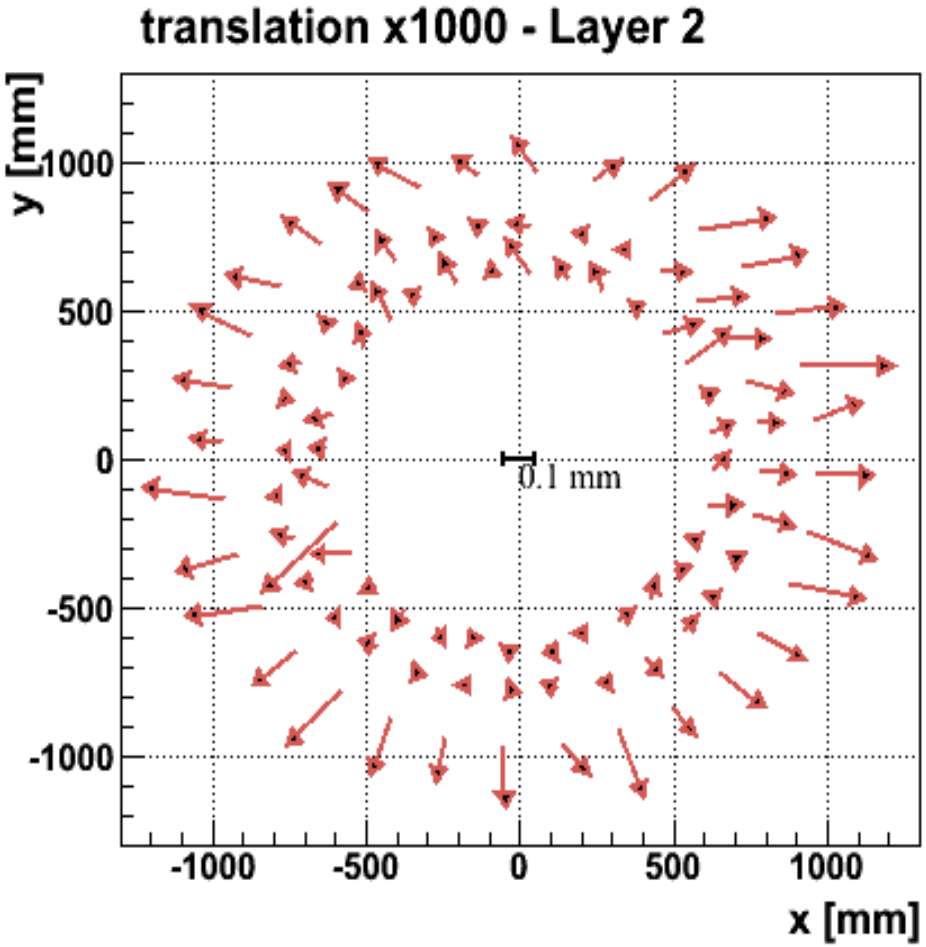
A/C side differences in TRT L2 Alignment

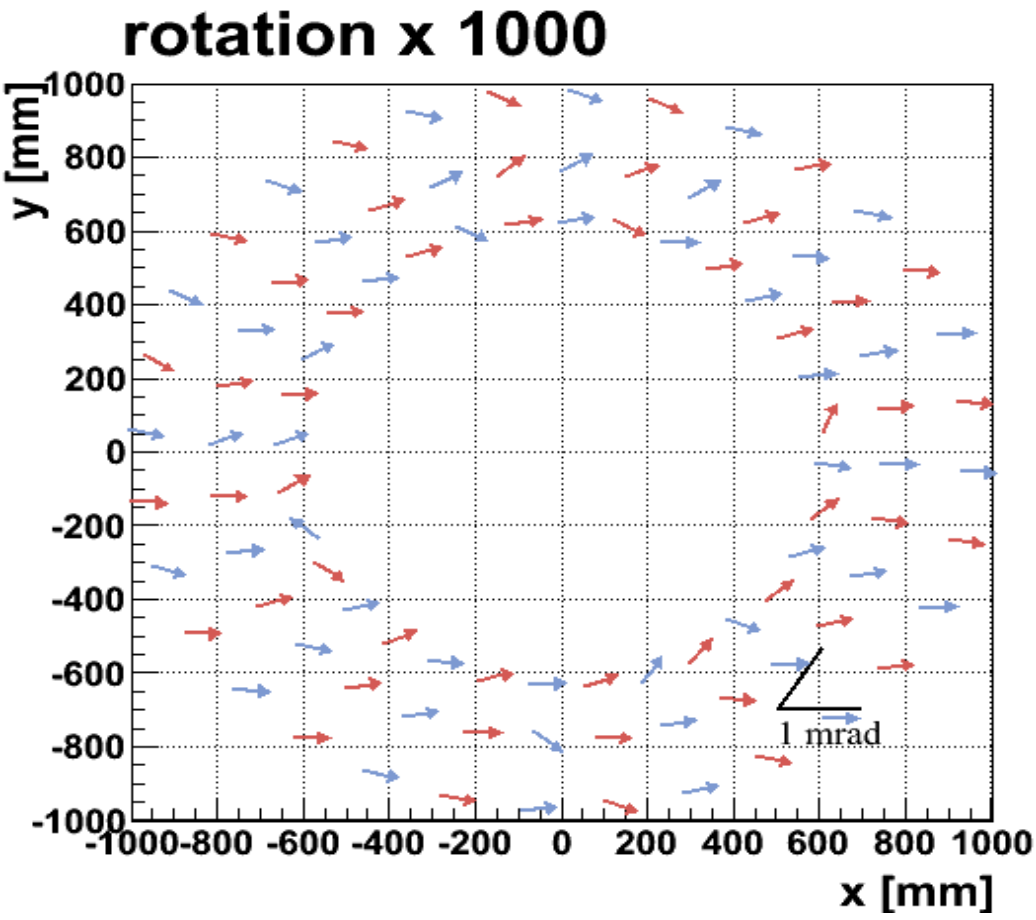
John Alison
Andrea Bocci

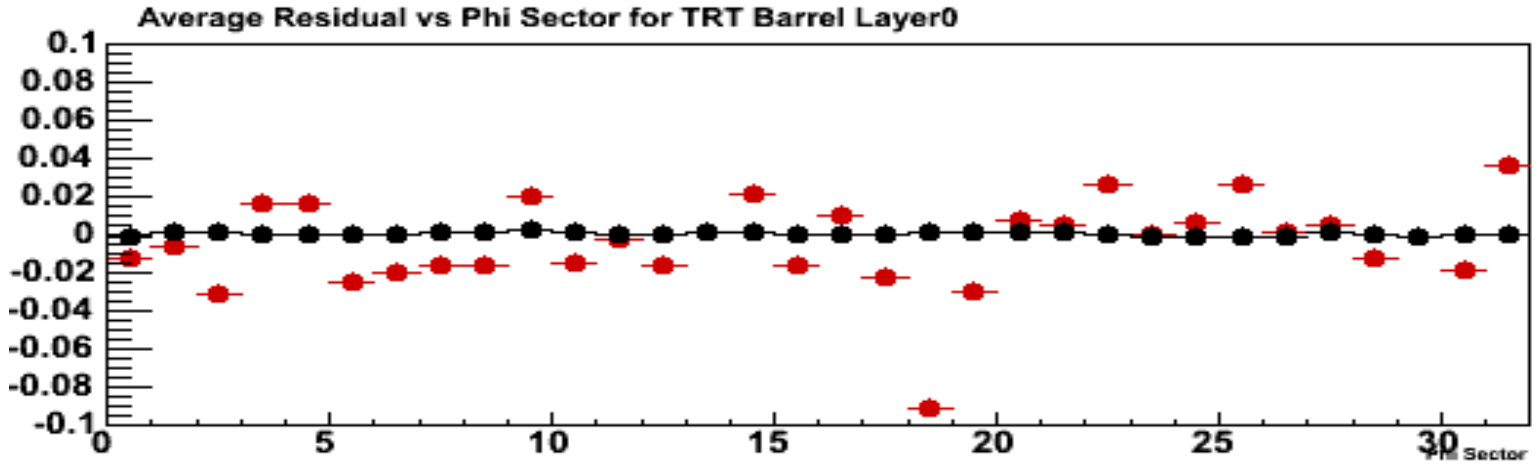
Running alignment with both sides

TRT-Only Tracks: > 45 hits, > 2 GeV (TRT_Cosmics_2008_07)

3 DoF: 2 translations, rotations about global z






Average Residual vs Phi Sector for TRT Barrel Layer0
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0.08
0.06
0.04
0.02
0
-0.02
-0.04
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-0.1
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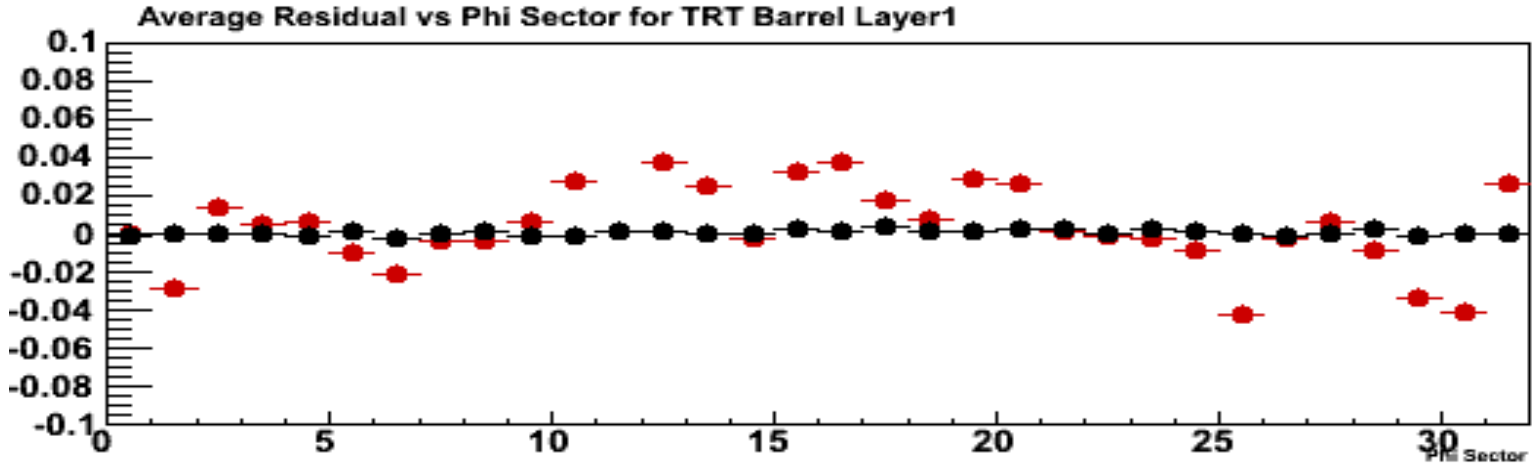
5
10
15
20
25
30
Phi Sector


Average Residual vs Phi Sector for TRT Barrel Layer1
0.1
0.08
0.06
0.04
0.02
0
-0.02
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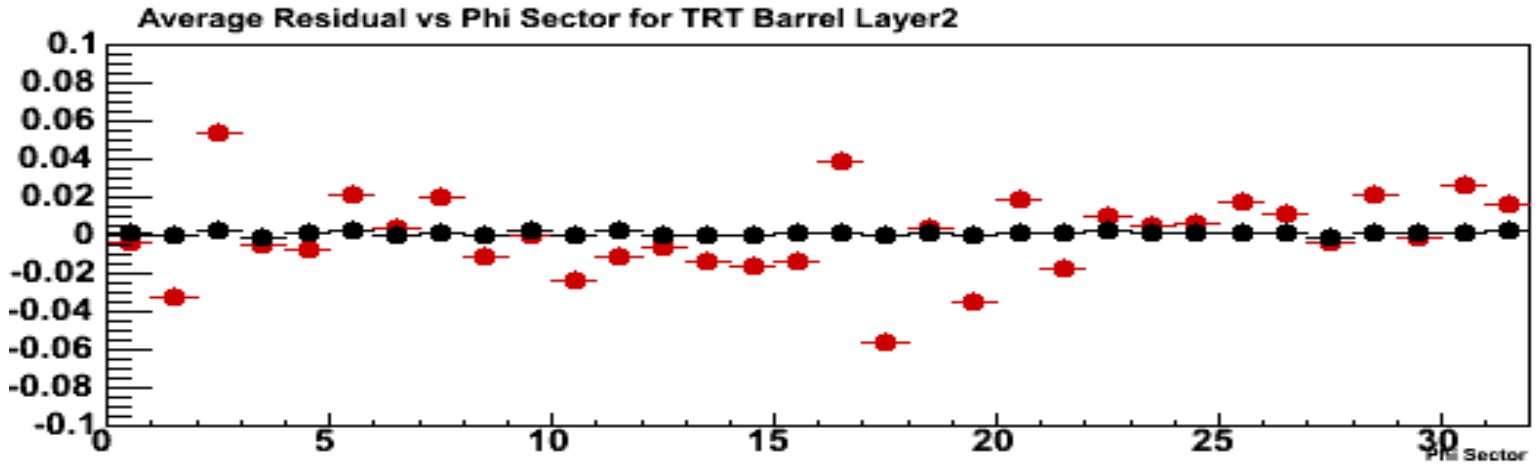
-0.08
-0.1
0
5
10
15
20
25
30
Phi Sector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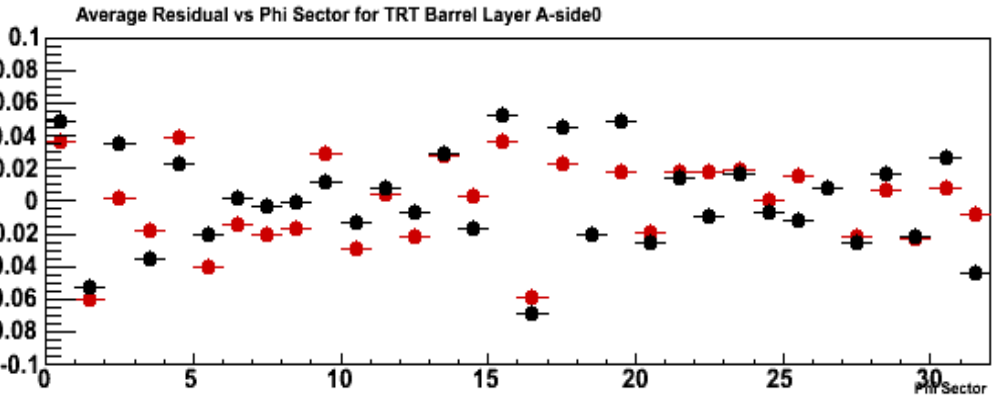
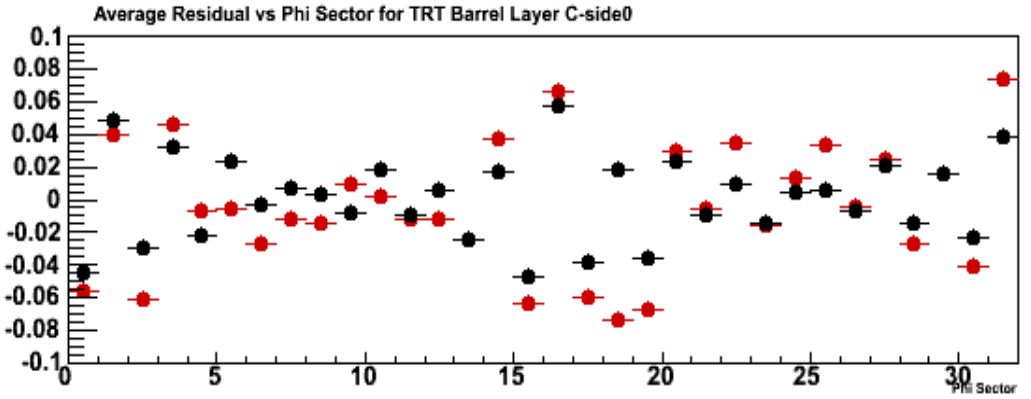
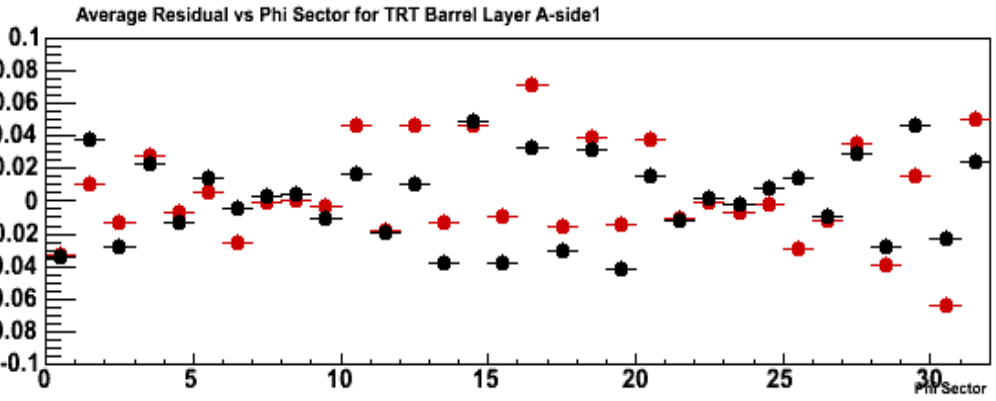
0.04
0.02
0
-0.02
-0.04
-0.06
-0.08
-0.1
0
5
10
15
20
25
30
Phi Sector

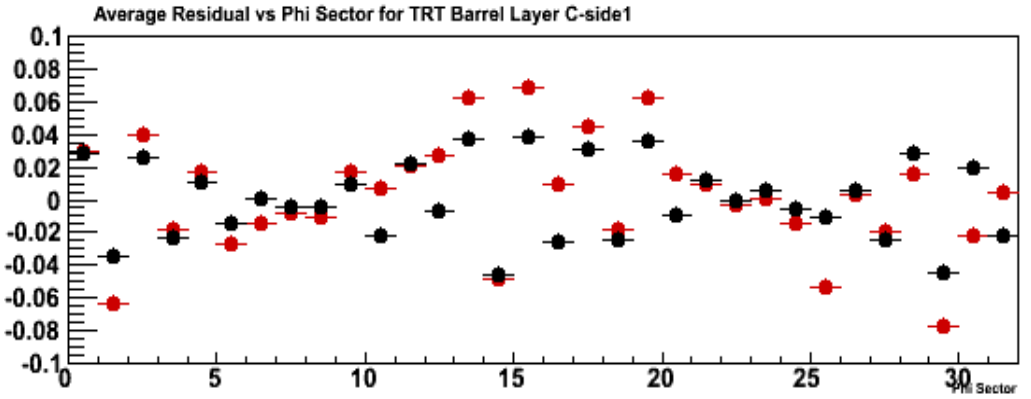
A -Side

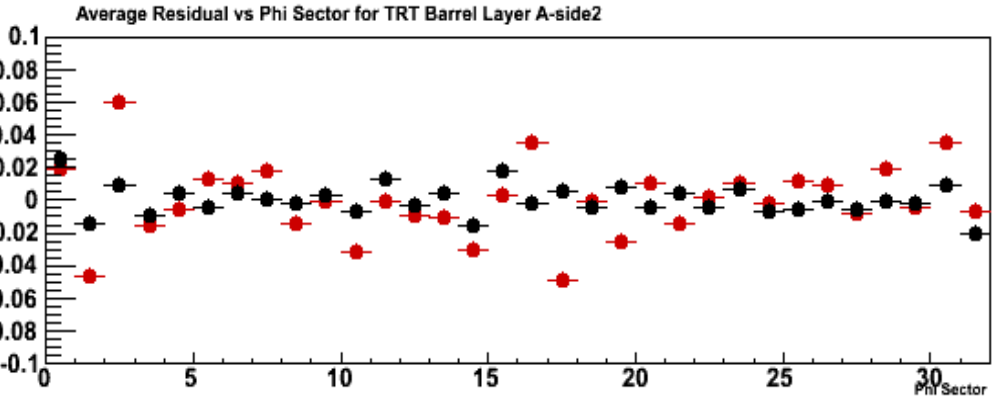
C-Side

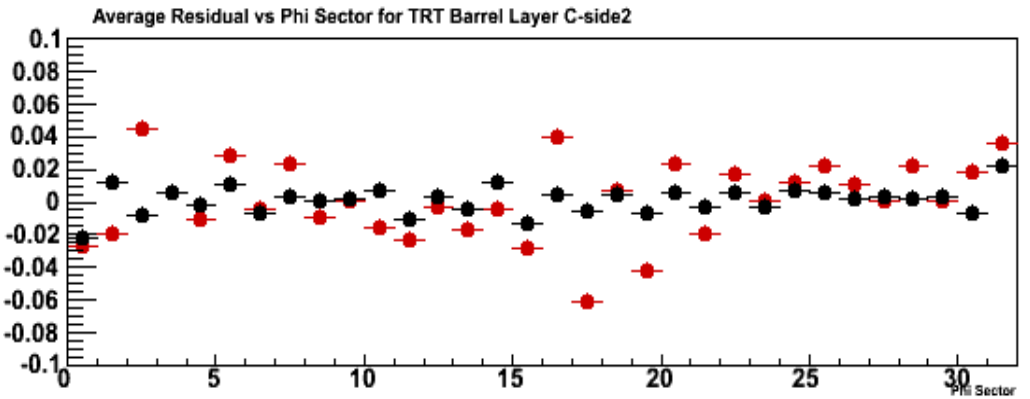

Average Residual vs Phi Sector for TRT Barrel Layer A-side0
Phi Sector


Average Residual vs Phi Sector for TRT Barrel Layer C-side0
Phi Sector


Average Residual vs Phi Sector for TRT Barrel Layer A-side1
Phi Sector


Average Residual vs Phi Sector for TRT Barrel Layer C-side1
Phi Sector

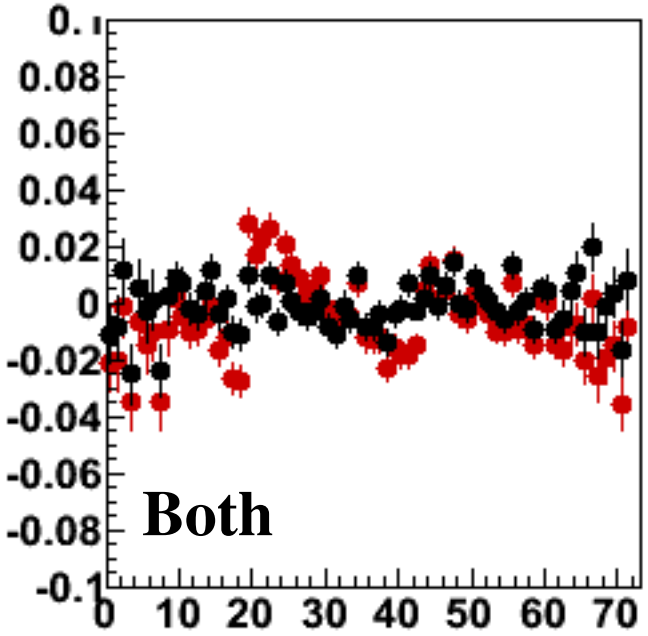

Average Residual vs Phi Sector for TRT Barrel Layer A-side2
Phi Sector

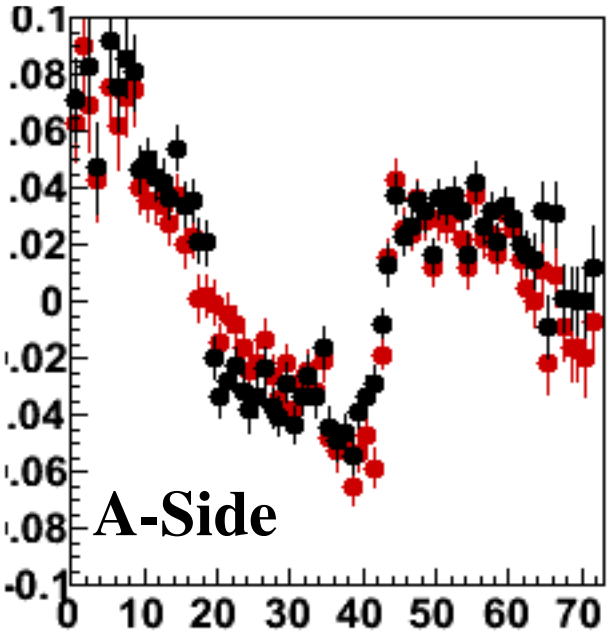

Average Residual vs Phi Sector for TRT Barrel Layer C-side2
Phi Sector

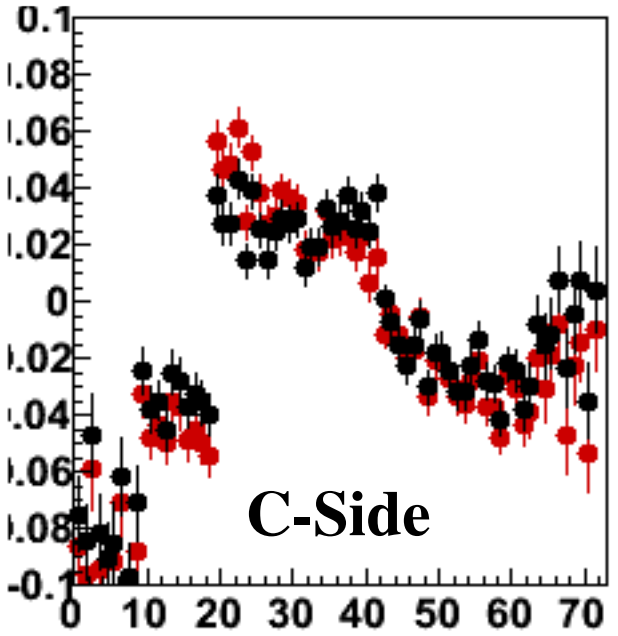
Module Level Misalignment

Phi Sector 0

Average Residual [mm] Vs Straw Layer

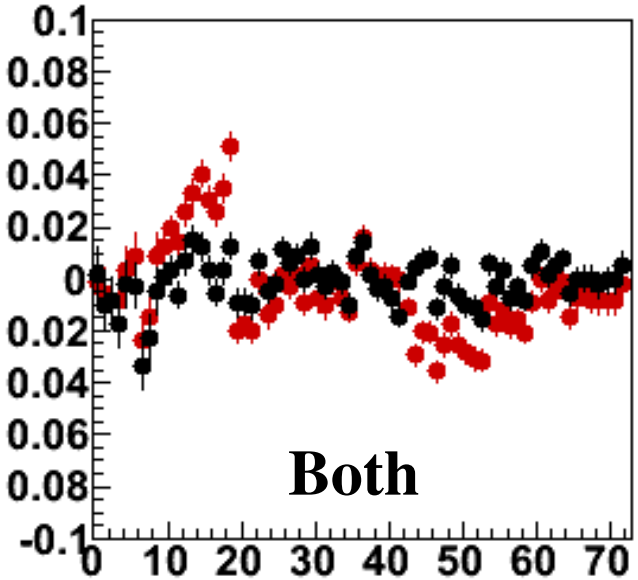


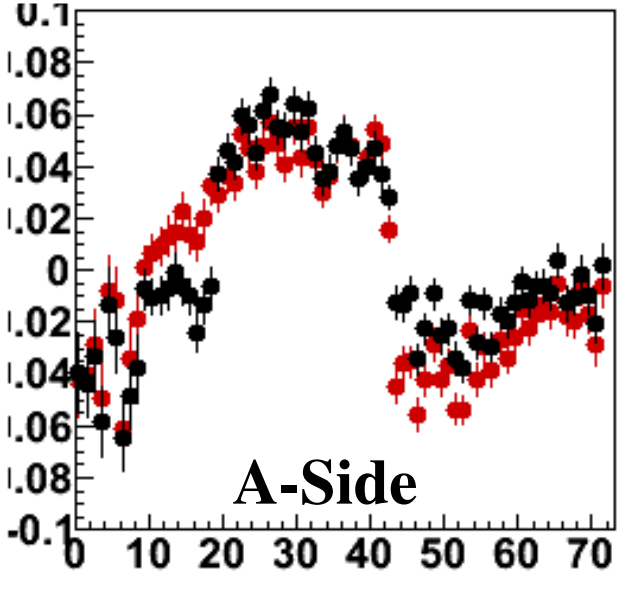


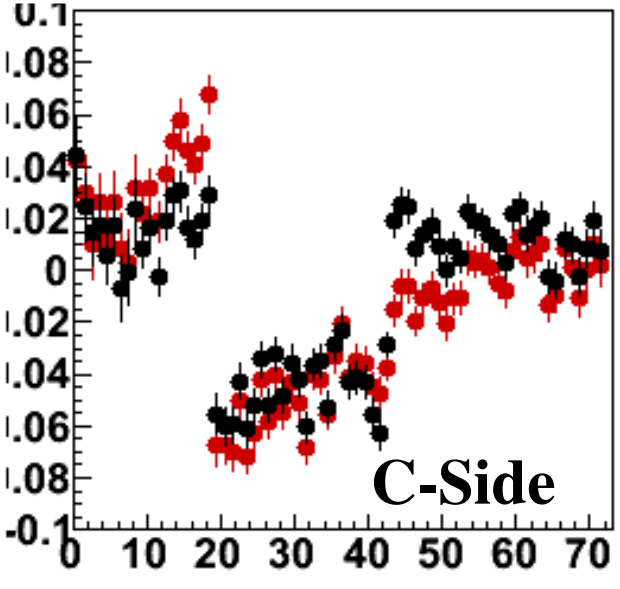


Phi Sector 4

Average Residual [mm] Vs Straw Layer







L2 Alignment “Side by Side”

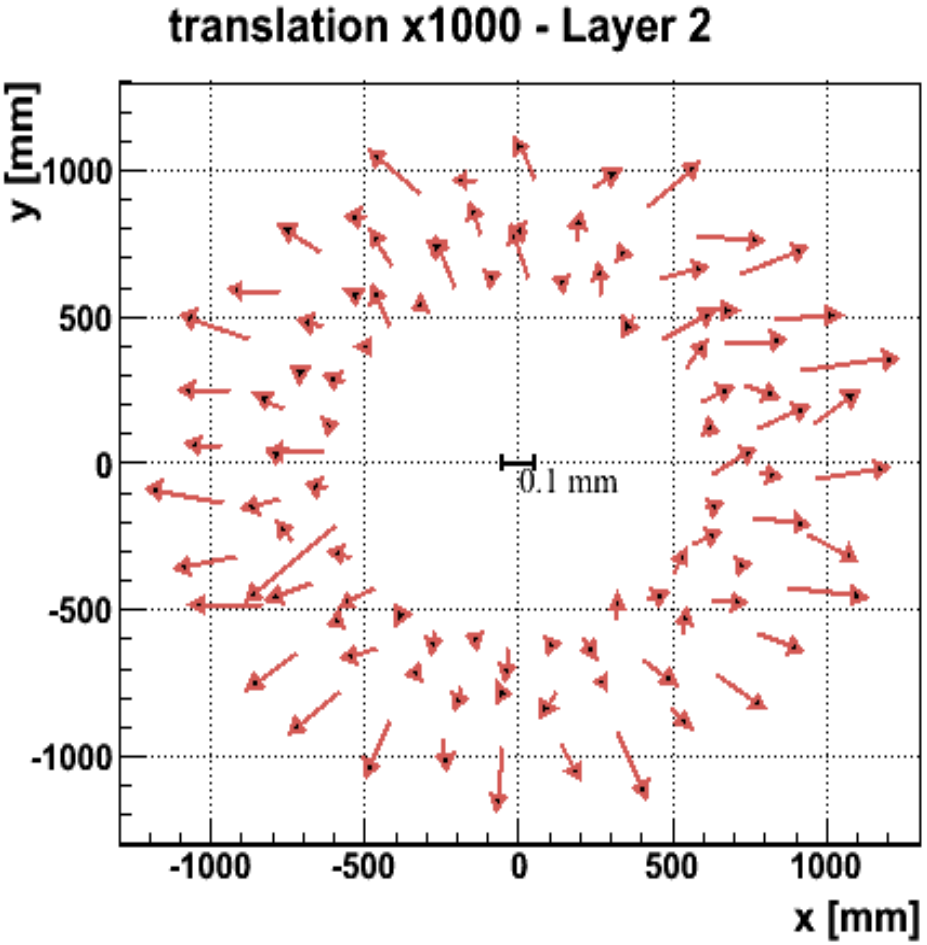
- Currently not foreseen to have separate module level constants A/C side
- This fact prevents us from aligning A/C separately.
- Work-around mask-off all hits in a side, alignment constants derived will be for only other side.

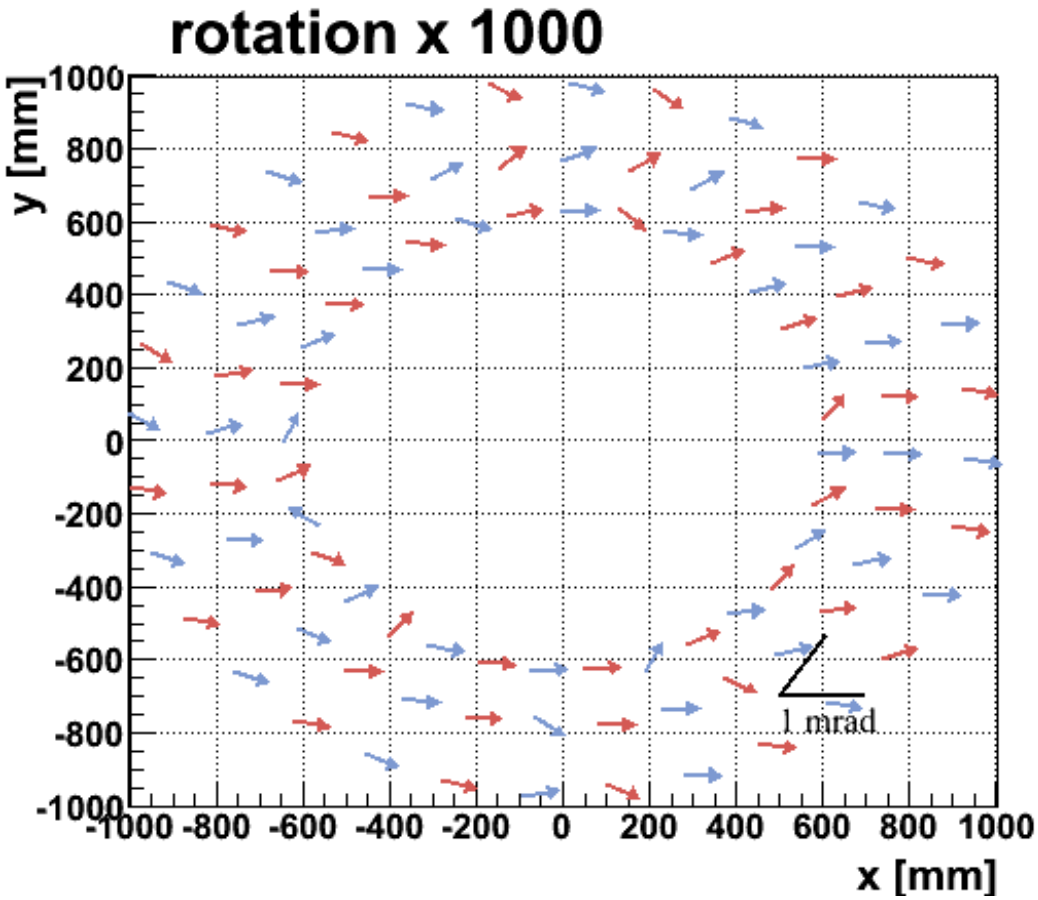
Running alignment with A-side

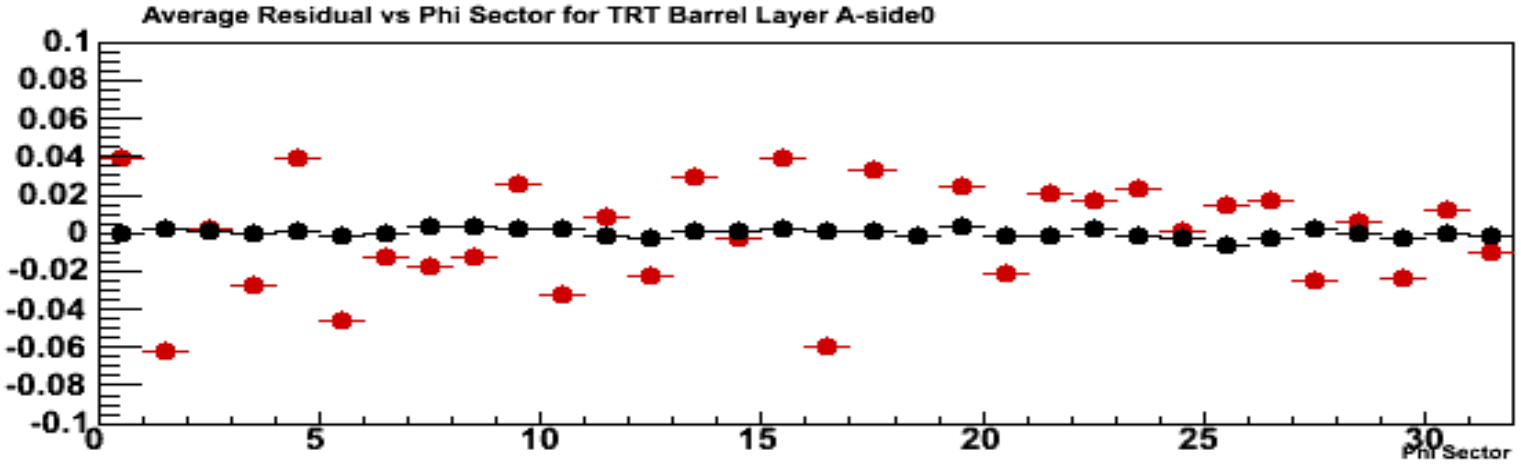
TRT-Only Tracks: > 45 hits, > 2 GeV (TRT_Cosmics_2008_07)

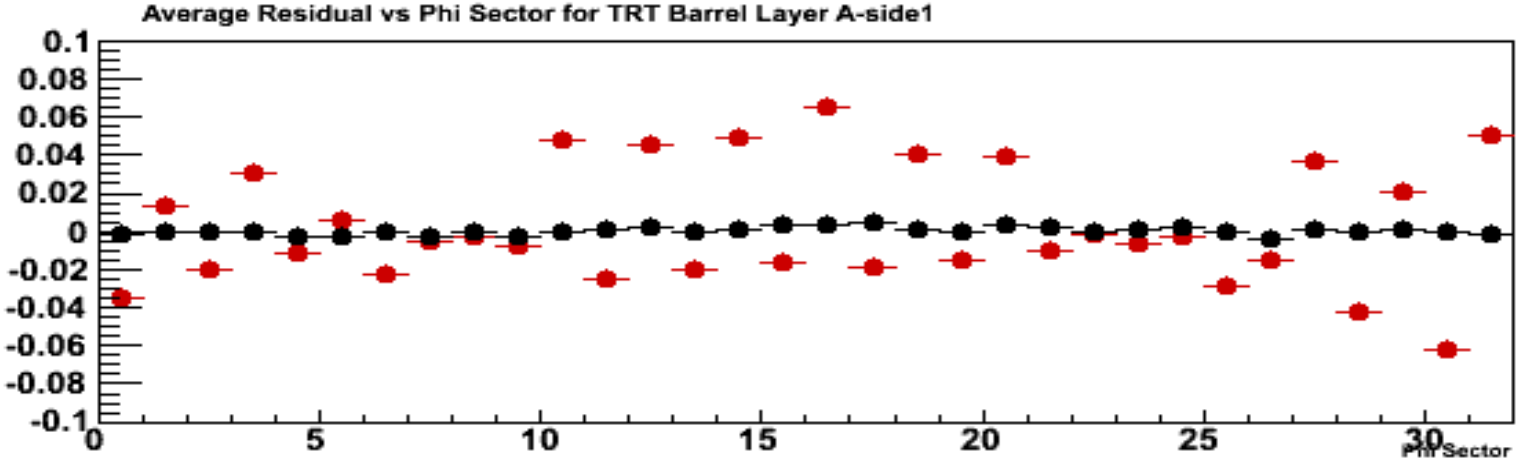
3 DoF: 2 translations, rotations about global z

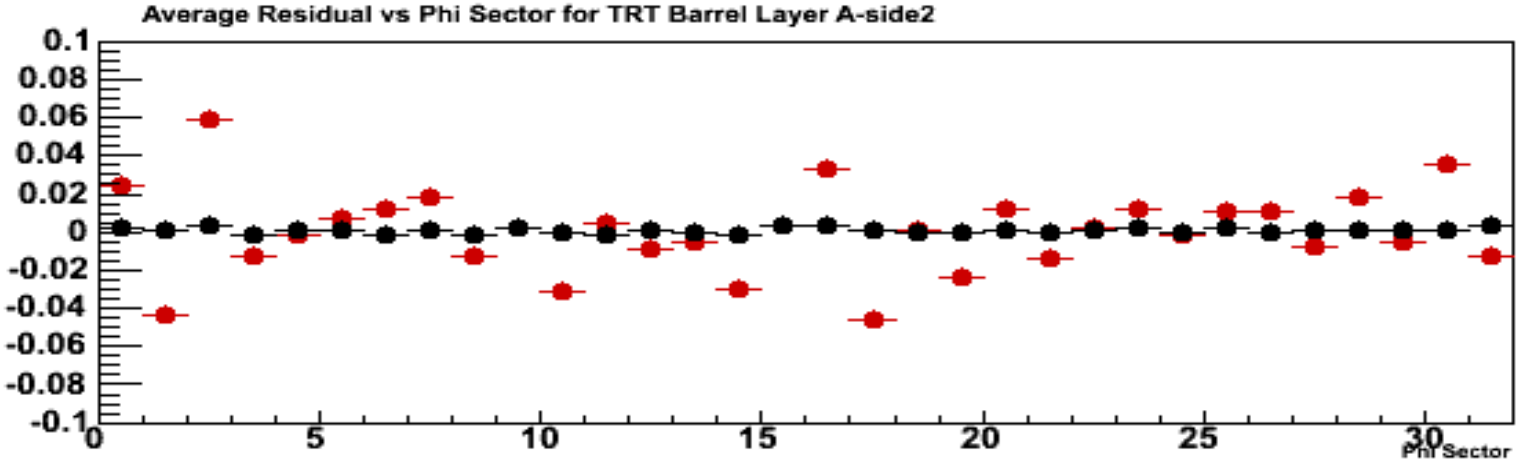
Masking off side C






Average Residual vs Phi Sector for TRT Barrel Layer A-side0
0.1
0.08
0.06
0.04
0.02
0
-0.02
-0.04
-0.06
-0.08
-0.1
0
5
10
15
20
25
30
Phi Sector

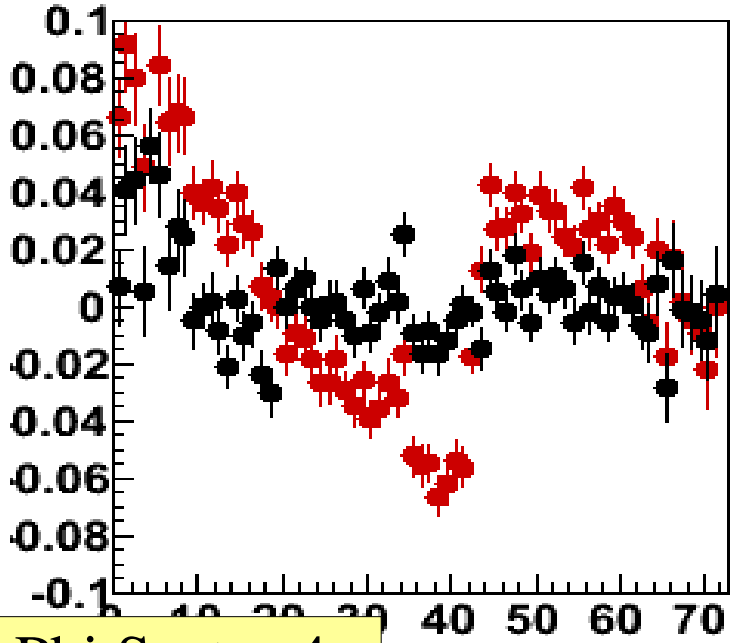

Average Residual vs Phi Sector for TRT Barrel Layer A-side1
0.1
0.08
0.06
0.04
0.02
0
-0.02
-0.04
-0.06
-0.08
-0.1
0
5
10
15
20
25
30
Phi Sector


Average Residual vs Phi Sector for TRT Barrel Layer A-side2
0.1
0.08
0.06
0.04
0.02
0
-0.02
-0.04
-0.06
-0.08
-0.1
0
5
10
15
20
25
30
Phi Sector

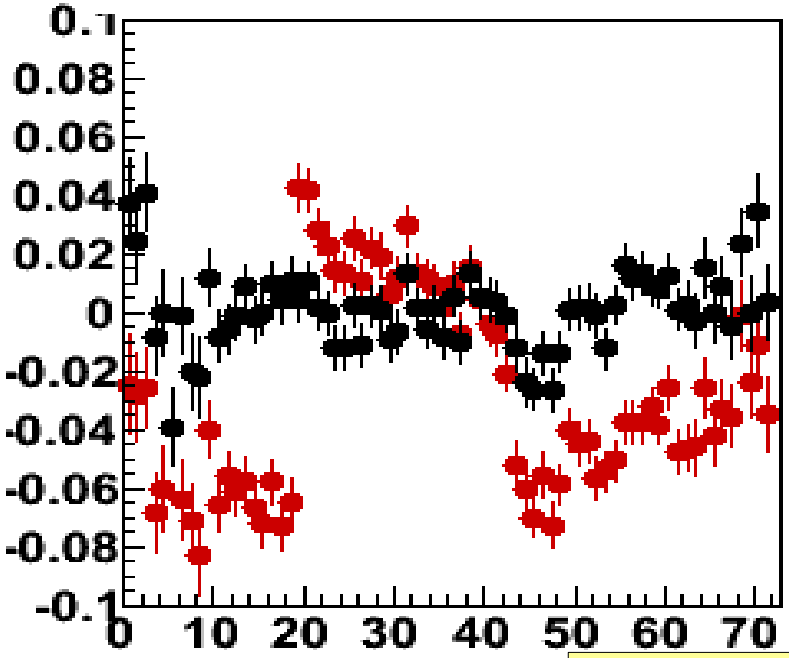
Module Level Misalignment

Average Residual [mm] Vs Straw Layer

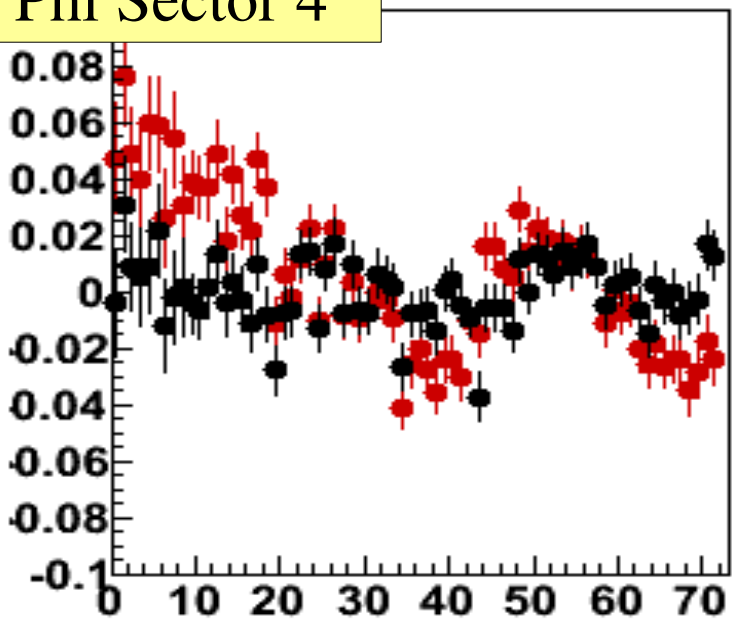
Phi Sector 0



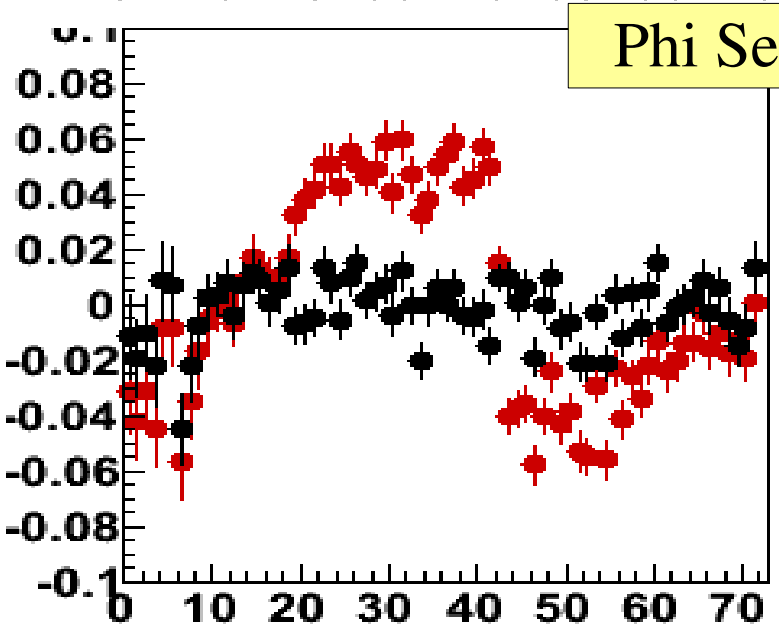
Phi Sector 1



Phi Sector 4



Phi Sector 14

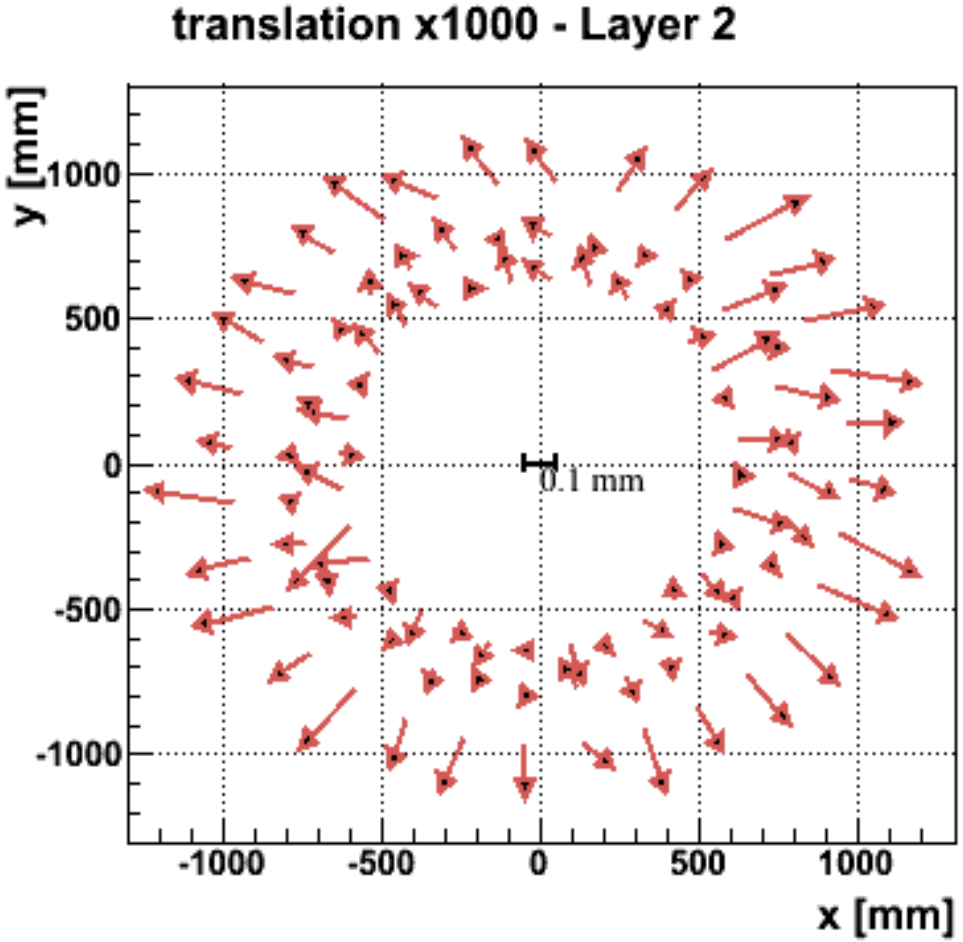


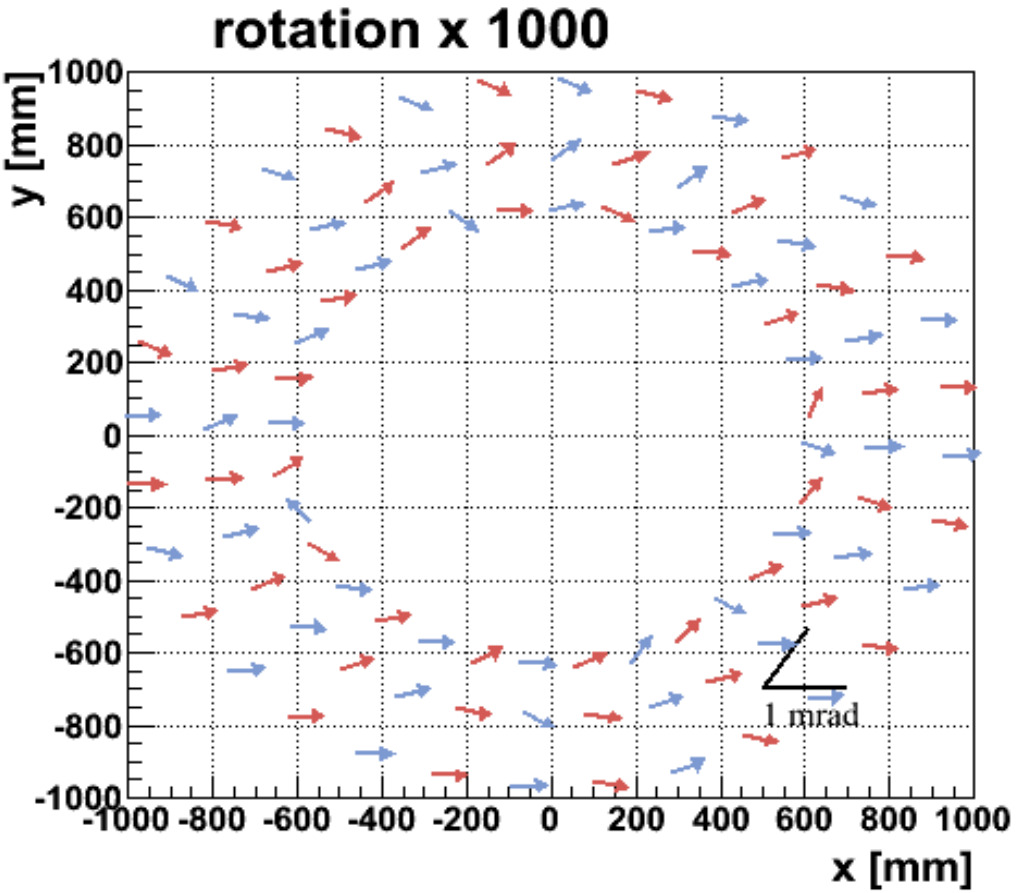
Running alignment with C-side

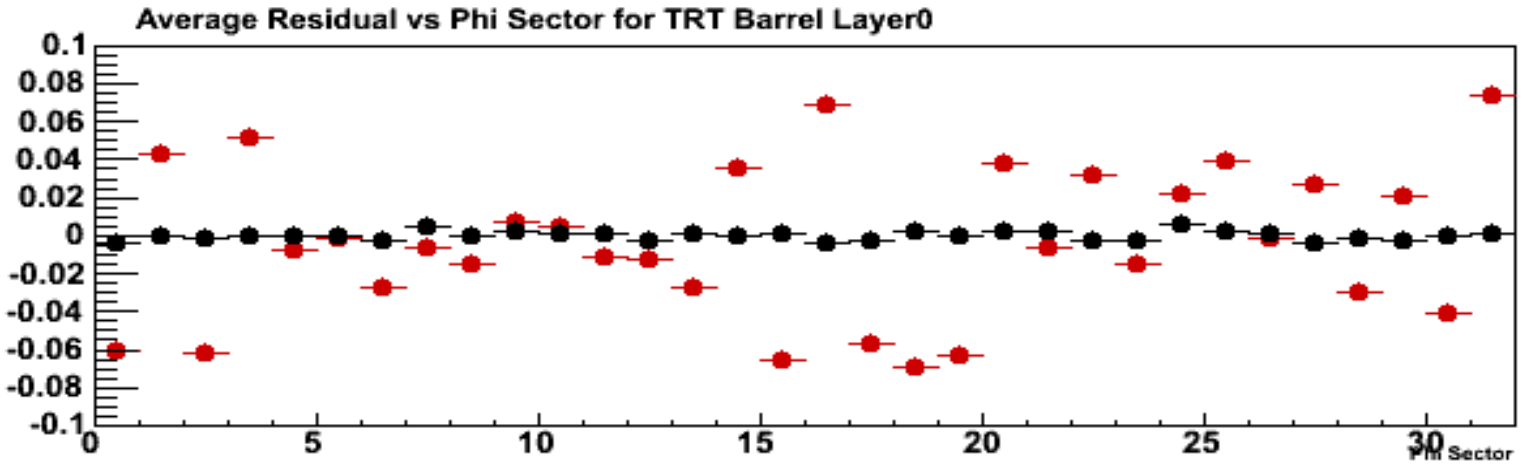
TRT-Only Tracks: > 45 hits, > 2 GeV (TRT_Cosmics_2008_07)

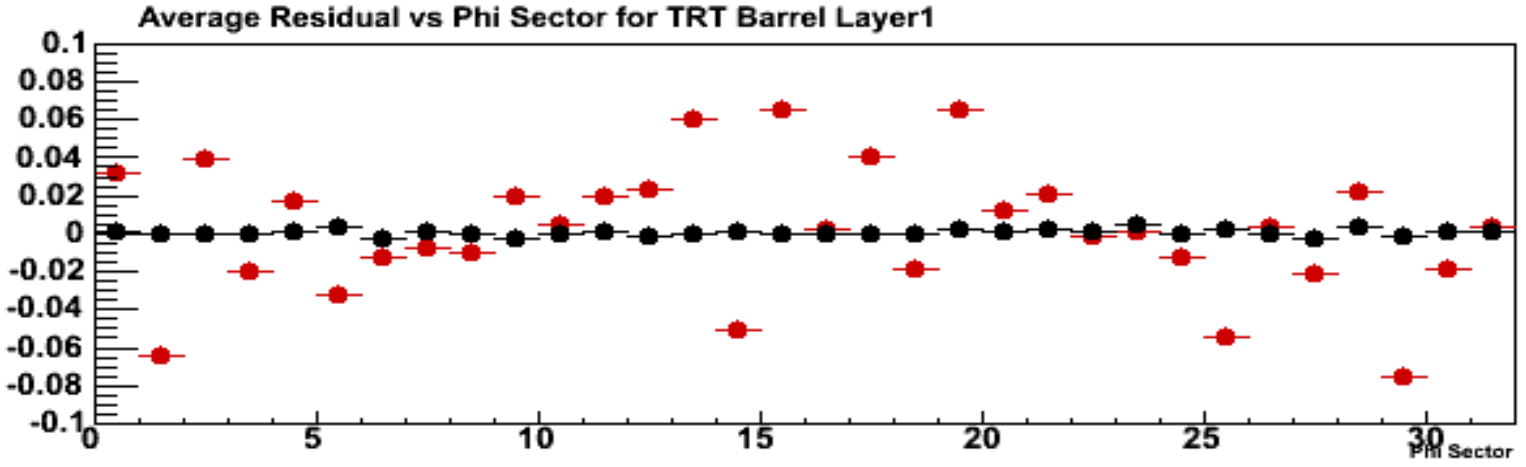
3 DoF: 2 translations, rotations about global z

Masking off side A






Average Residual vs Phi Sector for TRT Barrel Layer0
0.1
0.08
0.06
0.04
0.02
0
-0.02
-0.04
-0.06
-0.08
-0.1
0
5
10
15
20
25
30
Phi Sector


Average Residual vs Phi Sector for TRT Barrel Layer1
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0.06
0.04
0.02
0
-0.02
-0.04
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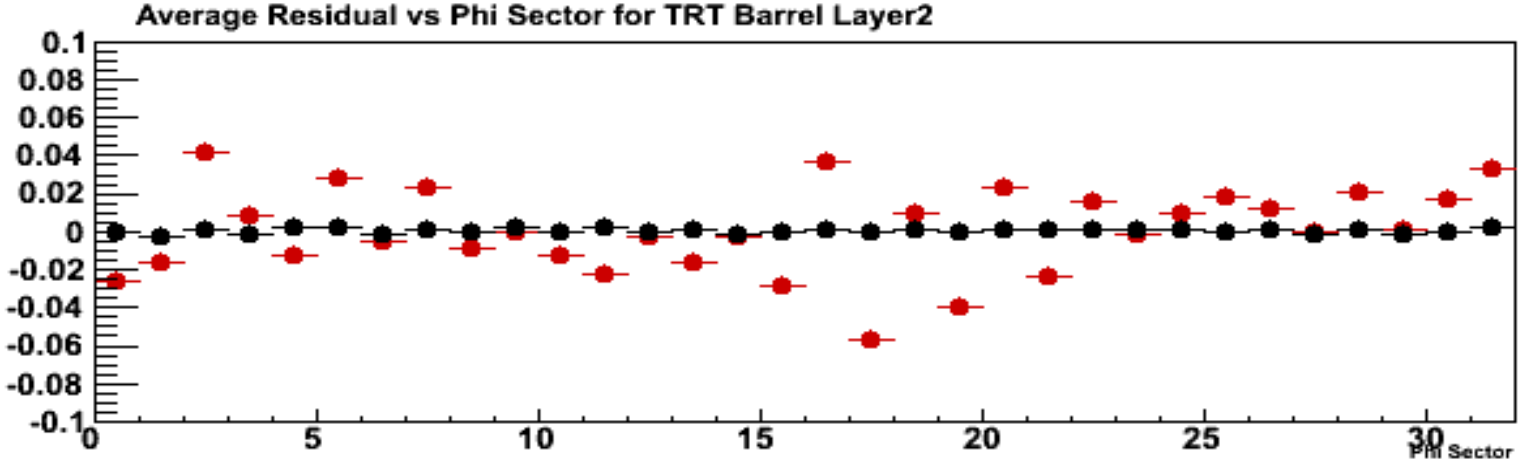
5
10
15
20
25
30
Phi Sector


Average Residual vs Phi Sector for TRT Barrel Layer2
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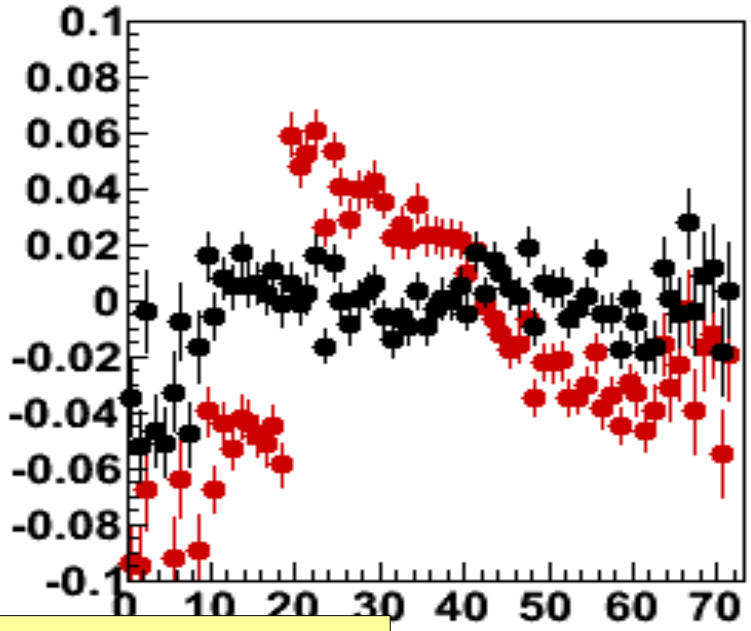
0.04
0.02
0
-0.02
-0.04
-0.06
-0.08
-0.1
0
5
10
15
20
25
30
Phi Sector

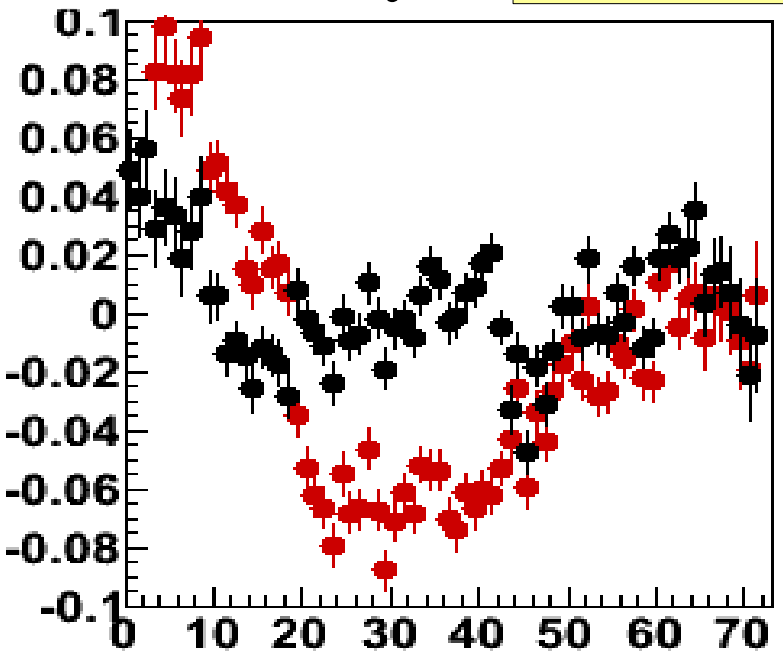
Module Level Misalignment

Phi Sector 0

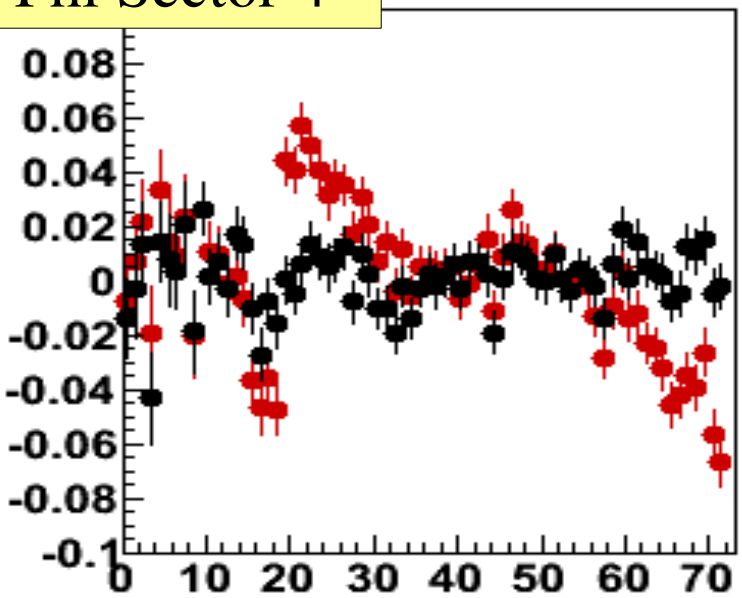
Average Residual [mm] Vs Straw Layer

Phi Sector 1

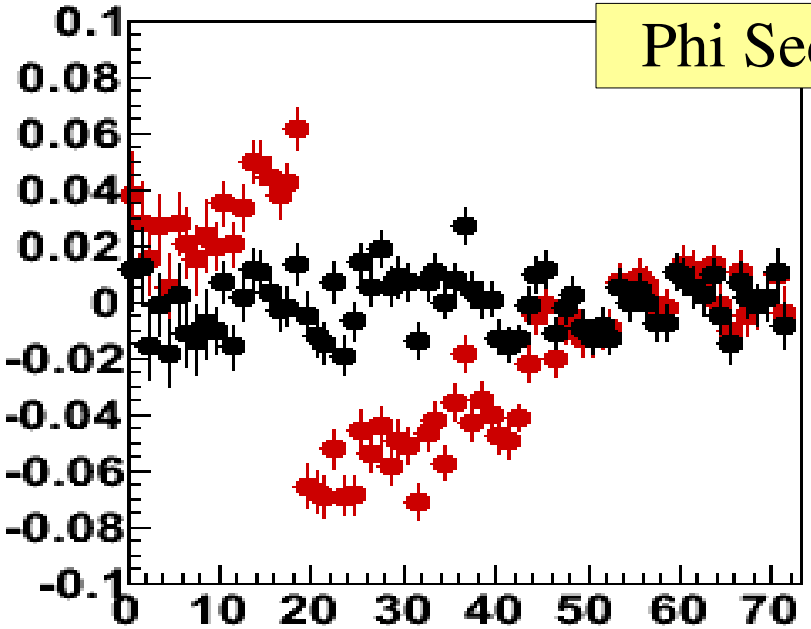




Phi Sector 4



Phi Sector 14



TRT Resolution

Combined Alignment

Both Sides	A-Side	C-Side
191 microns	188 microns	194 microns

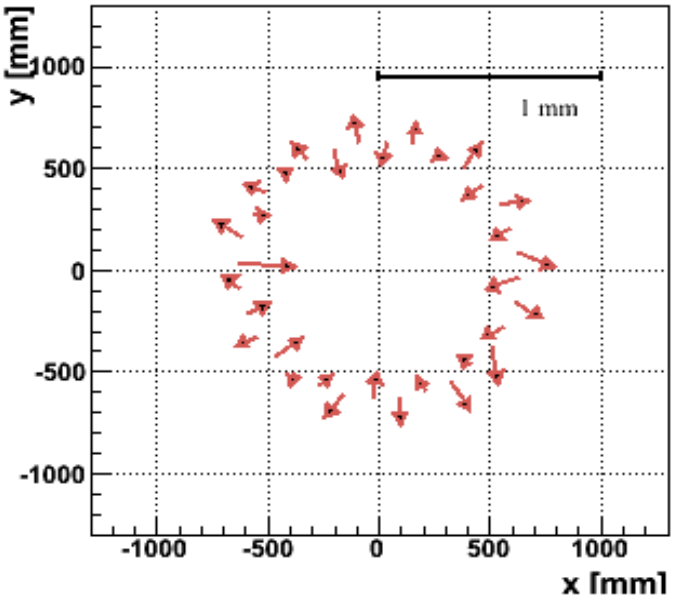
Separate Alignment

	A-Side	C-Side
	188 microns	190 microns

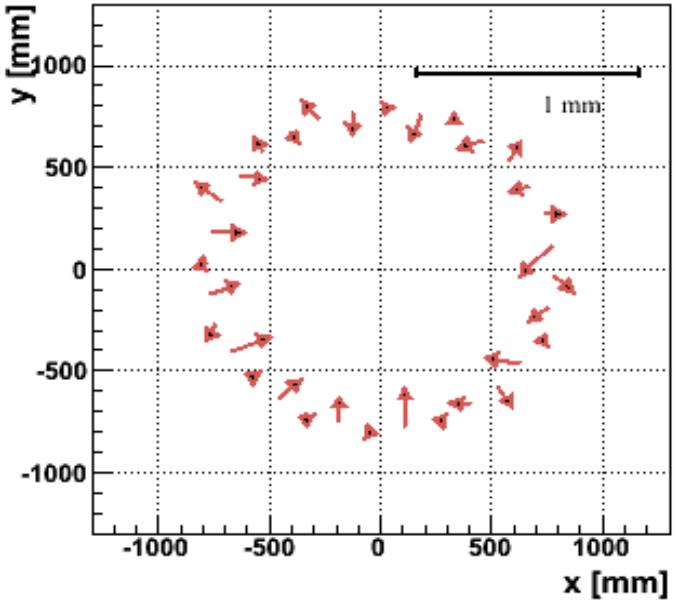
Module level alignment not limiting resolution

Differences in Alignment Parameters

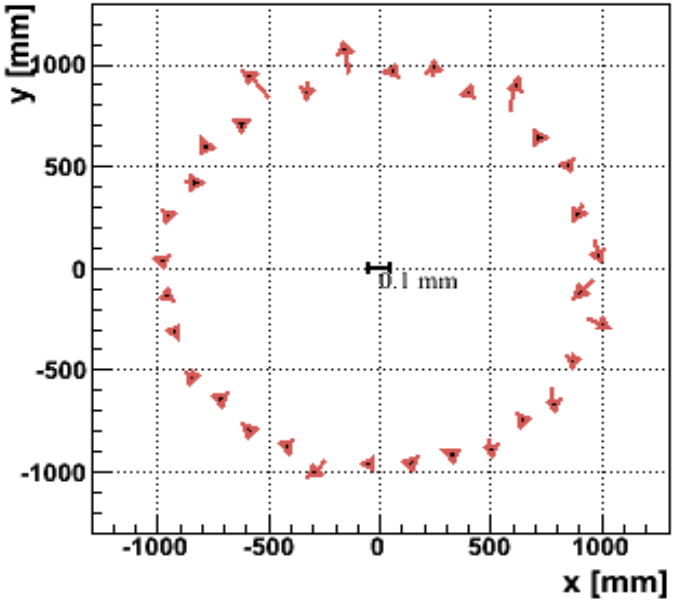
translation x 1000 - Layer 0



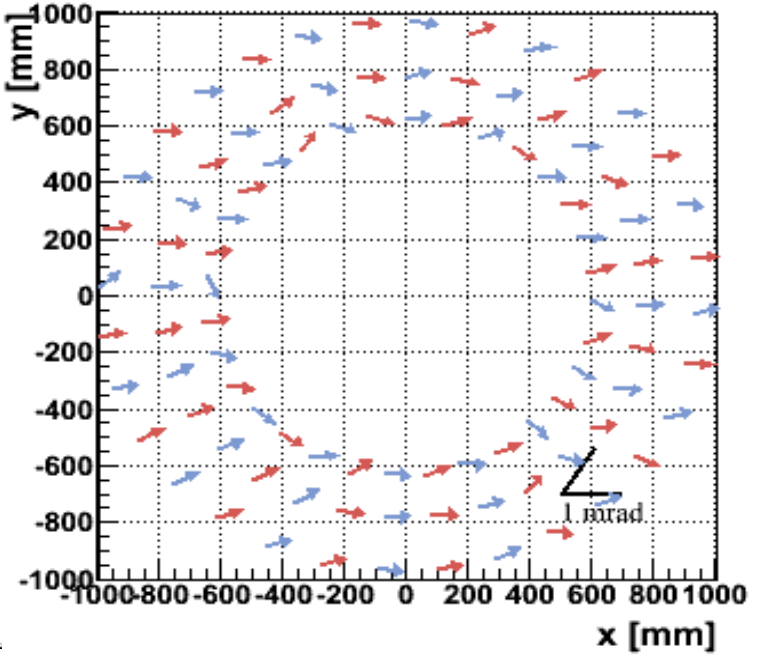
translation x1000- Layer 1



translation x1000 - Layer 2



rotation x 1000



Outlook

Understand the A/C side difference

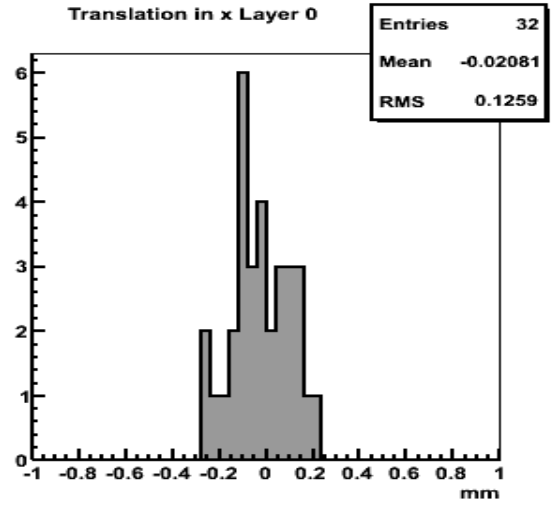
- Align with more runs, B-On/Off, realistic uncertainties
- Motivate differences physically ?

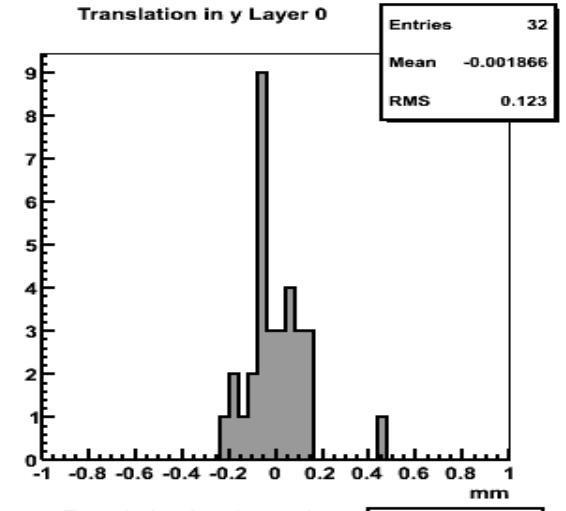
How/do we handle A/C difference in reconstruction?

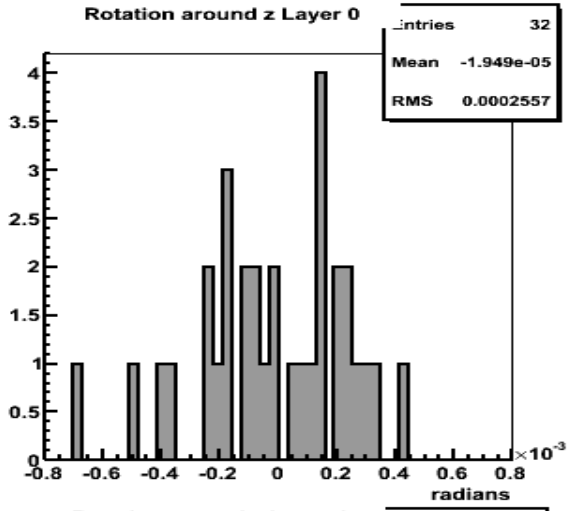
- Decision probably not up to us. Should provide the motivation.
- InDetReadoutGeometry vs GeoModel ?
  Do we care about simulating with the misalignment?
- ½ module level vs coherent movements of individual straws?

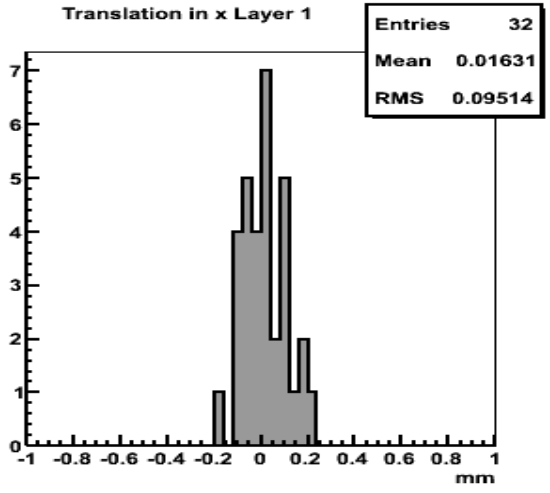
More details

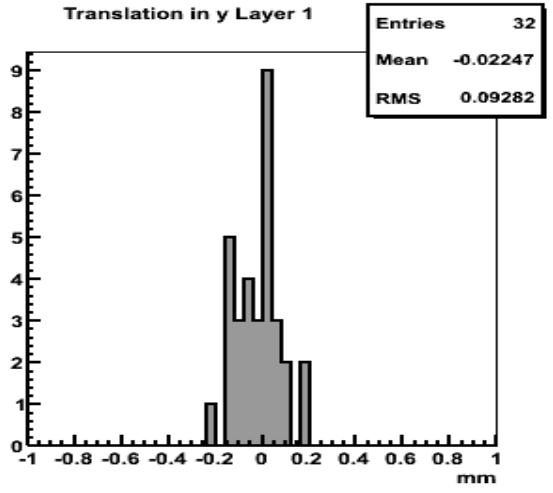
Differences A vs C

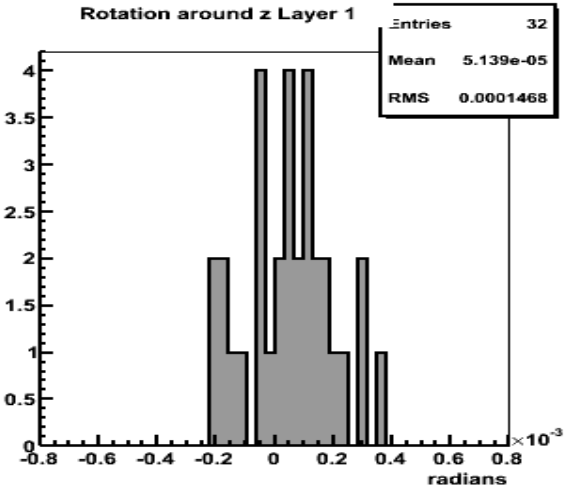


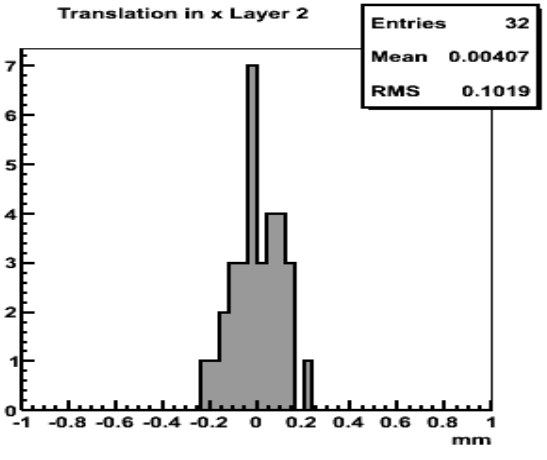


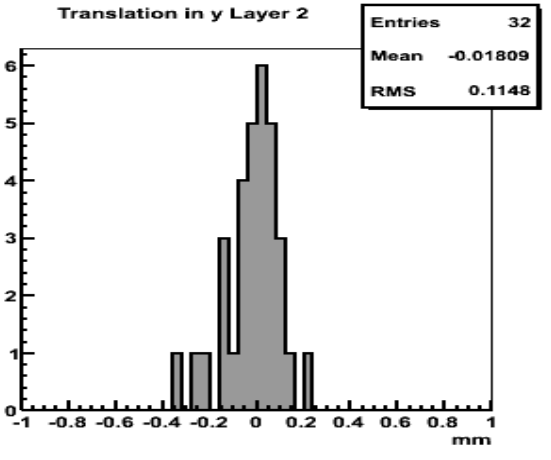


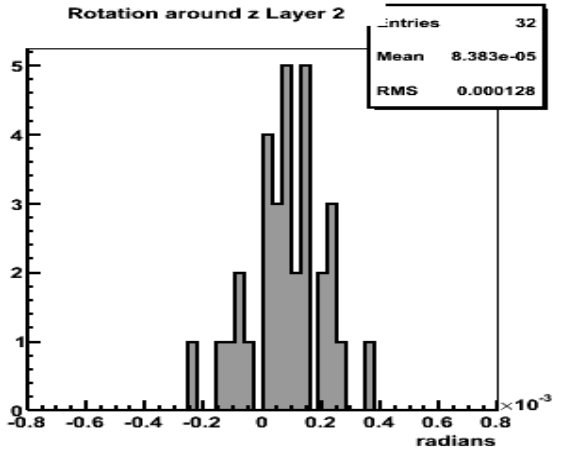




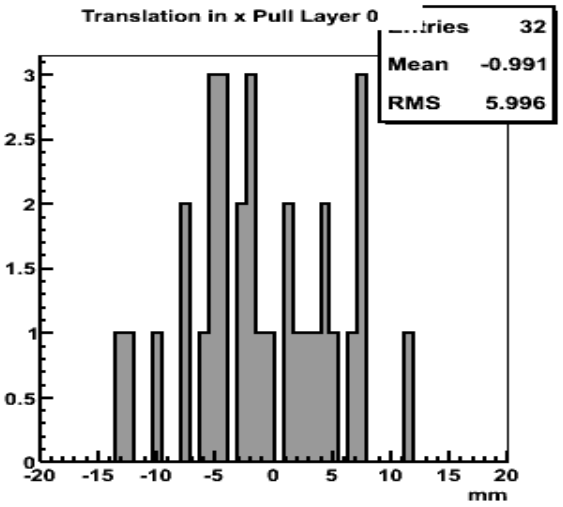


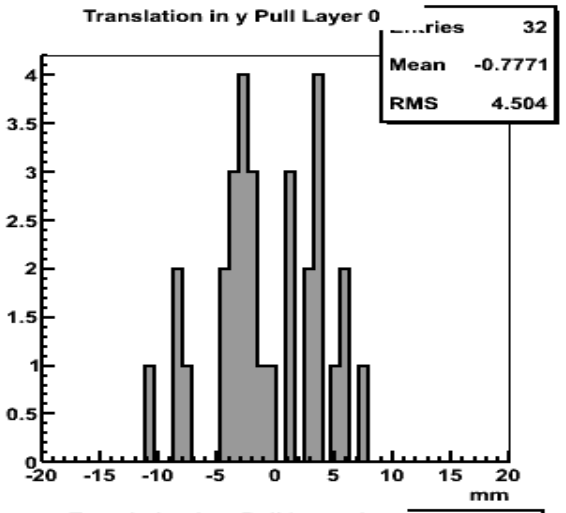


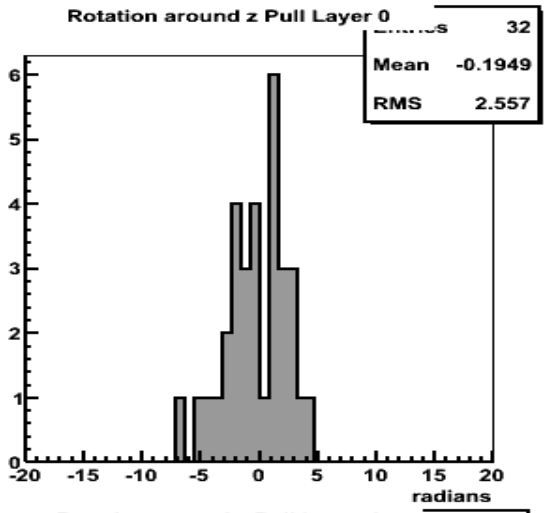


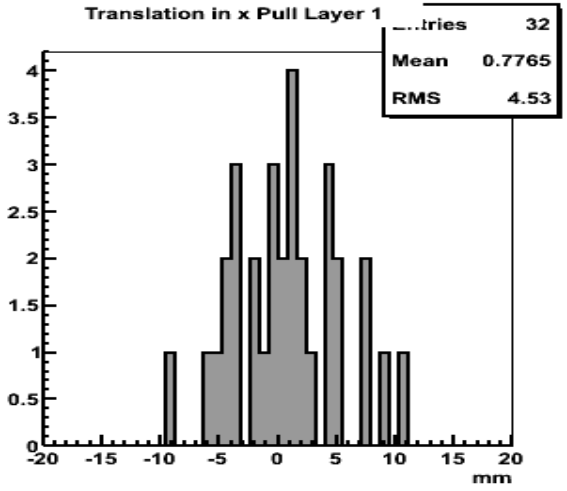


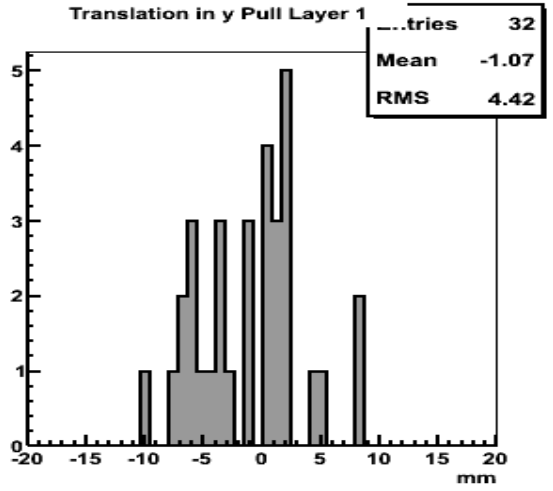
Pulls A vs C

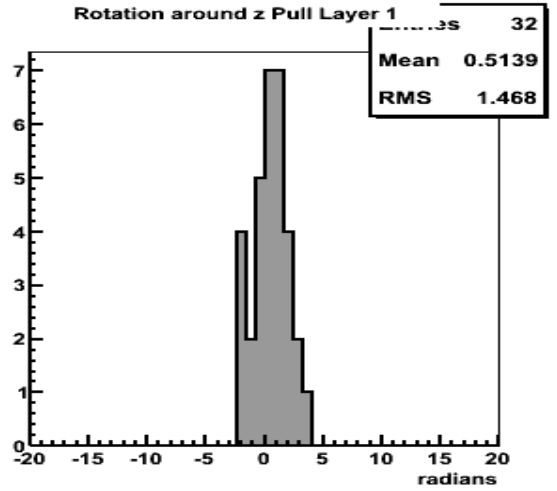

Translation in x Pull Layer 0
Mean -0.991
RMS 5.996
mm

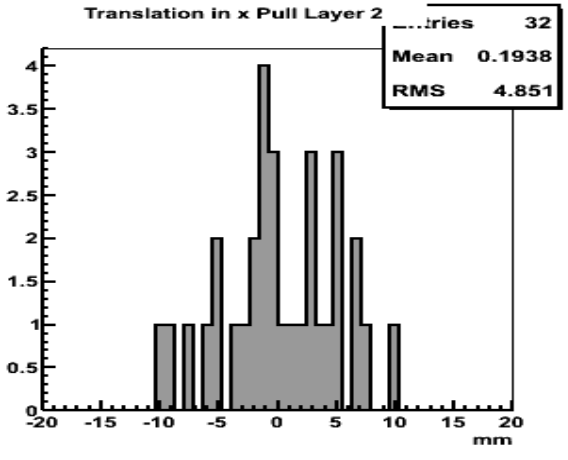

Translation in y Pull Layer 0
Mean -0.7771
RMS 4.504
mm

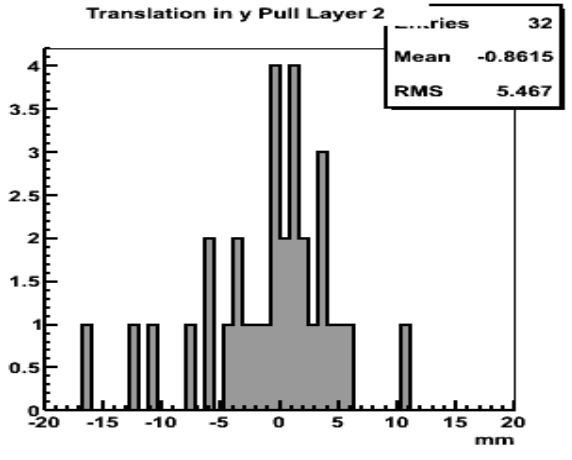

Rotation around z Pull Layer 0
Mean -0.1949
RMS 2.557
radians

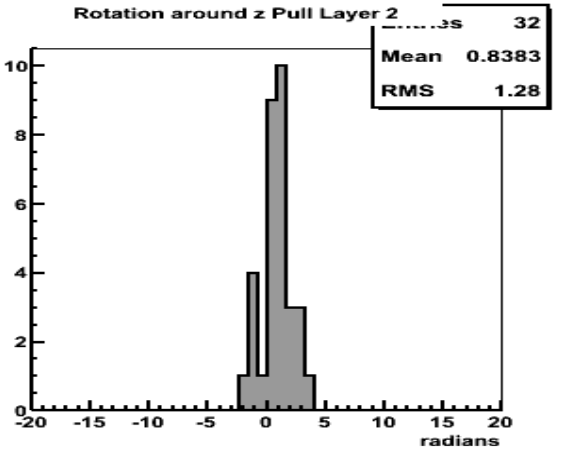

Translation in x Pull Layer 1
Mean 0.7765
RMS 4.53
mm


Translation in y Pull Layer 1
Mean -1.07
RMS 4.42
mm


Rotation around z Pull Layer 1
Mean 0.5139
RMS 1.468
radians


Translation in x Pull Layer 2
Mean 0.1938
RMS 4.851
mm


Translation in y Pull Layer 2
Mean -0.8615
RMS 5.467
mm


Rotation around z Pull Layer 2
Mean 0.8383
RMS 1.28
radians