DC Alignment Update

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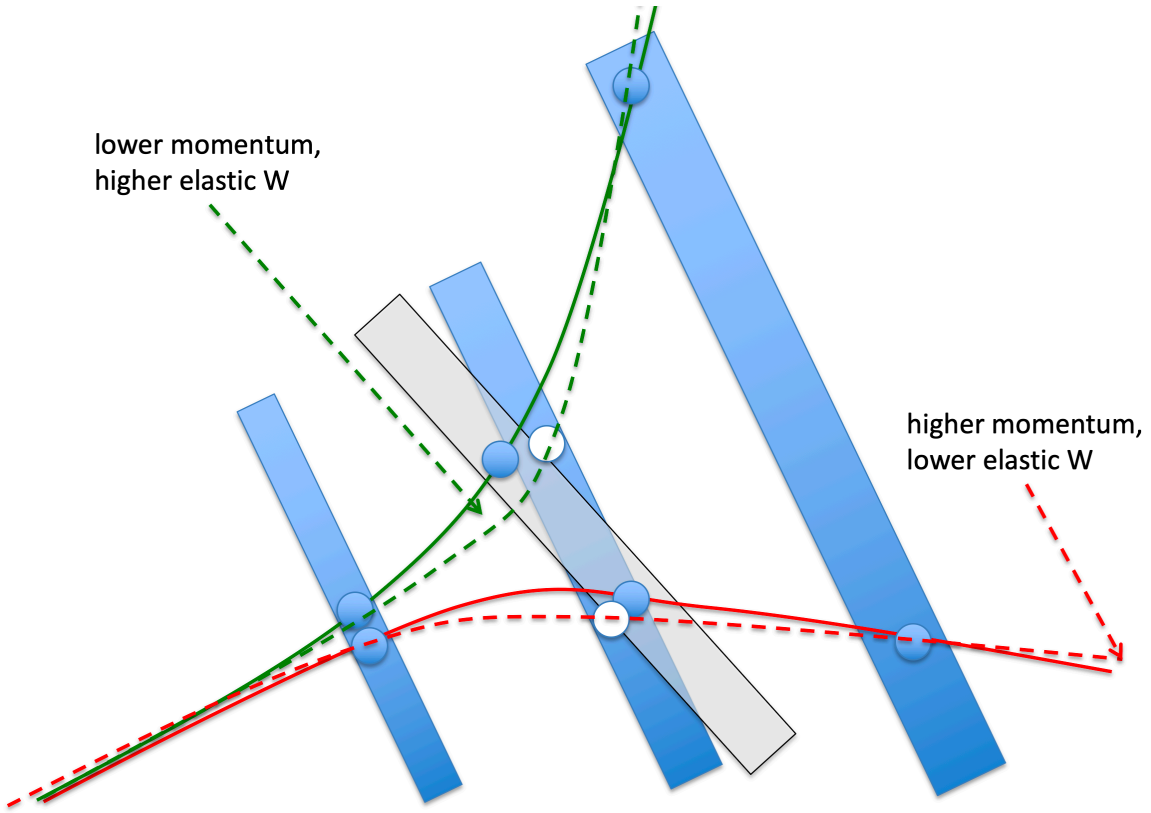
CLAS Collaboration Meeting
November 14, 2018

WILLIAM & MARY
CHARTERED 1693

Alignment Is Necessary

- Knowing the precise position of the drift chambers is critical for track reconstruction.



Calibration Data

- run 2467, 2.2 GeV, (B=0), empty target
- (Latest) reconstruction with coatjava 5c.6.9
- Minimizing the “residuals” from the TimeBasedTrkg:TBHits bank.
- Cuts on tracks: nphe > 2, calorimeter energy > 0.5 (2 GeV track)

Table	[/geometry/dc/region]
Variation	may_2018_engineers
Created	2018-05-25 12:34:56
Run range	0 - inf.
Author	thayward
Exact id	/geometry/dc/region:0:may_2018_engineers:2018-05-25_12-34-56

[Download text data]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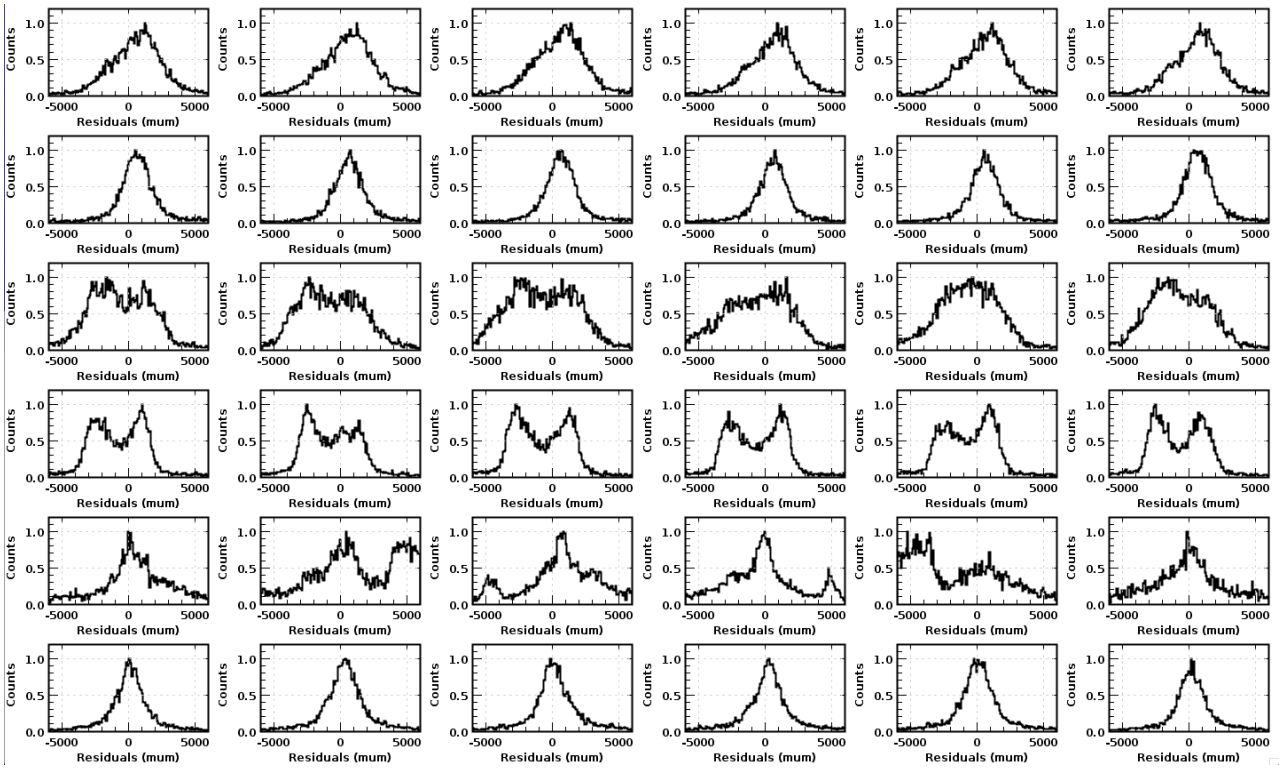
Early Mishaps: Time Calibration

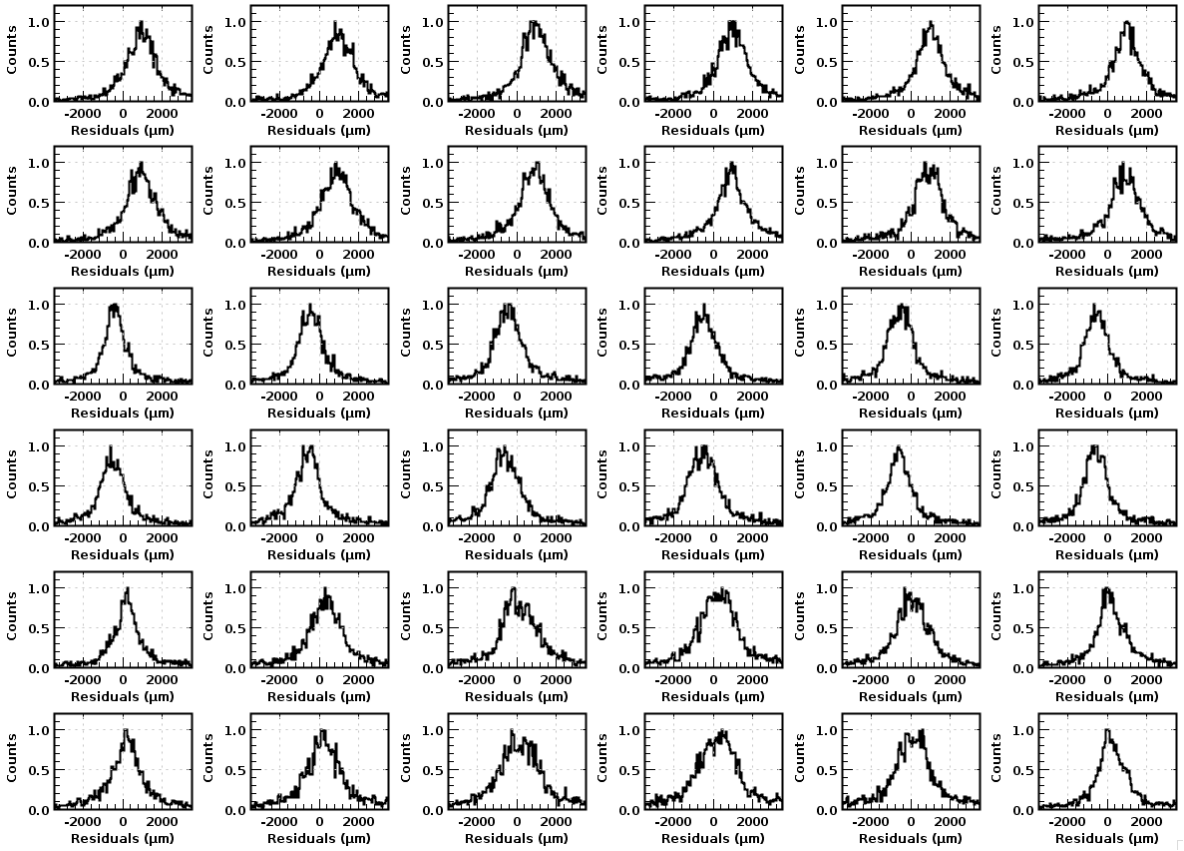
- Without time calibration, there are oddly shaped patterns, such as double peaks or asymmetric distributions.



Residual (micrometers)

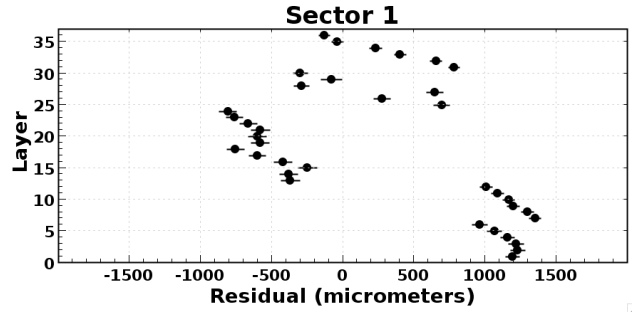
Default Geometry: Fixed Time Constants

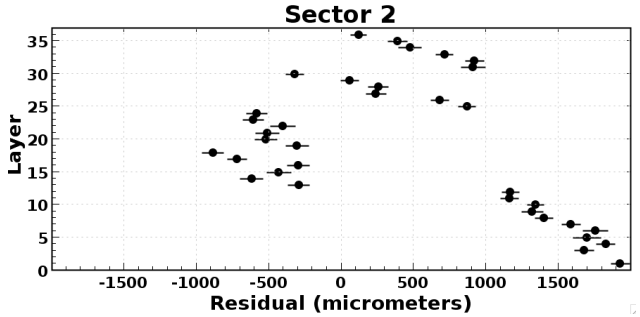
With the proper time calibration we get nice, symmetric Gaussian-like distributions.

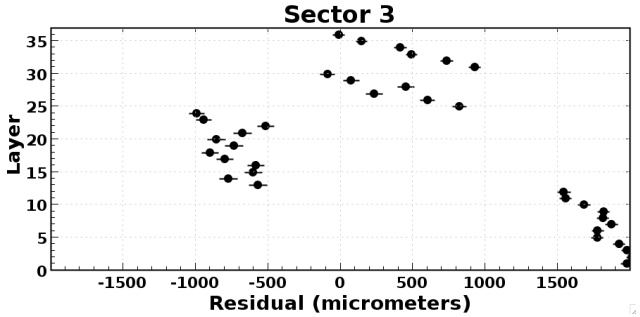


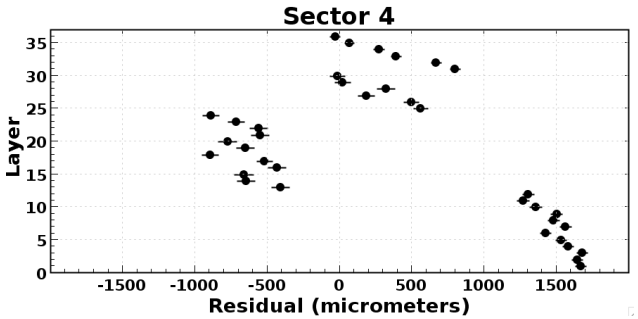
Residual (micrometers)

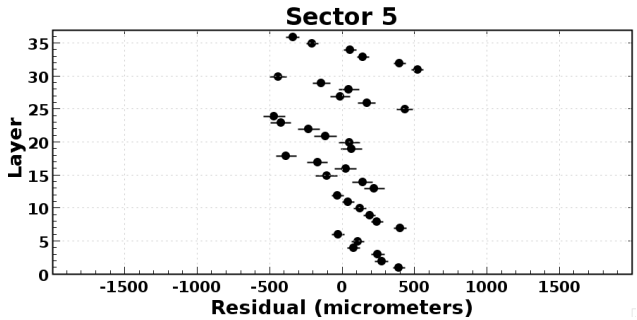
Early Mishaps: Wire Indexing

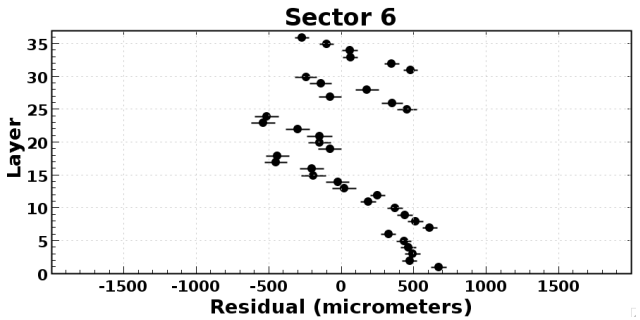




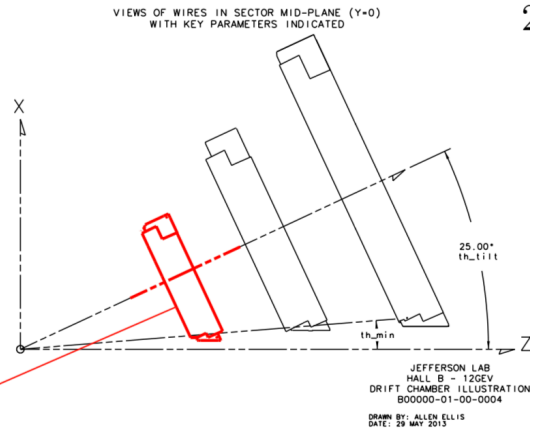


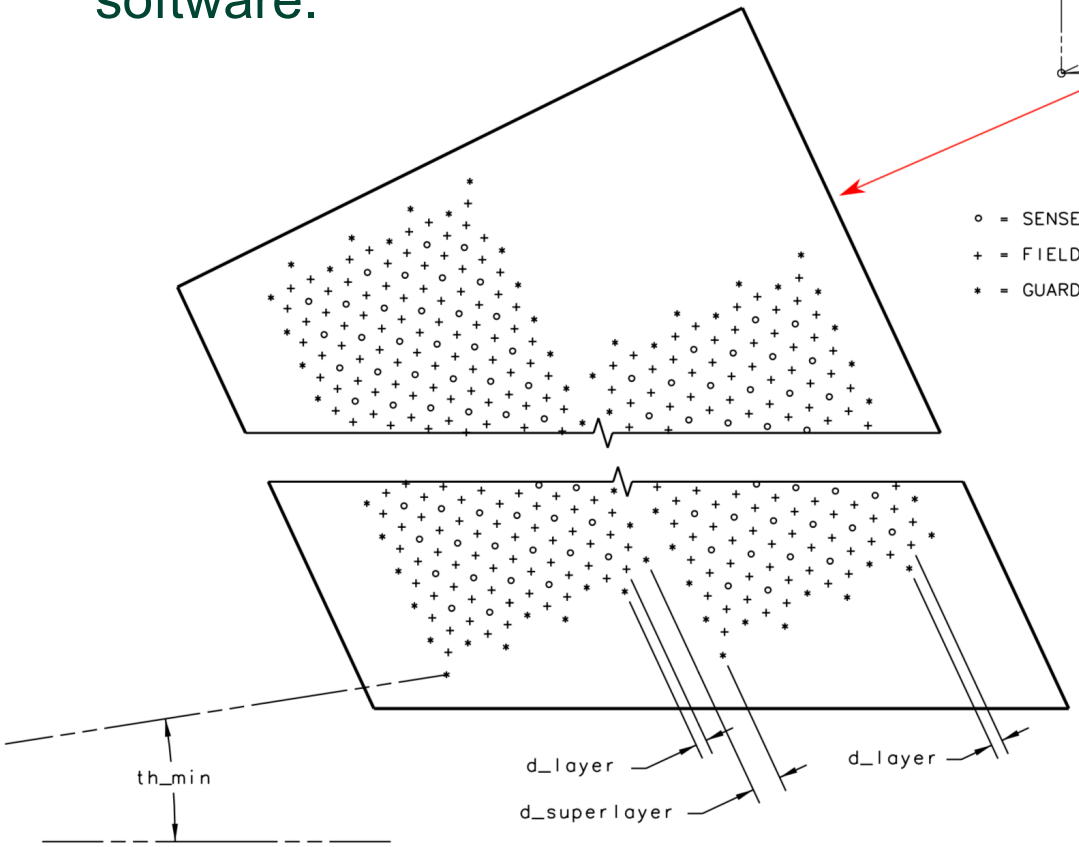


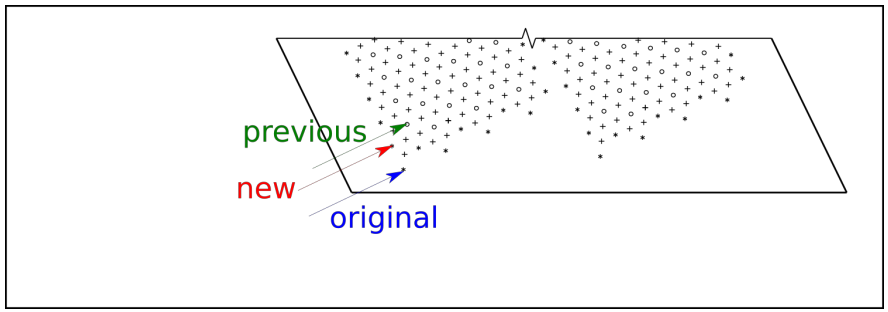




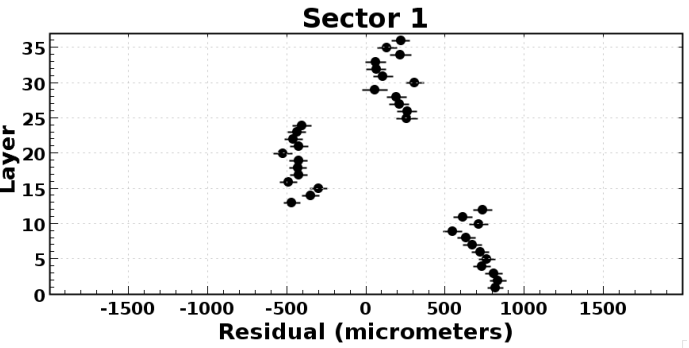
- Originally, there was a disconnect between the indexing of the first wire position between surveyors and software.

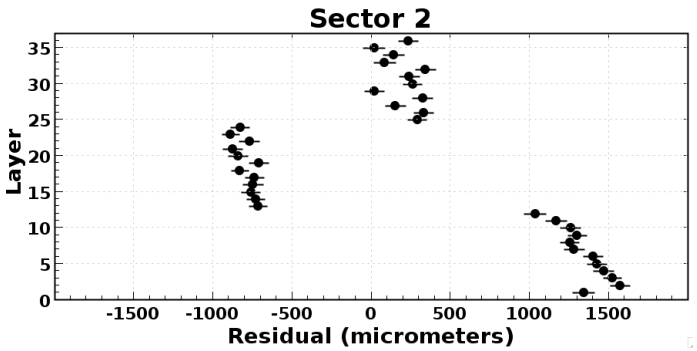


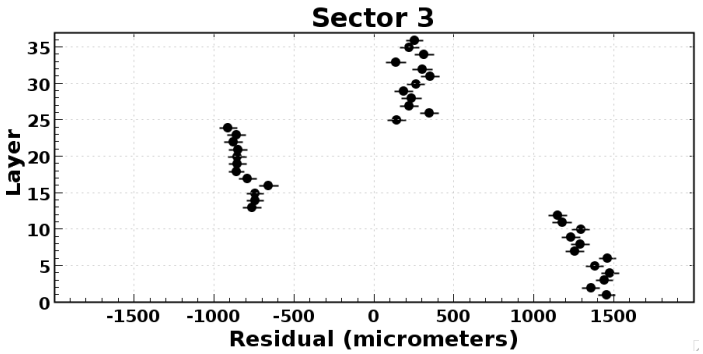


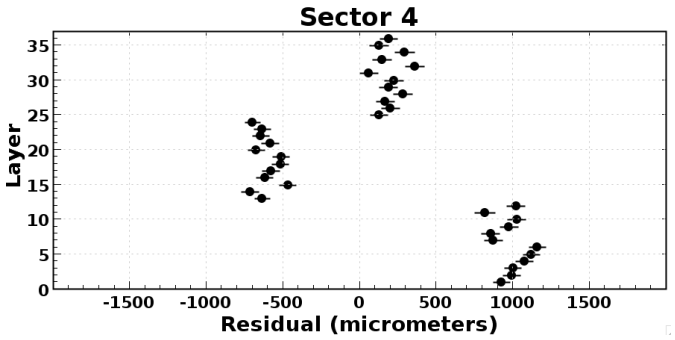


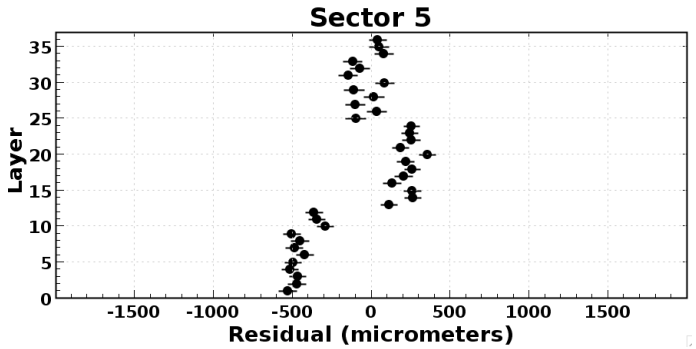
Default Geometry: Correct Indexing

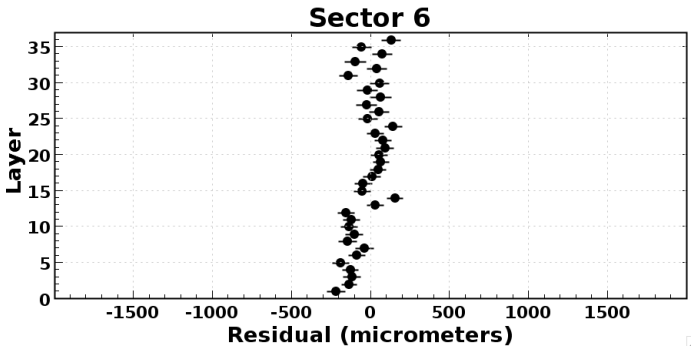












The Plan

- Use ccdb alignment tables to adjust the location of the 3 chambers.
- Find the shifts and rotations that minimize the residuals.

Data:

Show 50 entries Search:

region	sector	component	dx	dy	dz	dtheta_x	dtheta_y	dtheta_z
1	1	0	0	0	0	0	0	0
1	2	0	0	0	0	0	0	0
1	3	0	0	0	0	0	0	0
1	4	0	0	0	0	0	0	0
1	5	0	0	0	0	0	0	0
1	6	0	0	0	0	0	0	0
2	1	0	0	0	0	0	0	0
2	2	0	0	0	0	0	0	0
2	3	0	0	0	0	0	0	0
2	4	0	0	0	0	0	0	0
2	5	0	0	0	0	0	0	0
2	6	0	0	0	0	0	0	0
3	1	0	0	0	0	0	0	0
3	2	0	0	0	0	0	0	0
3	3	0	0	0	0	0	0	0
3	4	0	0	0	0	0	0	0
3	5	0	0	0	0	0	0	0
3	6	0	0	0	0	0	0	0

Showing 1 to 18 of 18 entries First Previous 1 Next Last

Nominal Shifts

- Create tables of nominal shifts by reconstructing with each of the possible shifts and rotations and observing the results.

Data:

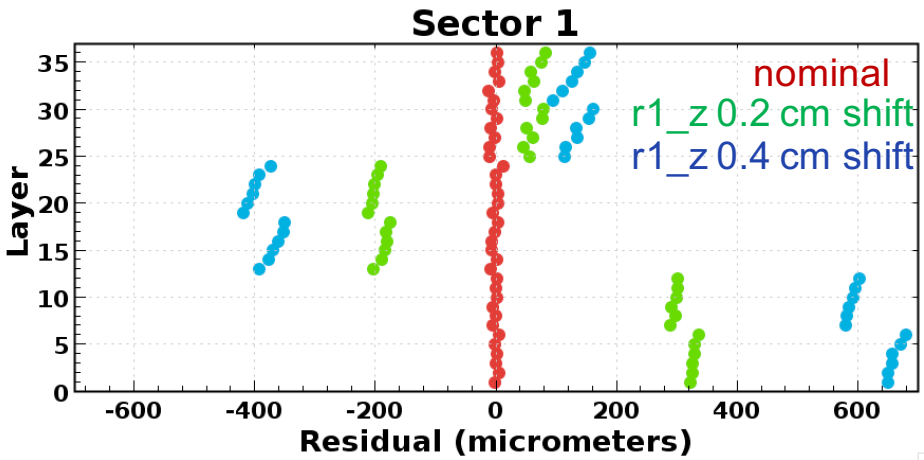
Show 100 entries Search:

region	sector	component	dx	dy	dz	dtheta_x	dtheta_y	dtheta_z
1	1	0	0	0	0.5	0	0	0
1	2	0	0	0	0.5	0	0	0
1	3	0	0	0	0.5	0	0	0
1	4	0	0	0	0.5	0	0	0
1	5	0	0	0	0.5	0	0	0
1	6	0	0	0	0.5	0	0	0
2	1	0	0	0	0	0	0	0
2	2	0	0	0	0	0	0	0
2	3	0	0	0	0	0	0	0
2	4	0	0	0	0	0	0	0
2	5	0	0	0	0	0	0	0
2	6	0	0	0	0	0	0	0
3	1	0	0	0	0	0	0	0
3	2	0	0	0	0	0	0	0
3	3	0	0	0	0	0	0	0
3	4	0	0	0	0	0	0	0
3	5	0	0	0	0	0	0	0
3	6	0	0	0	0	0	0	0

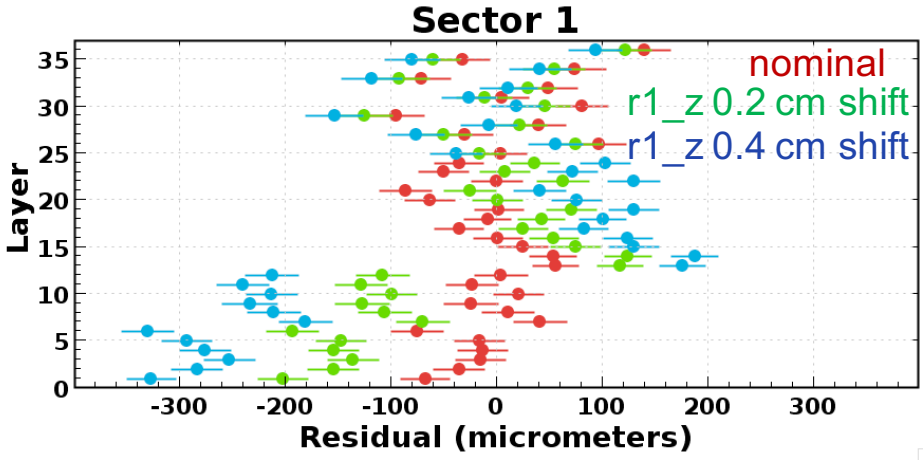
Showing 1 to 18 of 18 entries First Previous 1 Next Last

Angular Affects

gemc pseudodata



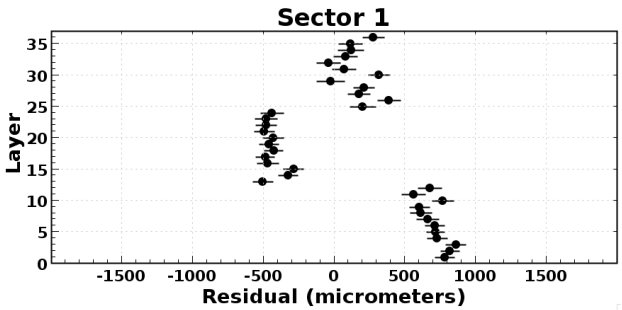
run 2467, data (special geometry)

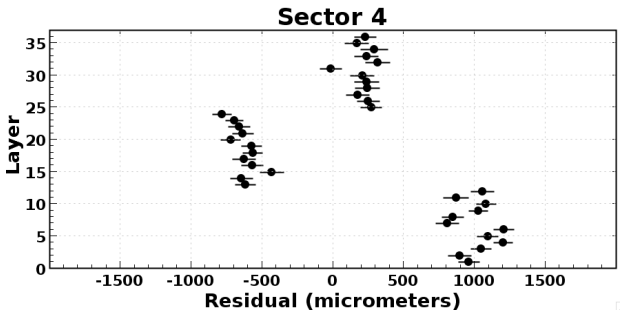


- Nominal shifts must be produced from a distribution that matches the angular distribution of the real data.

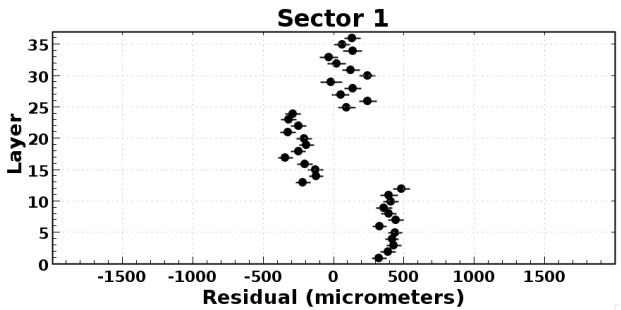
Tabulate the Shifts

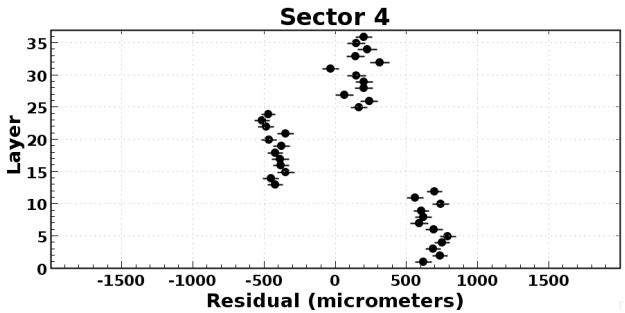
default geometry



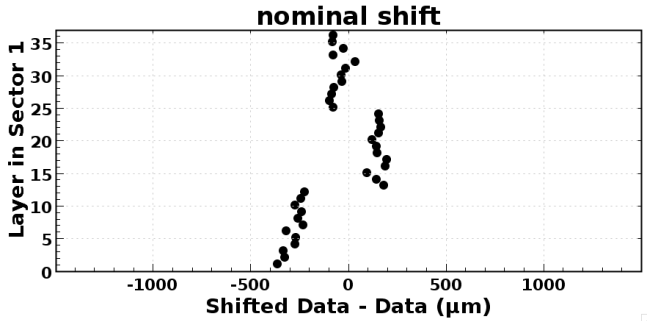


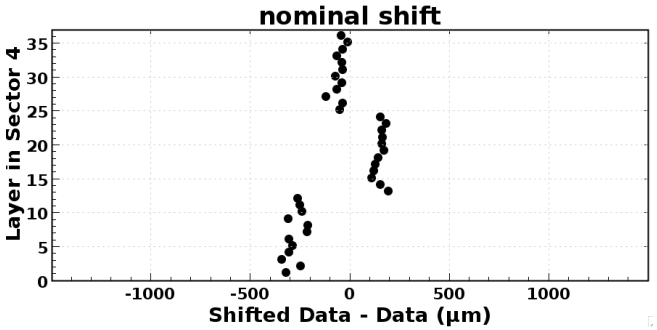
default geometry + r1 z shift





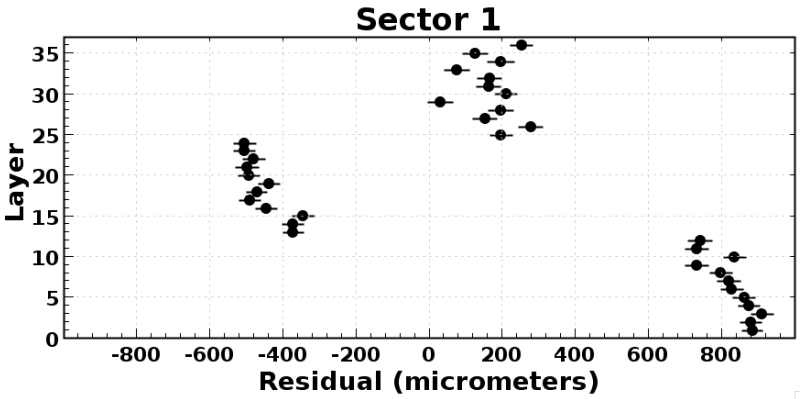
difference



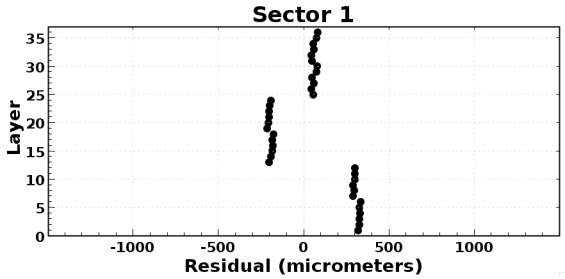


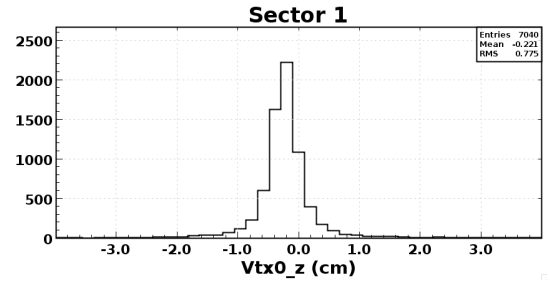
Ambiguities

May_2018_engineers

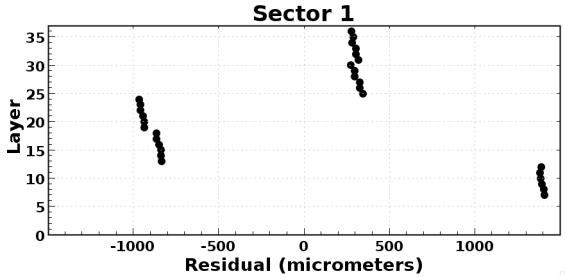


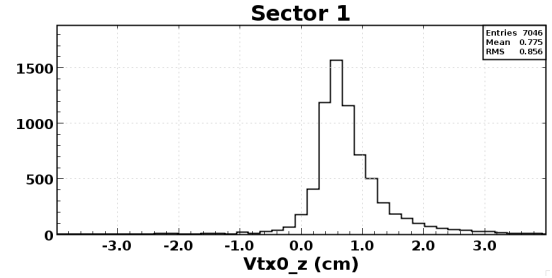
r1_z 0.2 cm shift





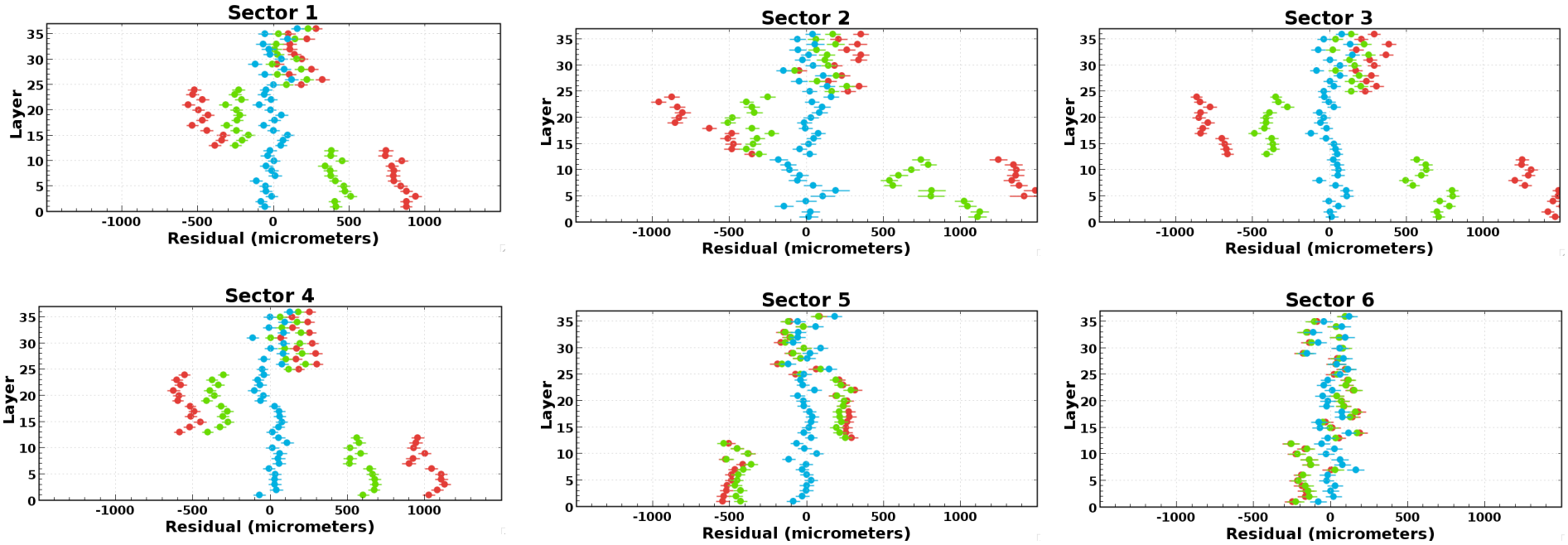
r2_x 0.2 cm shift





Results from trial and error

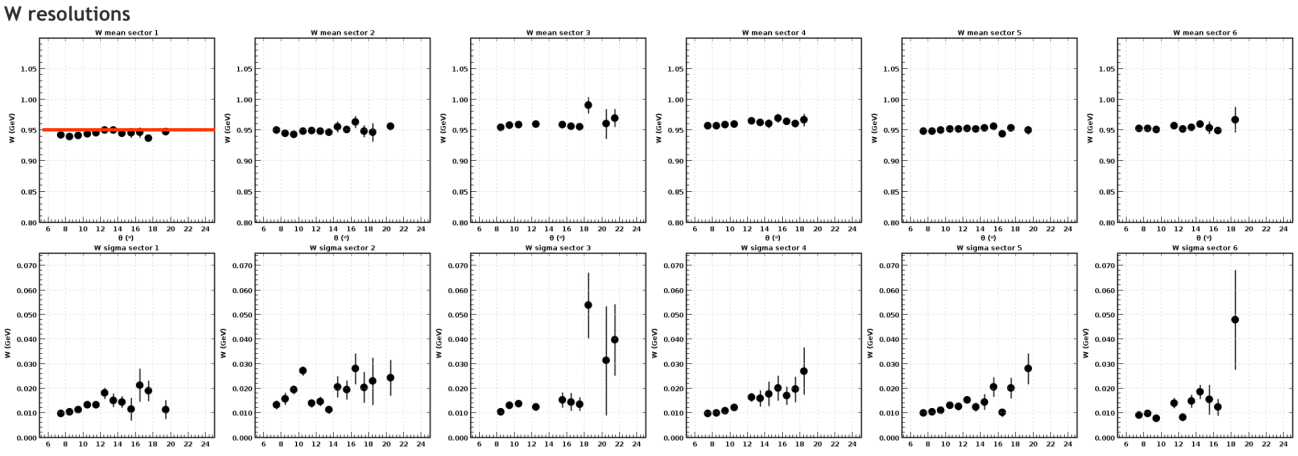
may_2018_engineers thayward_test_0004 thayward_test_0032



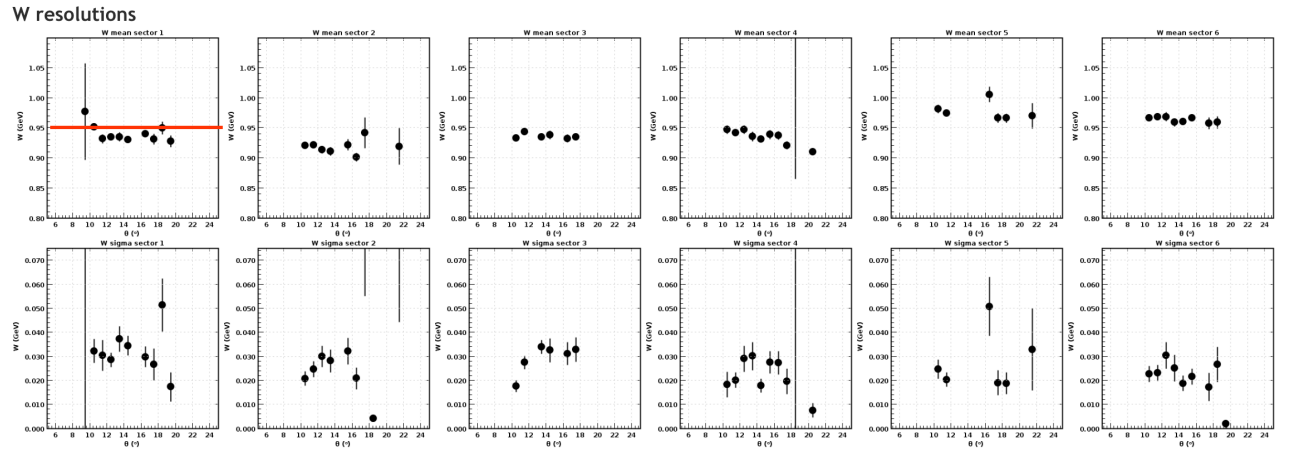
Elastic Peak

- Elastic peak is a derived quantity and not the ultimate measure of alignment success.
- Significant improvement since alignment began.

0.95



0.95



Conclusions

- Alignment solutions have been found to a ~150 micron level without full imposition of the vertex position.
- Incorporate full sector dependent beam vertex positions using the new coatjava 5b.7.1.
- Find unique *physical* solution based on minimizing residuals with MINUIT and outside information.
- Goal of finishing alignment process ahead of the spring cooking.