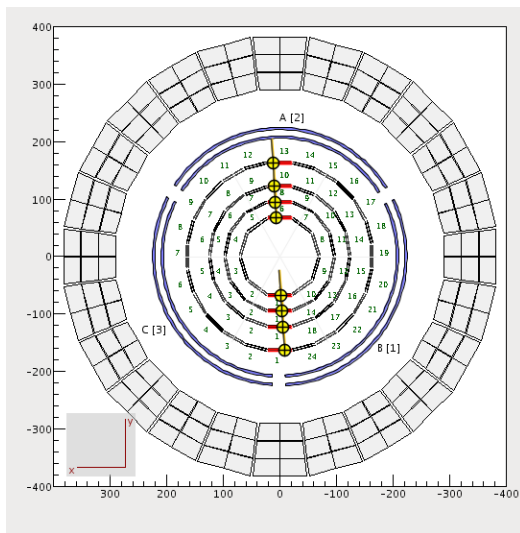


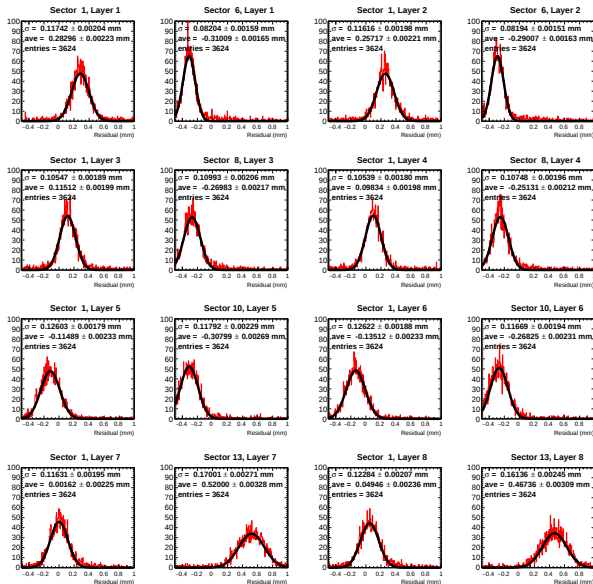
CLAS12 SVT Geometry Alignment



- 1 Goal: Correct mis-alignments of SVT to reach design resolution of $\approx 65 \mu m$.
- 2 Use millepede to do linear least-squares for large numbers of geometry parameters.
- 3 Code works for gemc cosmic ray simulated Type 1 events - reproduces simulated region 1 shift in x from $2 \mu m$ to $500 \mu m$.
- 4 SVT cosmic ray data Set 1 (REAL DATA!). Data collected May 11 - May 18, 2016.

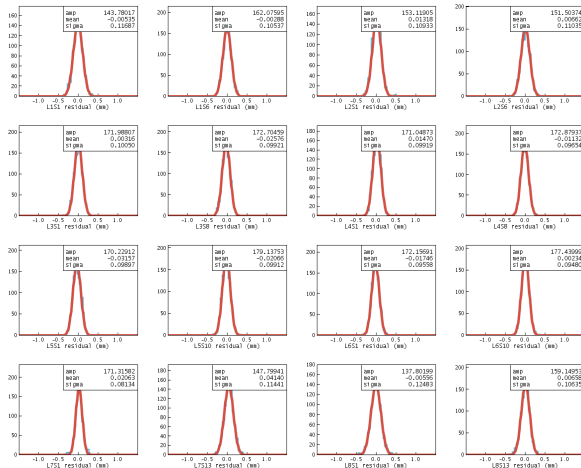
Run	Raw size (B)	Events
390.0	42826560	39974
391.0	2084516740	1943137
391.1	508684920	470770
392.0	2086105336	1893528
392.1	685182612	636408
393.0	462058480	464200
394.0	436896936	440531
6.3 GB		5.9M

CLAS12 SVT Cosmic Data - Residuals



- ① Each row is a region.
- ② Horizontal scale: $-0.5 - 1.0$ mm.
- ③ Vertical scale: 100 for all histograms.
- ④ $\sigma = 80 - 120$ μm
- ⑤ Misalignments up to 500 μm .

CLAS12 SVT Cosmic Data - Corrected Residuals



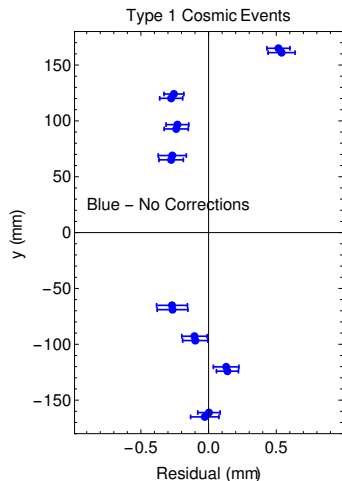
- 1 Improved SVT geometry has become available in the last two weeks.
- 2 Includes the capability to add misalignment shifts to the ideal geometry.
- 3 Used the millepede misalignments from the previous analysis.
- 4 Each row is a region.
- 5 Horizontal scale: -1.5 to 1.5 mm.
- 6 $\sigma = 80 - 120 \mu m$
- 7 Selection cuts:

Require eight crosses.

$$\chi^2 \leq 2.0$$

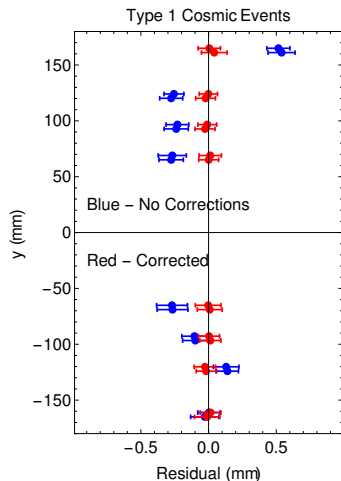
θ, ϕ both restricted to the range $70^\circ - 110^\circ$.

Compare corrected and misaligned residuals



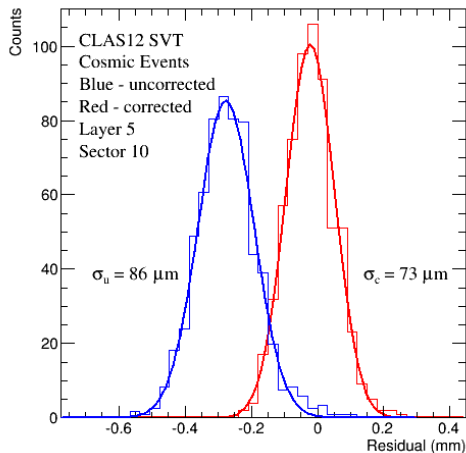
- 1 Misaligned results (blue) show fraction of cosmic ray data set.
- 2 χ^2 , θ , and ϕ cuts in use.
- 3 Misalignments and resolutions consistent with past results.

Compare corrected and misaligned residuals



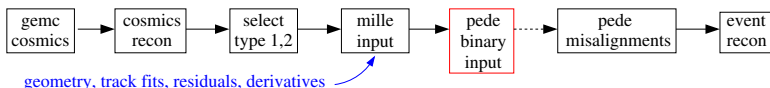
- ❶ Misaligned results (blue) show fraction of cosmic ray data set.
- ❷ χ^2 , θ , and ϕ cuts in use.
- ❸ Misalignments and resolutions consistent with past results.
- ❹ Aligned points (red) use full May 11-18 data set.
- ❺ Residuals on average within $\approx 20 \mu m$ of zero.
- ❻ Resolutions average $\approx 80 \mu m$.

Compare corrected and misaligned residuals



SVT Track-Based Alignment - Beyond Type 1

- 1 Sequence of steps for track-based alignment with millepede.



- 2 Extend code for all SVT topologies - generalized algorithms.

- 1 Type 1 and Type 2 comparisons and visualizations validate code.
- 2 beta version of Mille input code done.
- 3 Writing pede binary input code now.
- 4 Requiring 8 crosses for a good track.
- 5 Added monitoring histograms.

