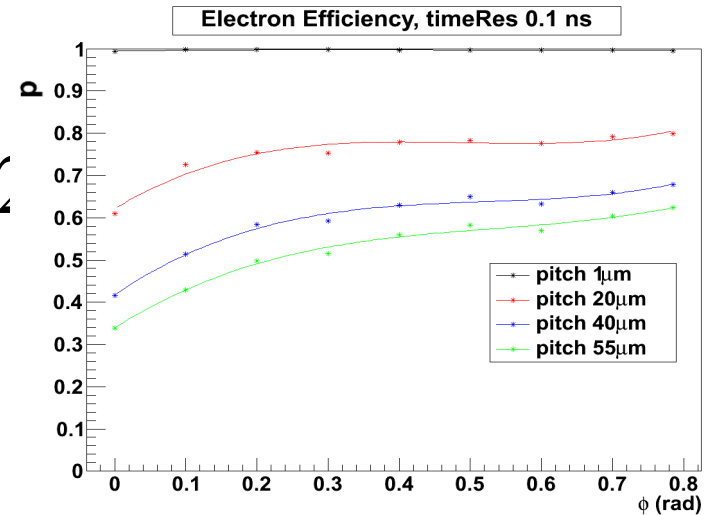
Effect on Resolutions



- Resolutions improves with new definition
- The new definition does not affect angle resolutions or the distributions from fits with fixed angles
- Angle dependency of the optimum plane makes things less clear.

Other Results (showed before)

- Track Efficiency ~ 99
- Angular resolution 1-2 degrees
- Electron efficiency:

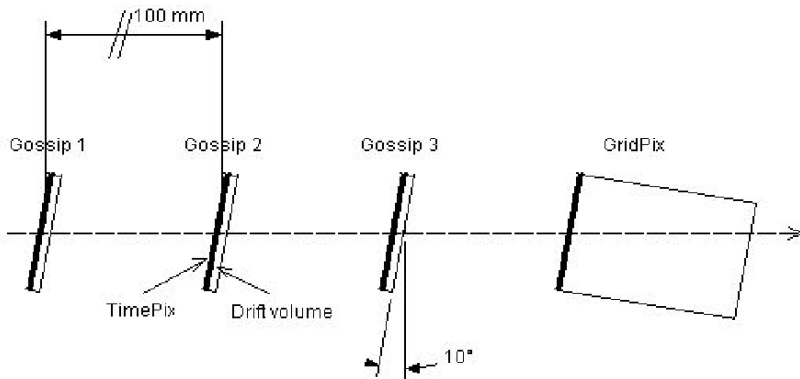


Testbeam Setup

Goal: verify MC simulation results

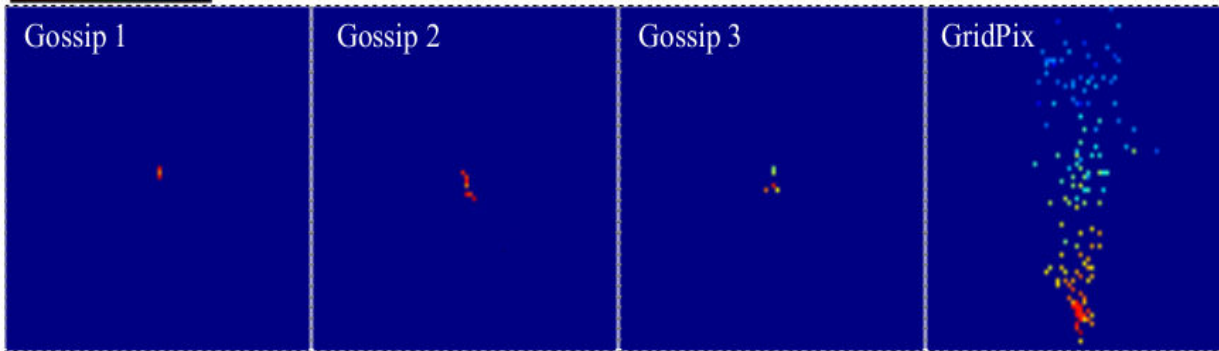
- Differences: Ar Isobutane 80/20 iso CO₂-DME 50/50 , Diffusion is ~3 times larger
- Only perpendicular tracks 100 GeV iso 1 GeV
- Timebins 12.5 ns iso 1.8 ns

Testbeam setup: 3 x gossip (~1mm) 1 x DICE (2 cm)

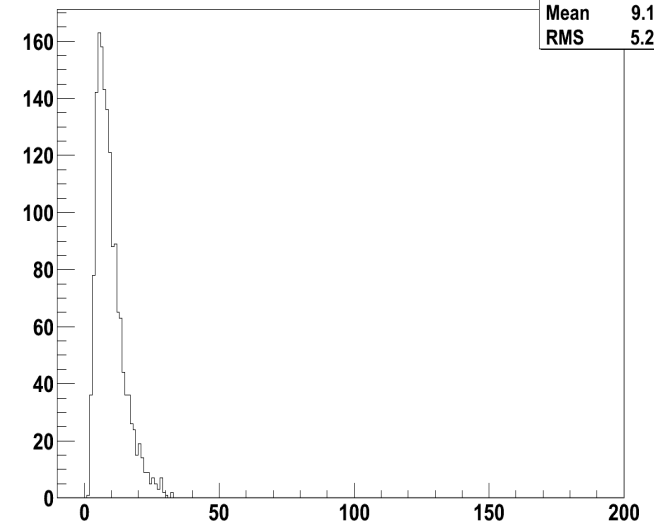


- Drift field ~600 v/cm
- Ingrids -440 V
- ~200 tracks analysed

Testbeam Results



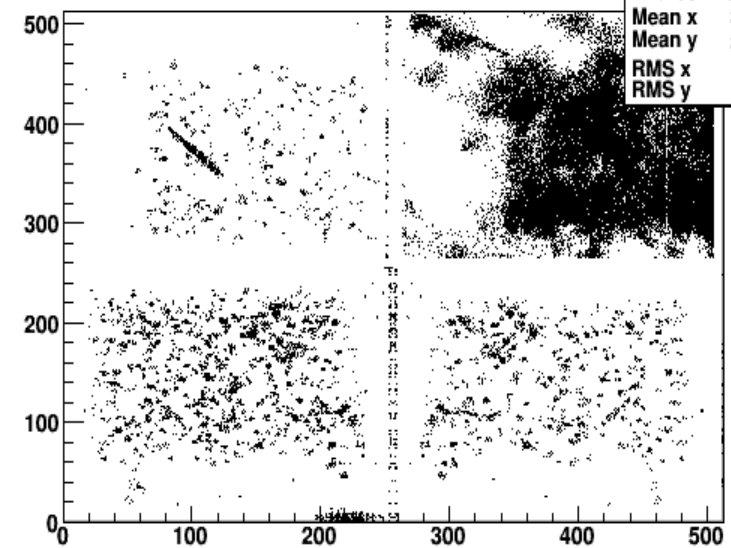
Time Spectrum Chip1 (bins)



fhTimeSpectrumChi	
Entries	154
Mean	9.11
RMS	5.20

Reality with Argon Isobutane:
 V_d Gossip: $4.8\text{cm/us} = 1\text{mm}/20.8\text{ns}$
 ~ 2 Timebins; Time slewing dominant

pixels

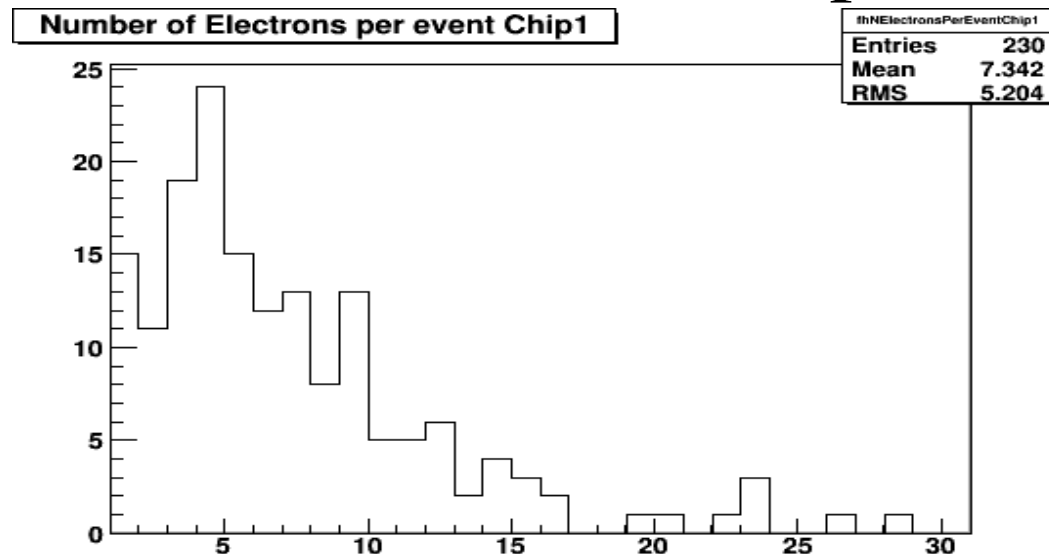


PixelHist	
Entries	53642
Mean x	385.6
Mean y	336.3
RMS x	110.3
RMS y	101.1

Angular resolutions; time info needed..

Testbeam Results

- In Argon Isobutane (80/20) ~ 114 electrons/cm = 11.4 electrons/mm
- Three gossips have ~5-6 electrons/evt
- Efficiency roughly 50% > 30% from MC # electrons CO2-DME 12 electrons/mm. Due to energy 1 GeV vs 100 GeV? Gap size?

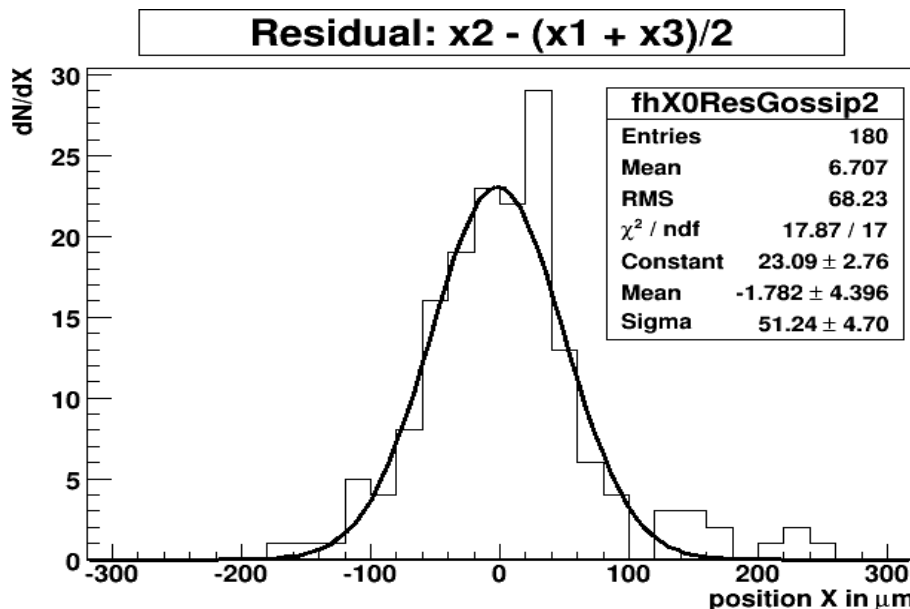


Testbeam Results

- Not enough time info → resolution from CoG
- The diffusion is ~ 3x larger in Testbeam compared with MCsim, resolution must be $12 * 3 \sim 36 \text{ um}$.

Very rough resolution calculation:

$$\text{If } \sigma_{\text{gos1}} = \sigma_{\text{gos2}} = \sigma_{\text{gos3}} \rightarrow 1.5 * \sigma_{\text{gossip1}}^2 = \sigma_{\text{res}}^2$$



$$\sigma_{\text{gossip}} \sim 40 \pm 5 \text{ um}$$

To Do



- Testbeam with CO₂ DME done last week with several angles, data must be analyzed.
- The simulation must be completed with all ingredients using Garfield (NEBEM incl)
- Reduce timeslewing problem

Backup

