~~First~~ Second Look At TRT L2 Endcap Alignment

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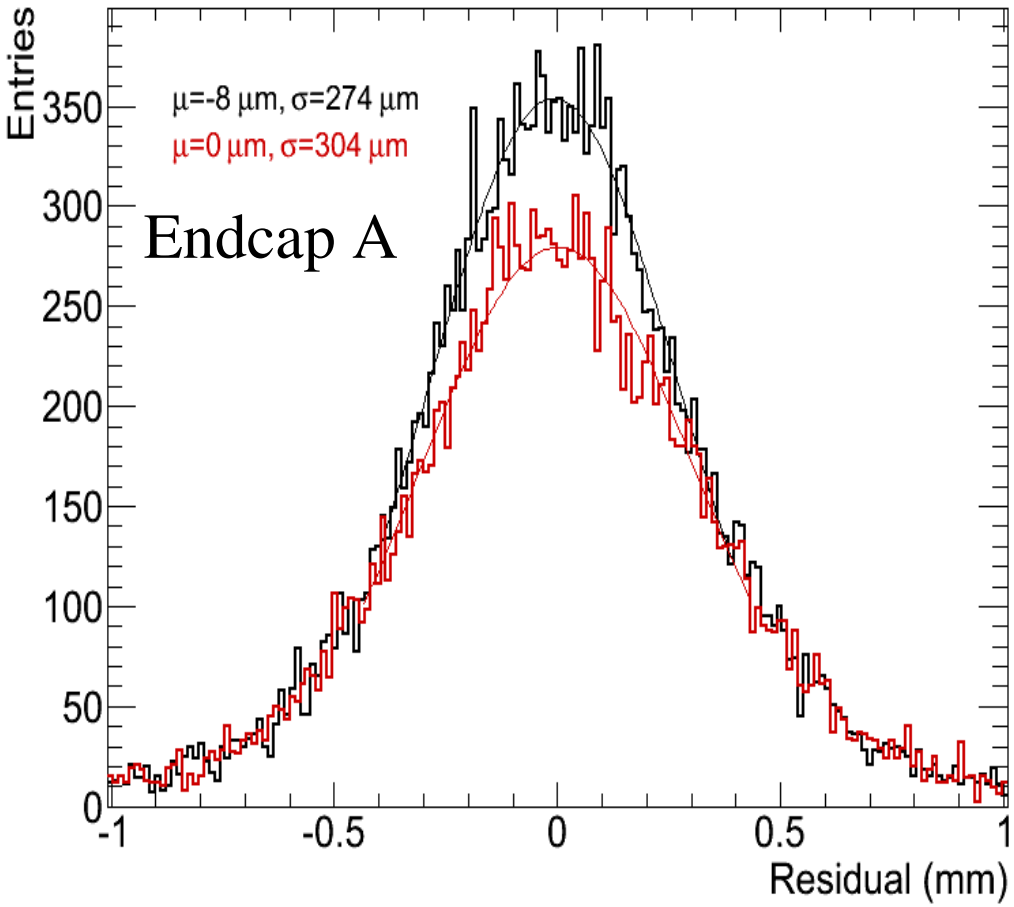
L2 Endcap Alignment

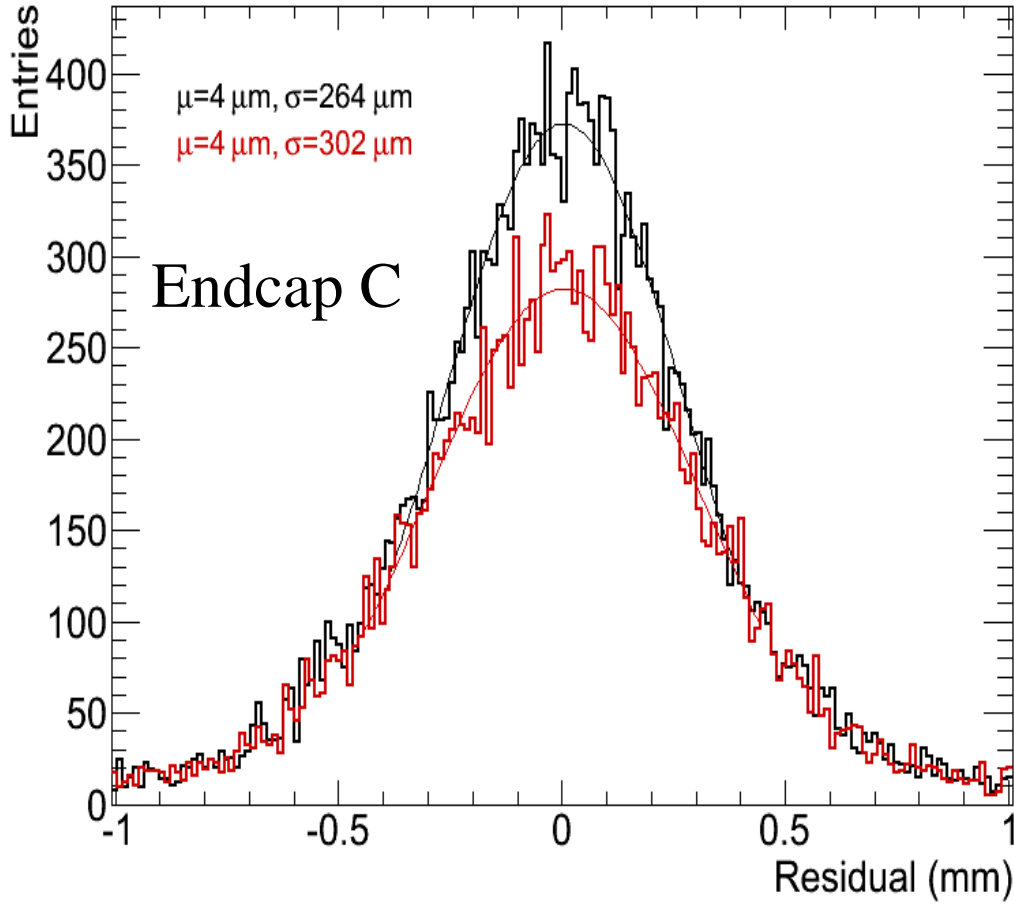
- **400K** events from fall **2008** data taken with **TGC stream**.
- Require **10 TRT Endcap hits, 5 SCT hits**
- Align each **4-straw plane wheel**. (6 x 2 x 2 + 8 x 2 = 40 rings/endcap)
- First Step step: align **rotations around global z, translations X and Y.**
- 3K tracks, ~1000 Hits per ring.

Alignment Convergence Endcap A

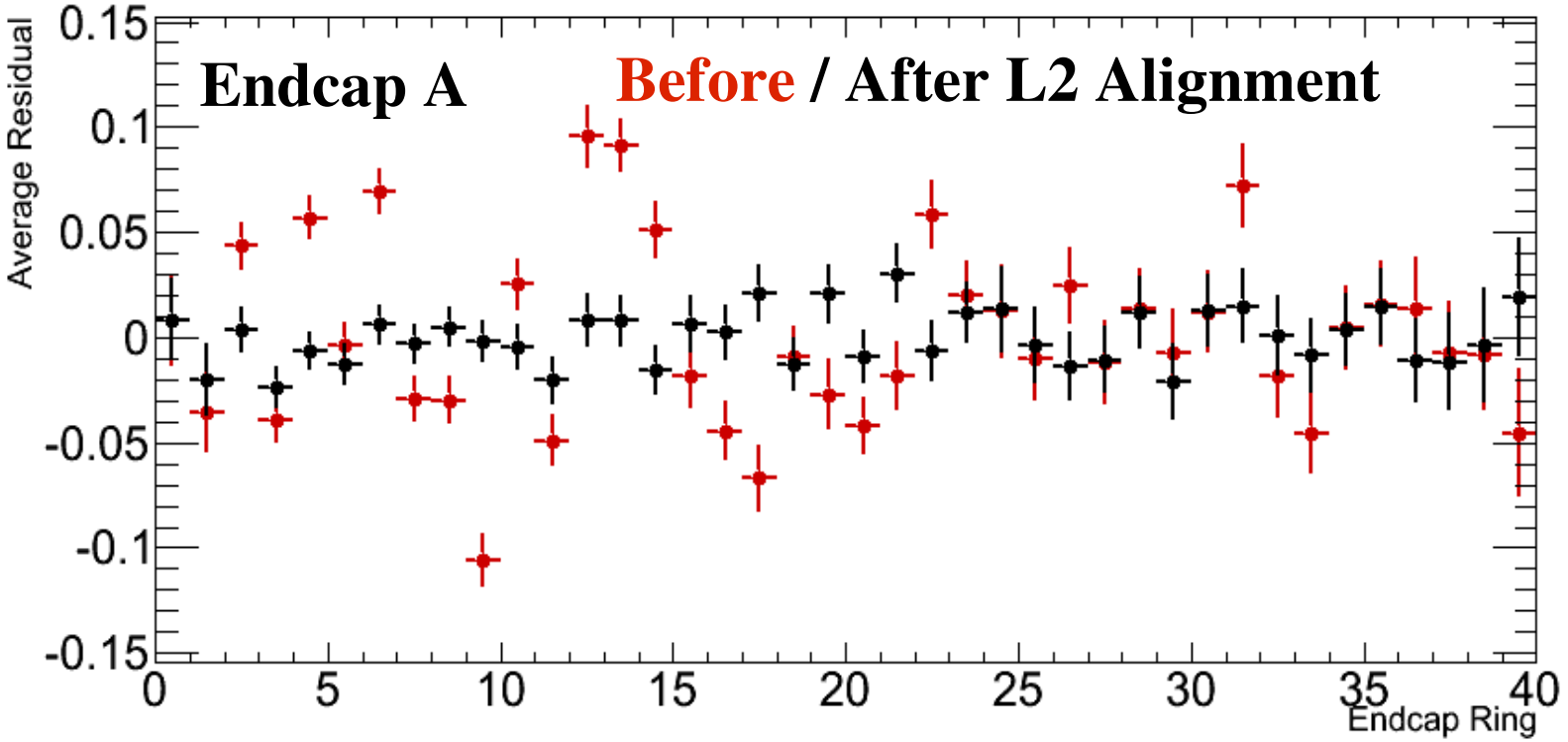
Alignment Convergence Endcap C

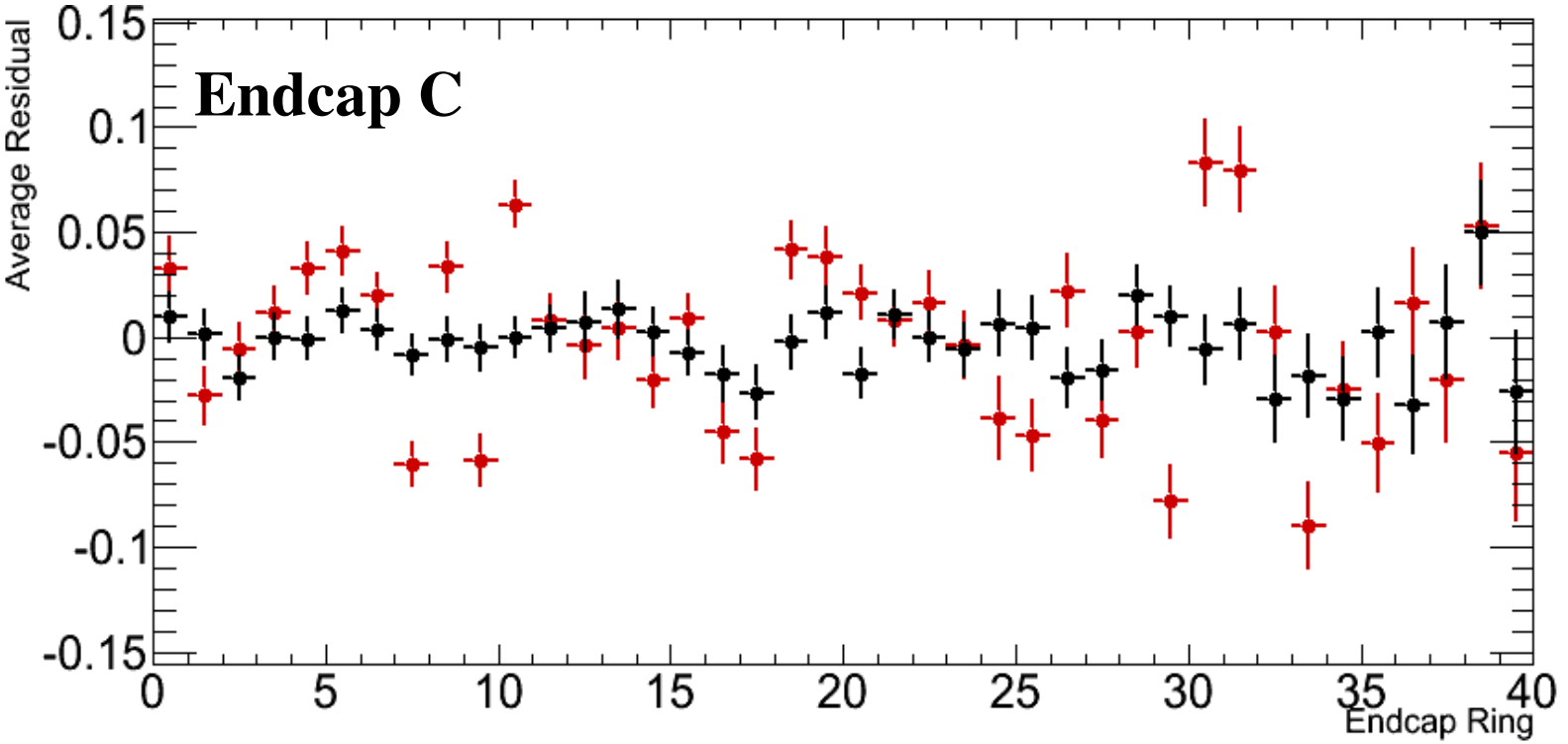
No pictures of convergence yet:
But it definitely was not as pretty as before.
Rot-z and Trans-x were OK
but Trans-y's convergence was worse





Before / After L2 Endcap Alignment


Endcap A
Before / After L2 Alignment
Average Residual
0.15
0.1
0.05
0
-0.05
-0.1
-0.15
0
5
10
15
20
25
30
35
40
Endcap Ring

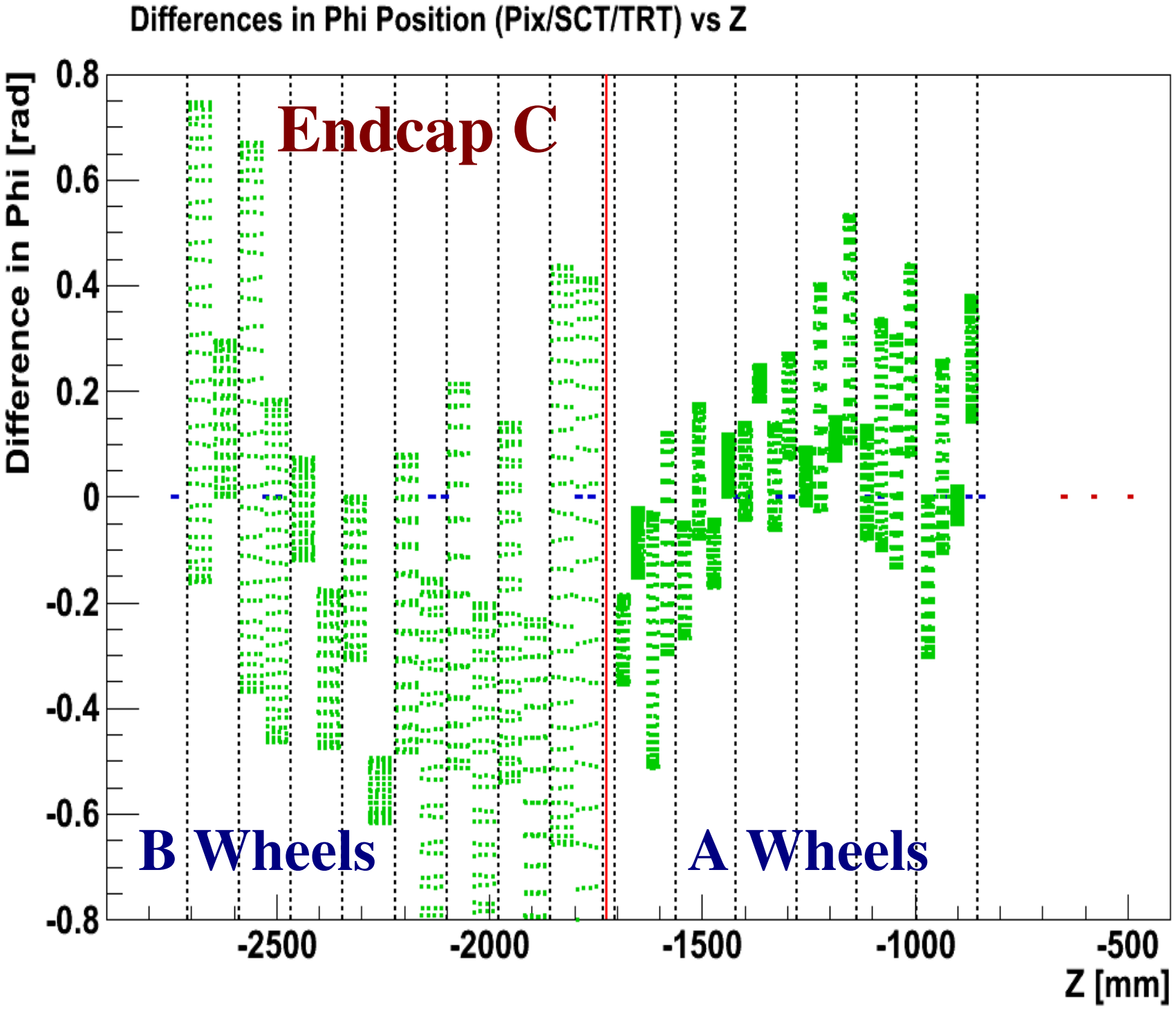

Endcap C
Average Residual
0.15
0.1
0.05
0
-0.05
-0.1
-0.15
0
5
10
15
20
25
30
35
40
Endcap Ring

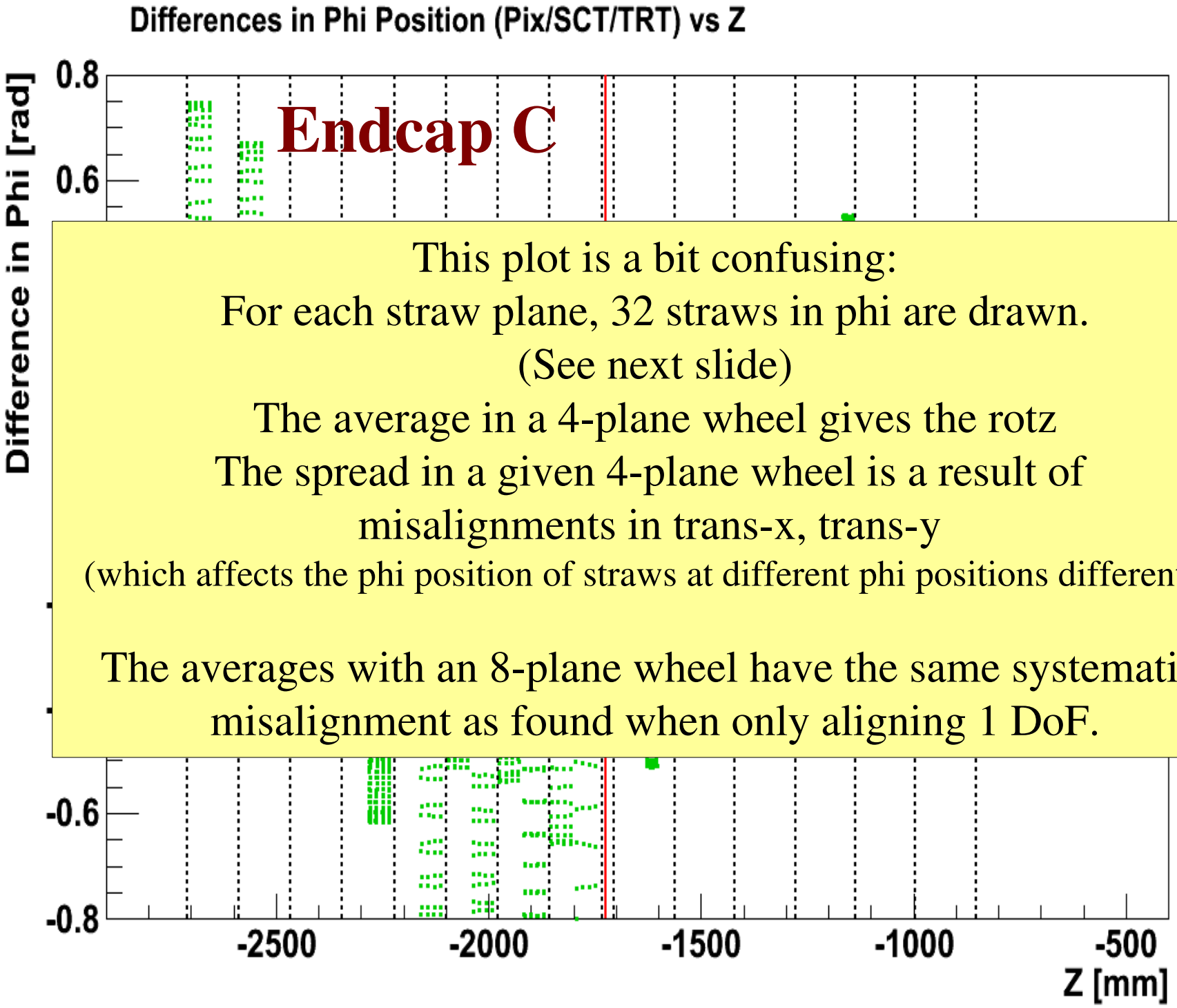
Geometry Comparison

Following slides show **differences** in Phi

(delta phi = atan(y1/x1) - atan(y2/x2)

Between Geometry **Before** and **After** L2 Endcap Alignment.

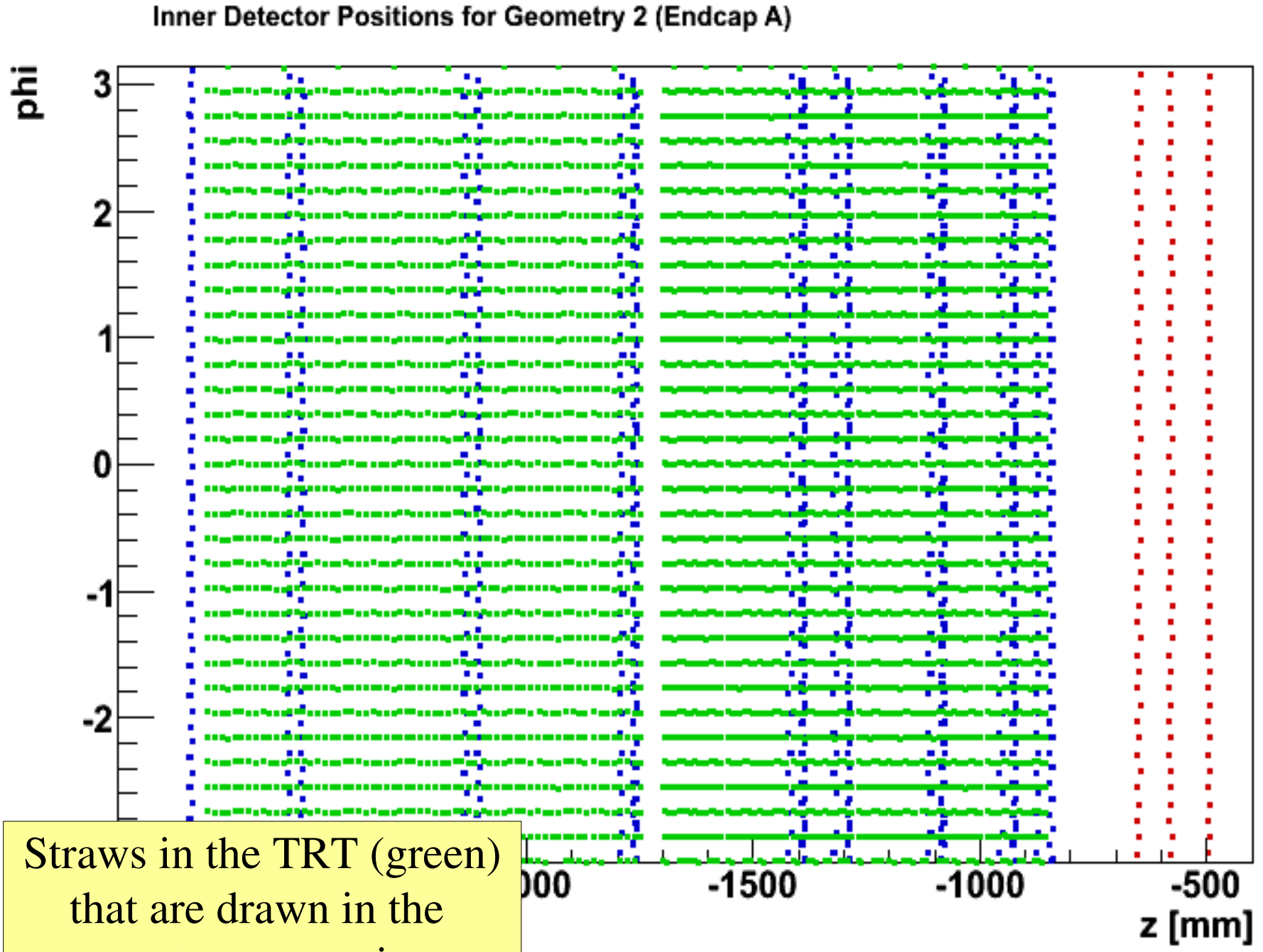

Differences in Phi Position (Pix/SCT/TRT) vs Z
Endcap C
B Wheels
A Wheels
Difference in Phi [rad]
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-2500
-2000
-1500
-1000
-500
Z [mm]



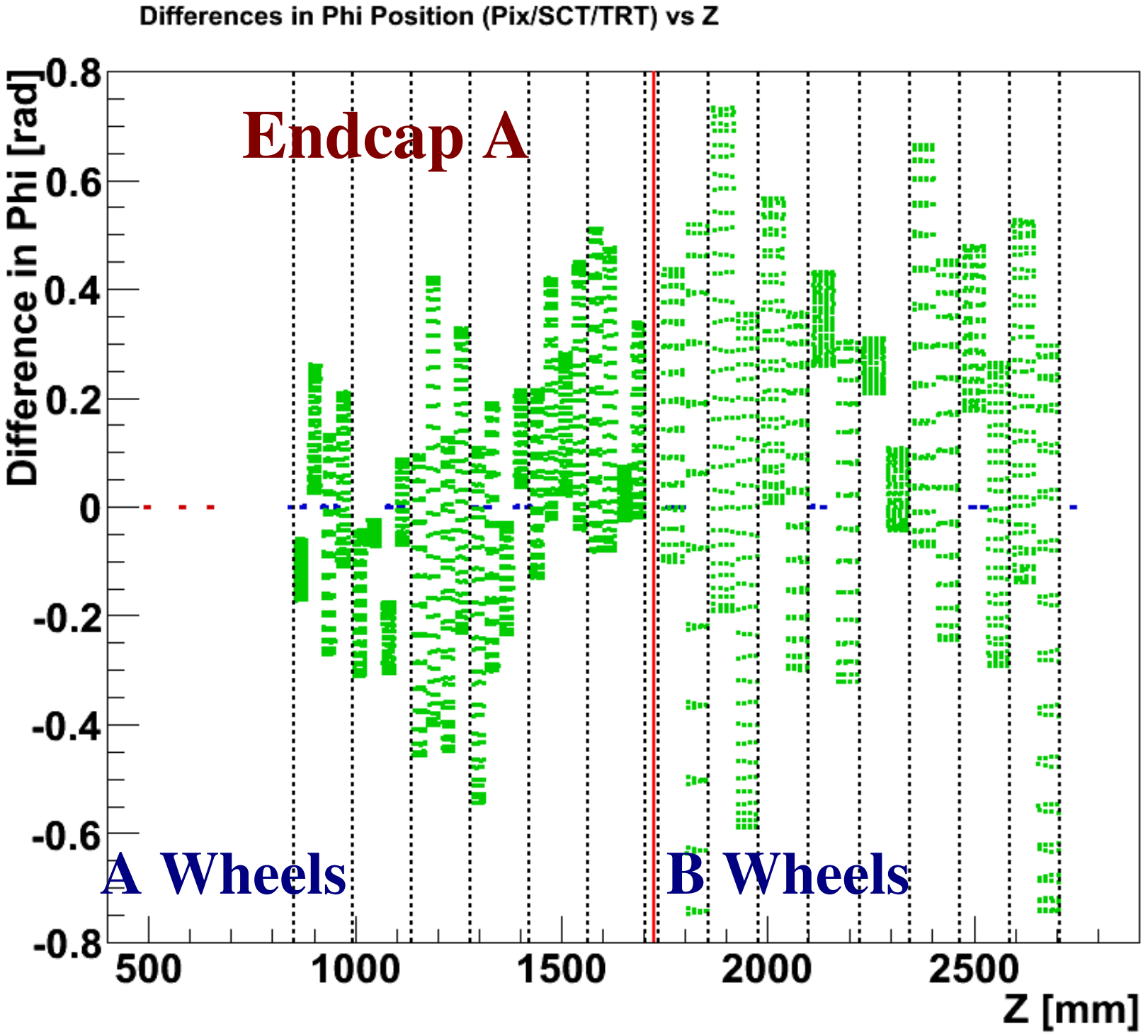
Endcap C

This plot is a bit confusing:
For each straw plane, 32 straws in phi are drawn.
(See next slide)
The average in a 4-plane wheel gives the rotz
The spread in a given 4-plane wheel is a result of misalignments in trans-x, trans-y
(which affects the phi position of straws at different phi positions differently)

The averages with an 8-plane wheel have the same systematic misalignment as found when only aligning 1 DoF.

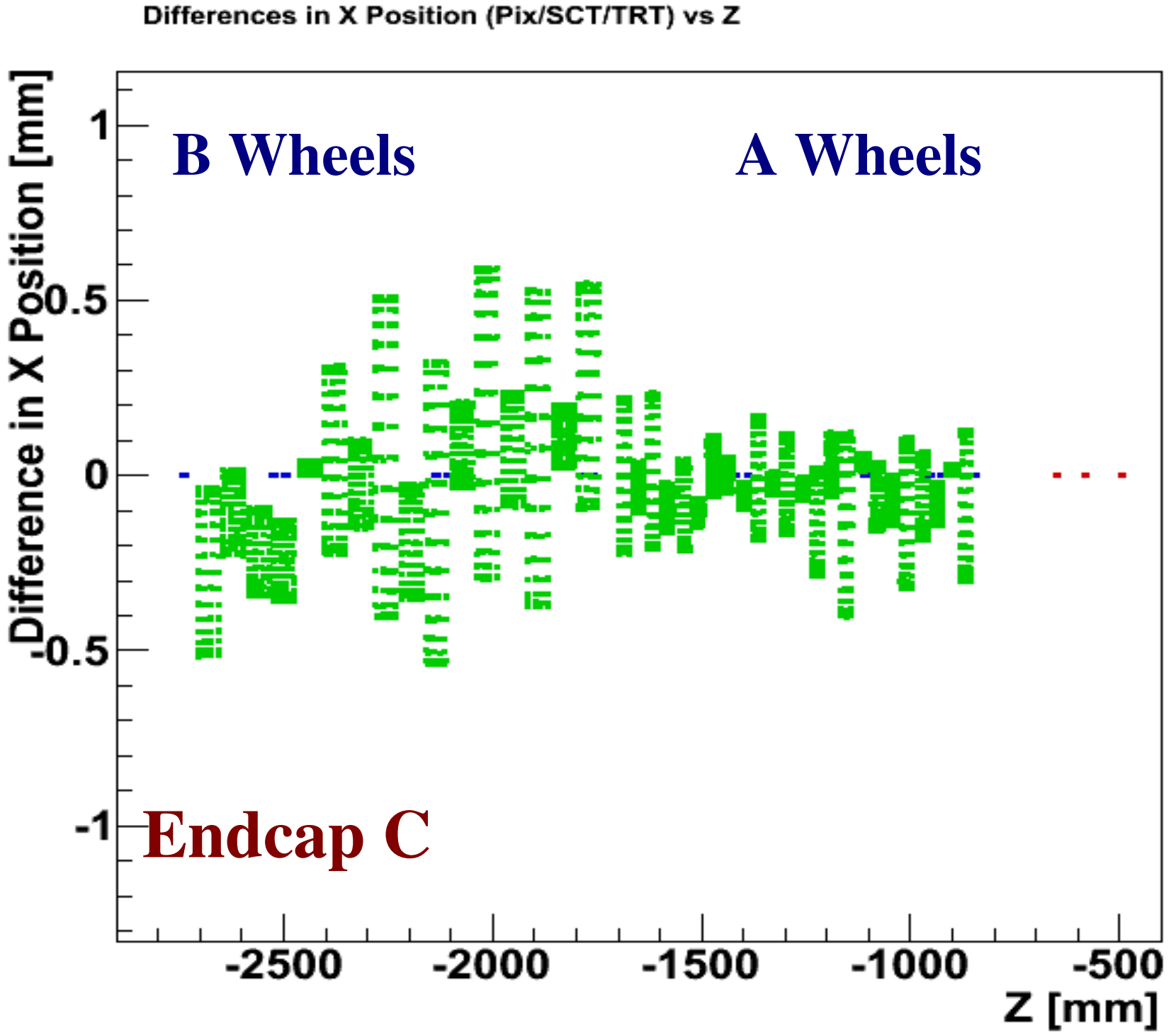


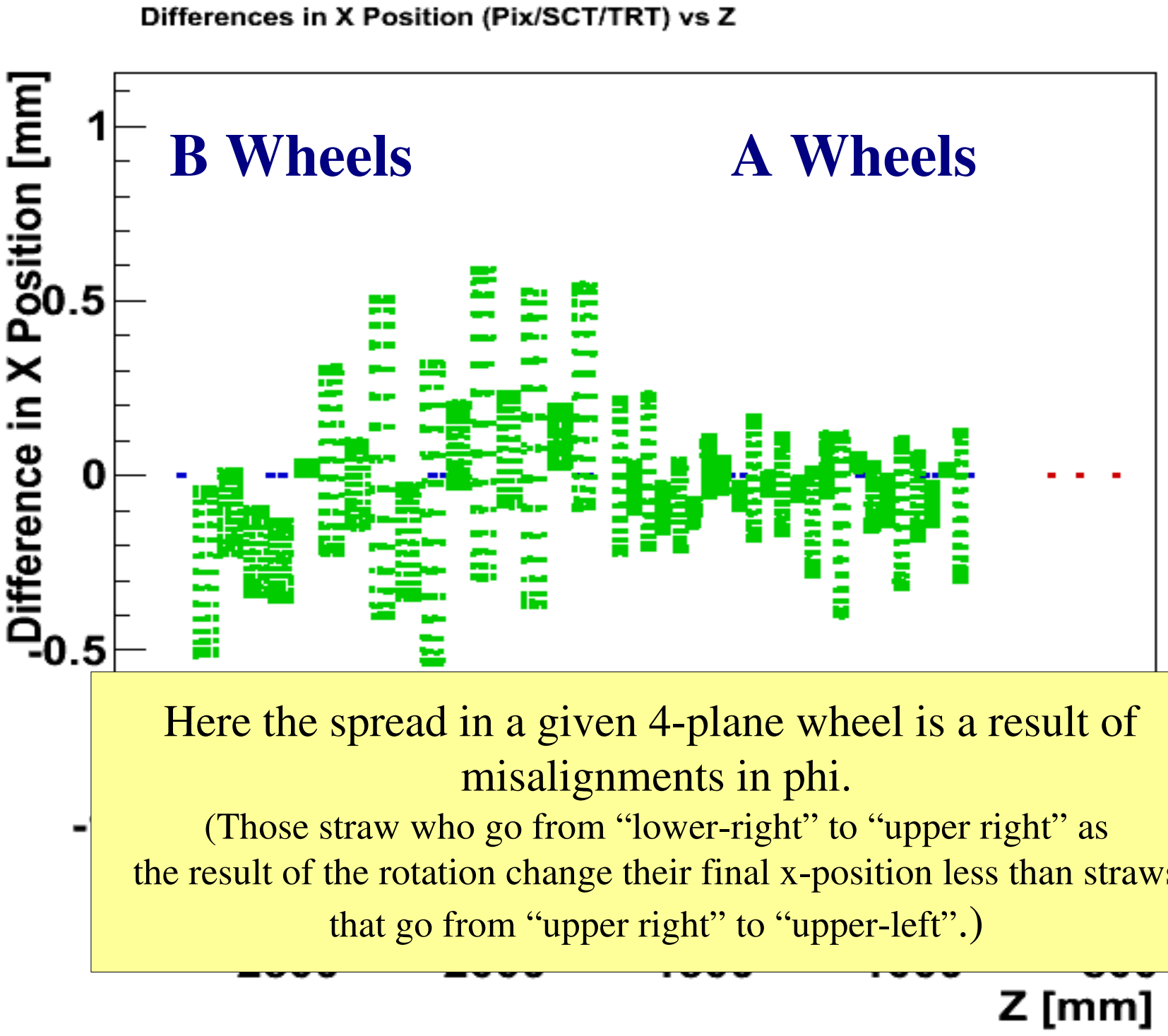
Straws in the TRT (green) that are drawn in the geometry comparisons


Differences in Phi Position (Pix/SCT/TRT) vs Z
Endcap A
A Wheels
B Wheels
Difference in Phi [rad]
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
500
1000
1500
2000
2500
Z [mm]

Geometry Comparison

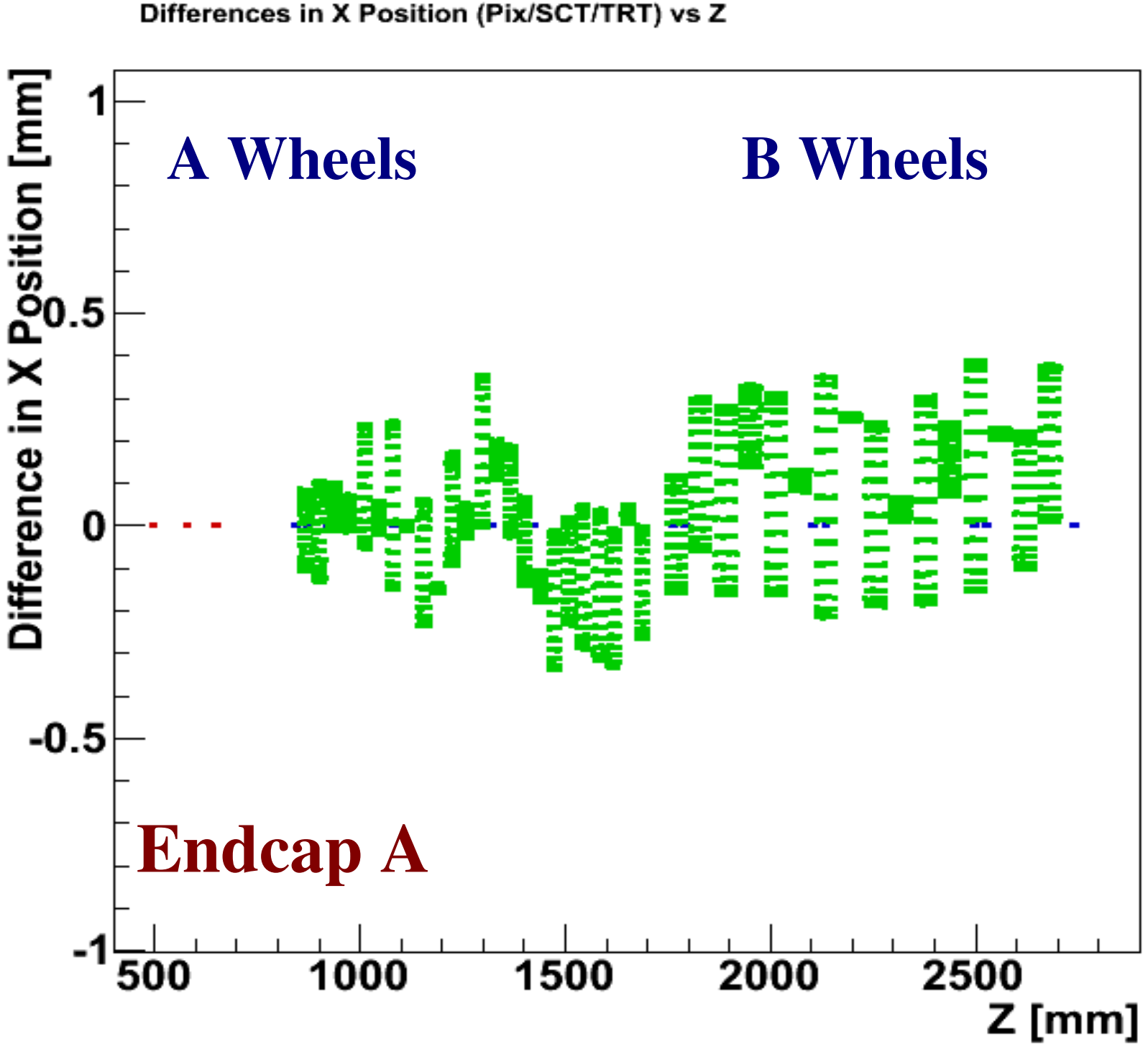
Following slides show **differences** in X
Between Geometry **Before** and **After** L2 Endcap Alignment.


Differences in X Position (Pix/SCT/TRT) vs Z
Difference in X Position [mm]
1
0.5
0
-0.5
-1
B Wheels
A Wheels
Endcap C
-2500
-2000
-1500
-1000
-500
Z [mm]



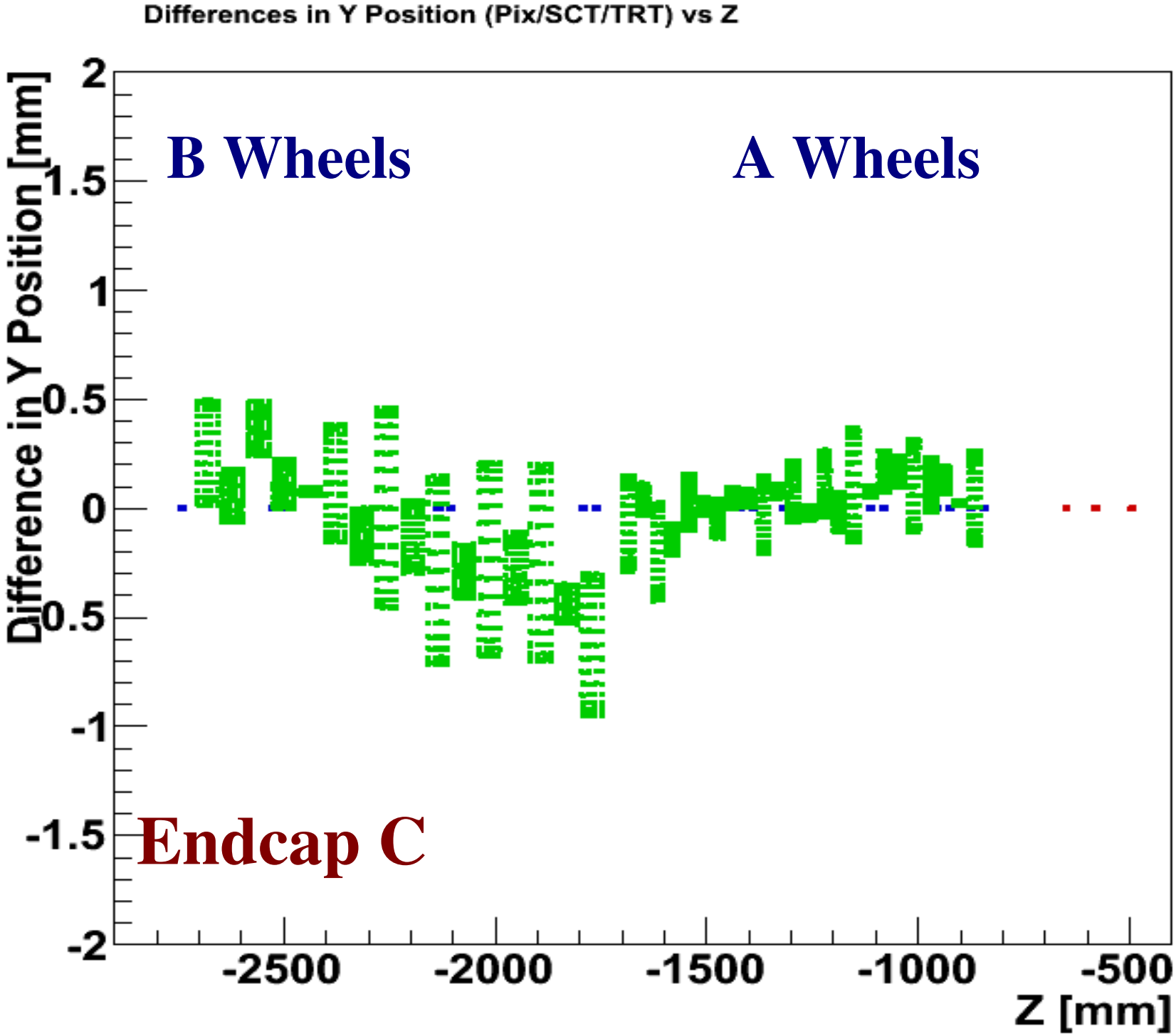
Here the spread in a given 4-plane wheel is a result of misalignments in phi.

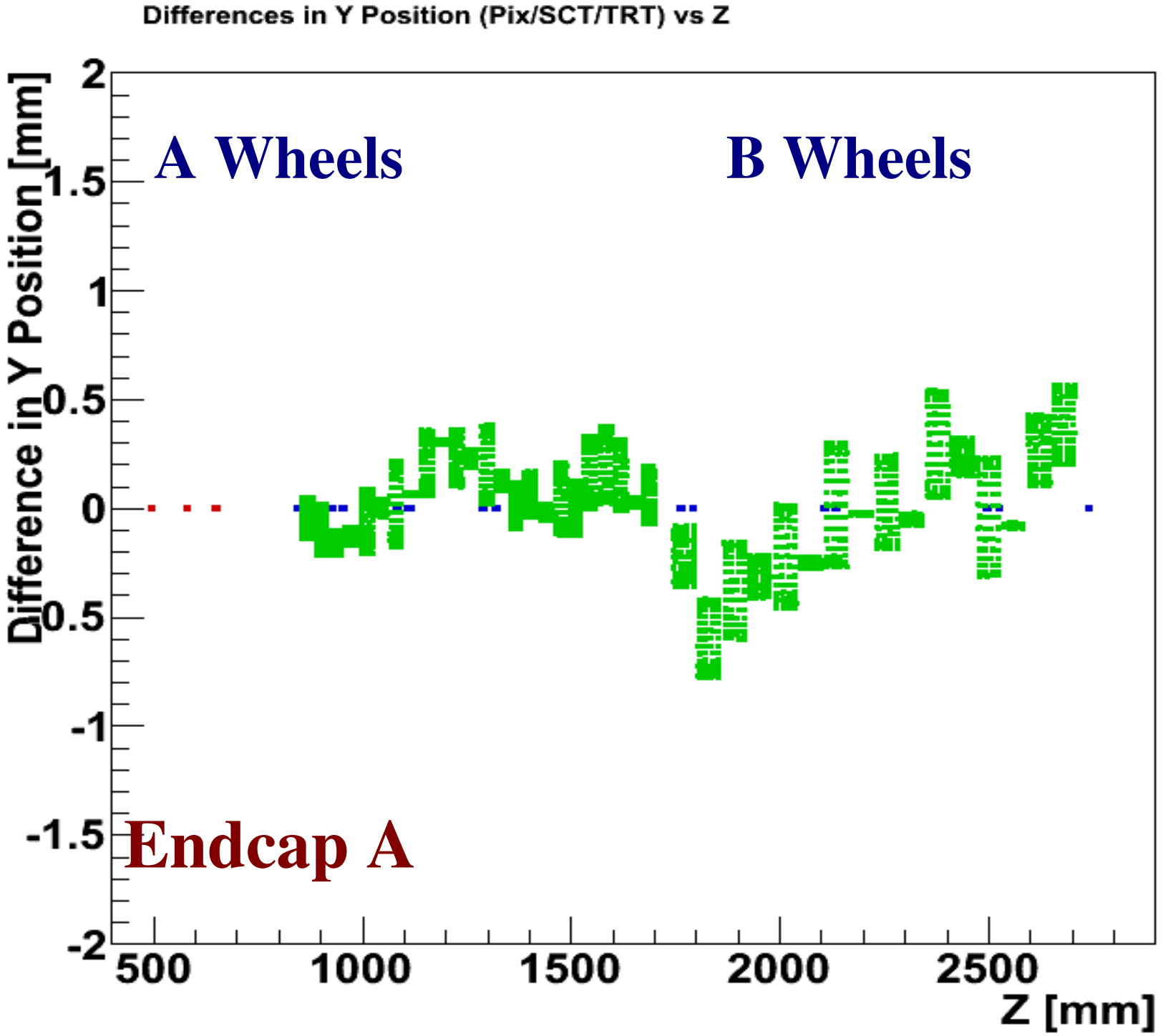
(Those straw who go from "lower-right" to "upper right" as the result of the rotation change their final x-position less than straws that go from "upper right" to "upper-left".)


Differences in X Position (Pix/SCT/TRT) vs Z
Difference in X Position [mm]
1
0.5
0
-0.5
-1
500
1000
1500
2000
2500
Z [mm]
A Wheels
B Wheels
Endcap A

Geometry Comparison

Following slides show **differences** in Y
Between Geometry **Before** and **After** L2 Endcap Alignment.


Differences in Y Position (Pix/SCT/TRT) vs Z
Difference in Y Position [mm]
2
1.5
1
0.5
0
0.5
-1
-1.5
-2
B Wheels
A Wheels
Endcap C
-2500
-2000
-1500
-1000
-500
Z [mm]


Differences in Y Position (Pix/SCT/TRT) vs Z
Difference in Y Position [mm]
2
1.5
1
0.5
0
0.5
-1
-1.5
-2
500
1000
1500
2000
2500
Z [mm]
A Wheels
B Wheels
Endcap A

Preliminary Remarks

- TRT L2 Endcap Alignment well behaved with cosmics.
- In general rotz < ½ milli-radian
- Appears to be systematic misalignment between 4-plane rings within 8-plane wheels. (Reasonable?)
- Larger, more coherent twisting of Endcap C.

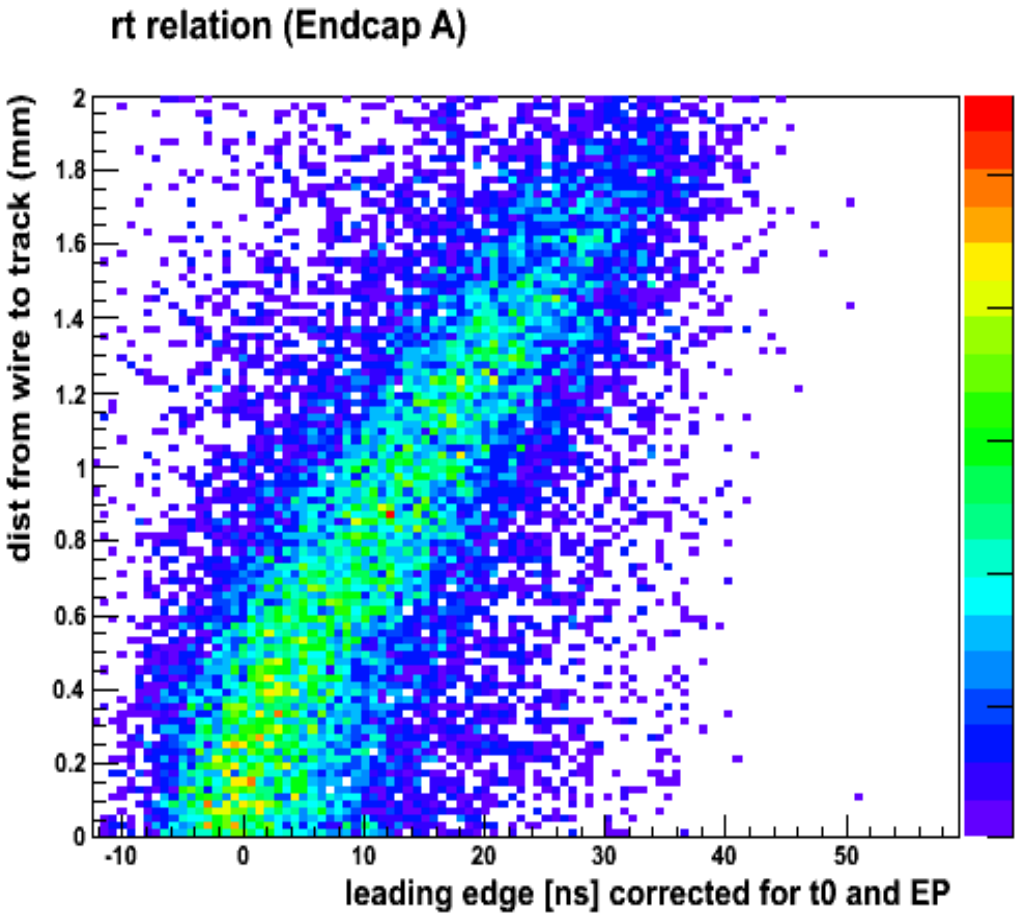
Backups

Track Selection

```
# Configure Track Selection
# ==============================
SelectTRTAlignTracks.inputTrackList = 'Tracks'
if solenoidOn:
    SelectTRTAlignTracks.PtMin = 2000
else:
    SelectTRTAlignTracks.DoPtCut = False
SelectTRTAlignTracks.MinPixelHits = 0
SelectTRTAlignTracks.MinSCTHits = 5
SelectTRTAlignTracks.MinTRTHits = 10
SelectTRTAlignTracks.RequireEndcapHits = True
SelectTRTAlignTracks.MinEndcapHits = 10
SelectTRTAlignTracks.MinBarrelHits = 0
SelectTRTAlignTracks.UseCosmicTrackSelection = True
SelectTRTAlignTracks.OneTrackPerEvent = True

topSequence += SelectTRTAlignTracks
print          SelectTRTAlignTracks
```

Before Alignment



After Alignment