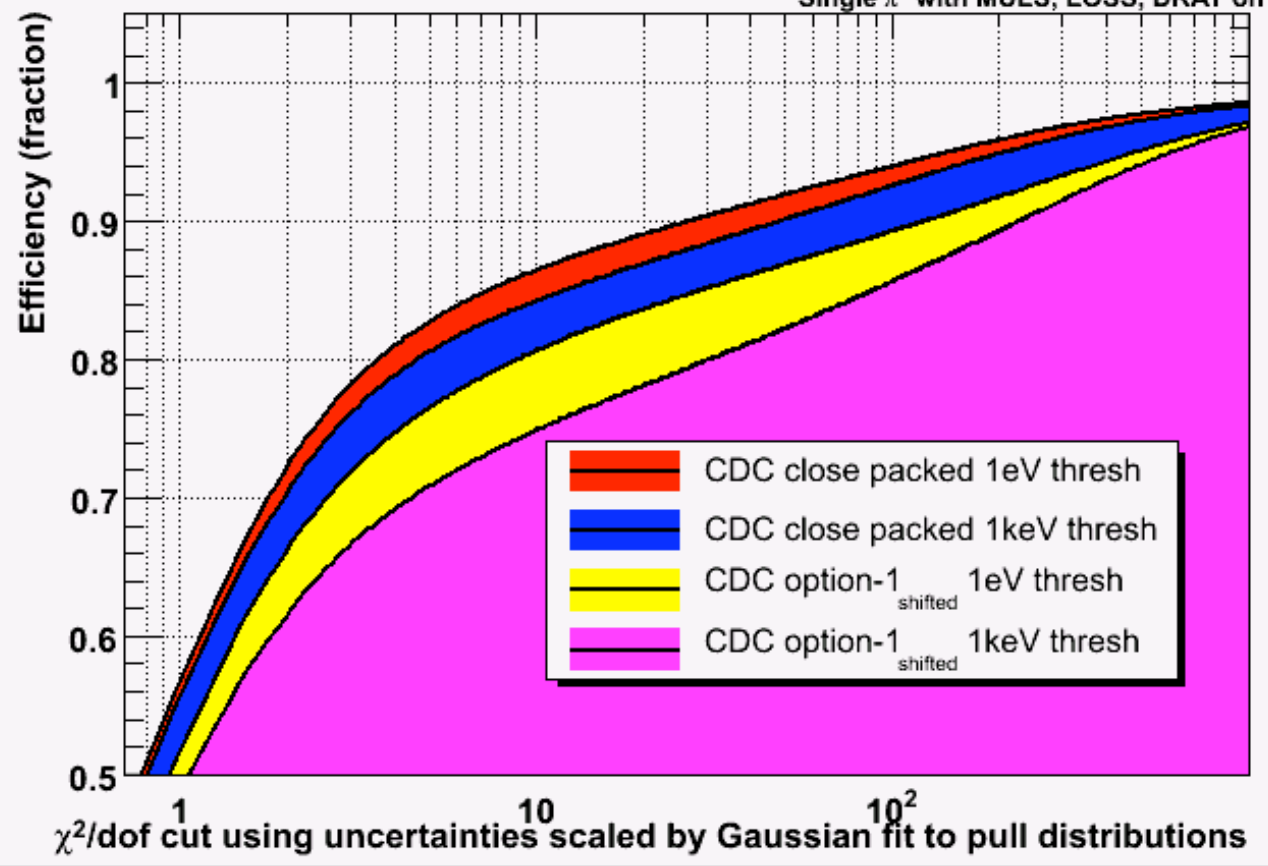# CDC Tracking Software

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Sept. 8, 2008

Efficiency vs. cut on χ^2/dof (scaled)

August 23, 2008 DL
svn revision: 4096
Candidates from finder
Single π^+ with MULS, LOSS, DRAY on

Efficiency (fraction)

χ^2/dof cut using uncertainties scaled by Gaussian fit to pull distributions

CDC close packed 1eV thresh
CDC close packed 1keV thresh
CDC option-1$_{shifted}$ 1eV thresh
CDC option-1$_{shifted}$ 1keV thresh

2

How χ^2 is defined

The χ^2 is formed using the residuals between the fit and thrown parameters:

$$\chi^2 = (\Delta p_t / p_t)^2 + (\Delta \theta)^2 + (\Delta \phi)^2$$

If the components are independent and drawn from a Gaussian parent distribution, this would follow a "chi-squared" distribution with a well-known probability distribution (see next slide)

"Tracking Efficiency" compared to χ^2 cumulative distribution function
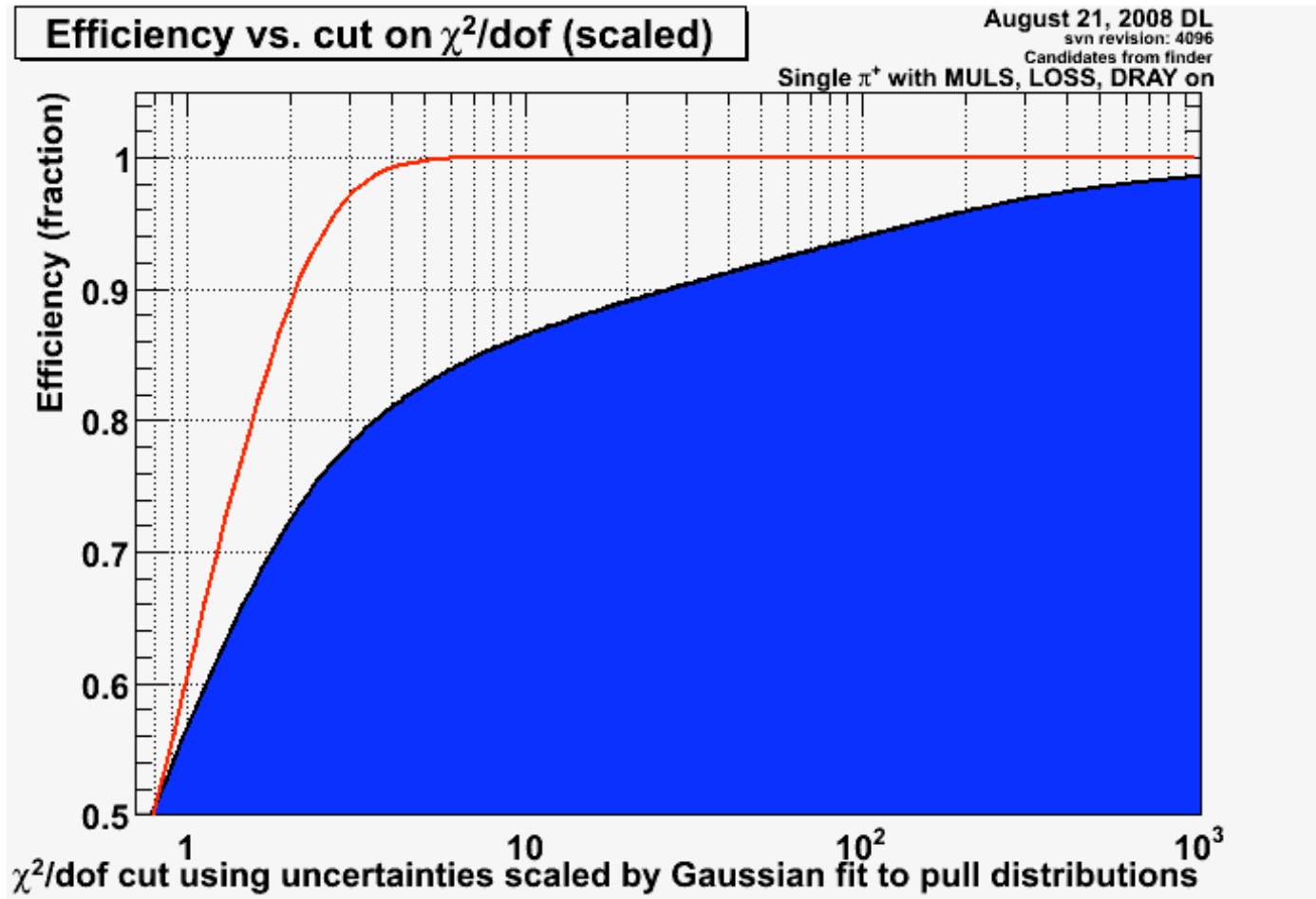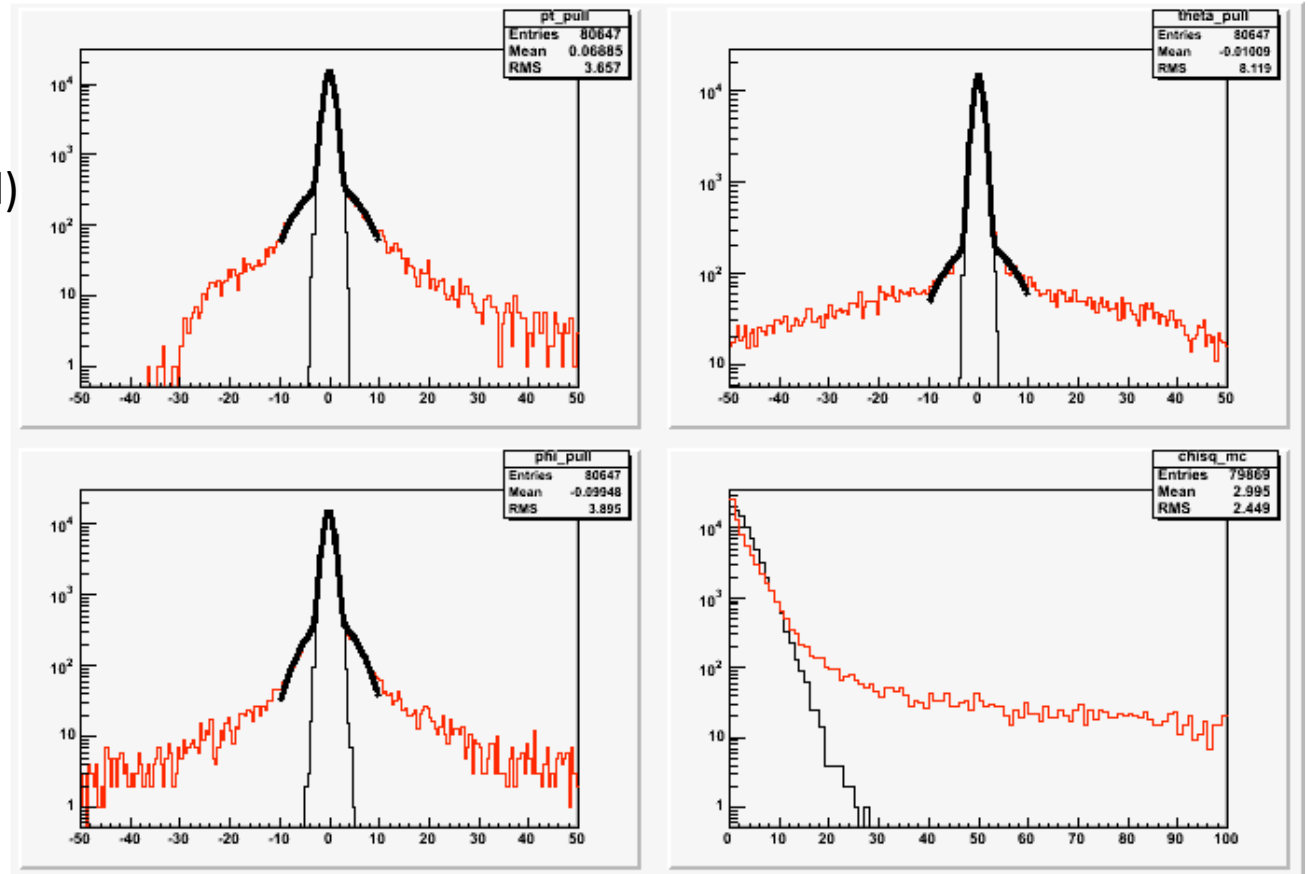
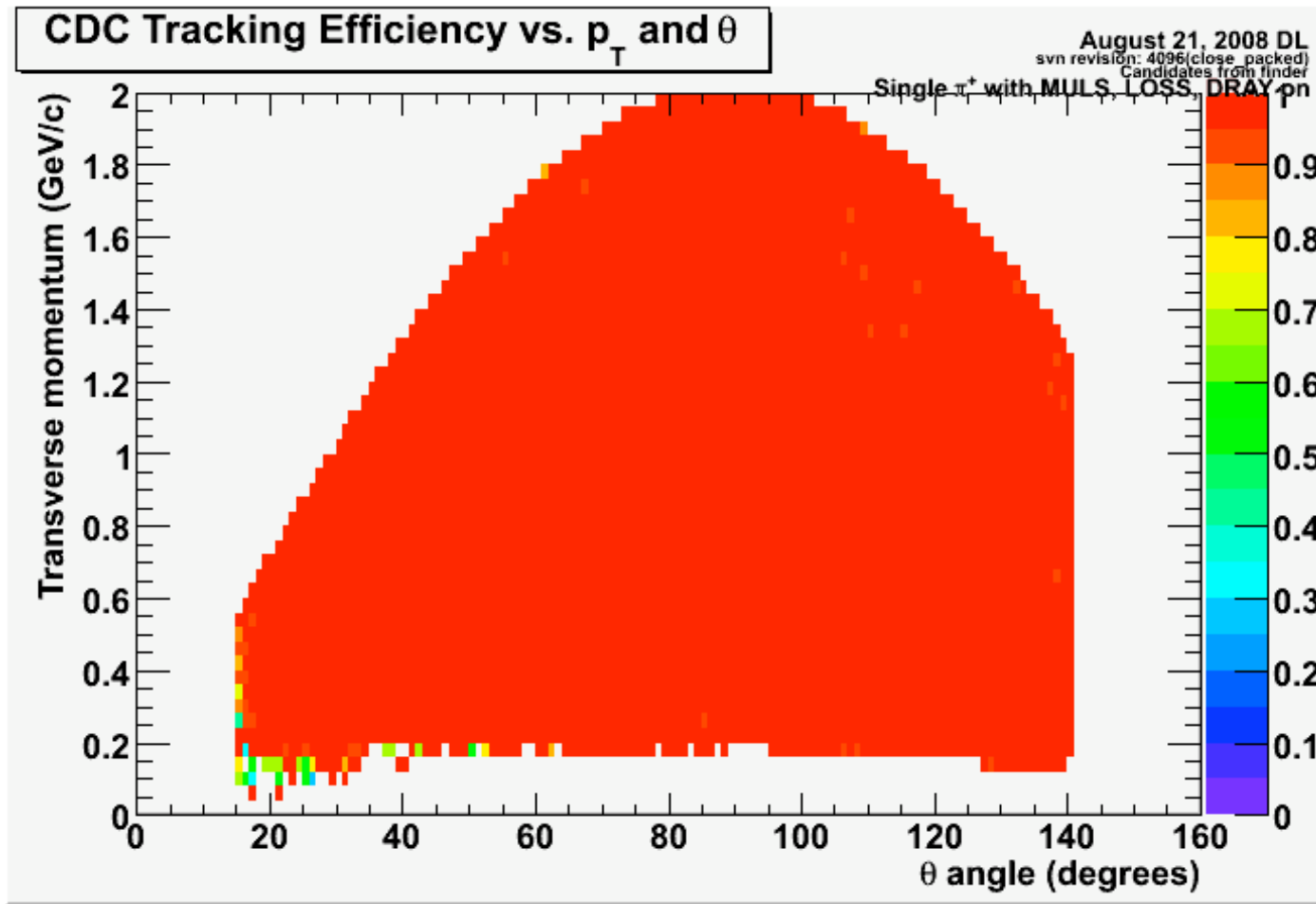# Pull distributions have non-Gaussian tails
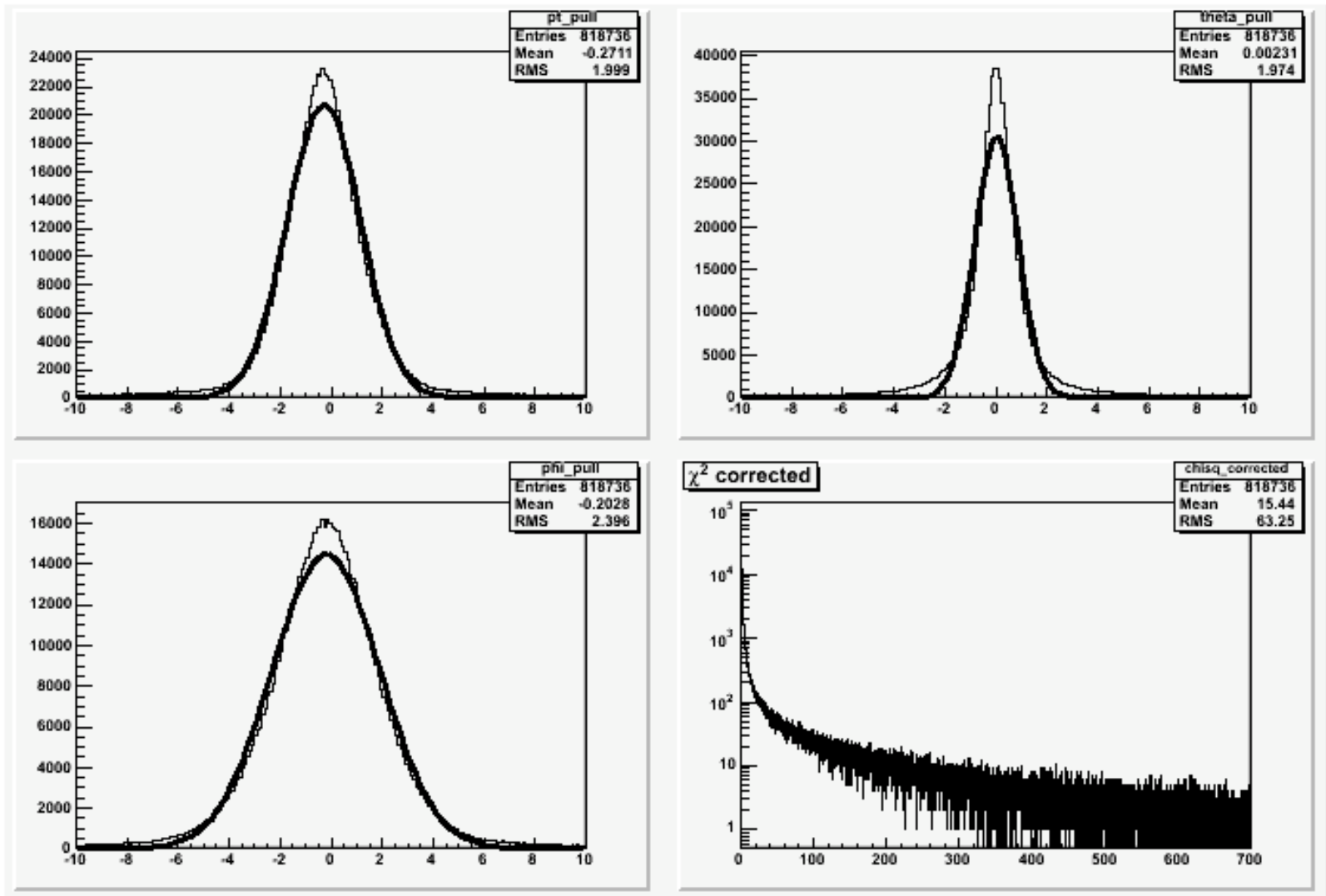
Pulls with double Gaussian fits

Red = Tracking Results
Thick black = double gaussian
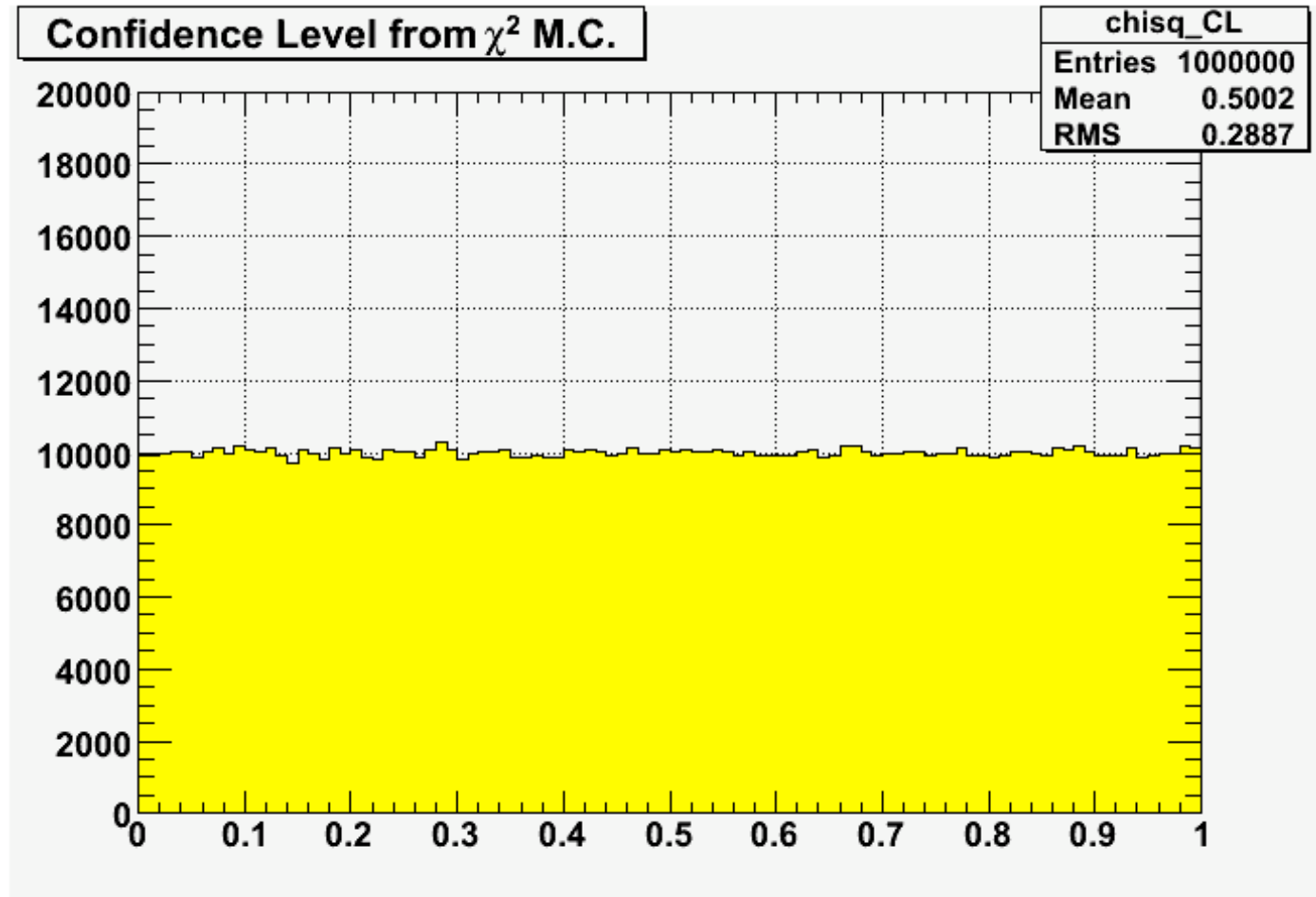Thin black = gaussian (sampled)

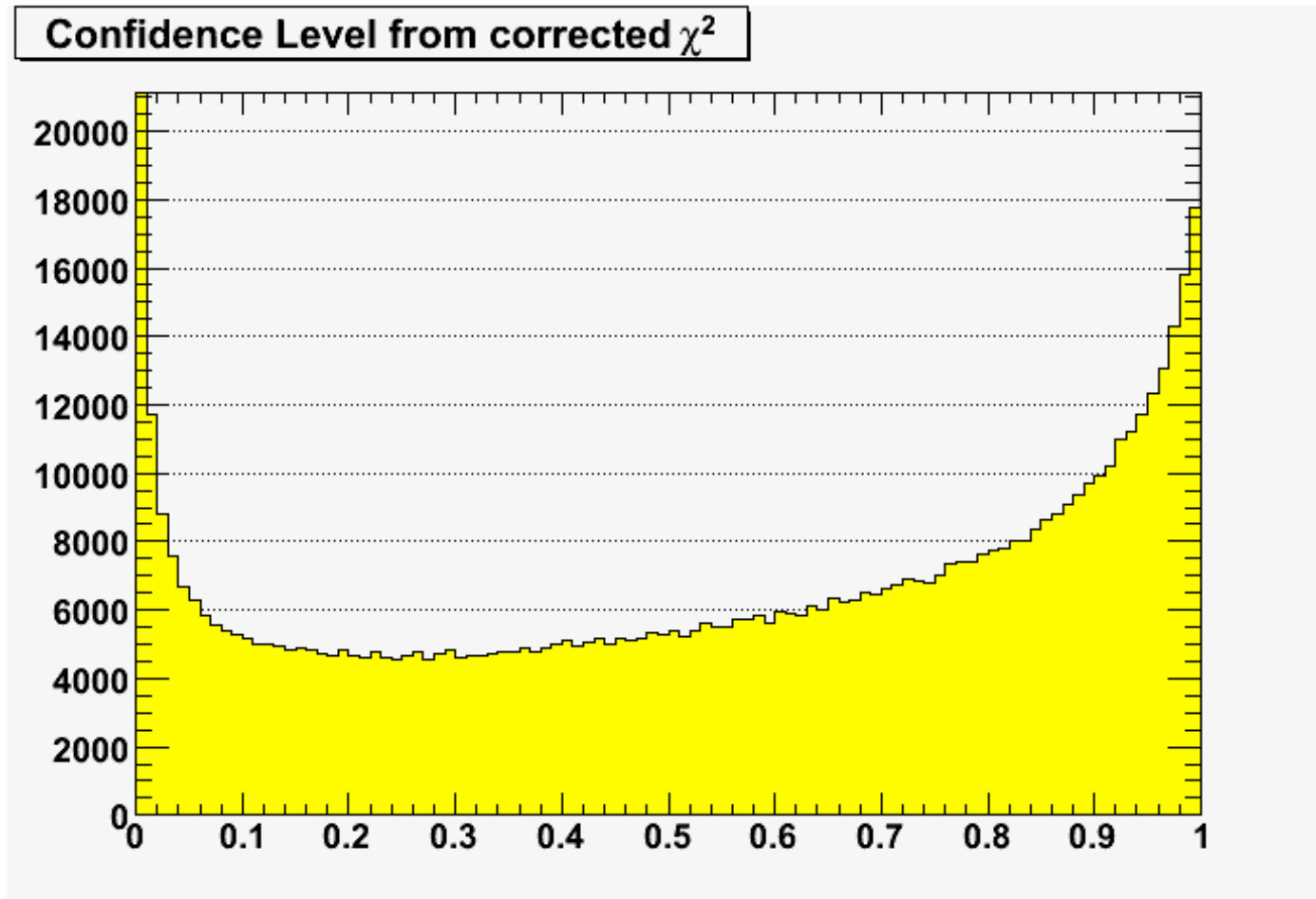# Efficiency as a function of phase space

0.2 GeV/c ≤ p ≤ 2.0 GeV/c   15º ≤ θ ≤ 140º

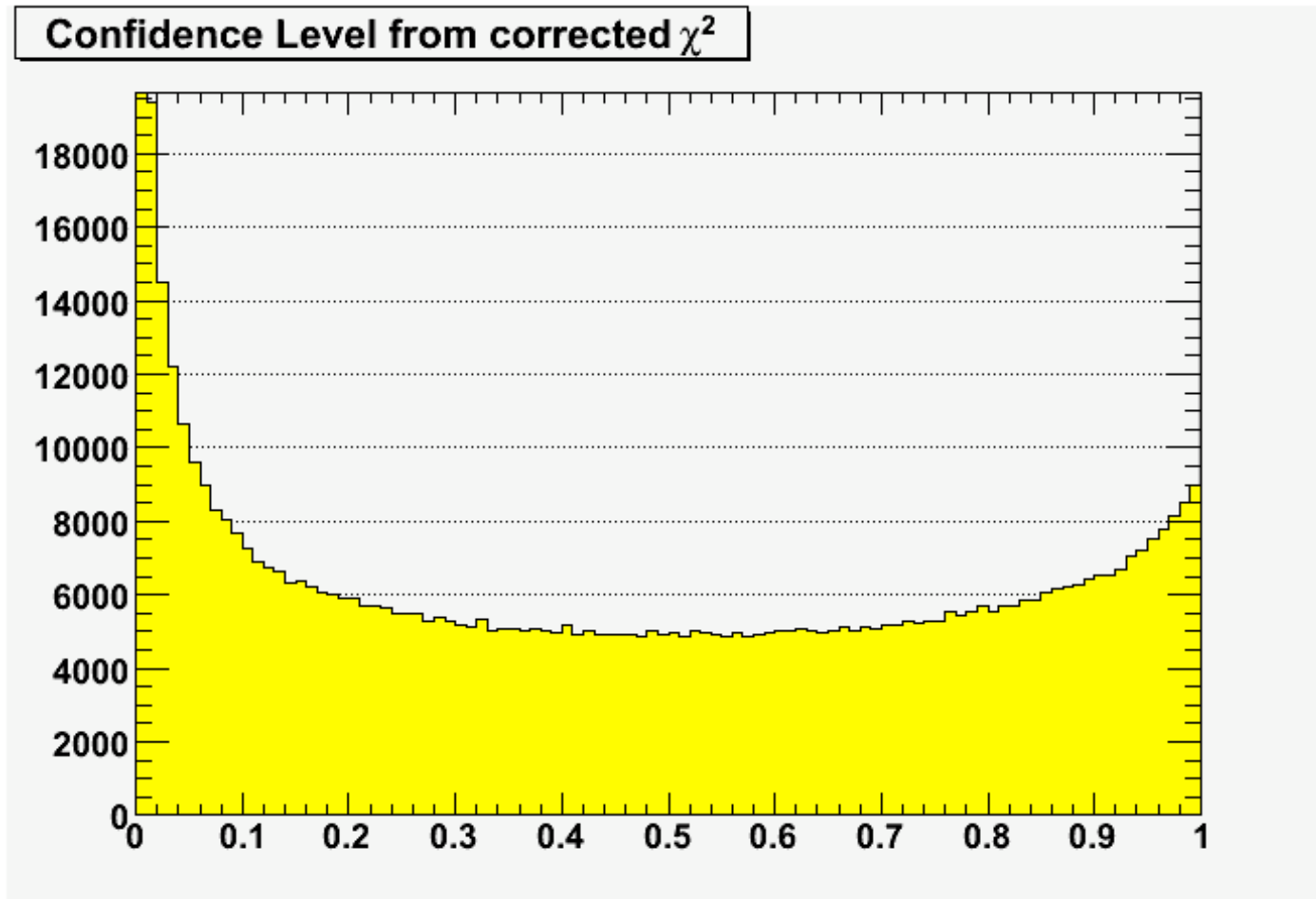# Expected Probability Density as a Function of the Integral Fraction

Probability Density from Tracking Results

Confidence Level from corrected χ^2

Fitting pulls to core Gaussians
(i.e. smaller errors)

Next step

- There is some evidence that suggests the "bad" fits come from poor choices for the L-R ambiguity solution, particularly in the stereo

- If this is true, tracking based only on wire-positions would have broader pull distributions, but they would have Gaussian tails

- Tracking code is being reconfigured to make access to wire-based tracks easier. This is about 85% done.