

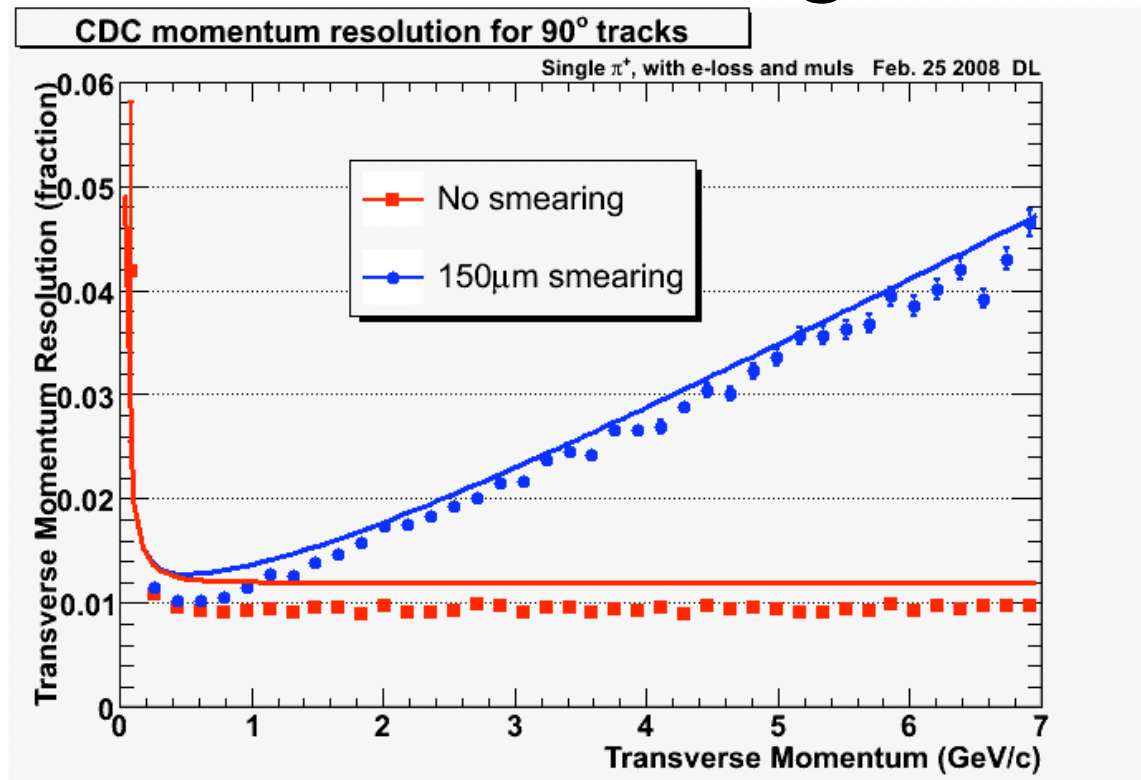
Charged Particle Reconstruction Status

Feb. 22, 2008 David Lawrence

Work continues on documenting the tracking resolutions for single π^+ tracks.

Focus is shifting to understand and better measure our tracking efficiencies.

Parametric Calculation of 90° tracks vs. *hdgeant*

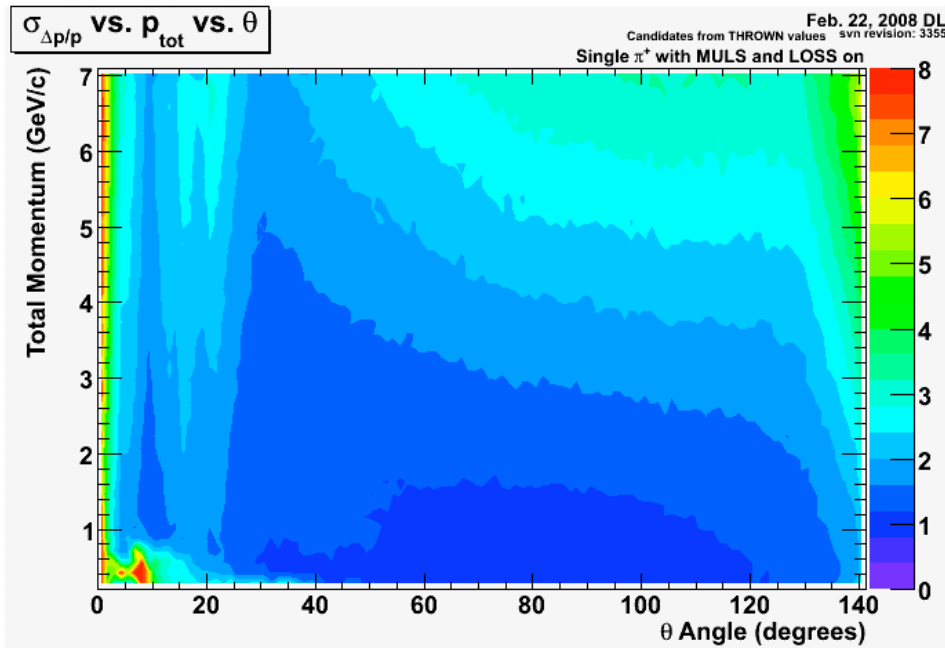


A plot similar to this was shown last week where the “No smearing” case showed a momentum dependence at high momentum indicating a problem. This exercise was repeated from the start and the problem seems to have gone away (i.e. I was making a mistake somewhere before.)

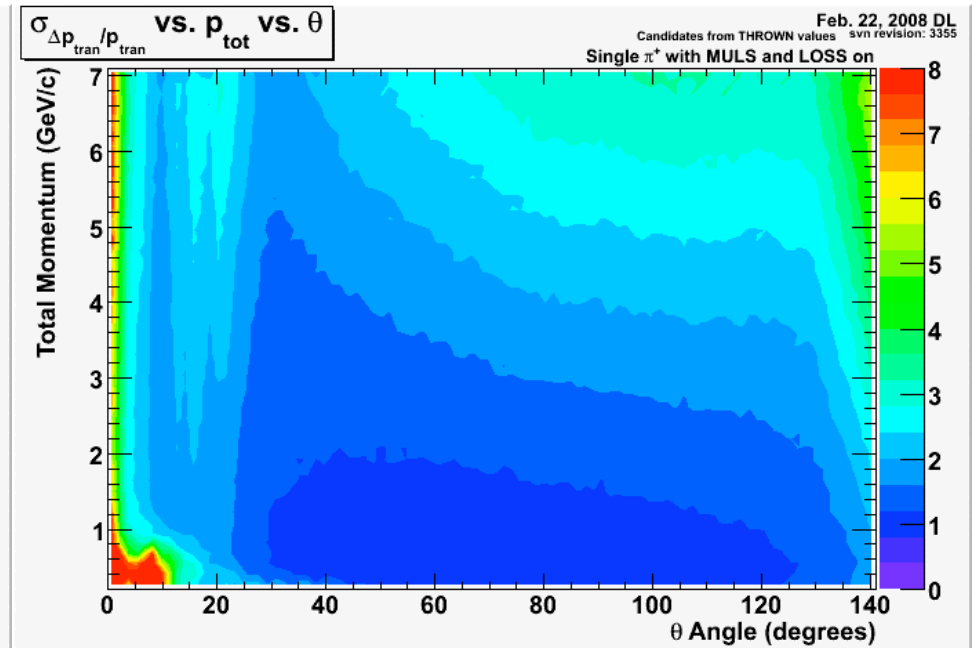
Nostalgia from last week ...

Momentum Resolution

Total Momentum Resolution



Transverse Momentum Resolution

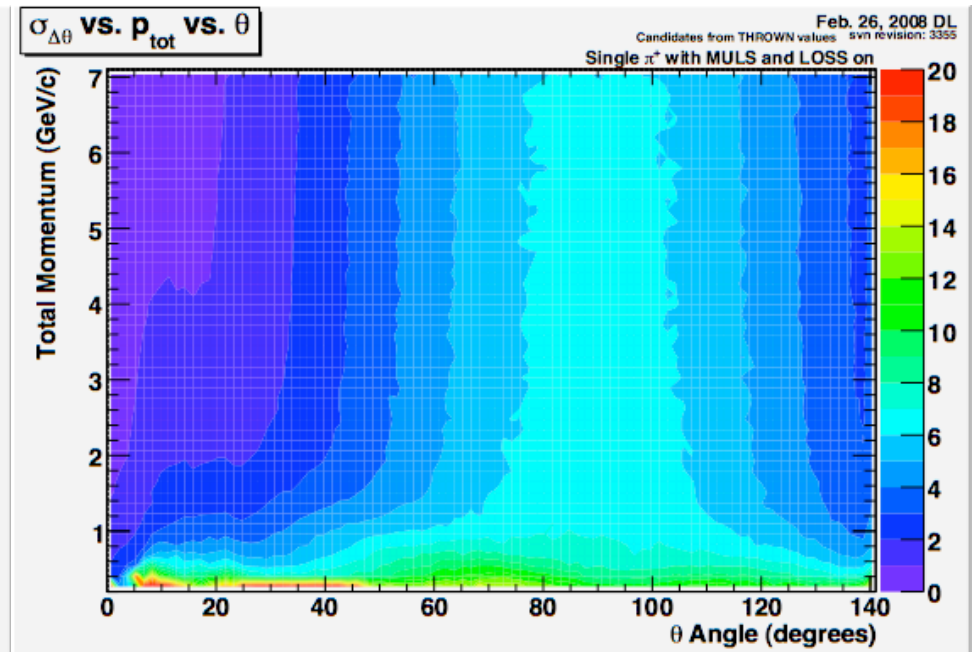
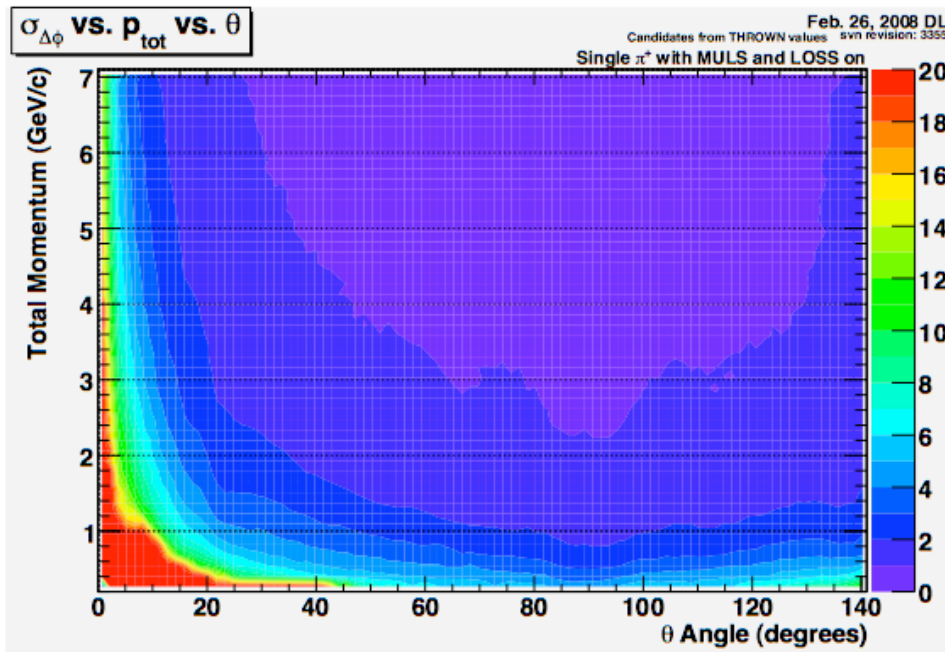


Angular Resolutions

(units of z-axis are milliradians)

$\delta\phi$

$\delta\theta$



(Never shown before!)

(Re)Defining Tracking Efficiency

Old method: *(good for candidates)*

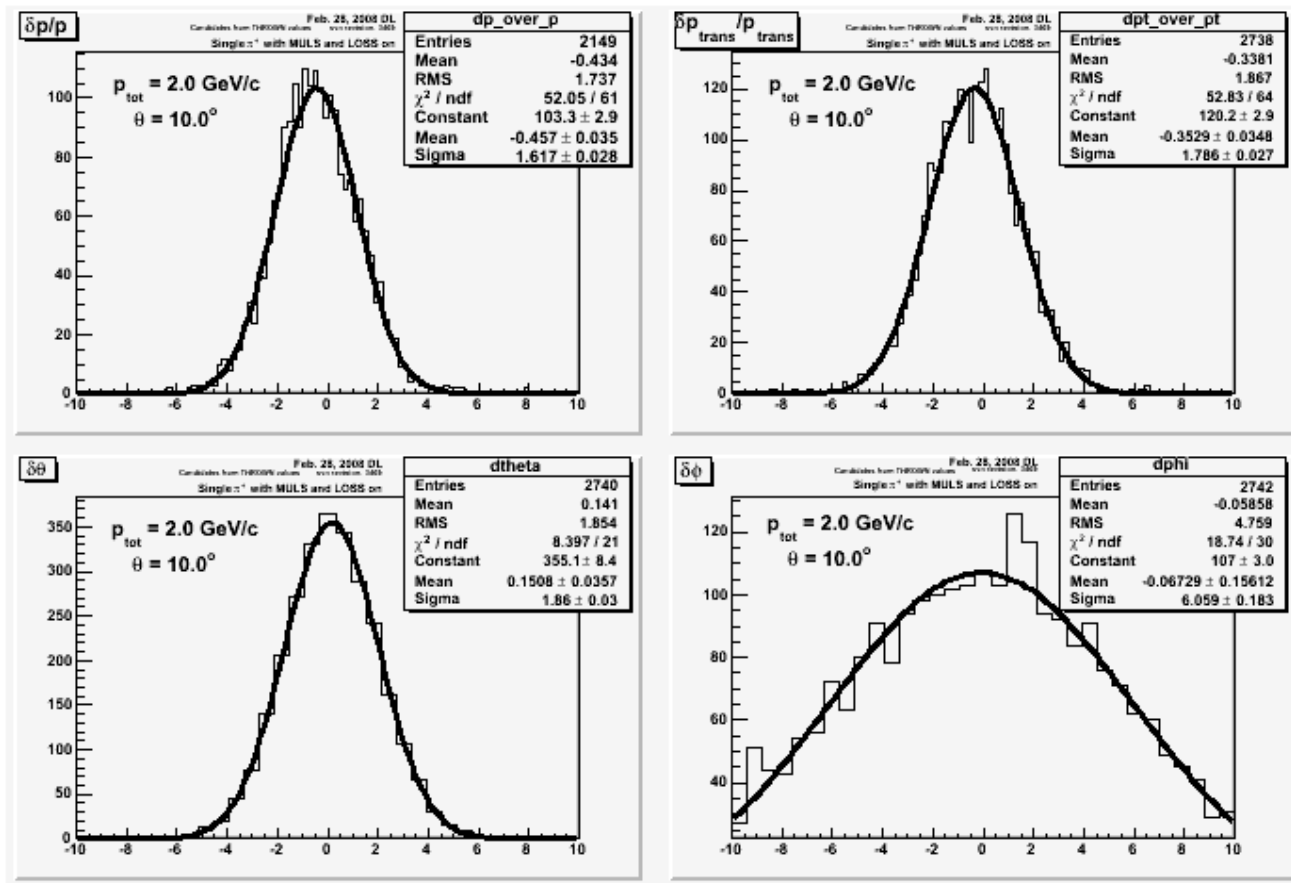
- *Obtain list of wires hit by “thrown” track using truth information.*
- *Compare to list of wires close to track candidate.*
- *If enough of them match, then the track was found.*

New method: *(good for fit tracks)*

- *Use resolutions obtained from M.C. to calculate a χ^2 (likelihood) for each track based on the “thrown” values.*
- *Use a χ^2 cut of $\sim 3\sigma$ to determine if track was found.*

Resolutions for single bin @ $p=2\text{GeV}/c$, $\theta=10^\circ$ π^+ tracks

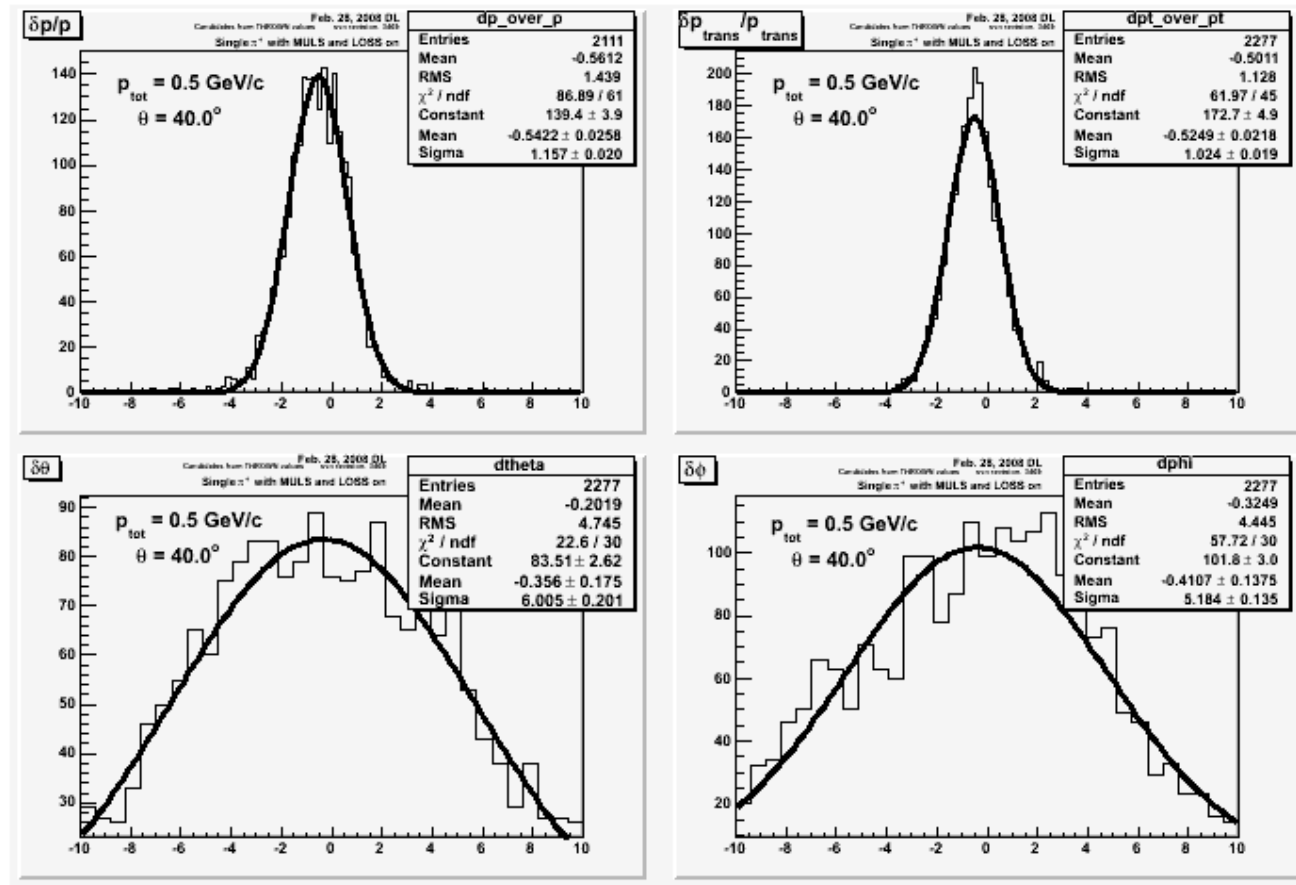
FDC



Distributions all look to be reasonably well described by a single Gaussian with no “background” function.

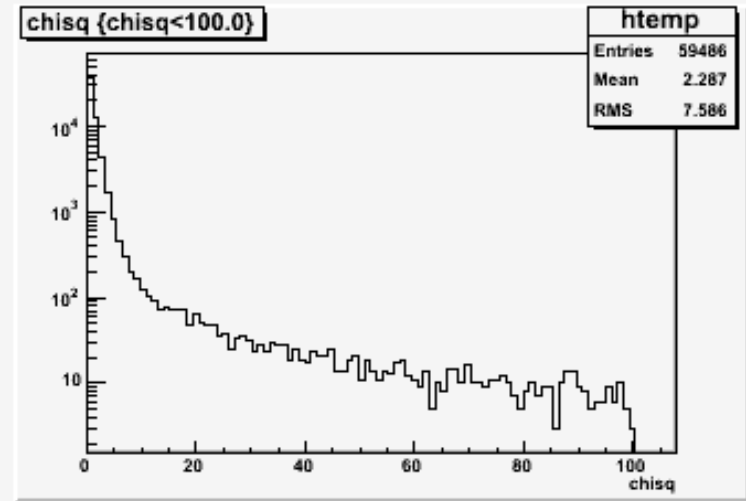
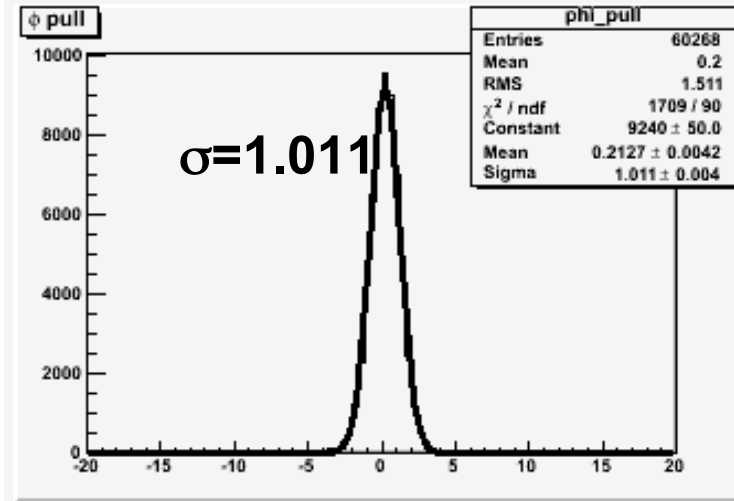
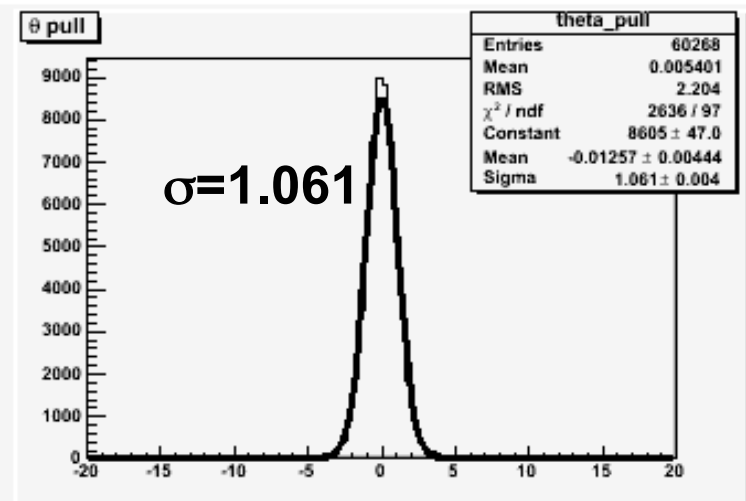
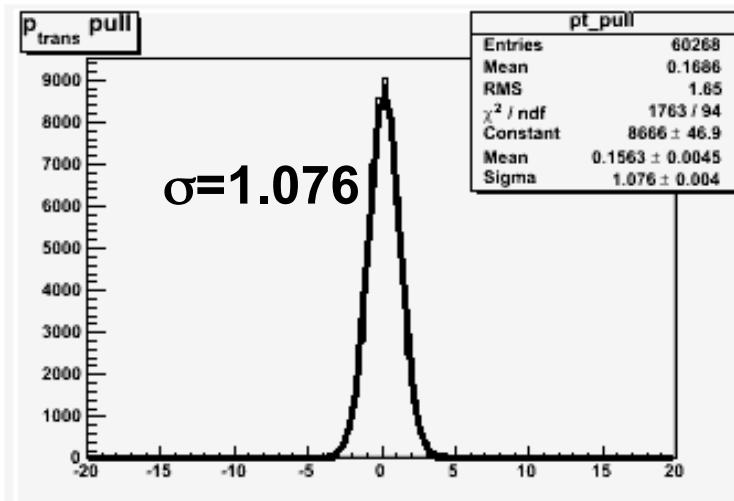
Resolutions for single bin @ $p=0.5\text{GeV}/c$, $\theta=40^\circ$ π^+ tracks

CDC

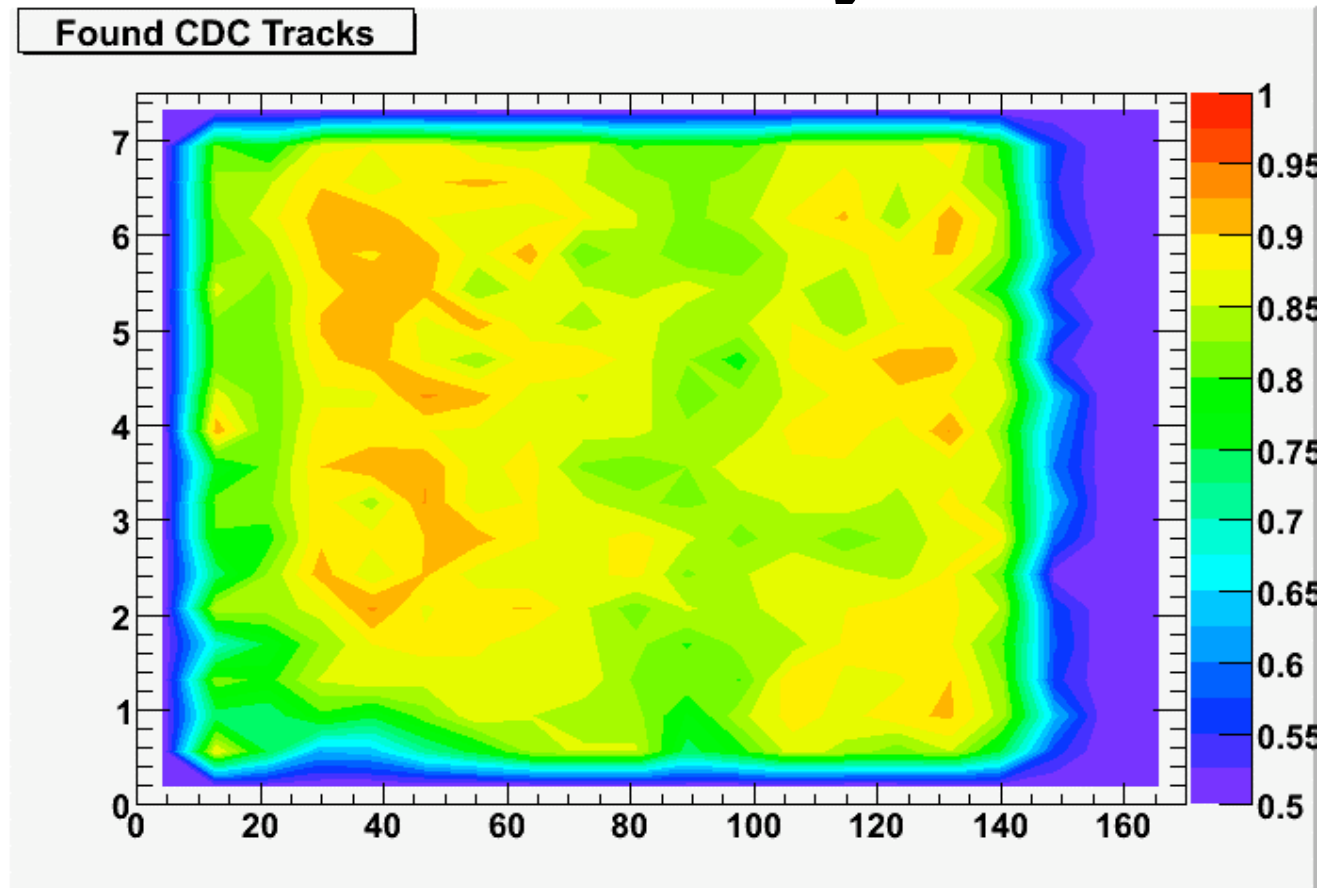


Distributions all look to be reasonably well described by a single Gaussian with no “background” function.

Pulls for p_t , θ , and ϕ for π^+ tracks thrown isotropically from 15° - 20° and $0.1\text{GeV}/c$ - $7.1\text{GeV}/c$



Fraction of *perfect* candidates that are successfully fit is $\sim 85\%$

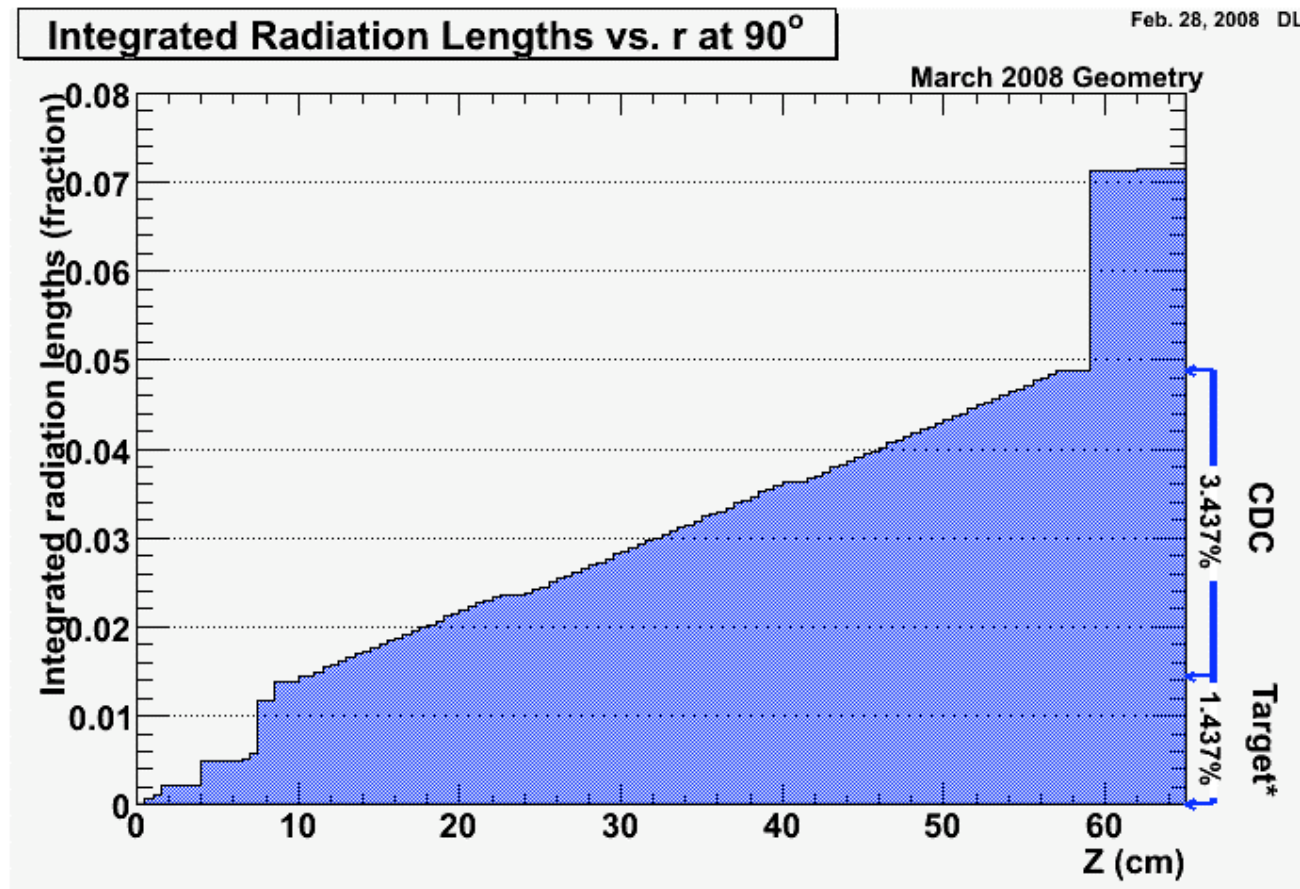


At this point, the fitter will tend to fail fits pretty quickly if it sees a problem. I'm currently working to understand the underlying cause for these failures.

hdgetresolution Command-line utility

```
>hdgetresolution 1.4 12.4 -ptotdelta 1.0 -npvals 5
Opened "hd_res_charged.root"
# ptot is in GeV/c and theta is in degrees
# Momentum resolution is fractional
# Angular resolutions in milliradians
# ptot  theta  dpt/pt  dtheta  dphi
1.4  12.4  0.0193214  2.43818  6.46971
1.65 12.4  0.0192506  2.24815  5.26692
1.9  12.4  0.0196435  1.95391  4.82313
2.15 12.4  0.0198876  1.80462  4.32079
2.4  12.4  0.0198262  1.70313  4.0761
```

Number of radiation lengths in the CDC and Target package



Nothing new or suprising here. Just a new plot I thought I'd share!

What's next ...

- Continue working on documenting the “pure” tracking resolutions.
- Resolve problems with failed fits and less-than-perfect efficiencies for a “perfect” finder.
- Look at resolutions in the presence of background and inefficient/dead wires

Only about 1.5 weeks of real work time left after subtracting time to prepare talk and pre-brief document!