



Results from 3D Track Fit



- 3D track fit method
- Measurement of detector alignment.
- Measurement of detector resolution.



3D Track Fit Method



- Lars Sonnenschein modified Valery's code [TestBeams/X5Boctober2001/test/TX5.cpp](#), to do 3D track fit.
⇒ Will be committed soon.

- Straight line track crosses detector at position z at point (x,y) .

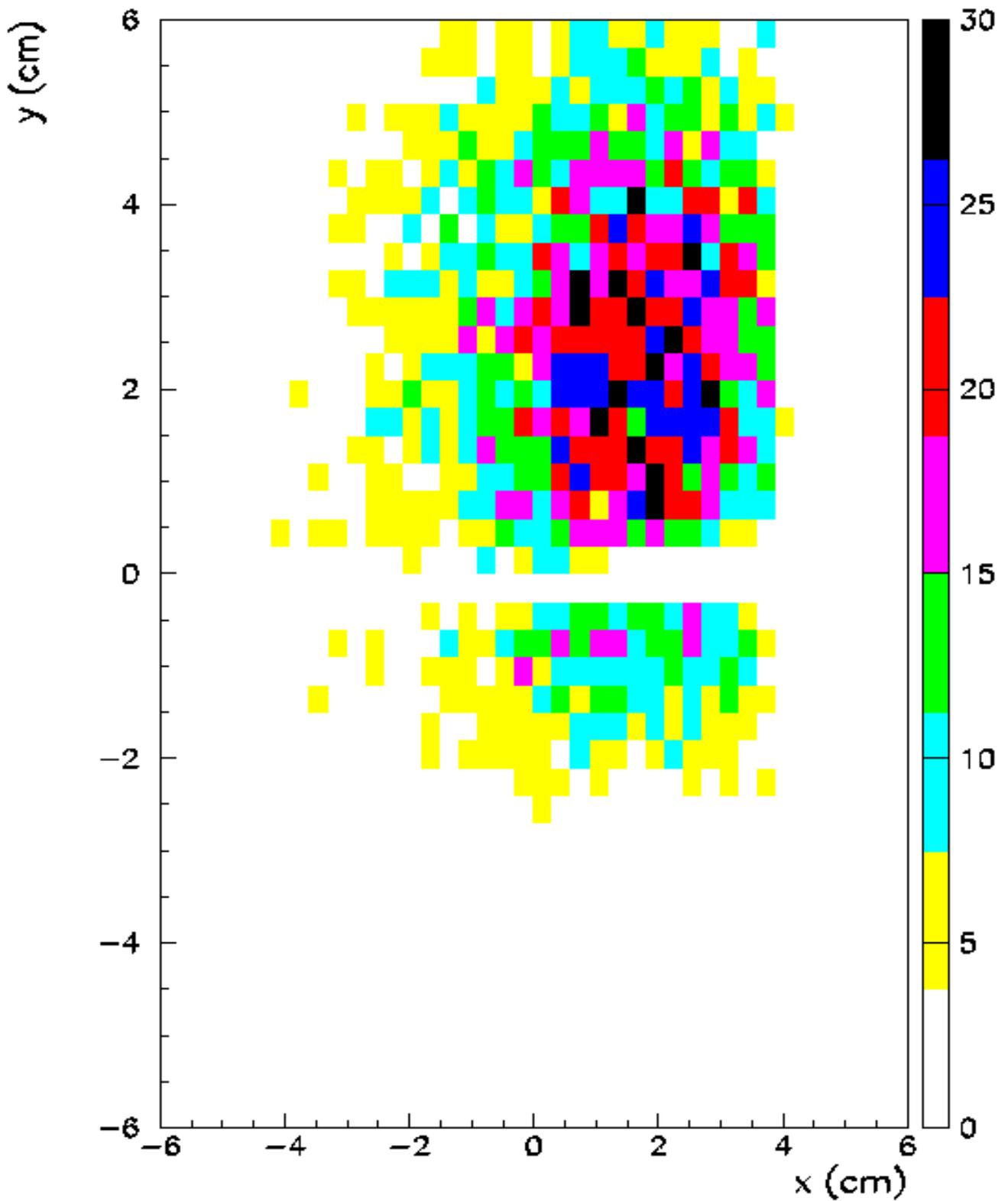
$$\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} x_0 \\ y_0 \end{pmatrix} + z \begin{pmatrix} mx \\ my \end{pmatrix}$$

- Residual in direction perpendicular to strips used to get χ^2 .

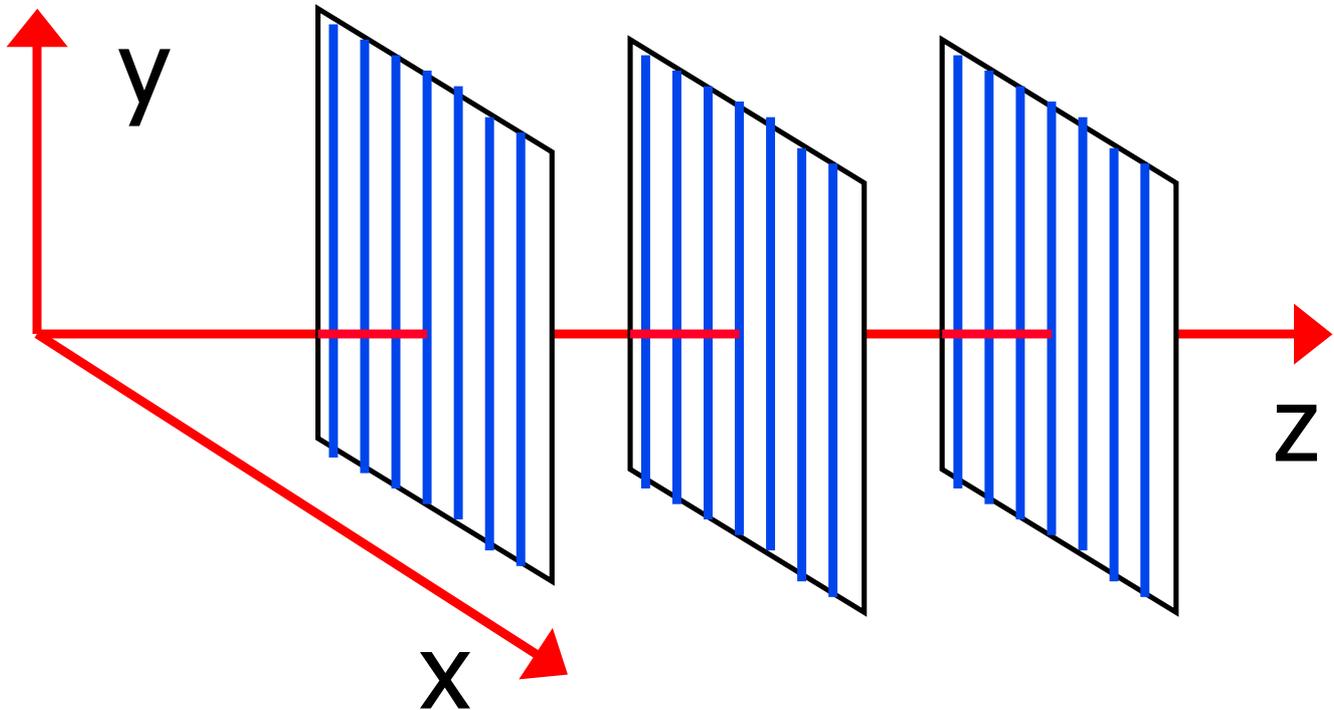
$$\text{residual} = u_{\text{cluster}} - \mathbf{n} \cdot \begin{pmatrix} x \\ y \end{pmatrix}$$

- After summing over all detectors, χ^2 can be minimized by simple matrix inversion.

Module 3



Beam Profile



Misalignment gives residual offset in non-stereo detectors of:

$$- \Delta x + y \Delta \phi$$

and in stereo detectors (angle α) of:

$$- \Delta x + y \cos \alpha \Delta \phi - x \sin \alpha \Delta \phi$$

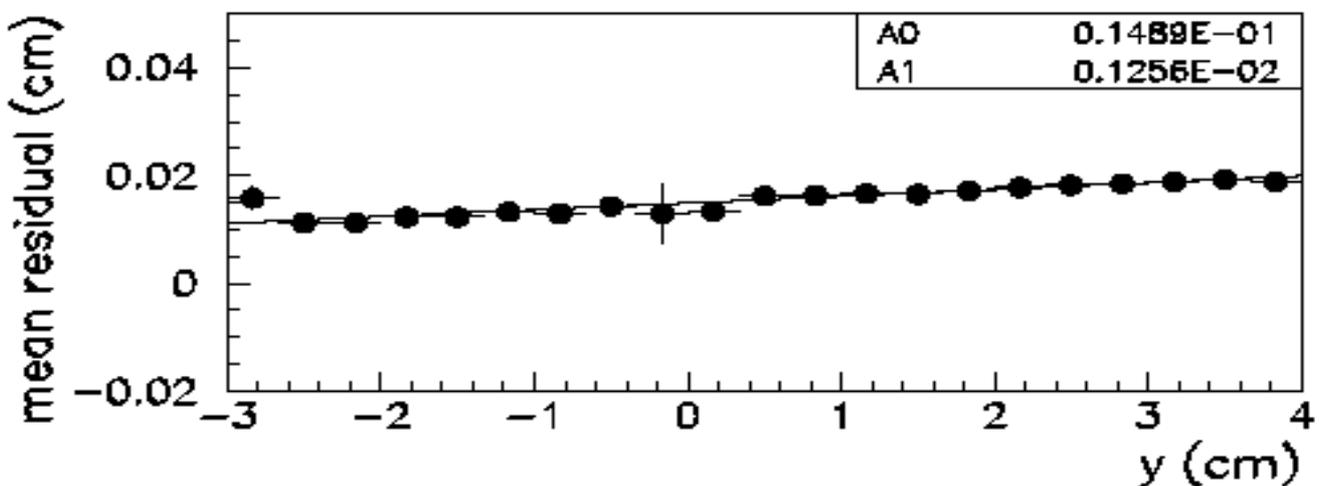
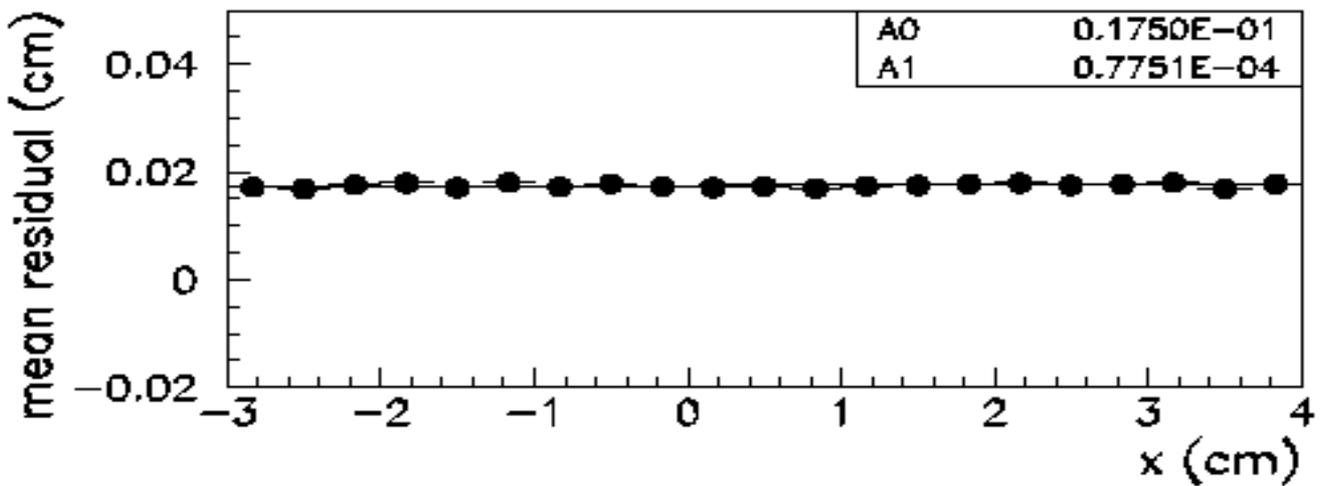
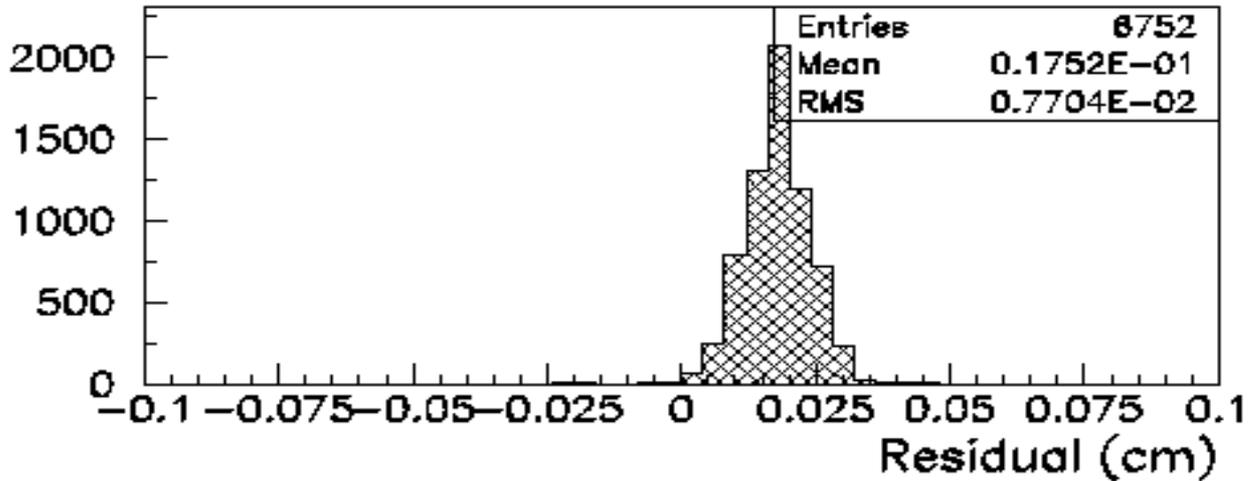
Fit track to 1st, 2nd, 5th and 6th detectors
and look at residuals in 3rd and 4th.



Before Alignment



Module 3

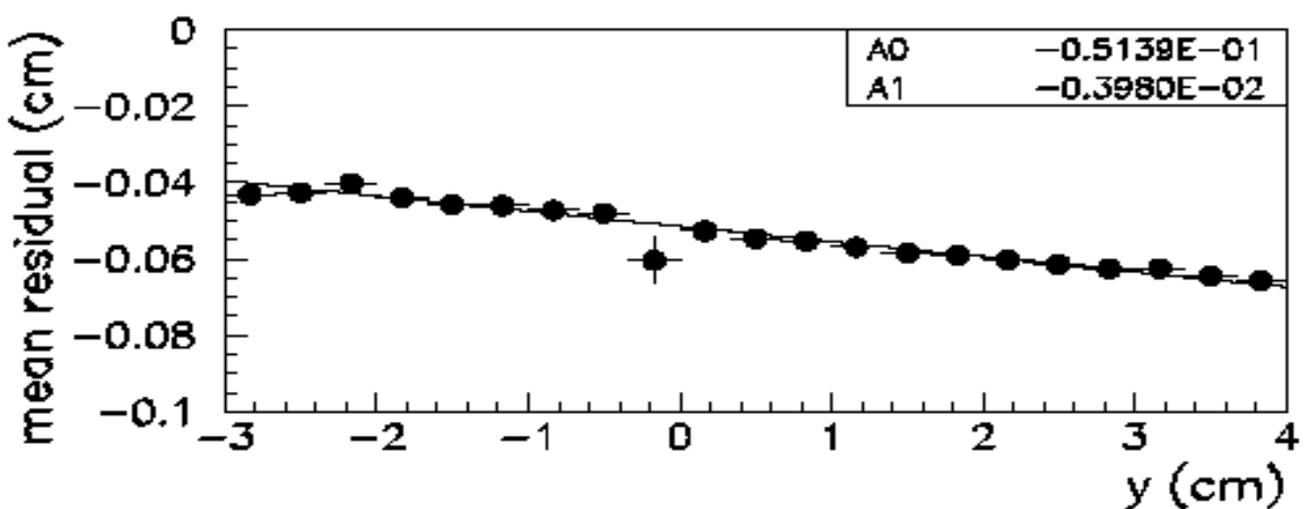
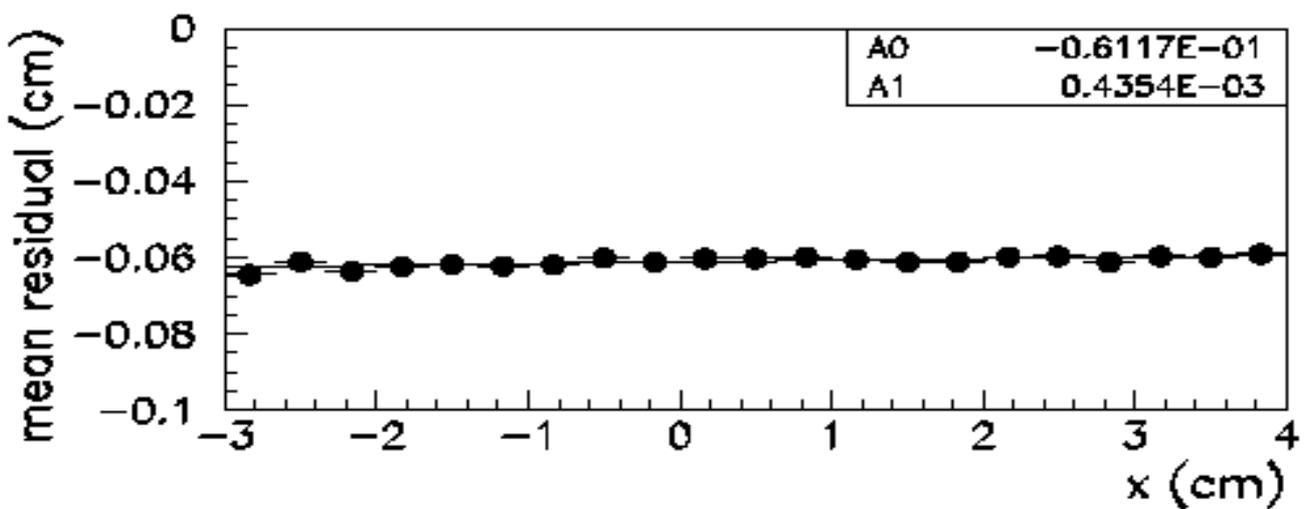
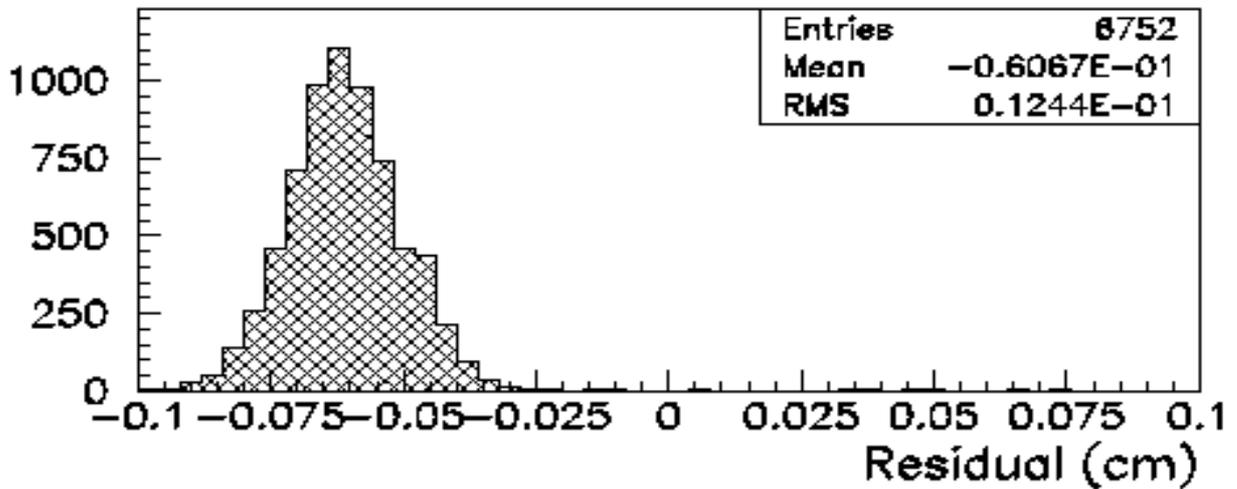




Before Alignment



Module 4

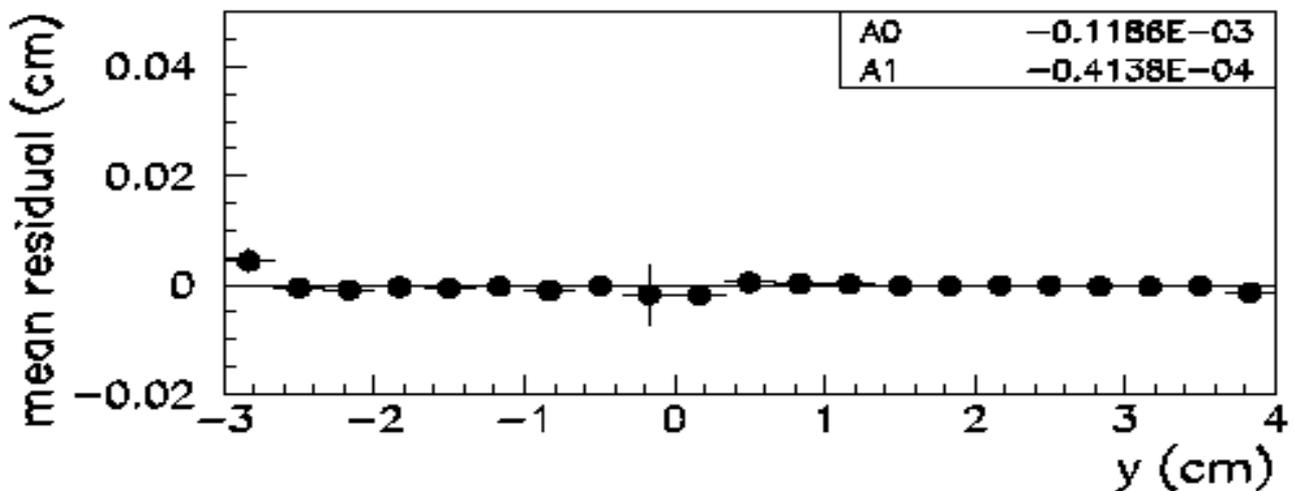
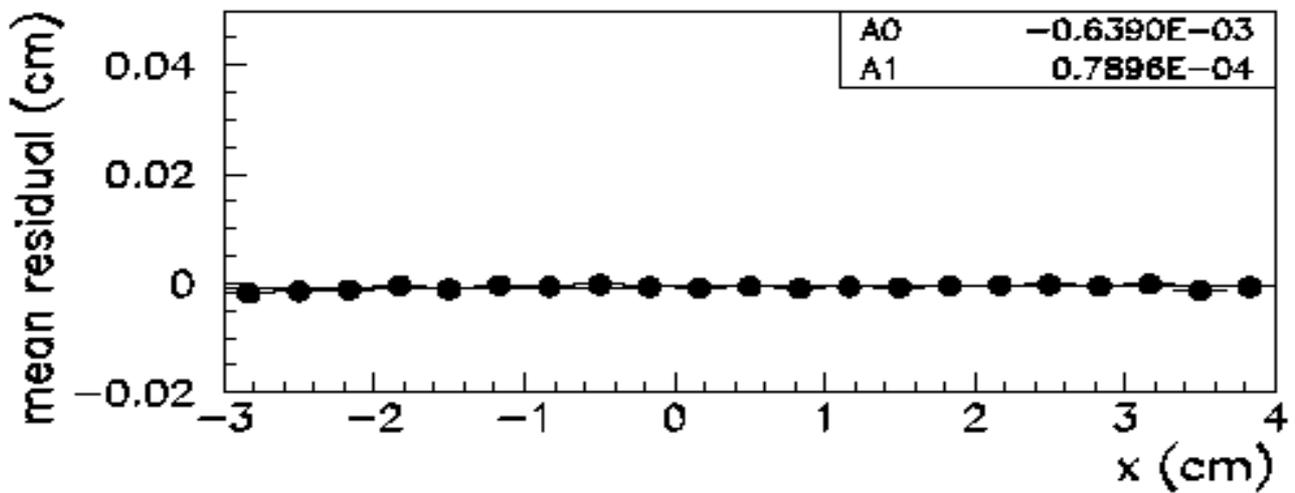
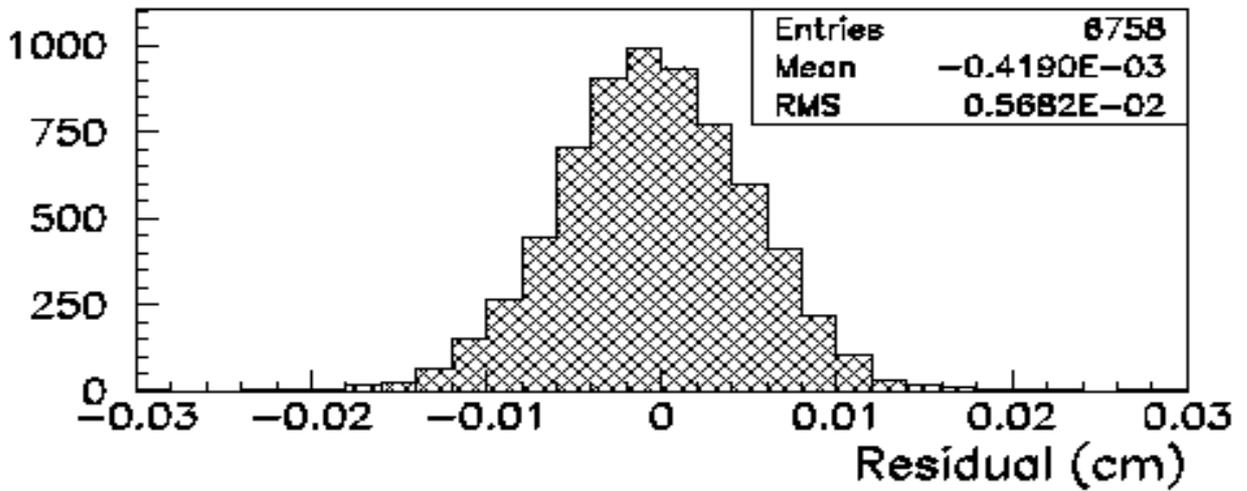




After Alignment



Module 3

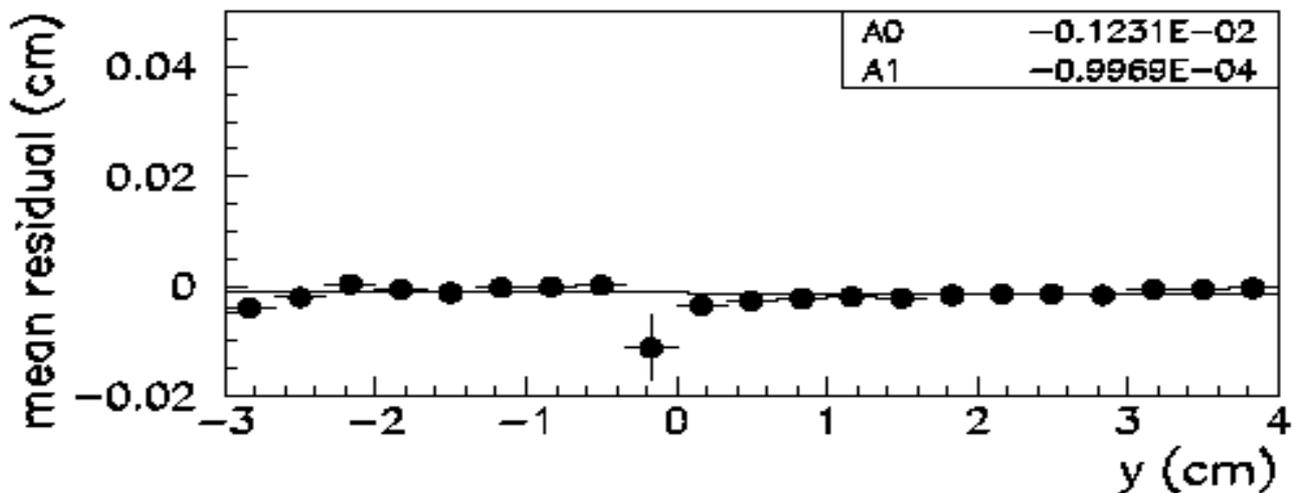
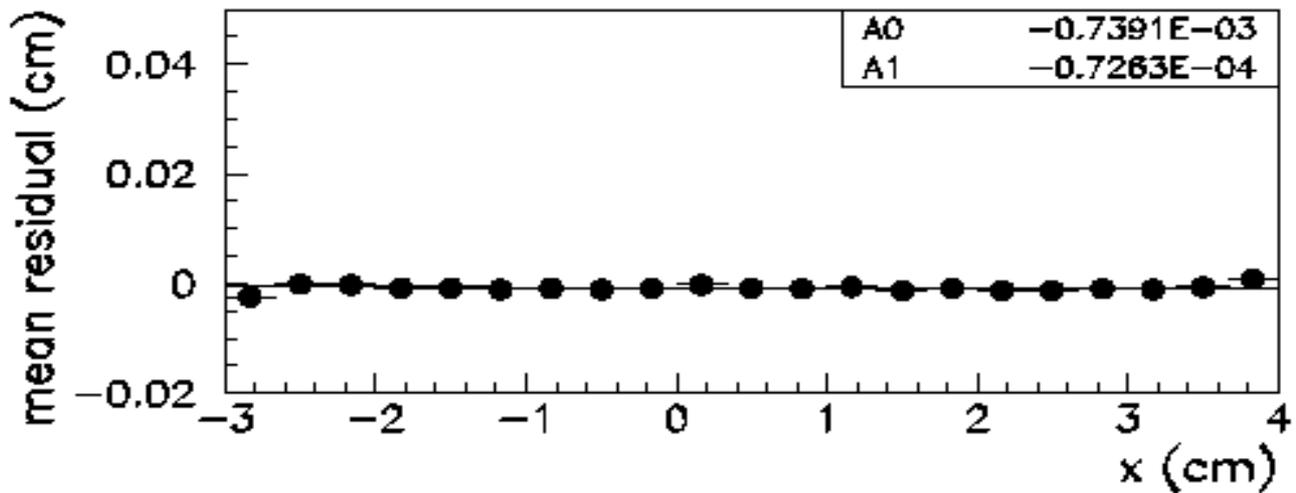
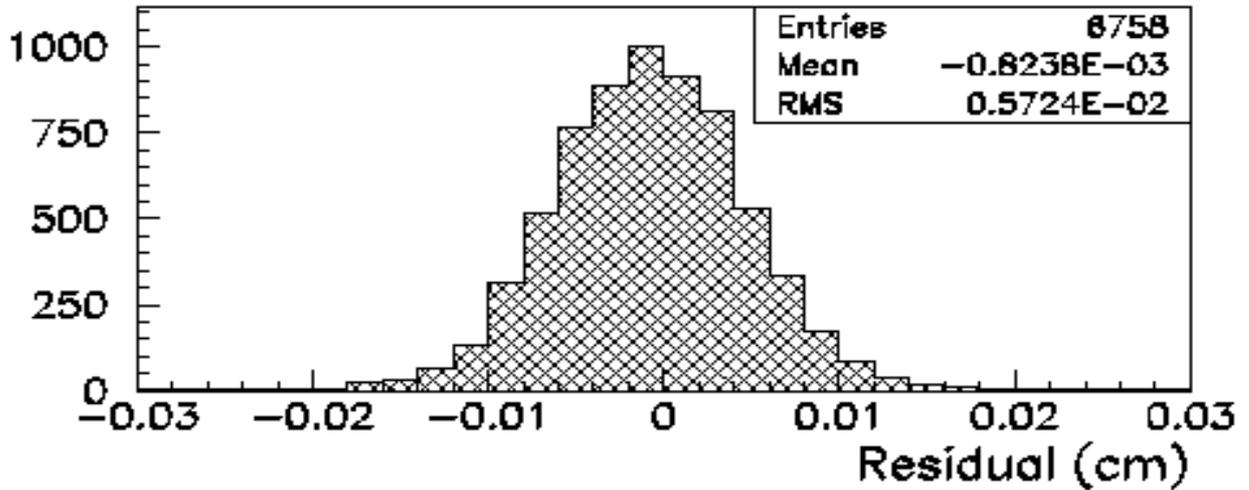




After Alignment



Module 4





Conclusions



- 3D track fit working - will be committed soon.
- Alignment of module 3:
 - ⇒ $\Delta x = -150 \mu\text{m}$
 - ⇒ $\Delta\phi = +1.3 \text{ mrad}$
- Alignment of module 4:
 - ⇒ $\Delta x = +510 \mu\text{m}$
 - ⇒ $\Delta\phi = -4.0 \text{ mrad}$
- Width of residual distribution = $57 \mu\text{m}$
= $\text{sqrt}[\sigma_3^2 + (\sigma_1/2)^2 + (\sigma_5/2)^2] = 1.22\sigma$

⇒ Resolution = $47 \mu\text{m}$

c.f. $183/\text{sqrt}(12) = 53 \mu\text{m}$.