

FDC Global Track Fitting

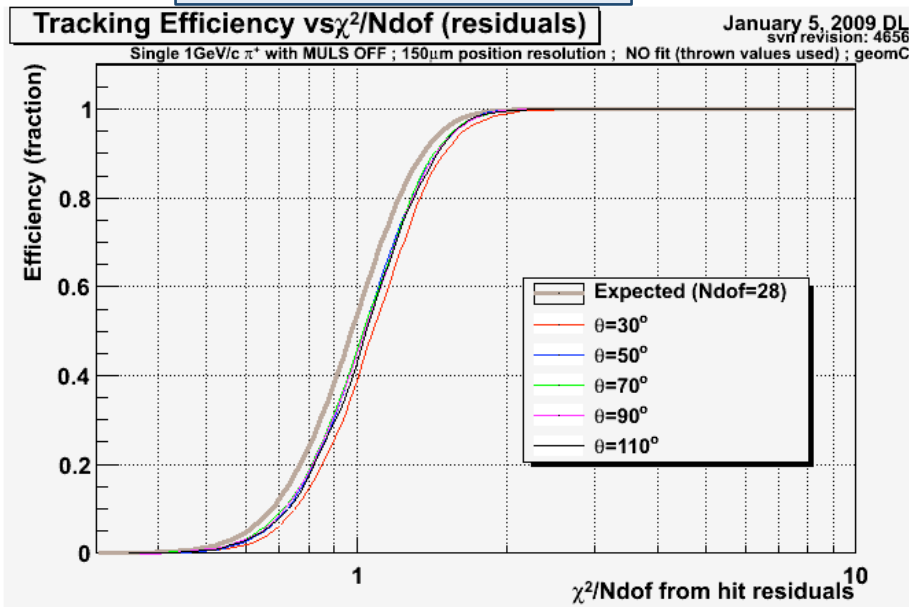
Jan. 12, 2009

David Lawrence JLab

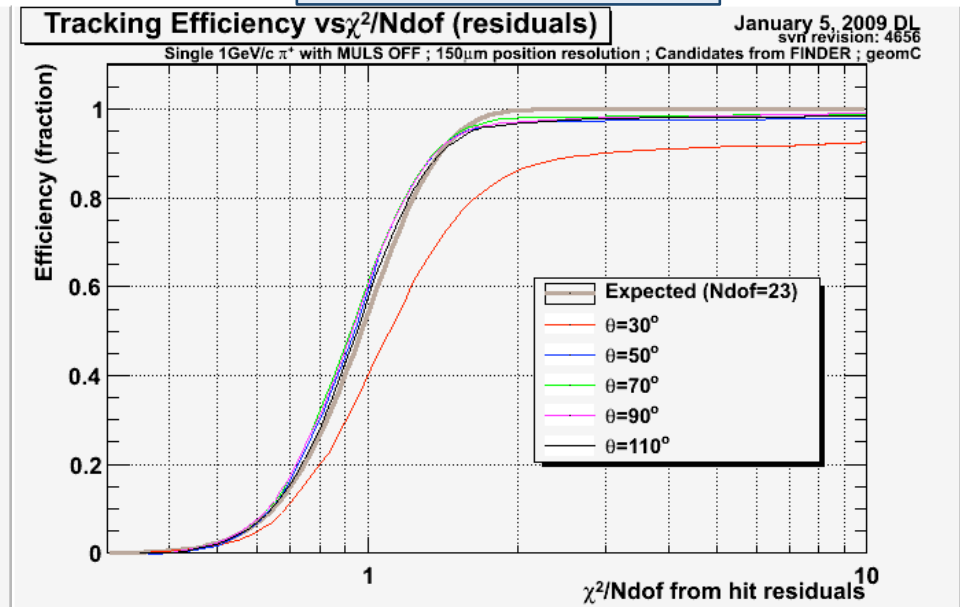
Review of where we are ...

- In December, results were presented showing significant improvement in the cumulative χ^2 distributions after the target constraint was removed from the fits.
- There was one remaining issue with the CDC itself which was: Understand why the 30° tracks stood out in the fit track cumulative χ^2 distribution.
- The next study was to start looking at the FDC with the specific goal of optimizing the CDC length simultaneously with the FDC package positions.

Thrown tracks (no fit)

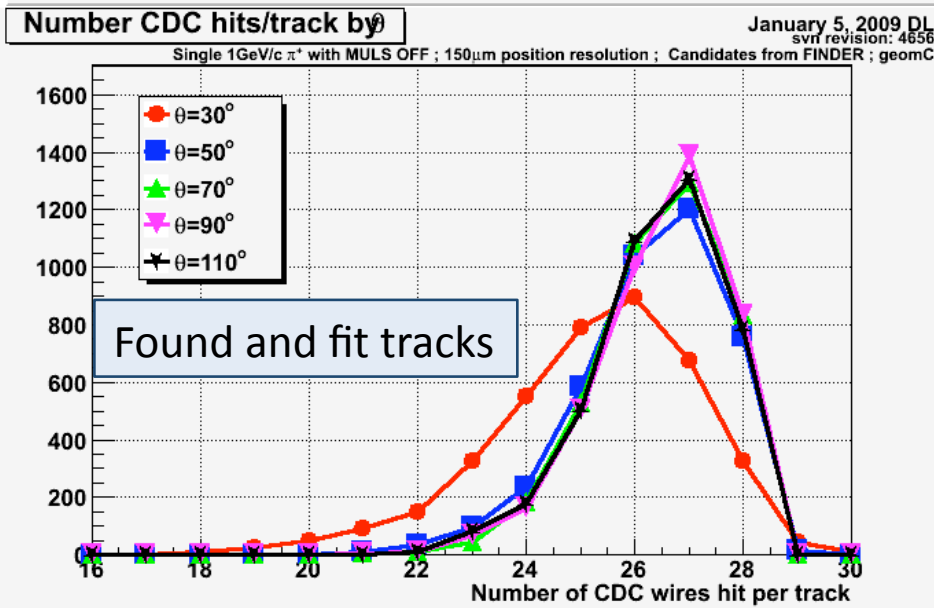
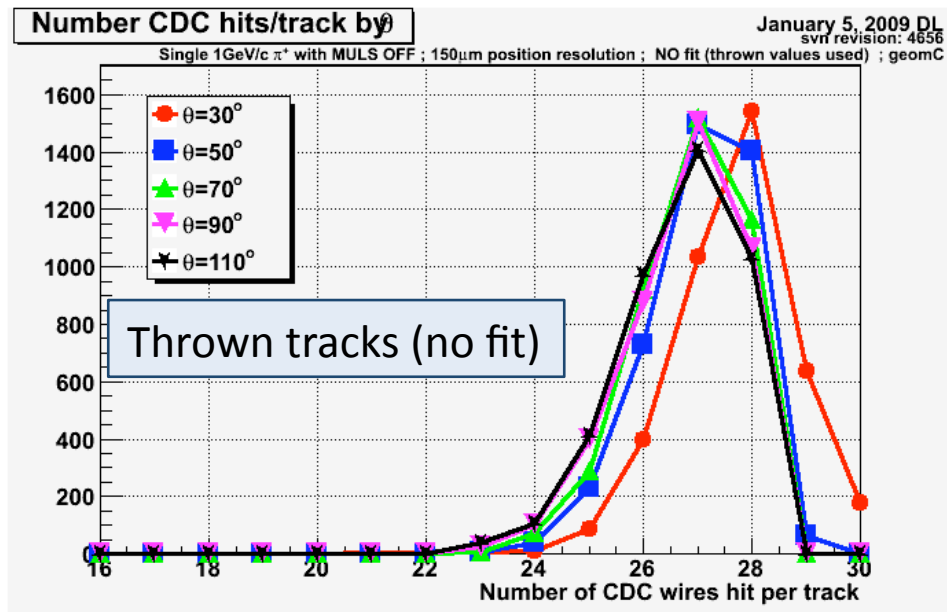


Found and fit tracks



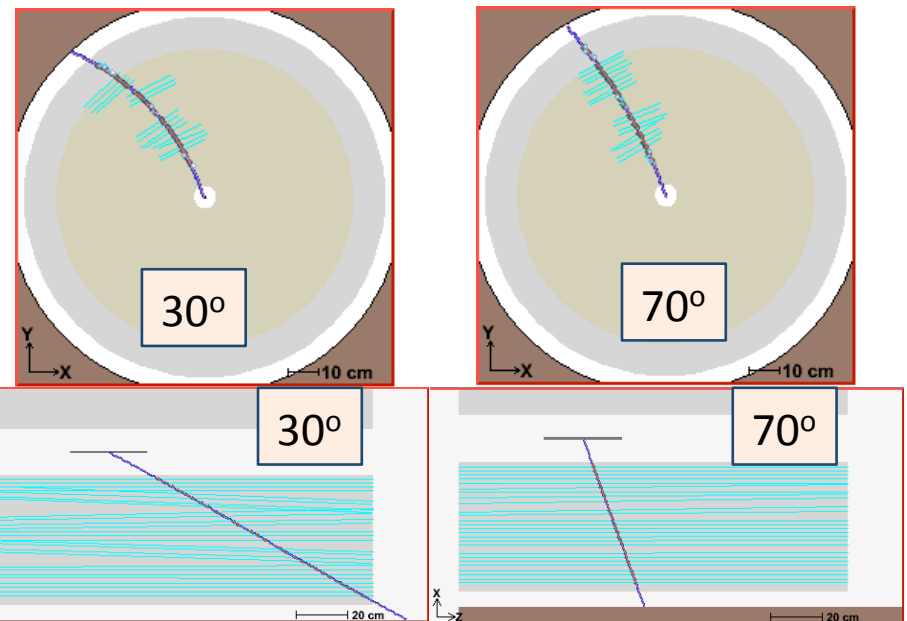
Number of hits per track in CDC

1 GeV/c π^+ tracks



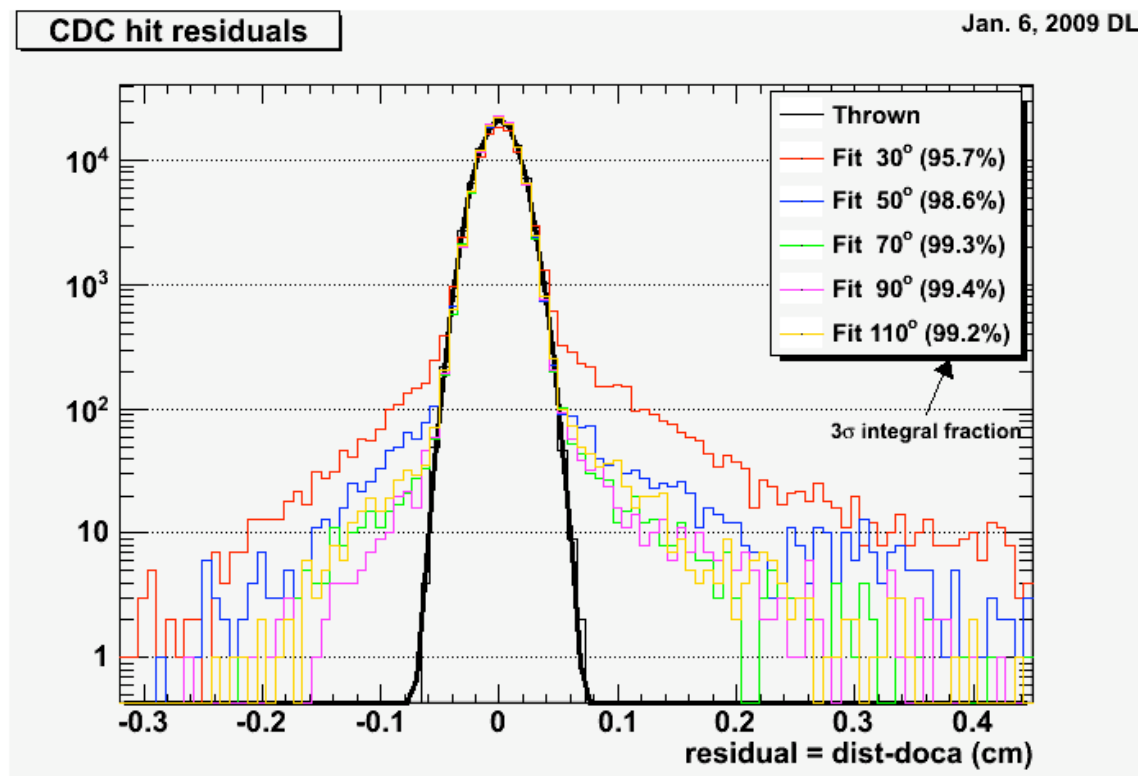
There is simultaneously a higher probability of getting multiple hits per layer in 30° tracks and a higher probability of rejecting hits that belong to a track.

Hit selection based on proximity to helical fit which will be worse in forward region where field becomes less uniform.



CDC residuals by angle

1 GeV/c π^+ tracks

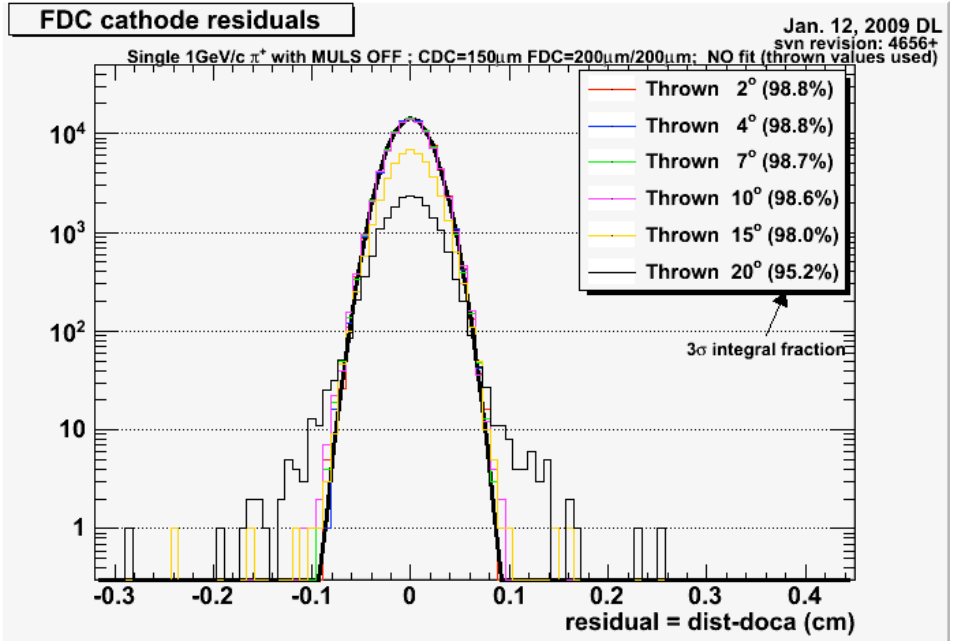
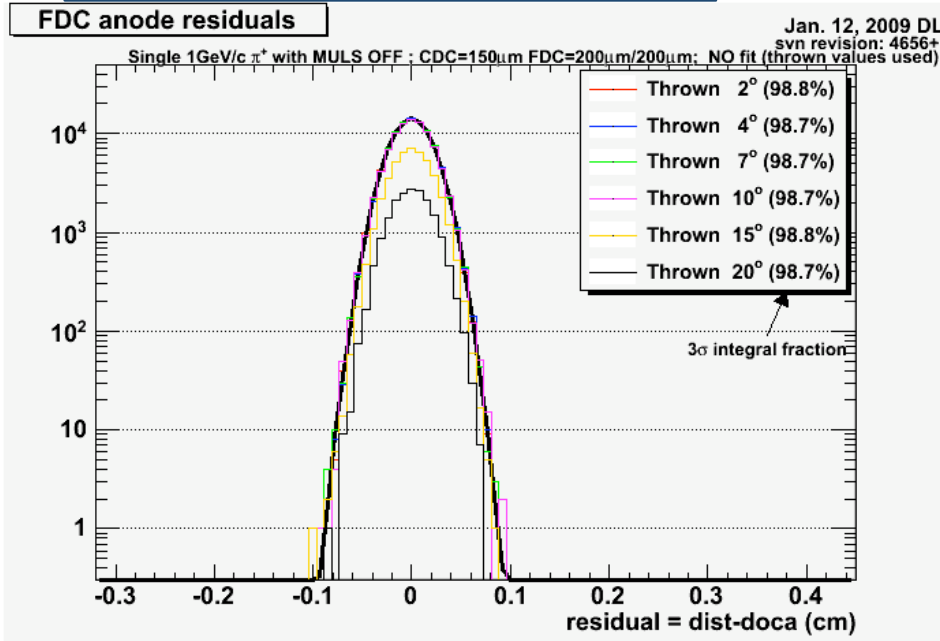


30° tracks have larger “wings” than other angles which pushes the tracking χ^2 further out in the tails of the χ^2 distribution.

FDC residuals for thrown tracks

Residuals perpendicular to wire

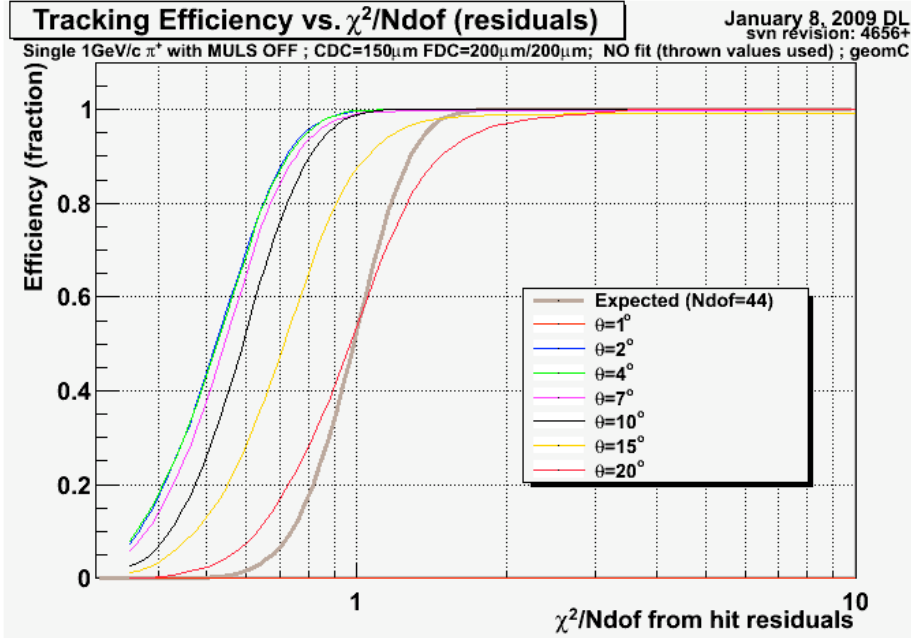
Residuals along the wire



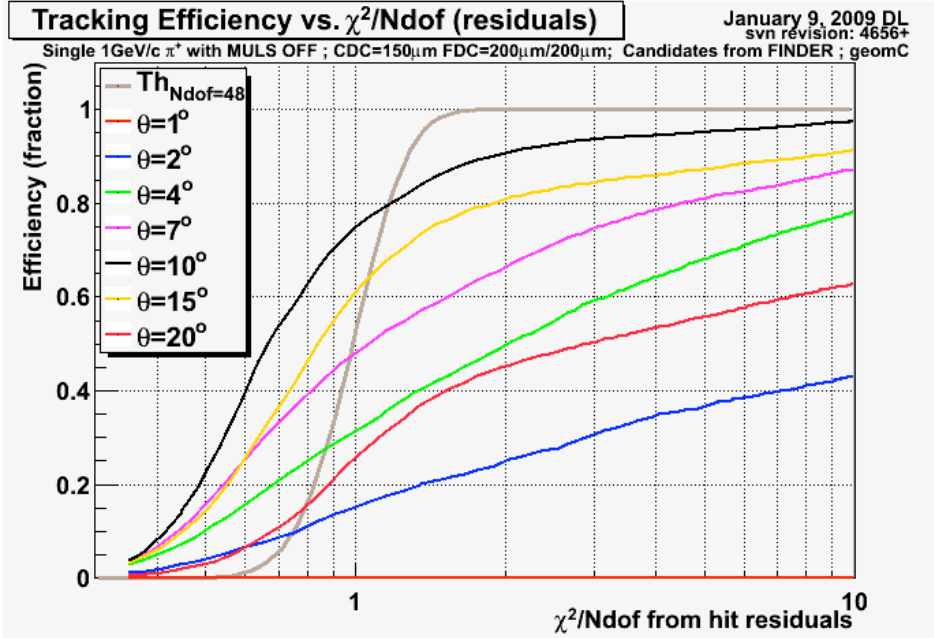
- Amplitude differences due to hitting 4, 2, or 1 FDC packages, depending on angle
- Pedestal smearing on cathodes increased by factor of 9 to achieve 200 μ m residual.

Cumulative χ^2 distributions for FDC with both anode and cathode hits included

Thrown tracks (no fit)

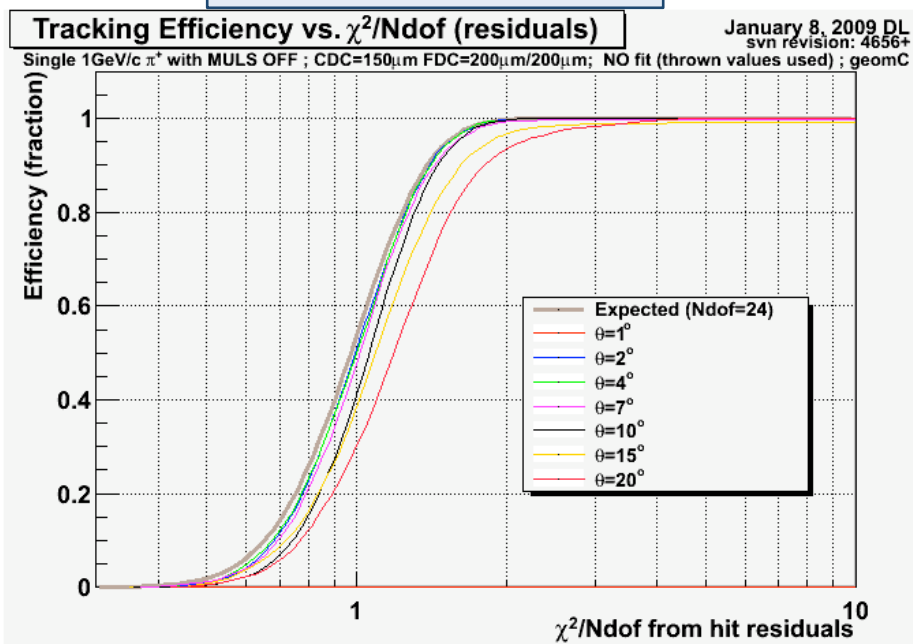


Found and fit tracks

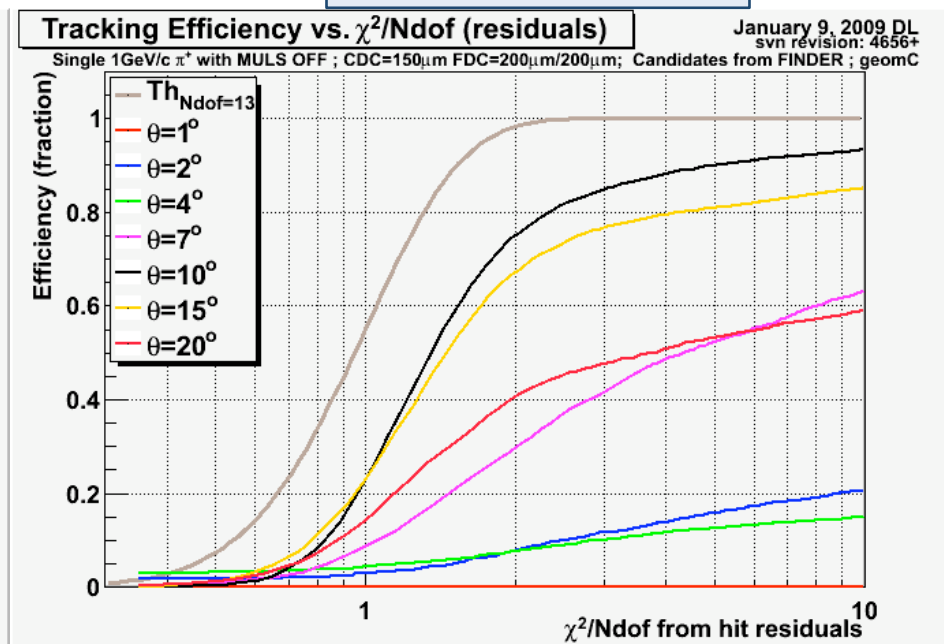


Cumulative χ^2 distributions for FDC with only anode hits included

Thrown tracks (no fit)



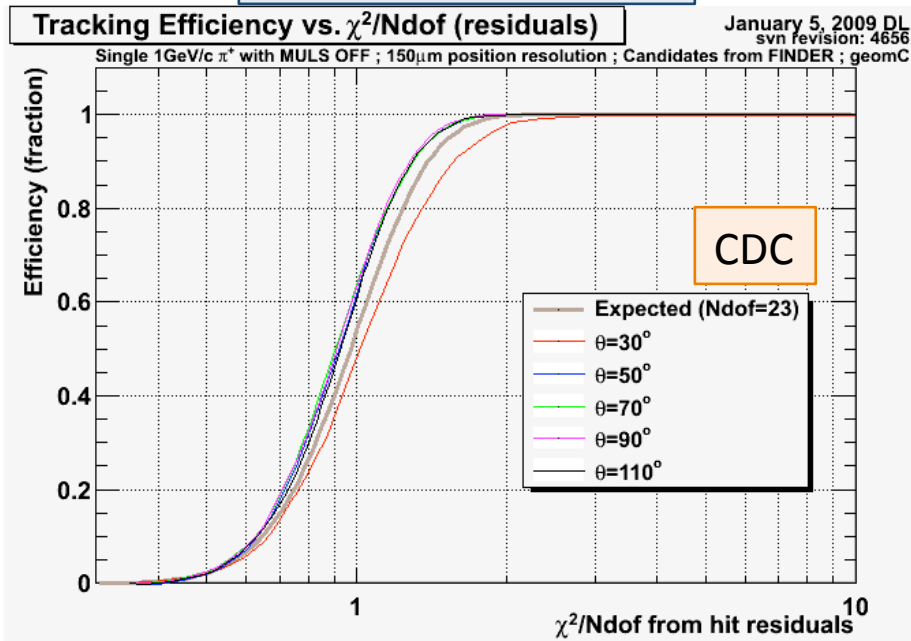
Found and fit tracks



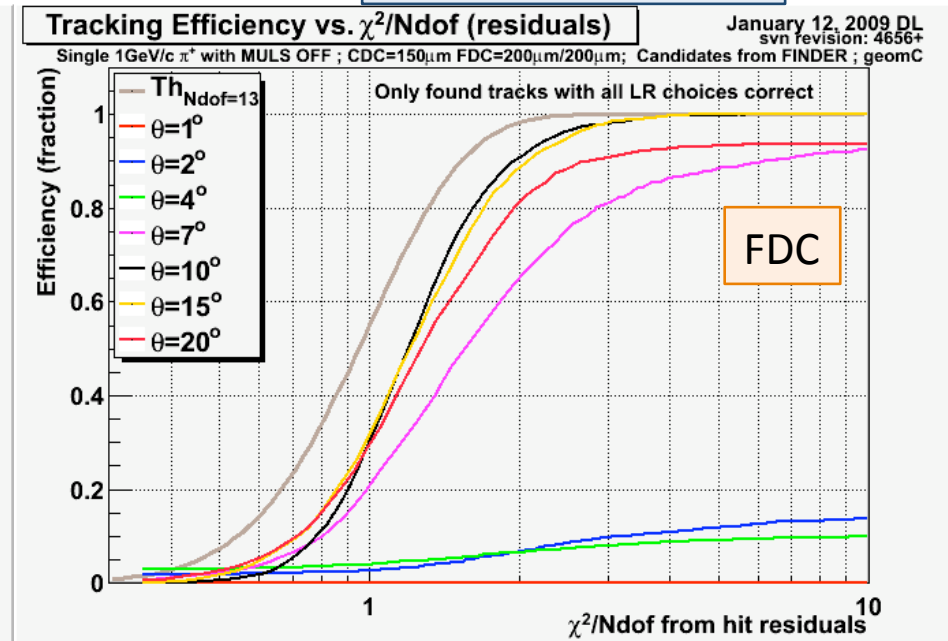
Cumulative χ^2 distributions for FDC anode hits for tracks with all LR choices correct

Note: The cut on “all LR choices” implies a cut on the track having been found.

Thrown tracks (no fit)



Found and fit tracks



Summary

- FDC χ^2 distribution not fully understood for cathode information
- FDC χ^2 distribution not fully understood for anode-only fit distributions
- 1° , $1\text{GeV}/c$ π^+ tracks do not appear to be passing through the active volume of FDC like they should