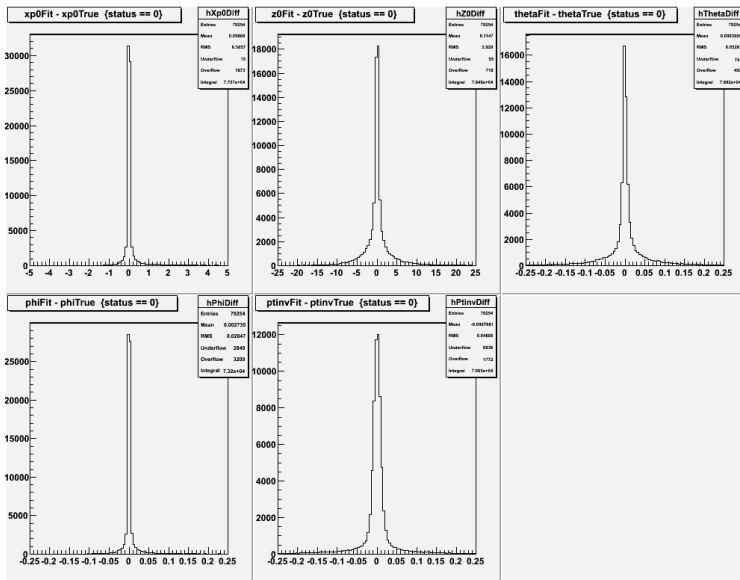


Least-Squares Track Fitter

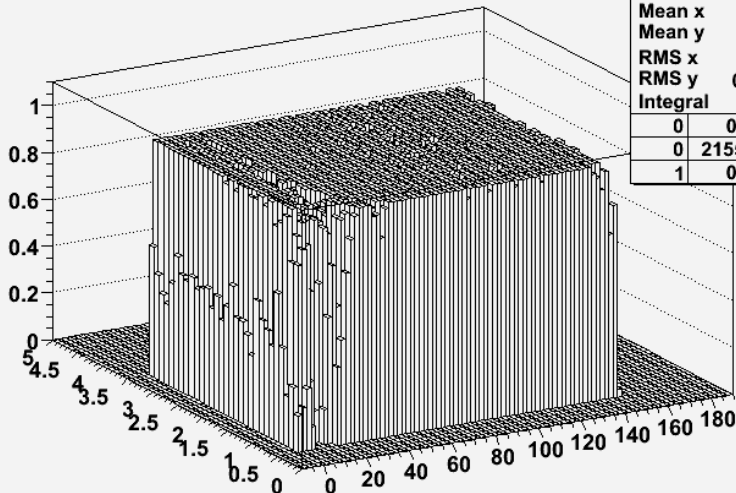
- Uses Levenberg-Marquardt algorithm from GNU Scientific Library (from MINPACK)
- Not a finder
- Initial parameters estimated from hit list
- Swim particles through magnetic field
- Works with FDC hits, CDC hits, or any combination
- CDC: time residuals, FDC: pseudopoint space residual
- Constant errors, CDC: $150 \mu\text{m}$, FDC: $200 \mu\text{m}$
- Track parameters:
 - 1 Total inverse momentum: $1/p_t$
 - 2 Polar angle: θ
 - 3 Azimuthal angle: ϕ
 - 4 Transverse distance of point of closest approach to beamline: r_0
 - 5 Z of point of closest approach to beamline: z_0

Five parameters, fitted - true



fit efficiency, total momentum vs. polar angle

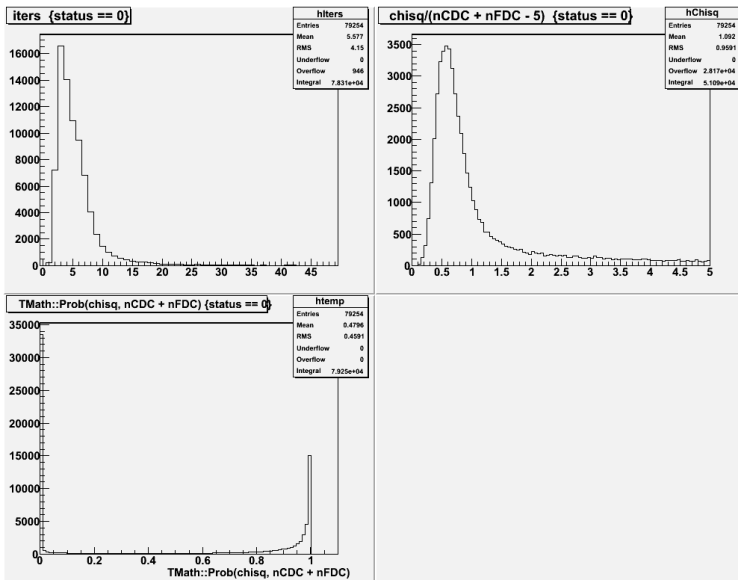
1.0/ptinvTrue/sin(thetaTrue):thetaTrue*57.295 {status == 0}



hPThetaFit

Entries	79254	
Mean x	75.02	
Mean y	2.014	
RMS x	42.02	
RMS y	0.8594	
Integral	2156	
	0	0
	0	2155
	1	0

Iterations, χ^2 , and χ^2 probability



Issues

- 1 Non-converging events: few percent
- 2 What is the source of anomalous probability distribution?
 - 1 FDC? CDC? Both?
 - 2 Particular regions of phase space?
 - 3 Out-of-time hits in “pure” (background free) one track events?
- 3 FDC errors
 - 1 anode drift time and each cathode should be separate measurements
 - 2 error from cathode should be a function of ionization
 - 3 error from anode should reflect smearing of drift time
- 4 Need to look at true vs. fitted chisq “parameter chi-squared”

$$\chi^2 = R^T C^{-1} R$$

where R is a vector of residuals: $r_i = x_{i,\text{measured}} - x_{i,\text{true}}$, i runs over the five parameters and C is the covariance matrix of the fit.

- 1 Which parameter(s) is (are) out-of-line?
- 2 What are the correlations among parameters?