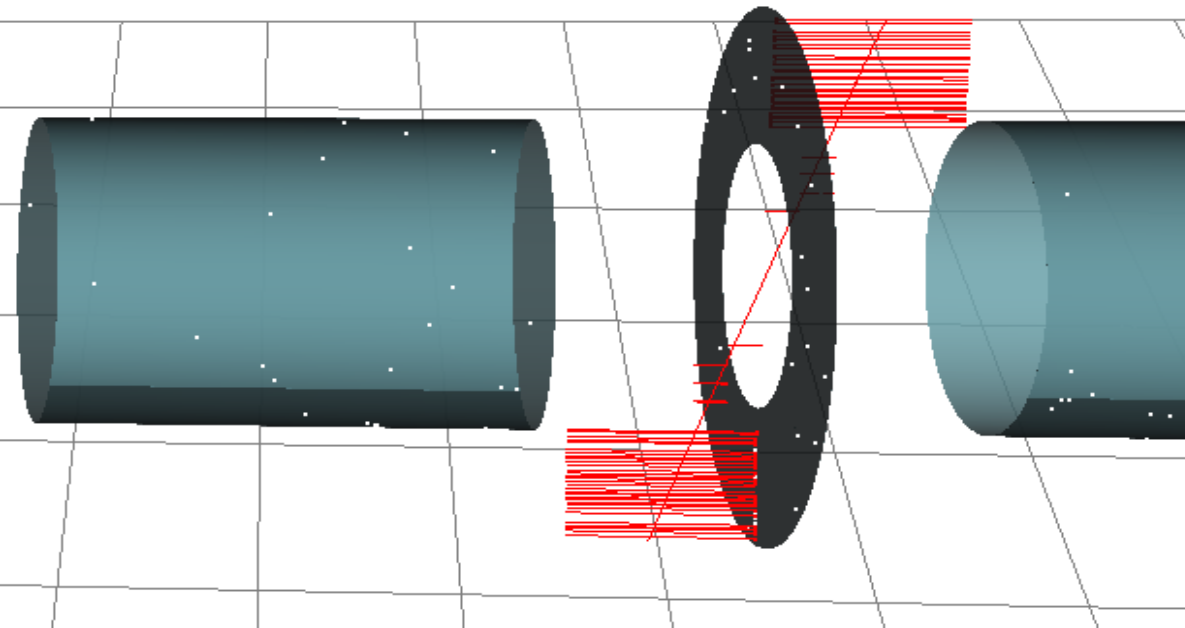# TRT Alignment with Cosmics

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Andrea Bocci

<u>Outline:</u>

- L1 Results
- What we've learned
- Outstanding Issues

L1 TRT Alignment Results

Initial Alignment

- Aligned TRT Barrel (5 DoF) and Endcaps (6 DoF) with run 90275
    Early run with B-Field and after the Xe gas change.
- Saw convergence, increase in hits / tracks with iteration.
    (Convergence an issue with some endcap DoFs)
- Monitoring plots validated alignment -> put in db
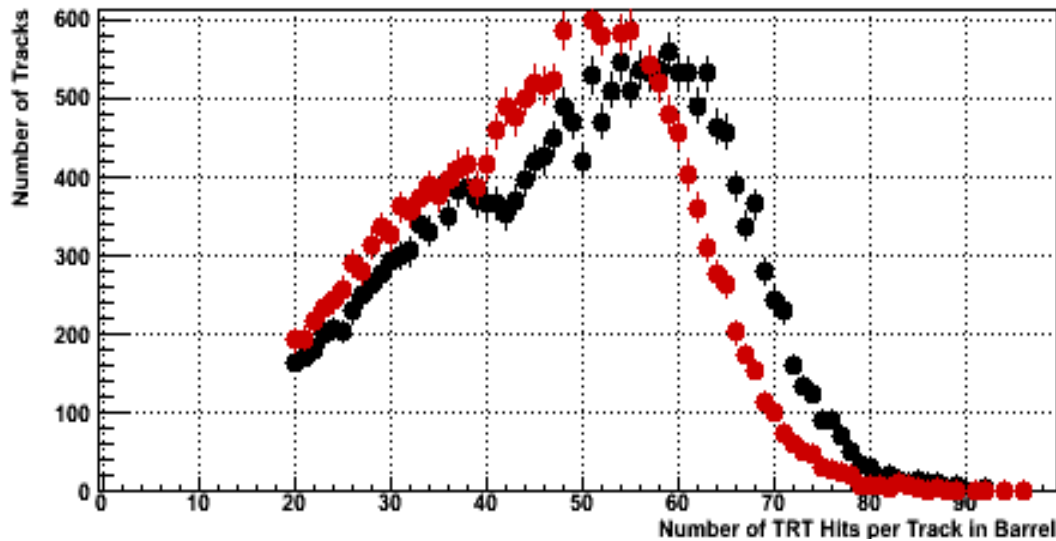

Plan

  - Align Barrel at L1 first (test robustness / estimate errors)
  - Use Barrel alignment as starting point for endcap alignment (same)
  - L2
  - L3

Ran into problems with step one of plan, which now seem to resolved.

L1 Alignment Results
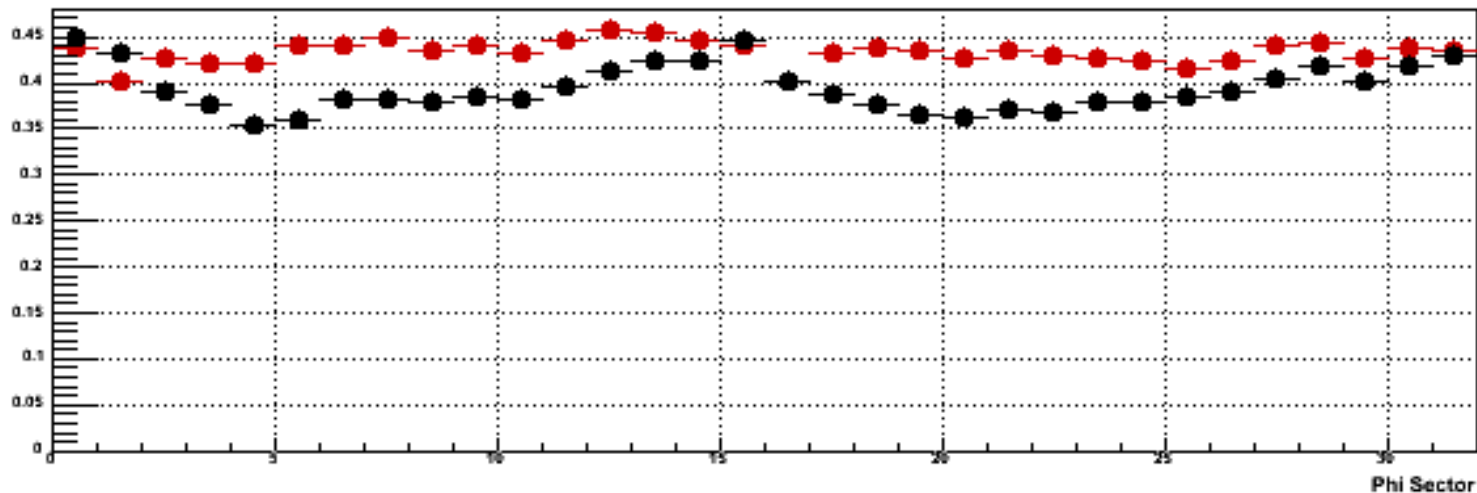
Number of trthits per track (Barrel)

Before TRT L1 Alignment

After TRT L1 Alignment

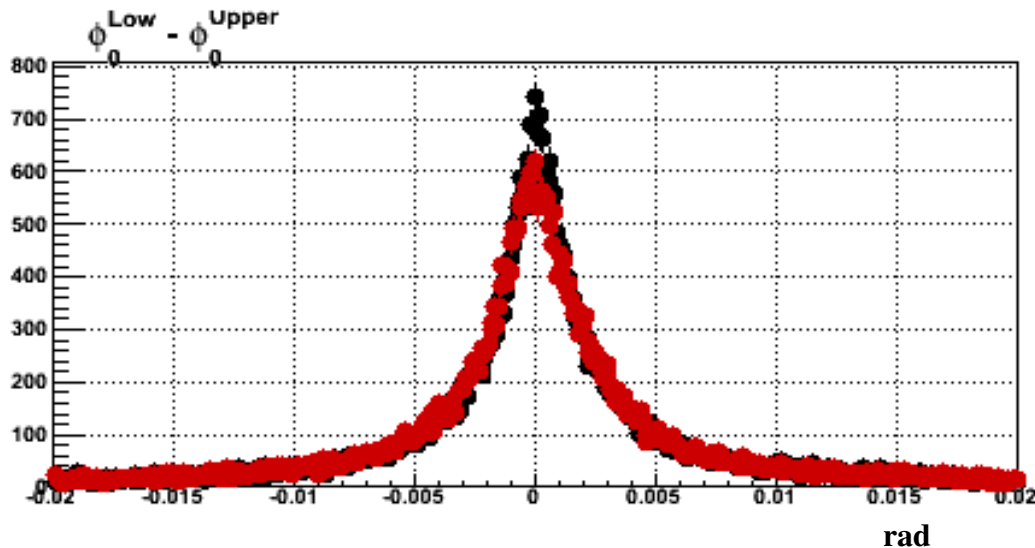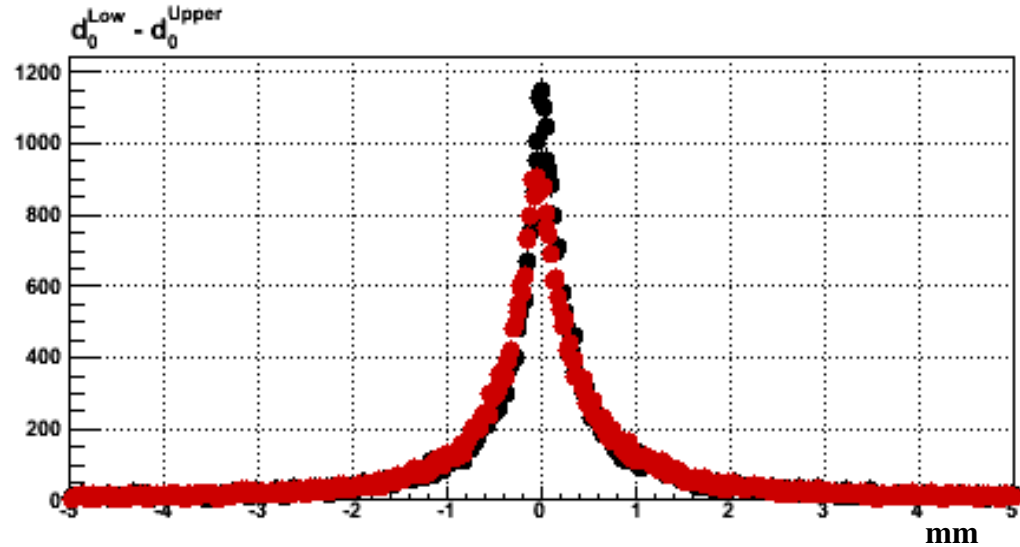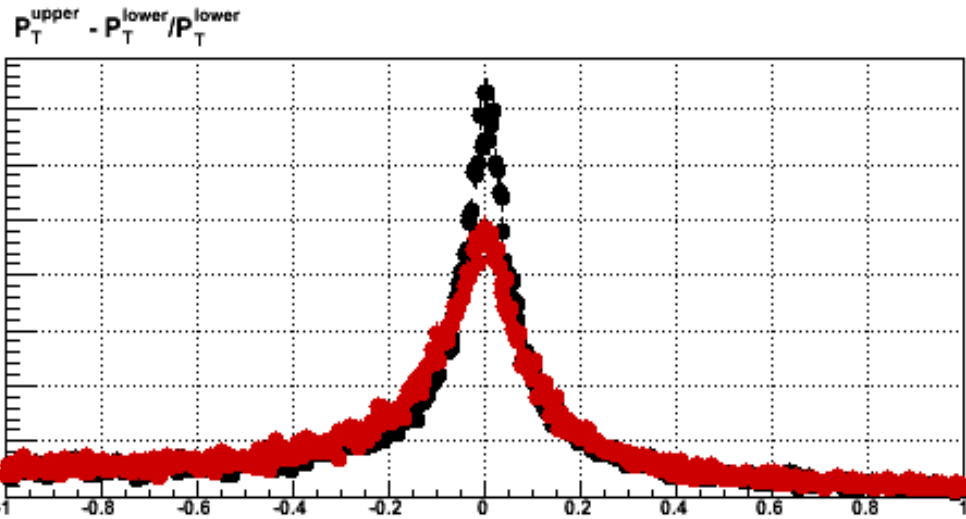Both with most recent Si Alignments

From Alignment Monitoring

Residual RMS vs Phi Sector for TRT Barrel Layer2

Overall resolution improves by ~ 100 microns

L1 Alignment Results

Before TRT L1 Alignment

After TRT L1 Alignment
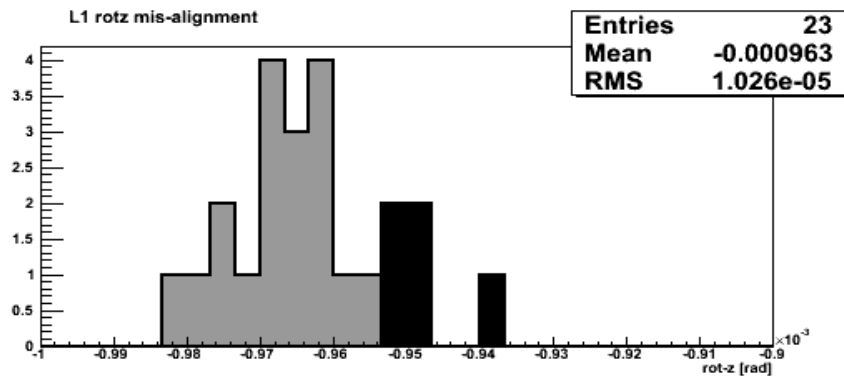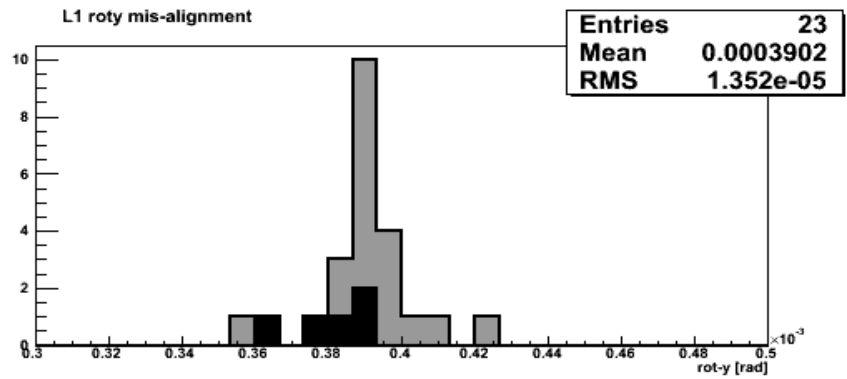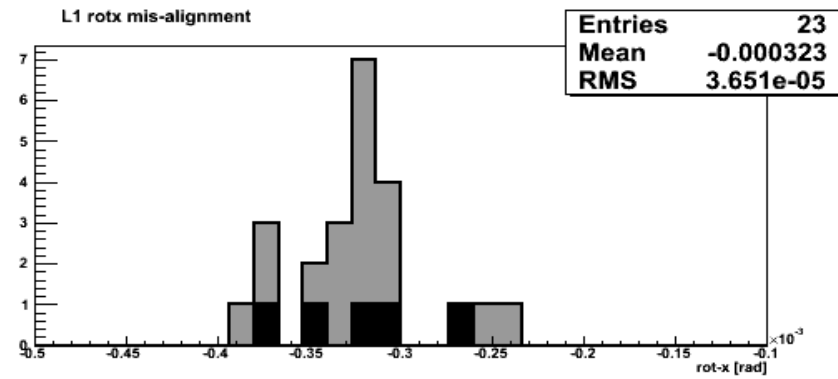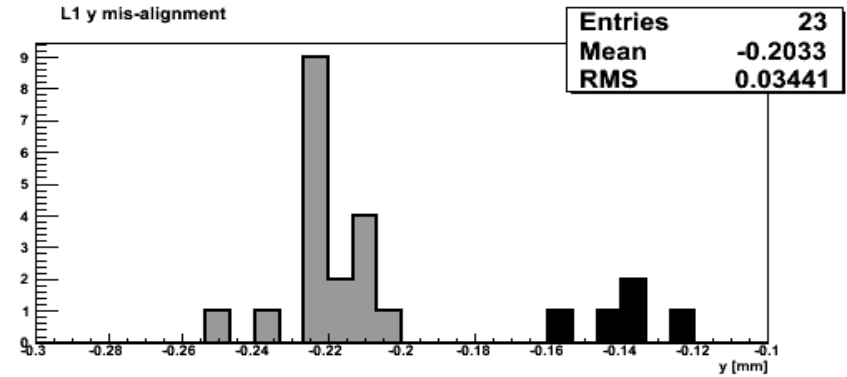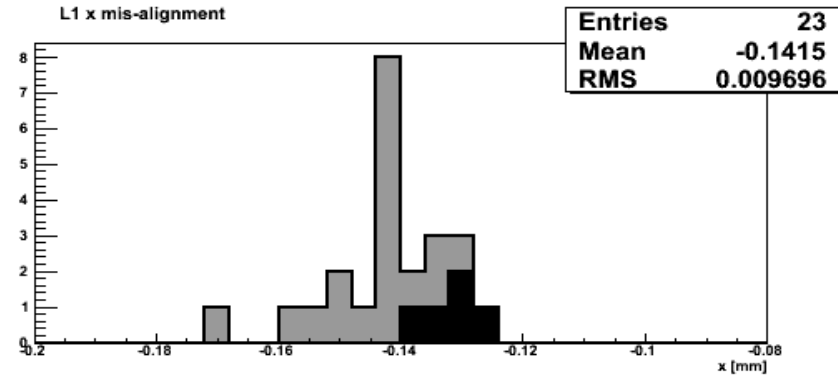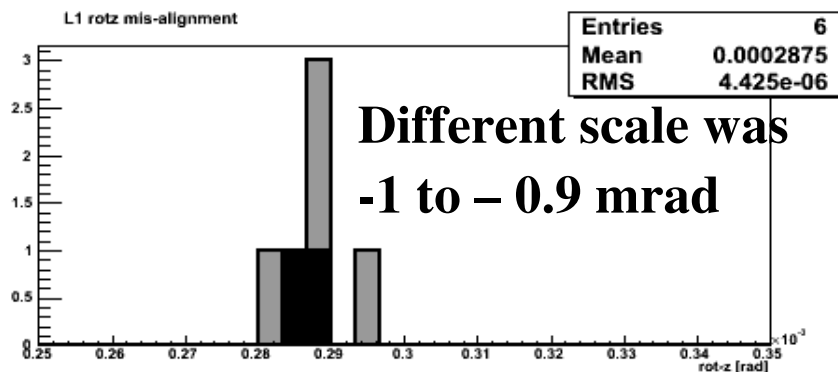
Both with most recent Si Alignments

From Alignment Monitoring

What we've learned

TRT L1 Alignment depends on Si alignment

Field On
Field Off

TRT L1 Alignment depends on Si alignment

Different scale was -1 to – 0.9 mrad
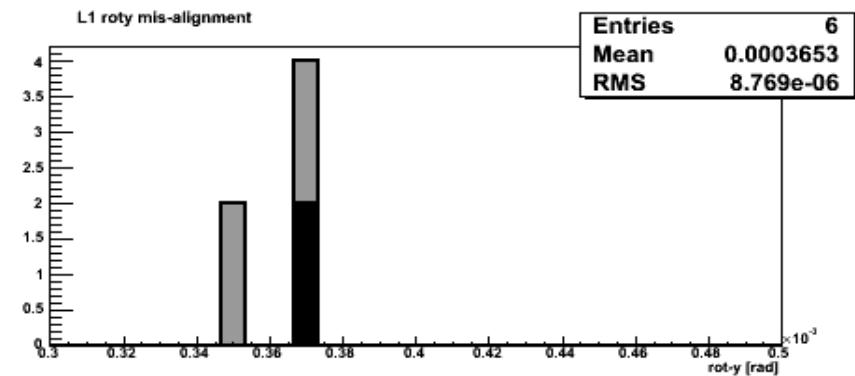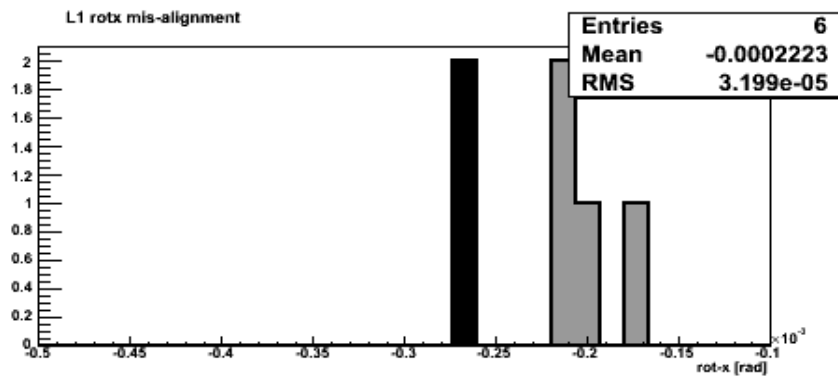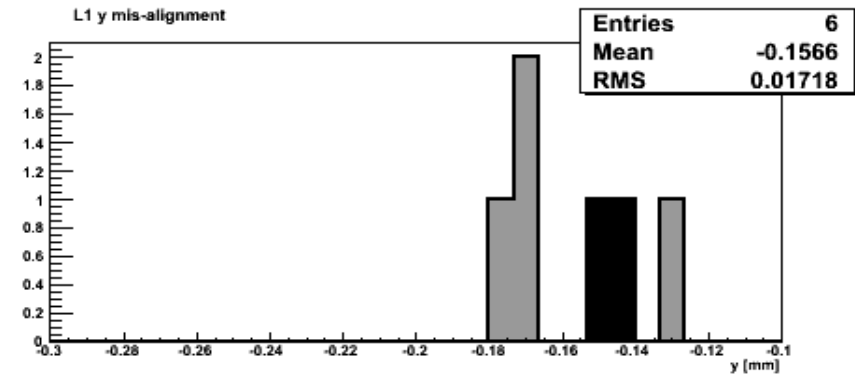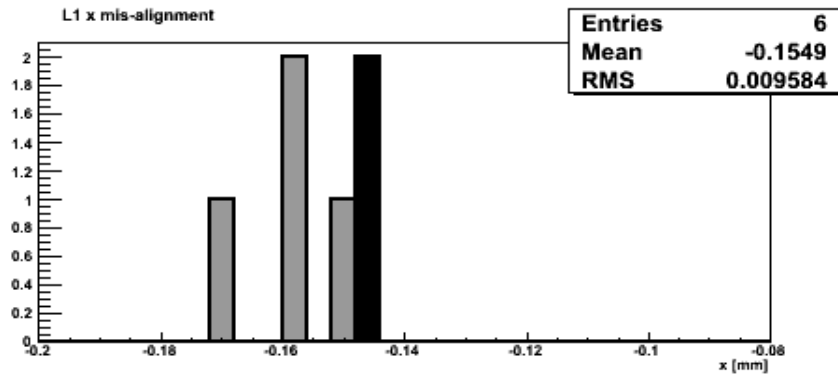
Field On
Field Off

TRT L1 Alignment does not depend on differences in TRT calibration

Results from:
- Monte Carlo with B on
- CTB with B off
- Calibration results with B on
- Calibration results with B off

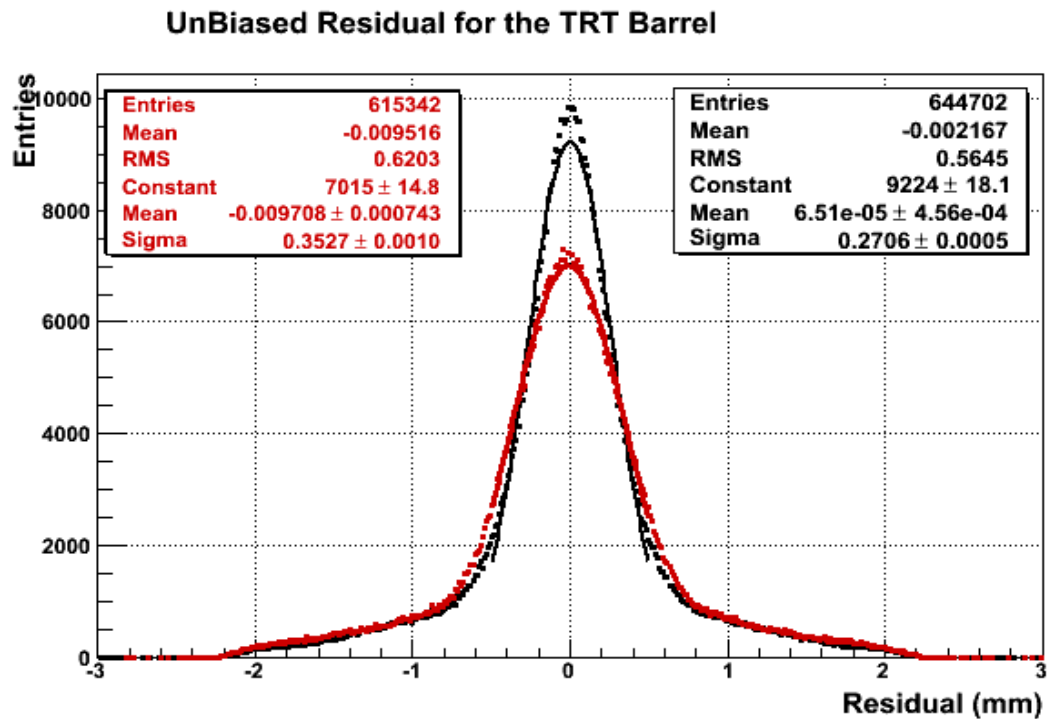All agree at the level of microns and micro-radians.

Outstanding Issues

Outstanding Issues

- Resolution of TRT-only tracks 210 microns
- Resolution of Combined (> 5 SCT hits, > 20 TRT hits) tracks is 260 microns

UnBiased Residual for the TRT Barrel

Entries	615342
Mean	-0.009516
RMS	0.6203
Constant	7015 ± 14.8
Mean	-0.009708 ± 0.000743
Sigma	0.3527 ± 0.0010

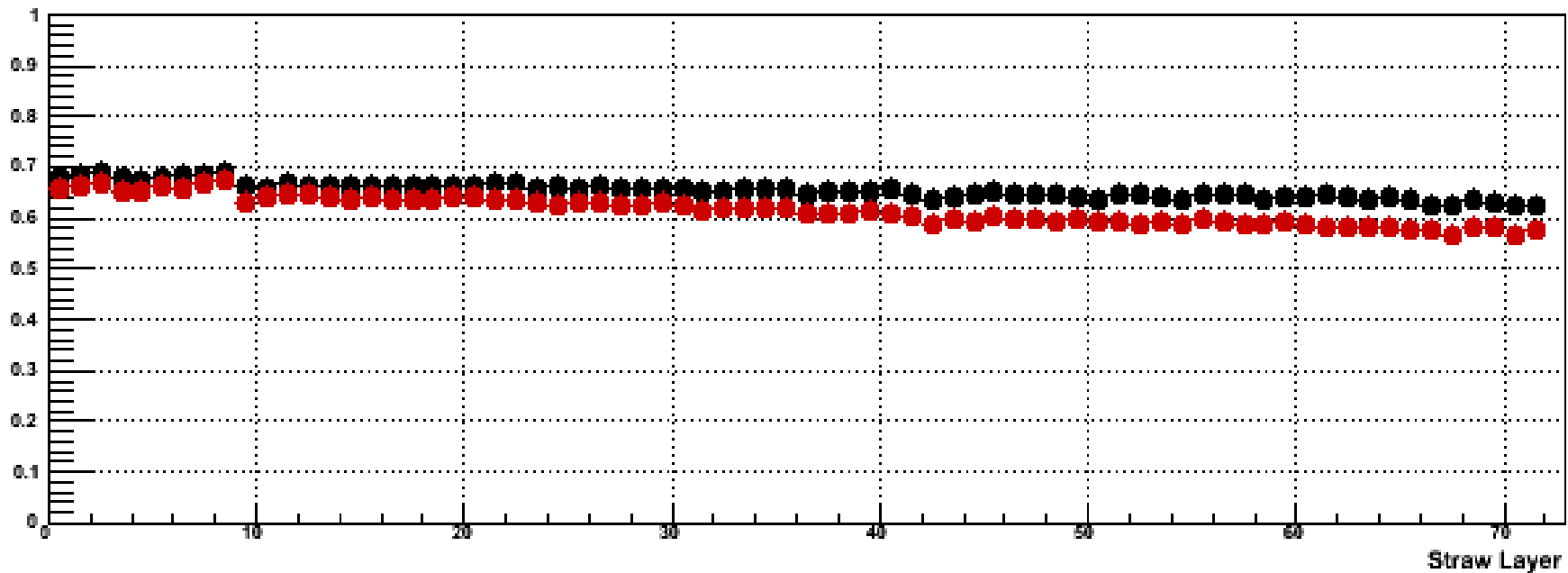|	
Entries	644702
Mean	-0.002167
RMS	0.5645
Constant	9224 ± 18.1
Mean	6.51e-05 ± 4.56e-04
Sigma	0.2706 ± 0.0005

- Track Selection issue ?
- Si Hit Selection issue ?
- Calibration ?
- L1 Alignment ?

Outstanding Issues

- Layers with short straws have higher % of precision hits.
- Ratio is function of R

Ratio Hits to total measurements vrs Straw Layer (Intergrated over Phi) for TRT Barrel layer
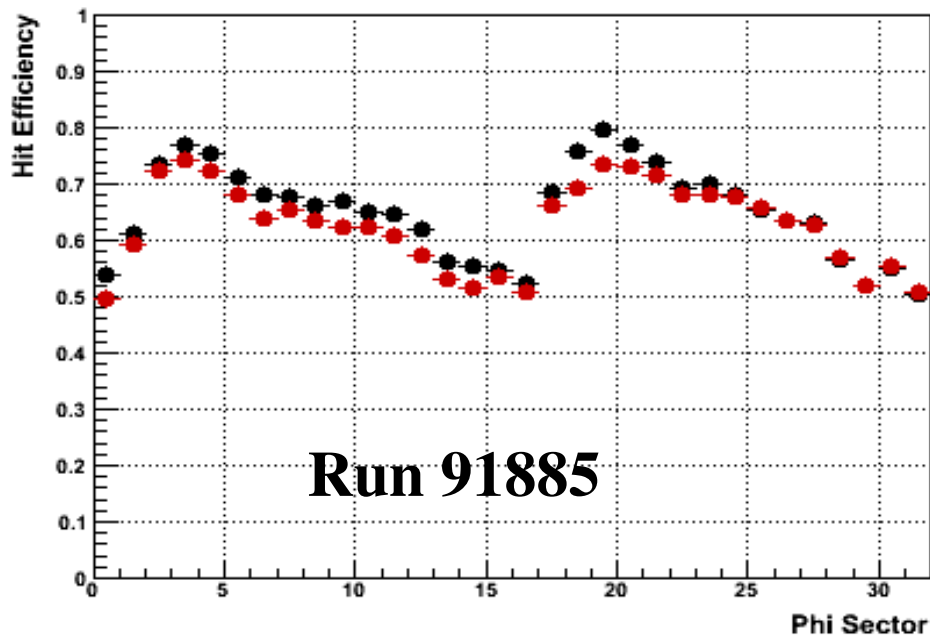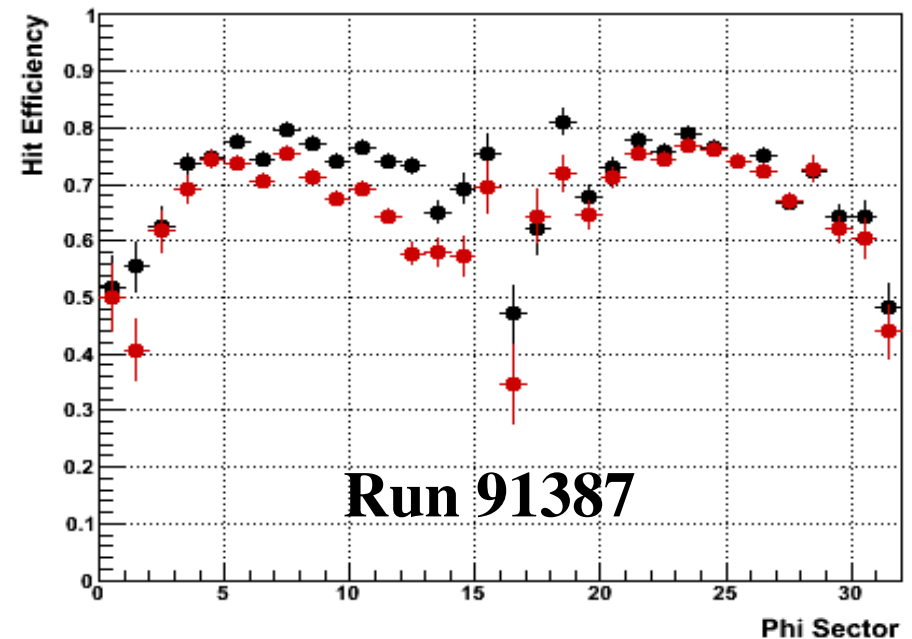
Outstanding Issues

- Wide run to run variation of hit ratios.
- Most of the inefficiency is in tube hits.
- Triggering effects?

Ratio hits to total measurements vrs phi sector for TRT Barrel layer 0

Run 91885

Ratio hits to total measurements vrs phi sector for TRT Barrel layer 0

Run 91387

To Do

L1 Alignment
- Close to determining errors on barrel alignment parameters
- Address outstanding issues
- Large L1 alignments found in the Endcaps need to be validated / errors determined

L2 Alignment
- TRT resolution should be 135 microns we see 190 with TRT only tracks
- Have a good shot of doing L2 in Endcaps with TGC tracks

L3 Alignment
- Needed for ultimate precision
- Tools need to be put in place, validated, and run.