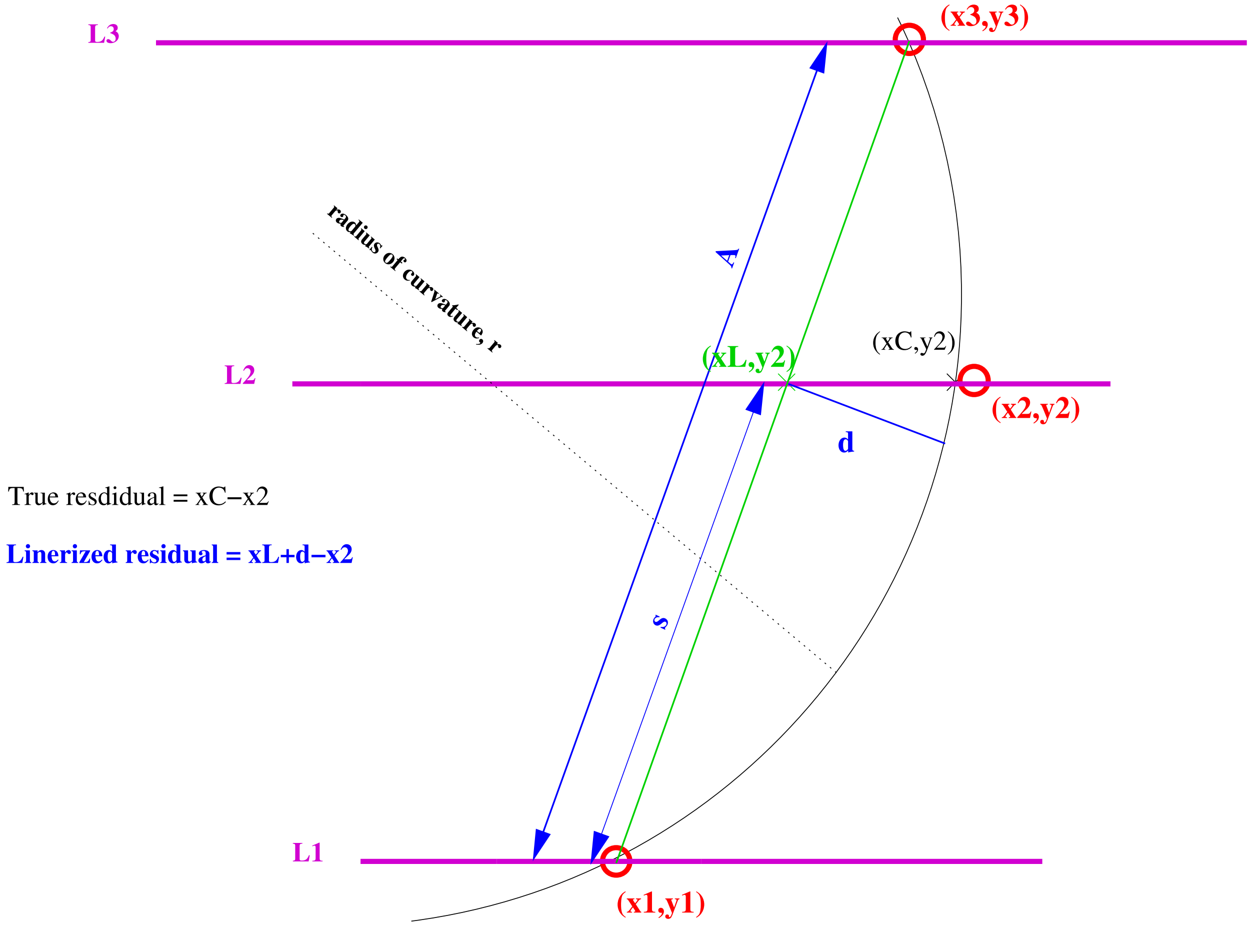
Method for Intrinsic RΦ Resolution

Remove as many external sources of error as possible

- **Assume that intrinsic resolution is gaussian**
- Select High Pt tracks > 15 GeV
- No ISL or L00 allowed in fit
- OIZ tracks with 5 axial, 2 stereo
- Track must go thru only 1 wedge, 1 barrel
- Make telescope with L1+L2+L3
- Require same cluster width on these layers
- Throw away track fit and make simple SVX-only fit!

Linerized Circle Passing Thru L1+L3



- Take radius of curvature from OIZ track fit

- Linerized residual is function of weight and can be computed exactly

Residual and Error Computed Track-By-Track

$$\begin{aligned}\delta &= x_{\mathrm{L}} + d - x_2 \\ &= (a + by_2) + d - x_2\end{aligned}$$

$$\begin{aligned}a &= x_1 - y_1(\frac{x_3 - x_1}{y_3 - y_1}) \\ b &= \frac{x_3 - x_1}{y_3 - y_1} \\ d &= r - \frac{1}{2}\sqrt{4r^2 - 4s(A - s)} \\ &\approx \frac{s(A - S)}{2r} \\ &= \frac{\sqrt{[(x_2 - x_1)^2 + (y_2 - y_1)^2][(x_3 - x_2)^2 + (y_3 - y_2)^2]}}{2r}\end{aligned}$$

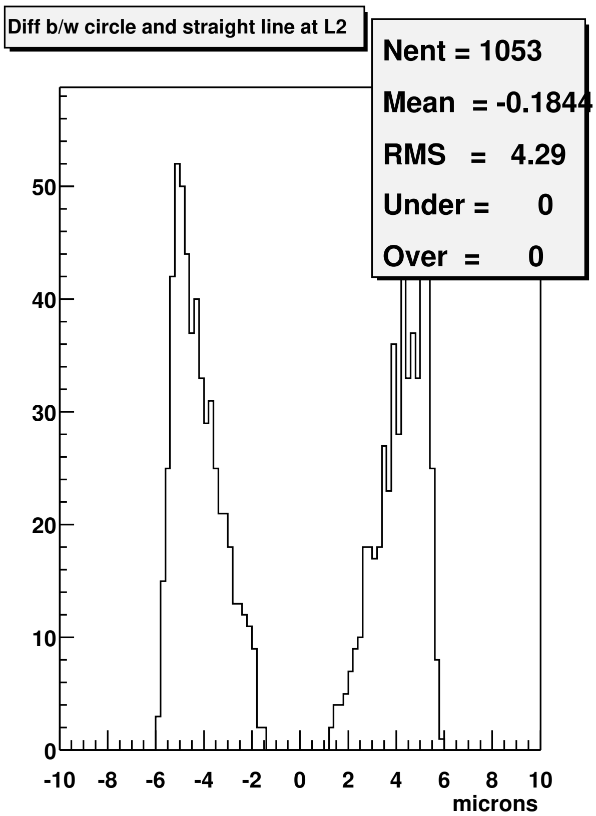
Residual and Error Computed Track-By-Track

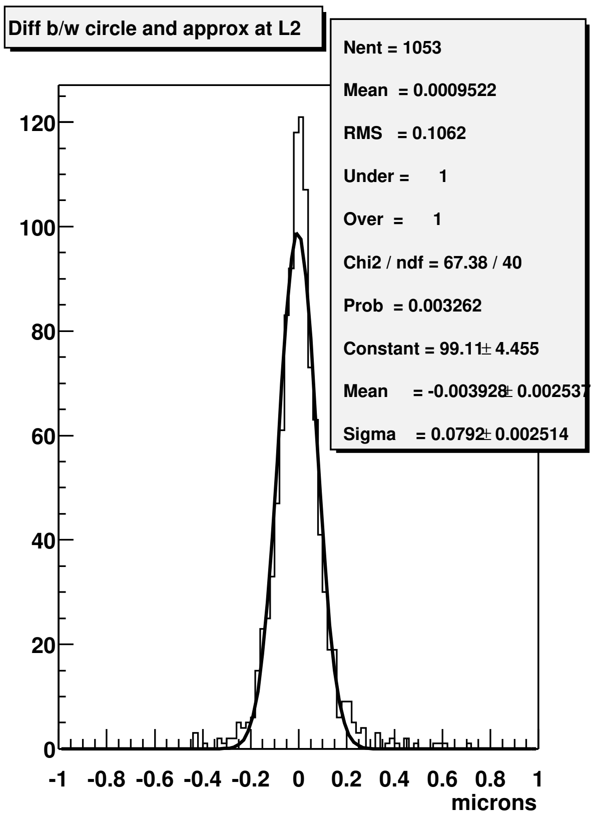
$\sigma_{x_i}$is function of cluster width

$$\sigma_\delta^2 = [\frac{y_3 - y_2}{y_3 - y_1} - \frac{1}{2r}(x_2 - x_1)\frac{A - s}{s}]^2 \sigma_{x_1}^2$$
$$+ [1 + \frac{1}{2r}(\frac{A - s}{s}(x_2 - x_1) - \frac{s}{A - s}(x_3 - x_2))]^2 \sigma_{x_2}^2$$
$$+ [\frac{y_2 - y_1}{y_3 - y_1} + \frac{1}{2r}(x_3 - x_2)\frac{s}{A - s}]^2 \sigma_{x_3}^2$$

Non-linear terms suppressed by $1/2r \sim 1/8000$ cm for $P_t = 15$ GeV

Linerized Circle Passing Thru L1+L3





- Straight-line good to $\sim 5\mu m$, but biased

- Linerized circle good to $\sim 0.1\mu m$ and unbiased

Unbinned Likelihood Fit

- Residual, $\delta = (a + by_2 + d) - x_2$, for a track

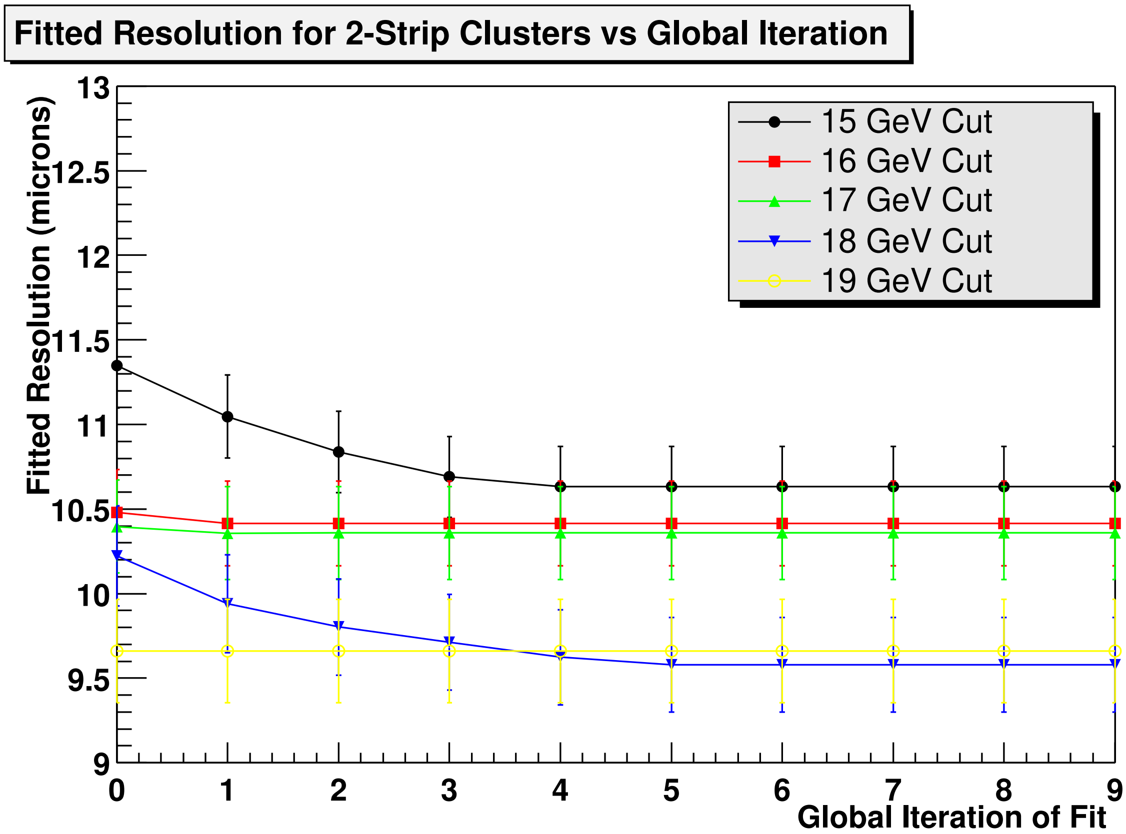
- Error on residiual is function of intrinsic resolution, σ, and geometry of line and circle, $\sigma_\delta(\sigma)^2 = \sigma_{\delta\mathrm{L}}(\sigma)^2 + \sigma_d(\sigma)^2$, where $\sigma^2_{\delta\mathrm{L}}$ is calculated from formula for line.

- Perform unbinned likelihood fit to unit gaussian

$$L_i = \frac{e^{-\frac{(\delta_i-\mu)^2}{2\sigma_{\delta_i}(\sigma)^2}}}{\sqrt{2\pi}\sigma_{\delta_i}(\sigma)}$$

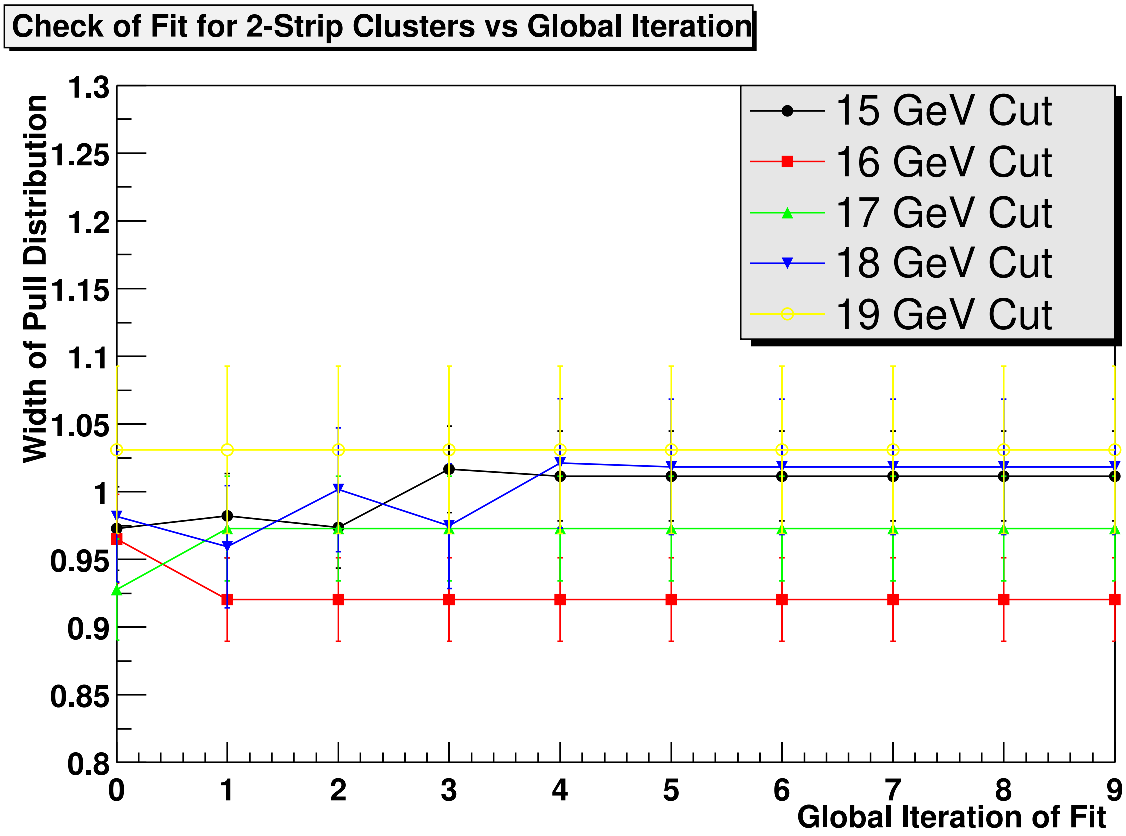
$$-\ln L = -\sum_i^{N_{\mathrm{track}}} \ln L_i(\sigma)$$

Resolution of 2-Strip Clusters



Make 2.5σ cut at each global iteration to remove non-gaussian effects from misalignment

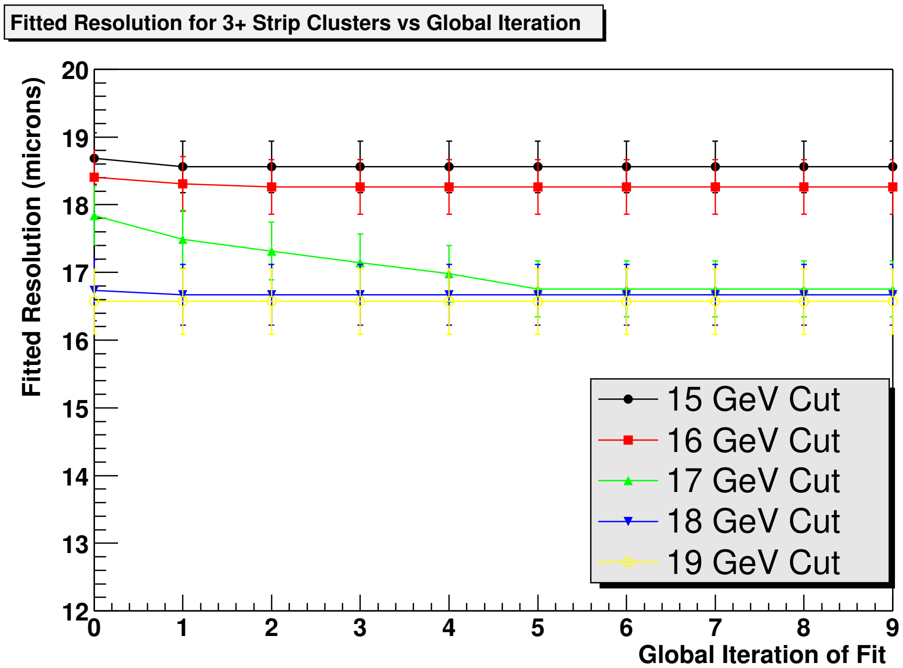
Check Fit at Each Global Iteration

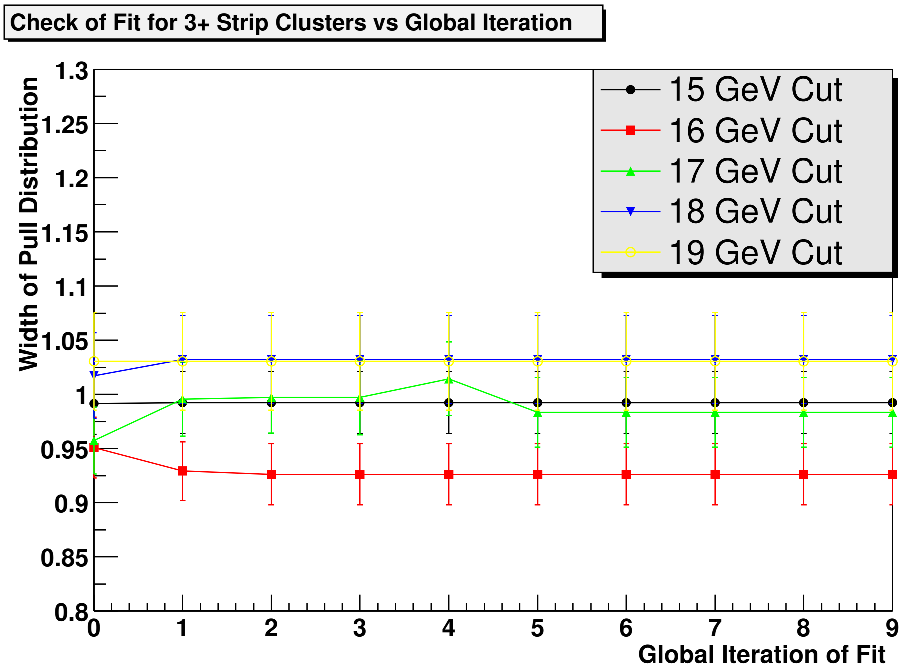


Check consistency of unit gaussian at each iteration

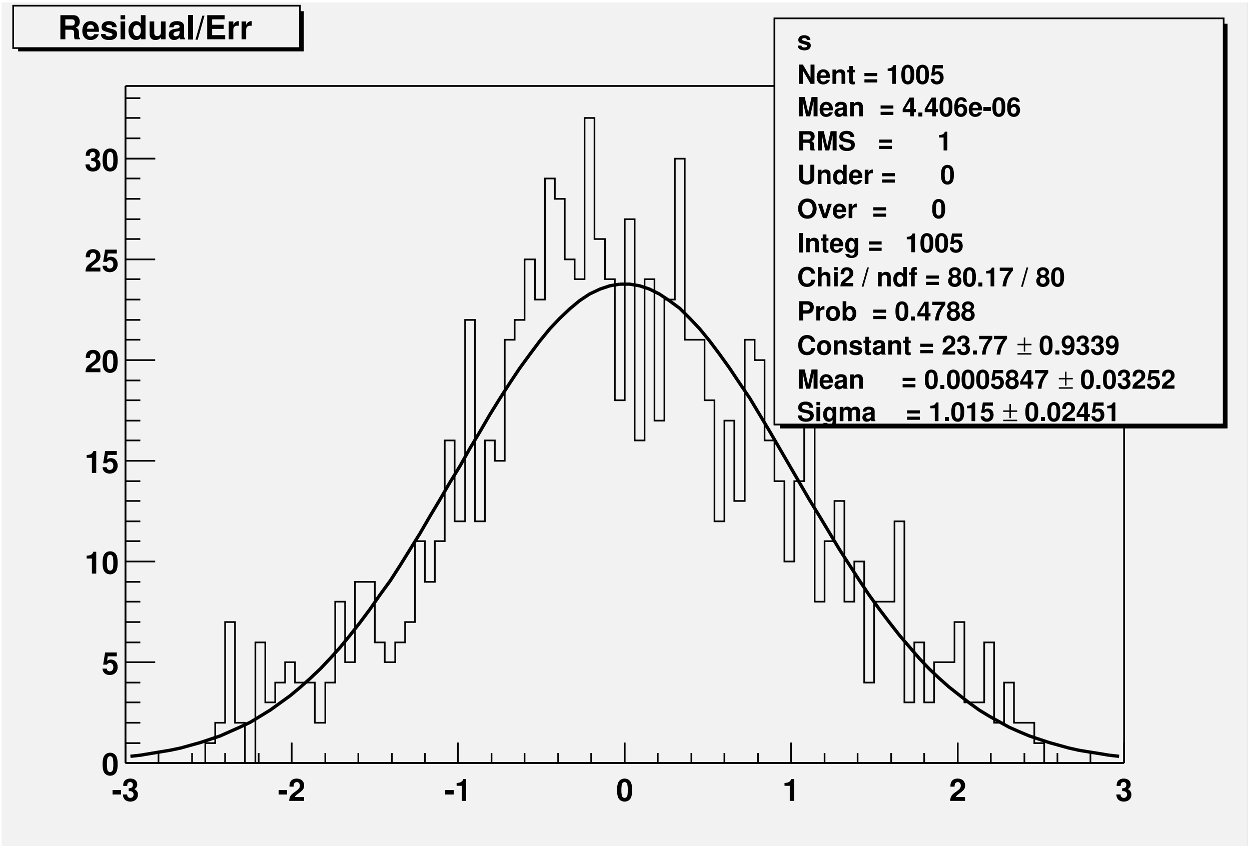
Looks ok

3+ Strip Clusters



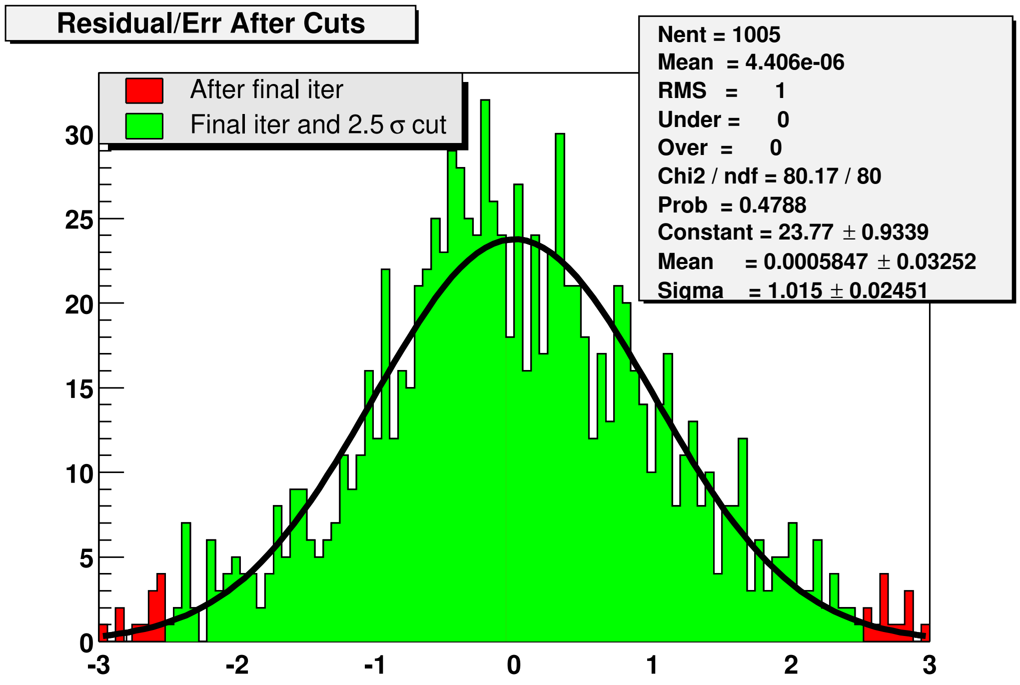


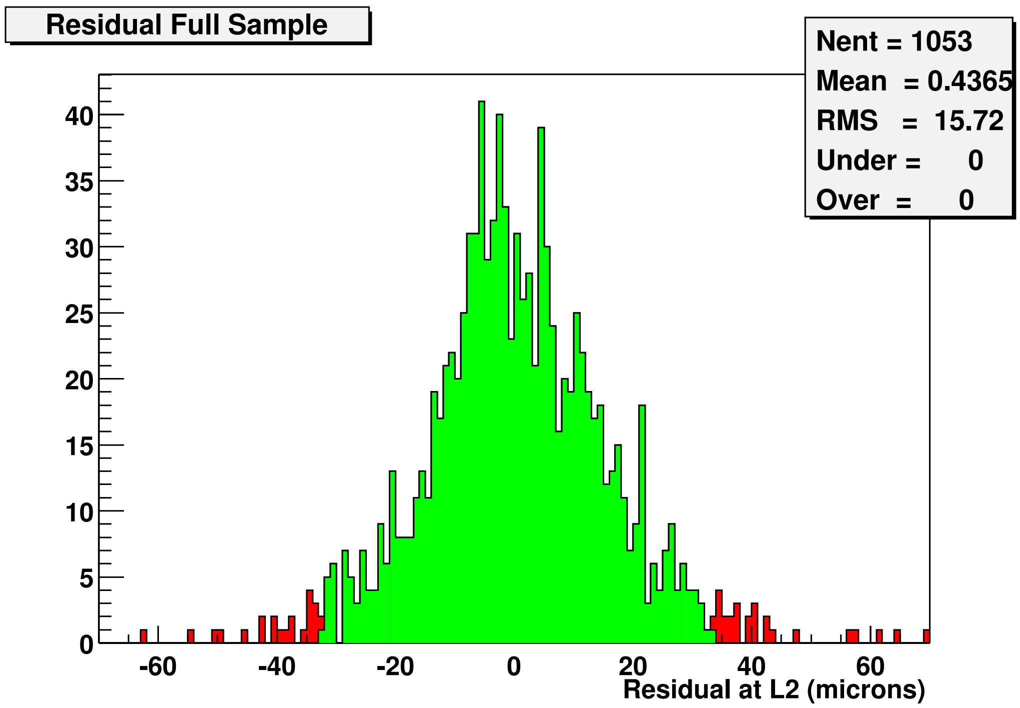
Check Fit After Last Iteration



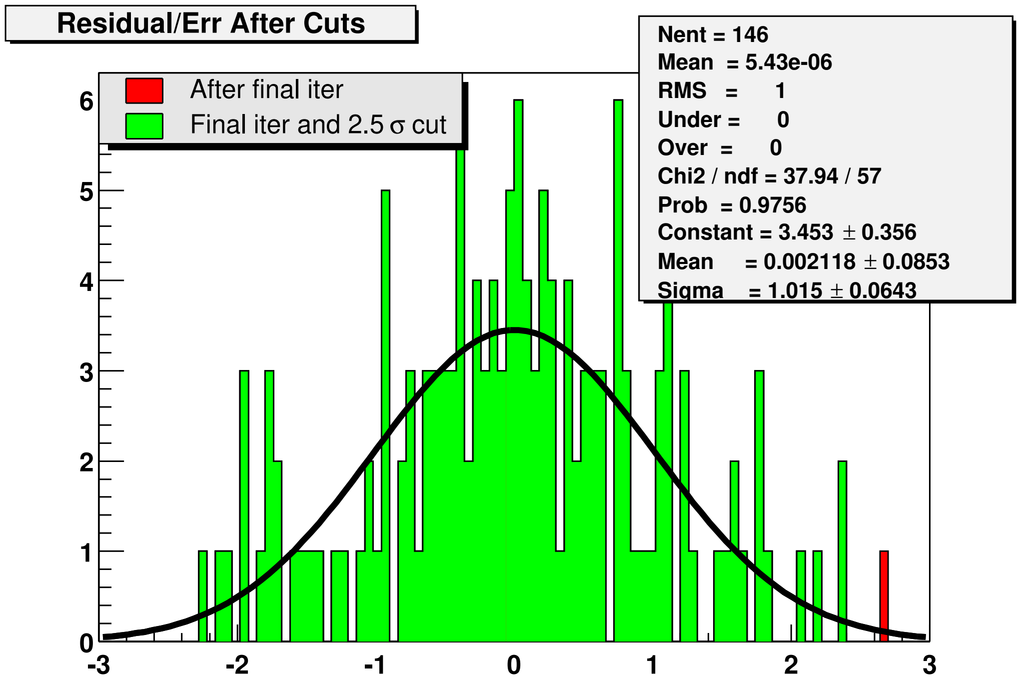
- Good unit gaussian for 15 GeV 2-strip sample
- P_t cut not doing much.
- Use 15 GeV sample to extract resolutions

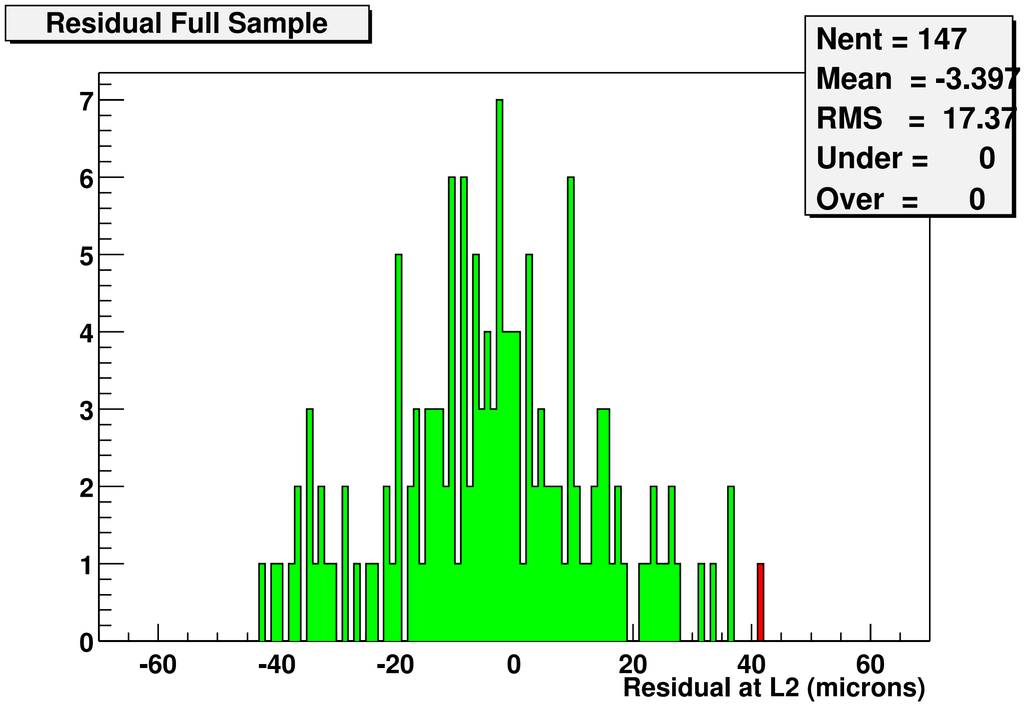
Effect of 2.5σ Cut in 2 Strip Sample



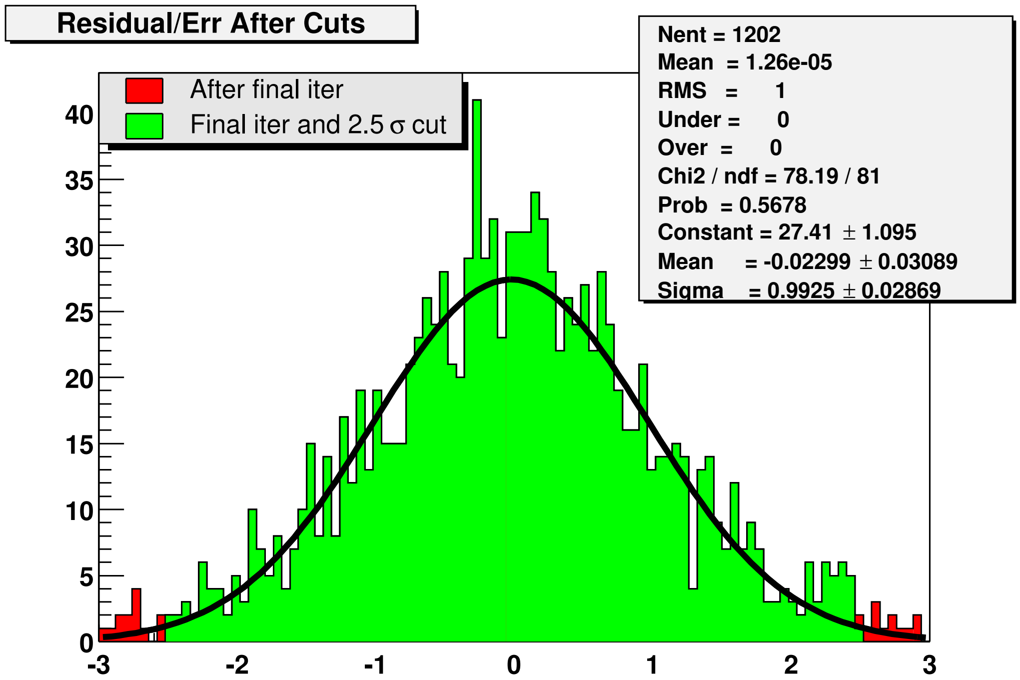


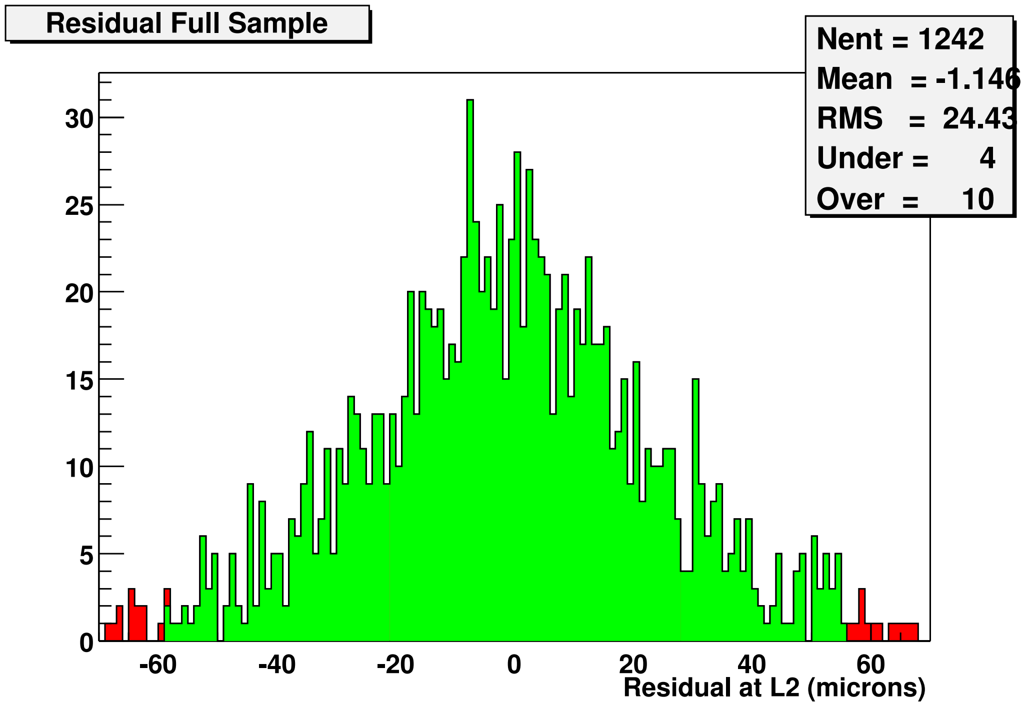
Effect of 2.5σ Cut in 1 Strip Sample





Effect of 2.5σ Cut in 3+ Strip Sample





Preliminary Results

Cluster Width	Resolution (μm)	Current (μm)
1	13.8 ± 0.8	13
2	10.6 ± 0.2	11
3+	18.6 ± 0.4	23