TRT Alignment with TRT Only Tracks

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Outline:

Alignment with TRT Segments
TRT Tracks with Beam Spot Constraint
Alignment with TRT Tracks (+BS)
Independence of TRT Alignment on Si
(a look at weak modes)

TRT Only Alignment

Motivation:

- Majority of the tracks we have now are TRT-only
- Cross check of the alignment with full tracks
- Provides an alignment with with out potential bias of Si
- If the TRT can align internally, can potentially help remove weak modes in Si through pT constraint

Alignment with TRT Segments

All previous TRT - only alignment studies have used TRT segments

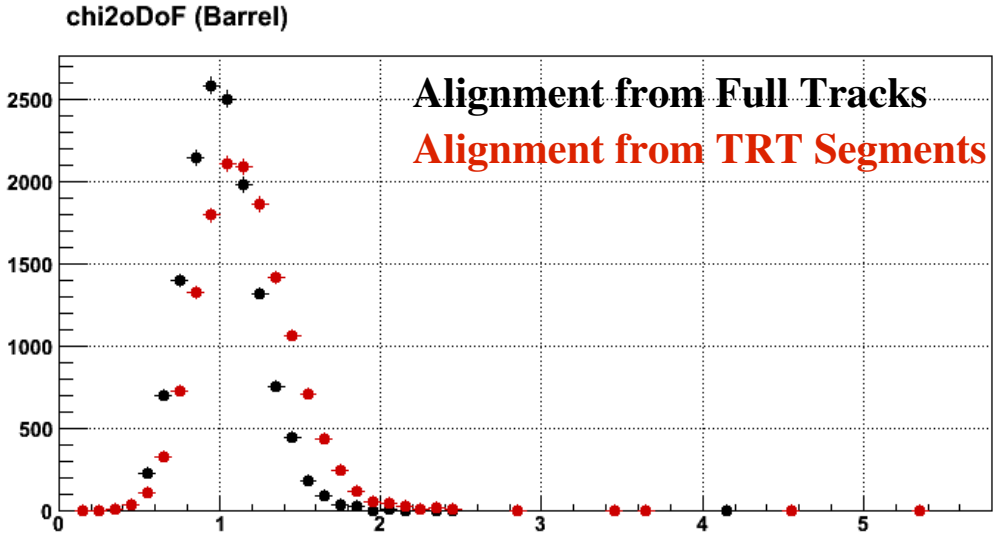
TRT Tracks from Segments

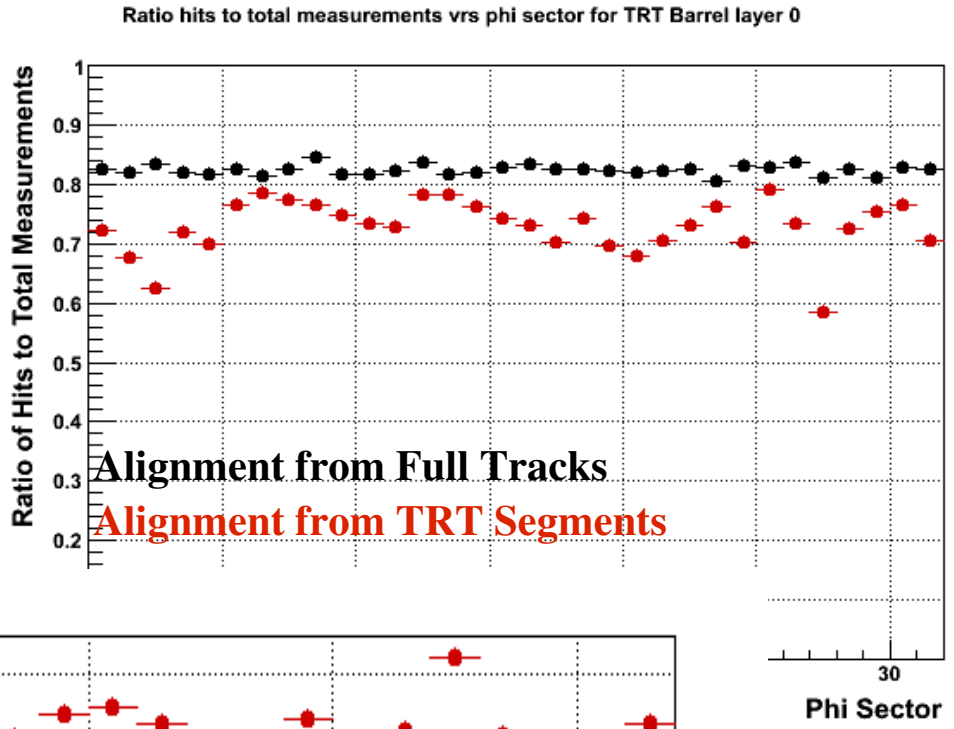
- start with the TRT segments found during pattern recognition
- create an input track parameter estimate from the segment's estimated position/momentum
- promote the segment + track parameters to track

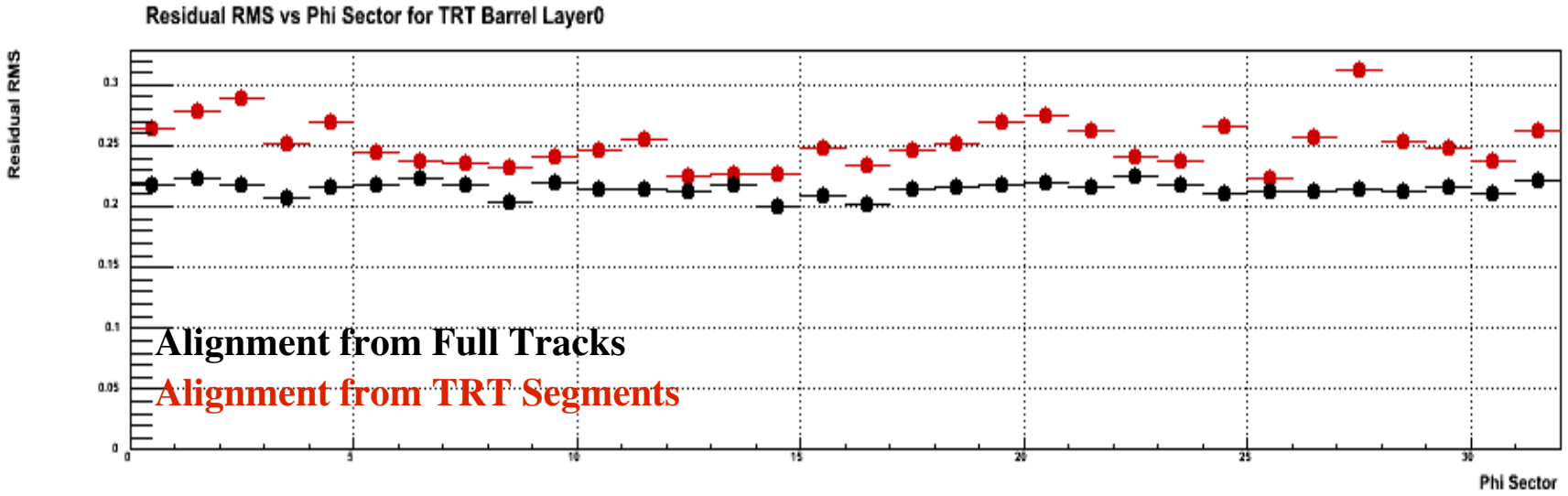
TRT Alignment using Segments

- ran the TRT internal alignment with TRT Segments (multi-muons)
- used alignment constant for Si and TRT (@ L1) derived in CSC
- ran 20 iterations and saw poor convergence (chi2 change, rotx, rotz,)
- hits / tracks peaked and began to decrease with iteration

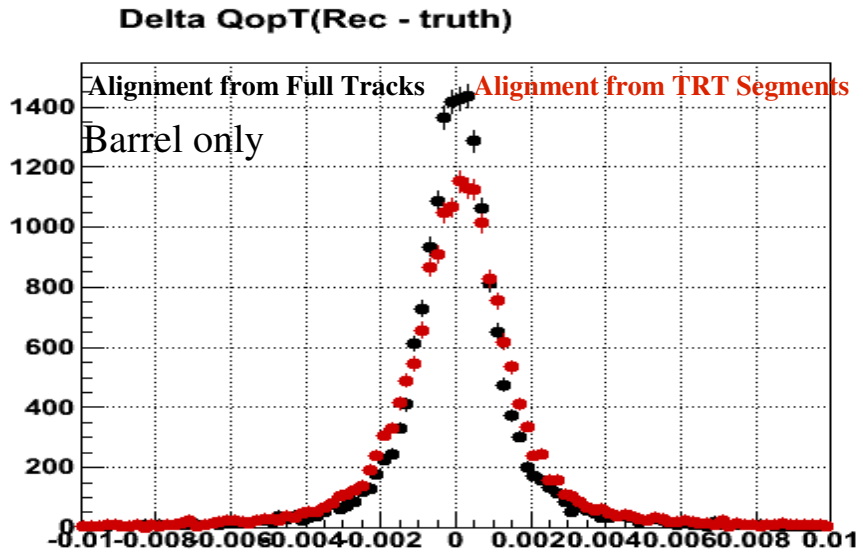
Alignment with TRT Segments

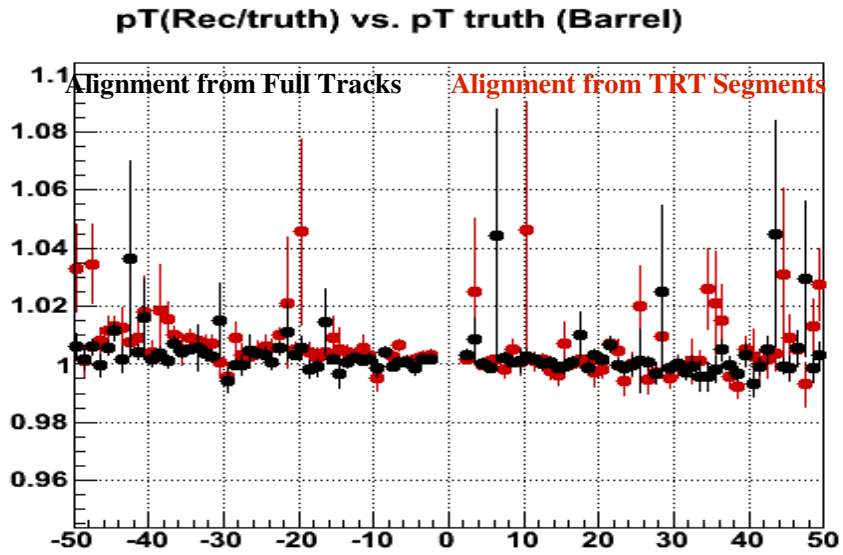


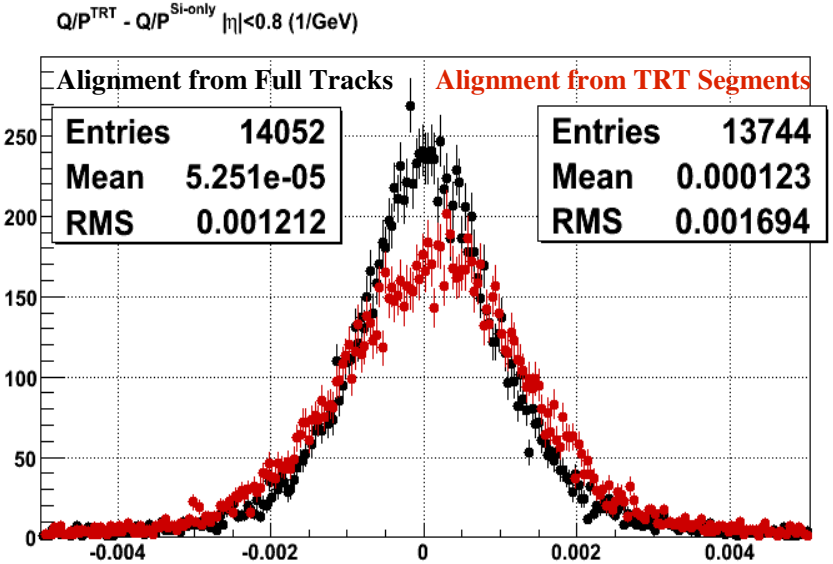


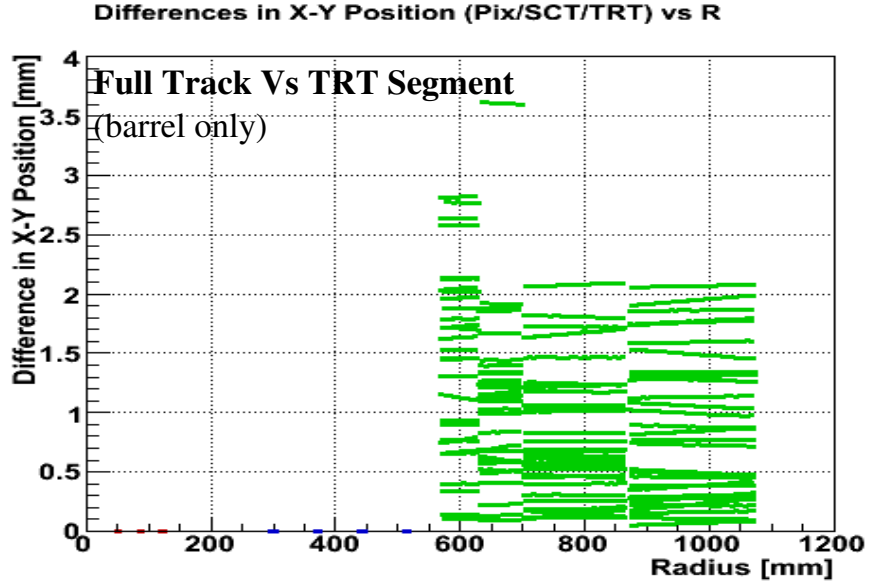


Alignment with TRT Segments









TRT Tracks with Beam Spot Constraint

Implemented new Track Selection Routine in TRTAlignAlgs

Reliance on Si through
Theta (get from pattern rec?)
Pattern Rec
Beam Spot (accuracy needed?)

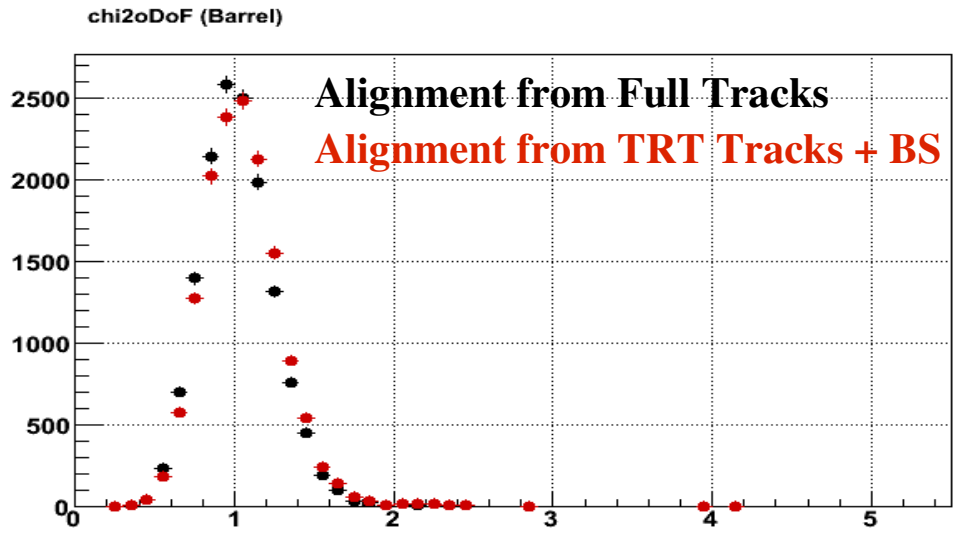
TRT Only Tracks + B.S.

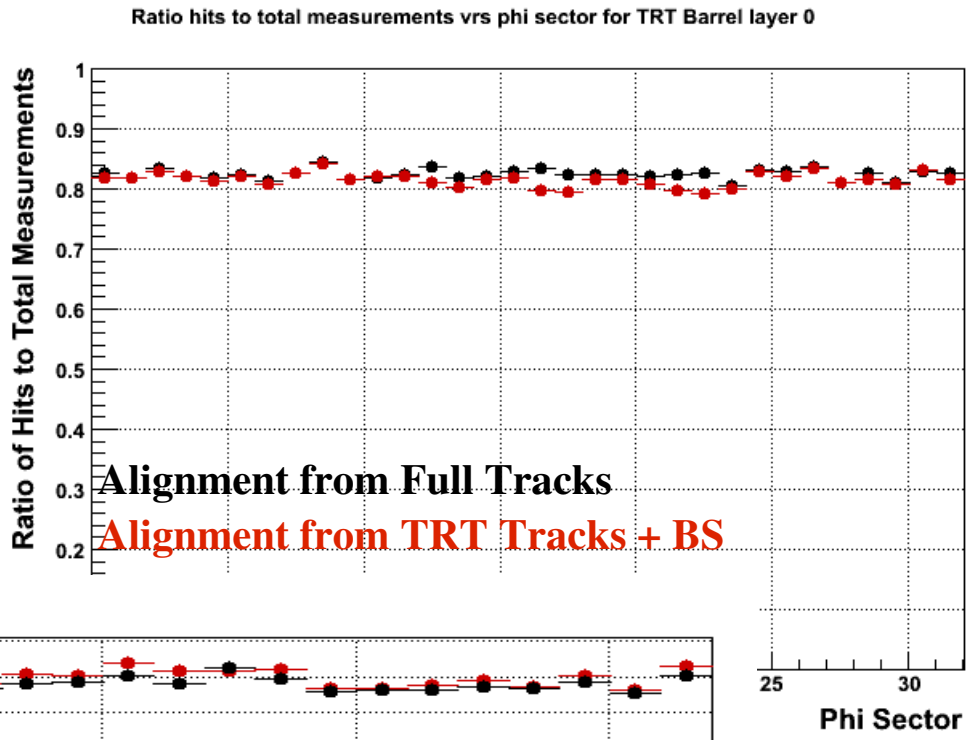
- Start with the full combined (Si + TRT) track
- Take theta track parameter from the full track
- Strip off the Si hits
- Add beam spot position as a measurement increase errors (x10)
- Fit track with Beam Spot pseudomeasurement and input theta

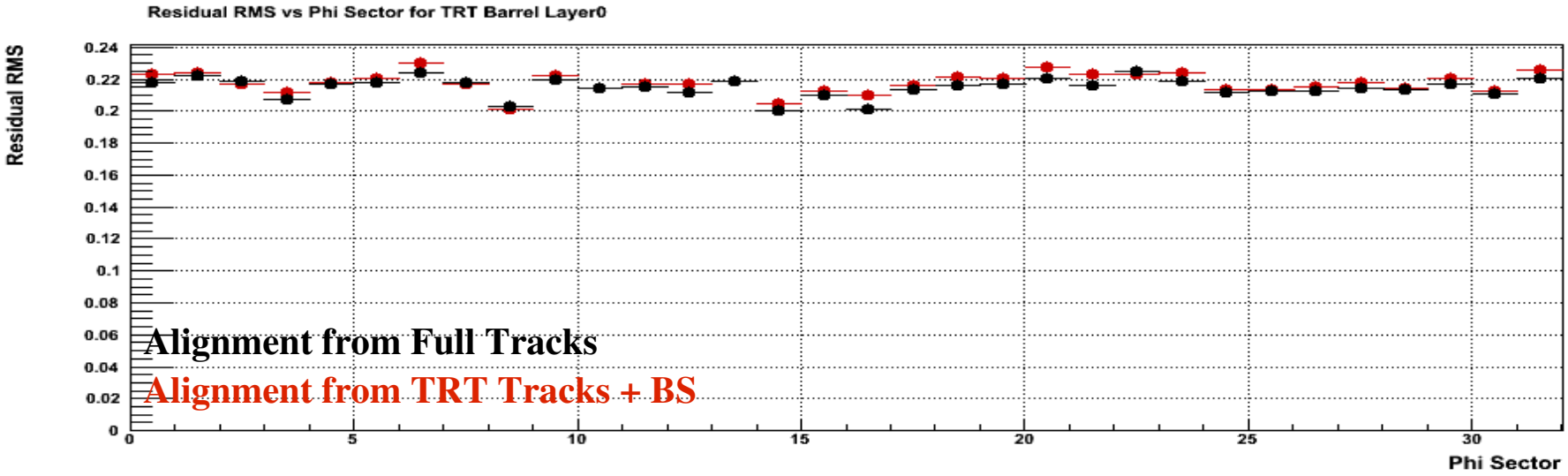
TRT Alignment with TRT Tracks + BS

- Ran the same internal alignment using the TRT Tracks + BS
- Ran 20 iterations and saw proper convergence
- Hits / Tracks increased and stayed constant

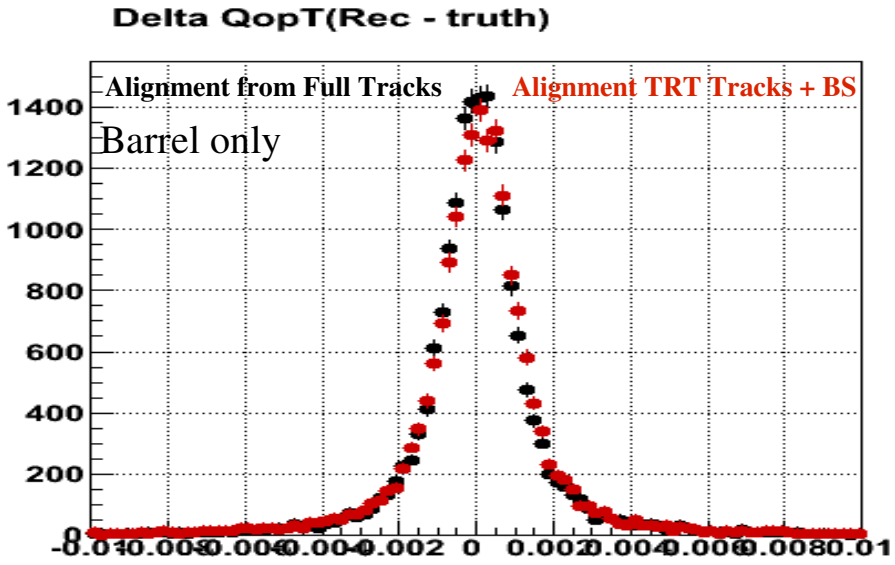
Alignment with TRT Segments

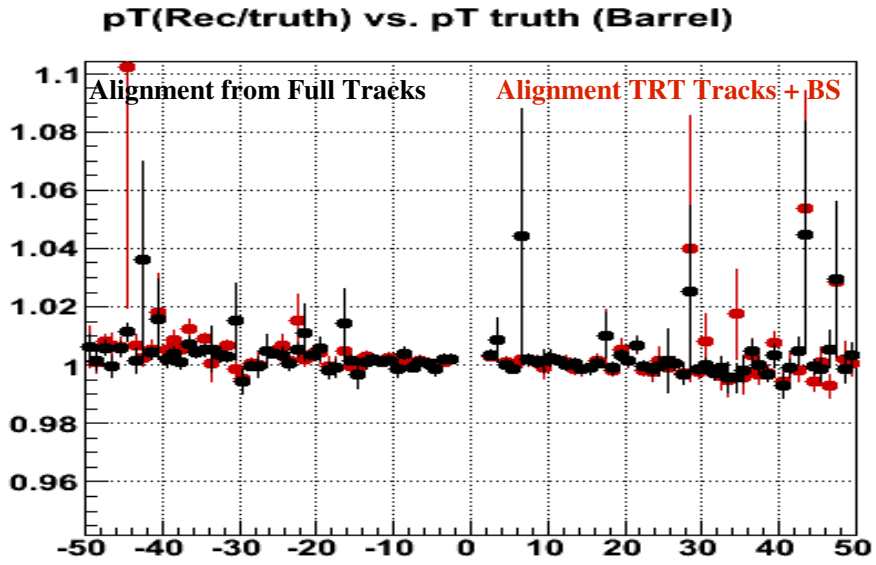


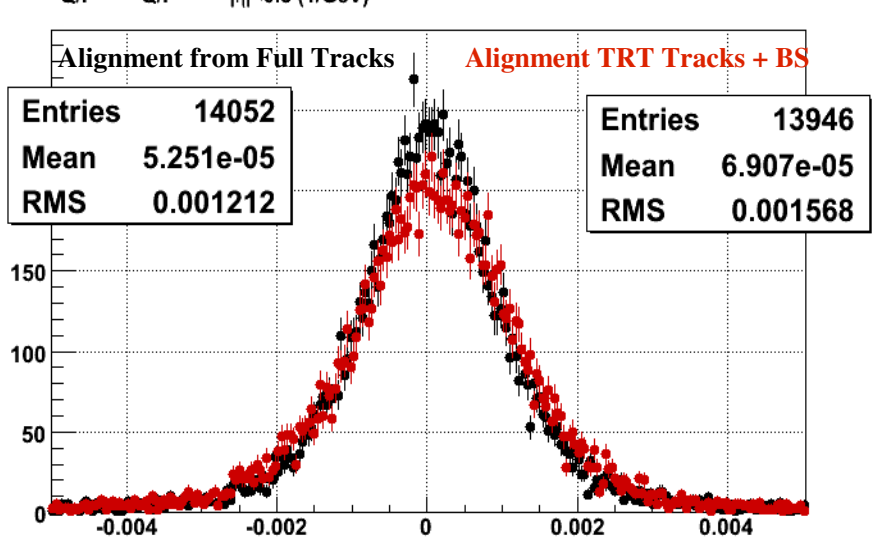


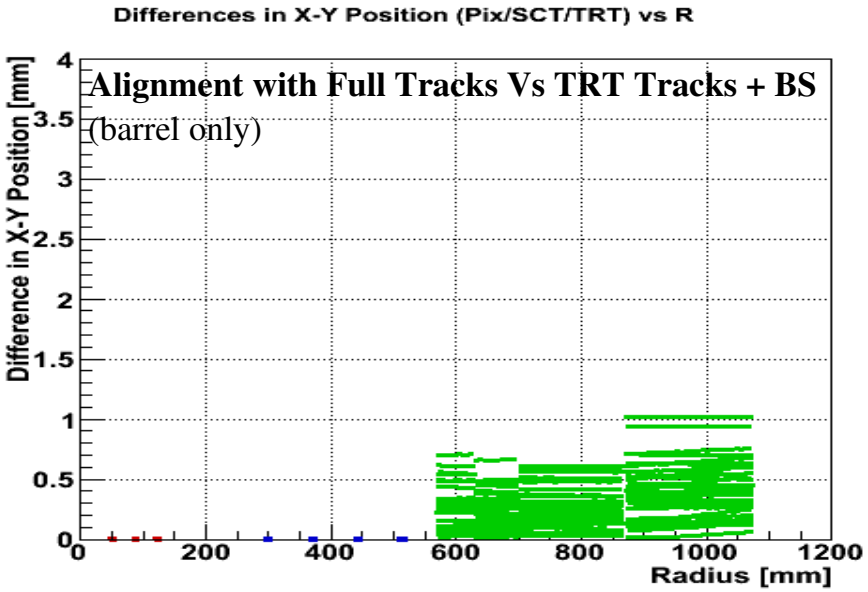


Alignment with TRT Segments





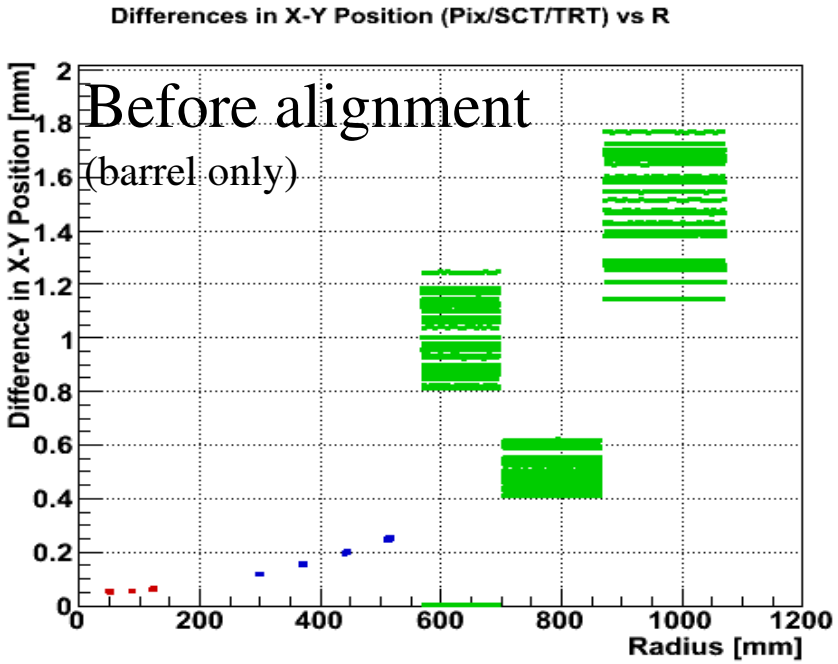


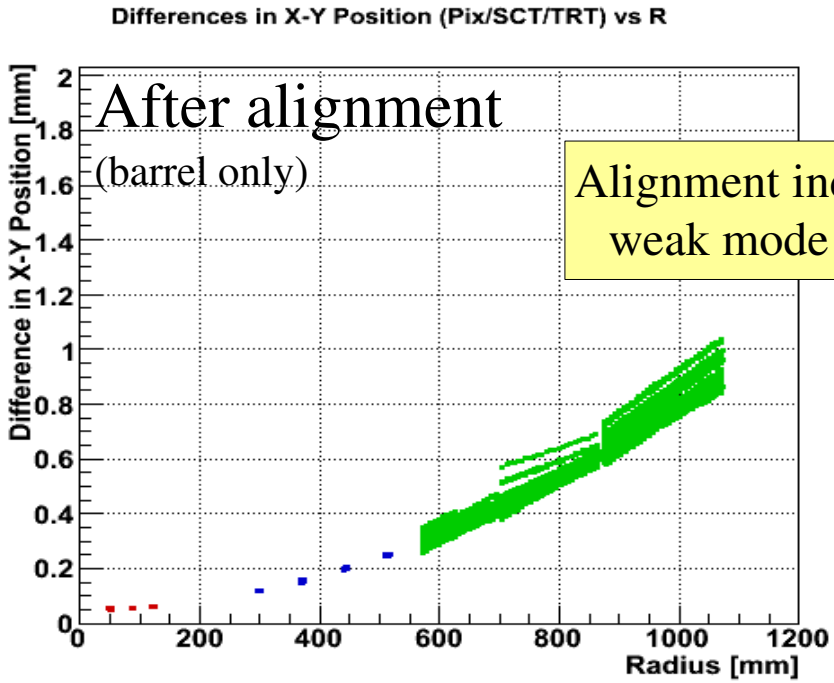


Dependence of the TRT Alignment on Si

Have seen that the presence of a weak mode in the Si has a large impact on the TRT alignment

- trivially true when using combined tracks
- Curl in Si induces a curl in the TRT
- Ran TRT internal alignment from: Si with Curl (InDetSi_CSCMisaligned_RDeltaPhi)
  TRT with CSC internal misalignments

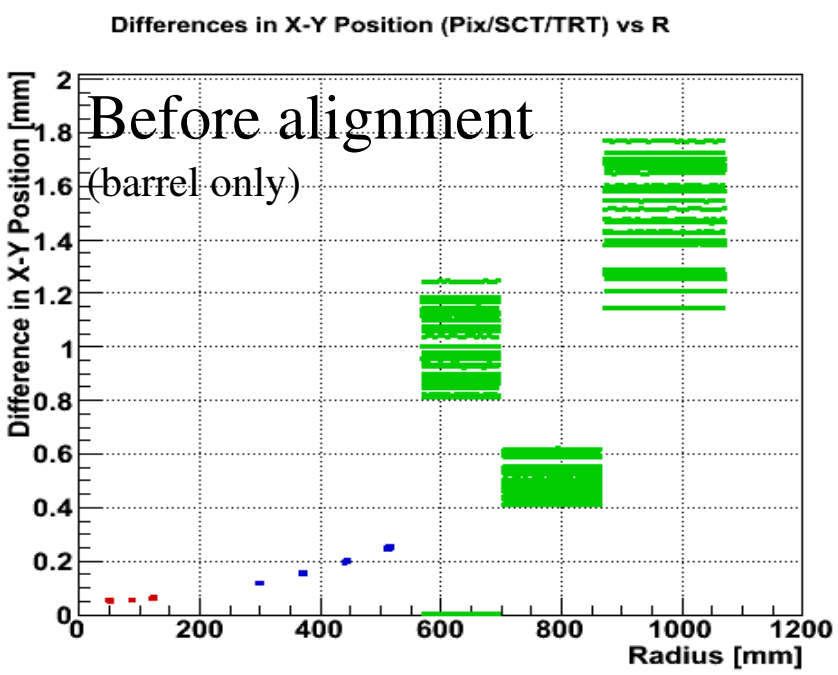


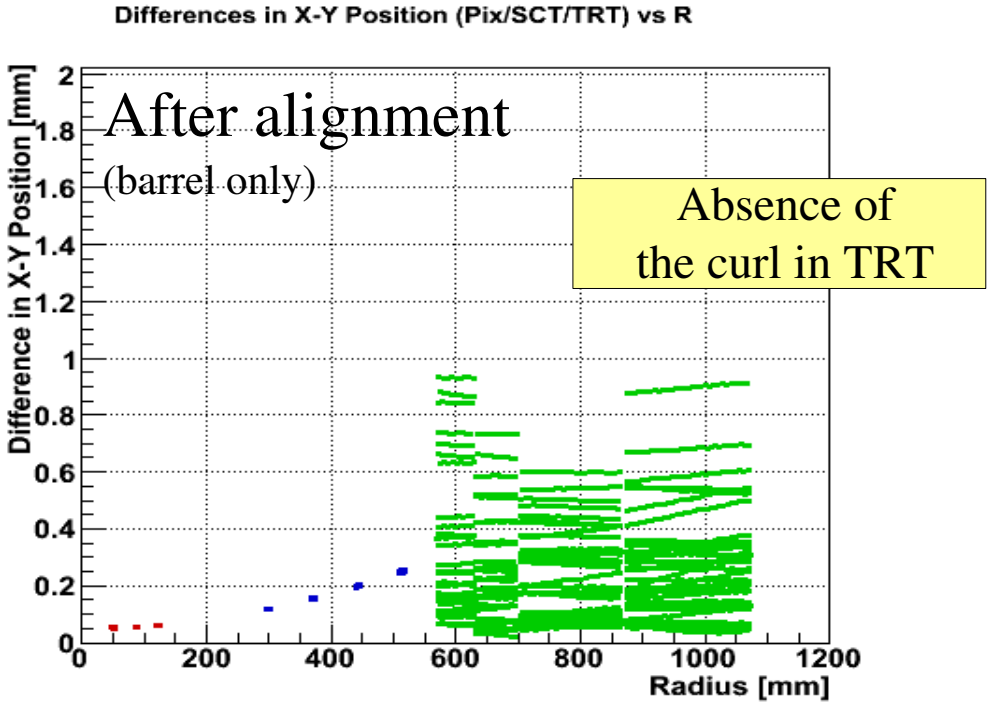


Dependence of the TRT Alignment on Si

Now run TRT using TRT Only tracks + BS and find the presence of weak mode in the Si does not induce the corrisponding weak mode in the TRT.

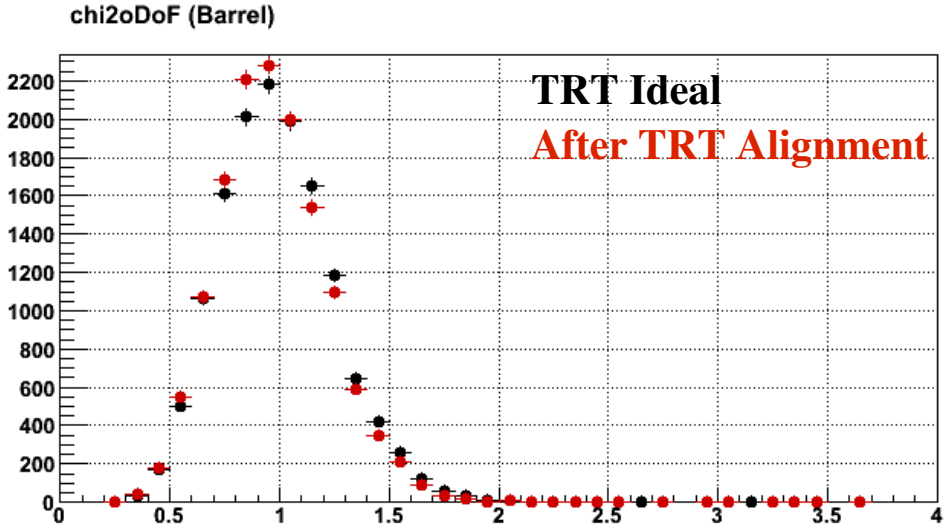
- still recover large misalignment in module layers
- misalignment largest closer to Si (expected from pattern rec)

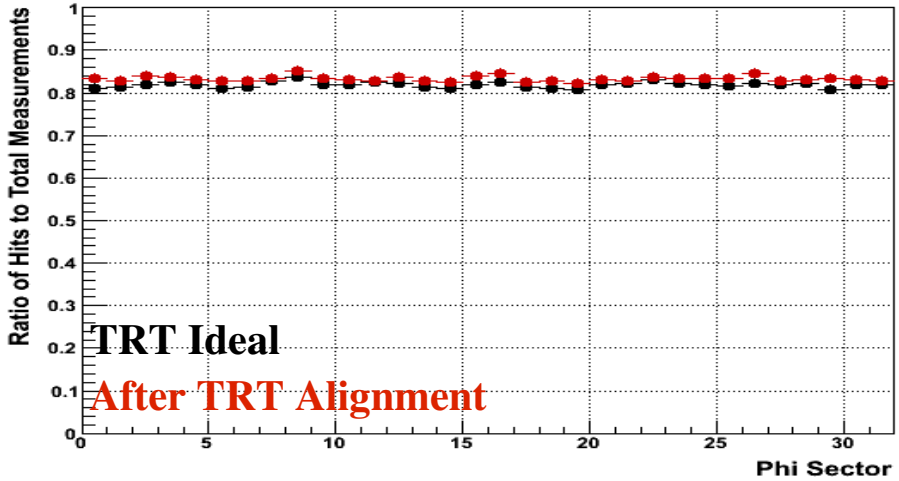




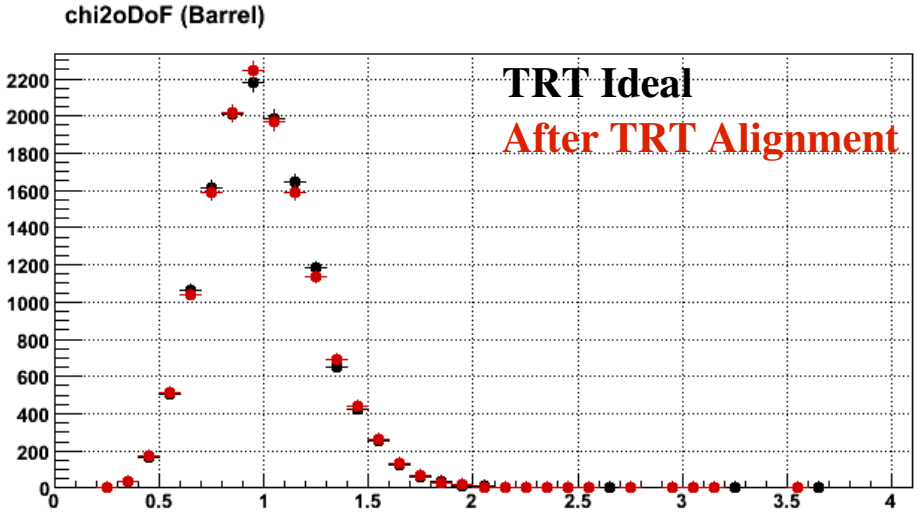
Dependence of the TRT Alignment on Si

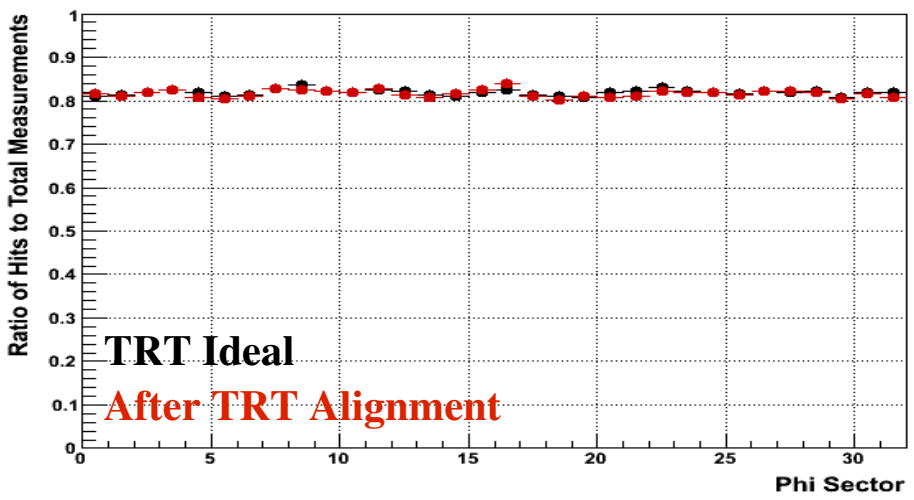
Alignment with Full Tracks





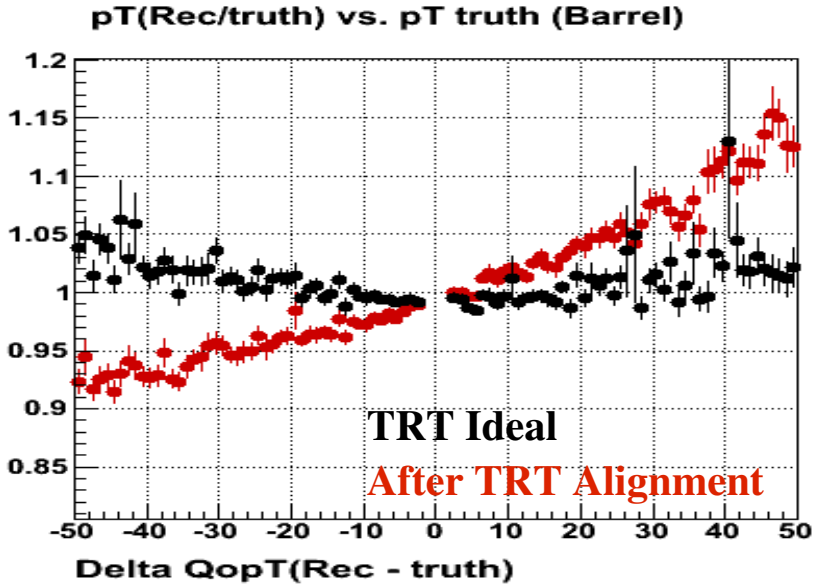
Alignment with TRT only Tracks



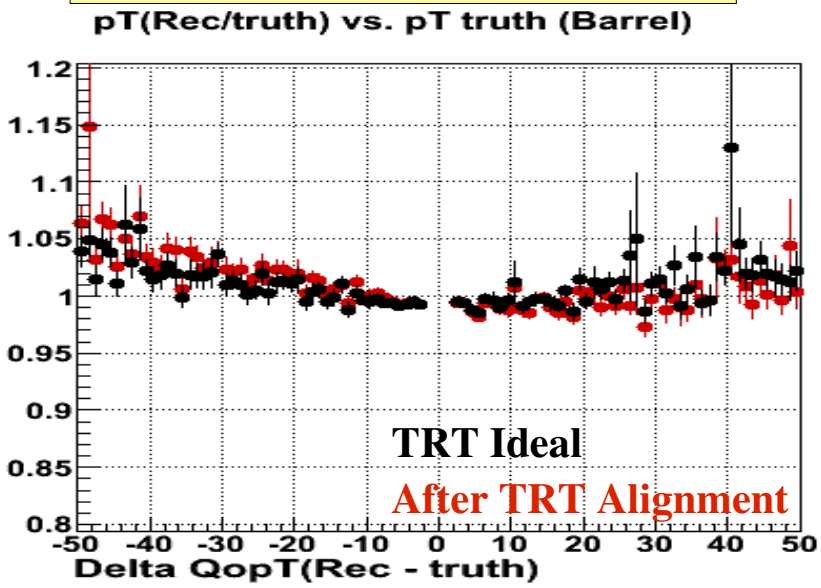


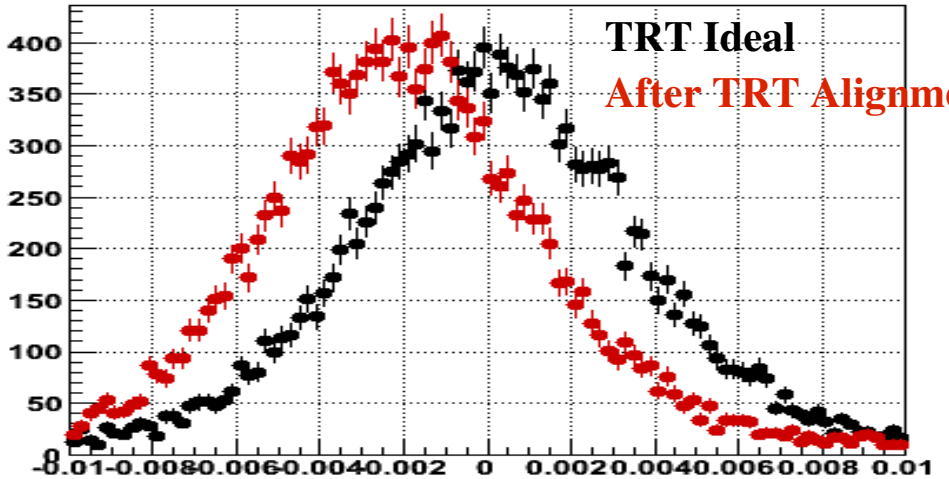
Dependence of the TRT Alignment on Si

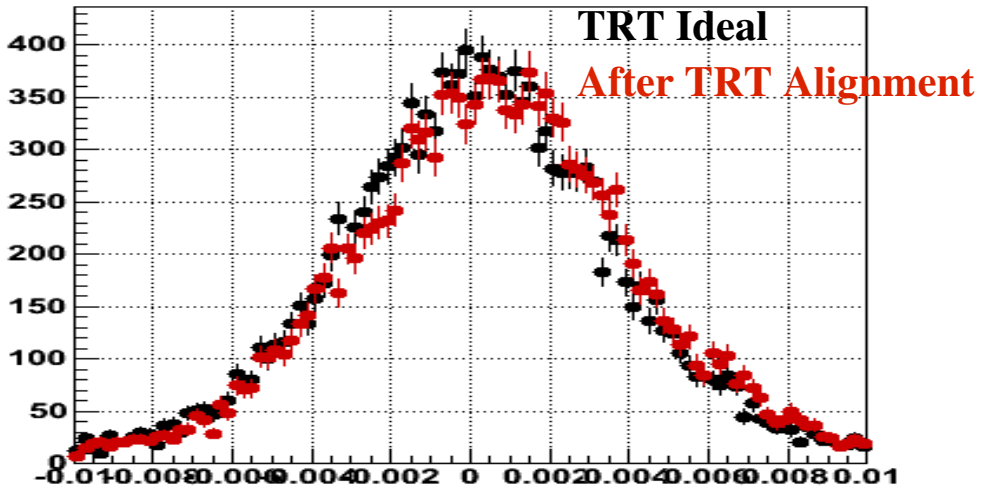
Alignment with Full Tracks



Alignment with TRT only Tracks





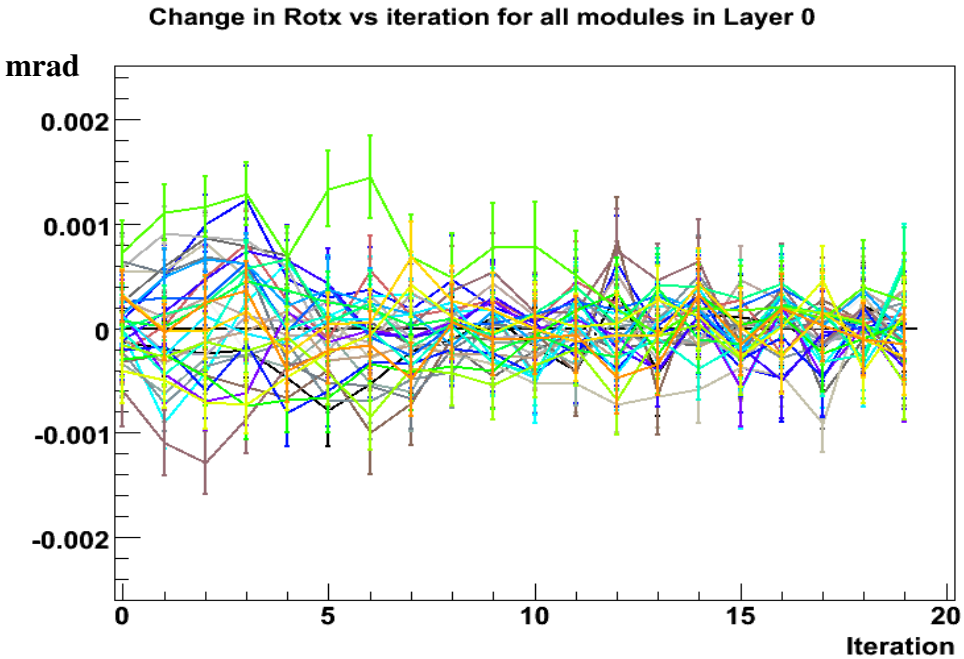


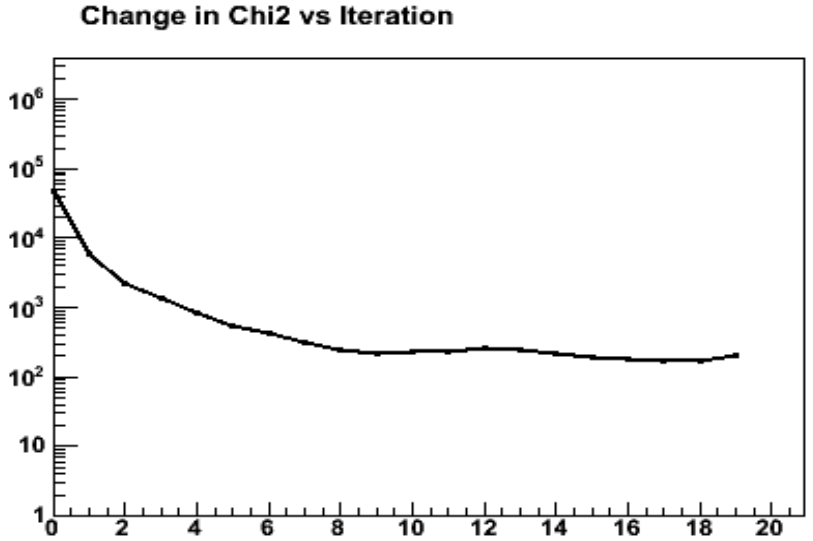
Conclusions

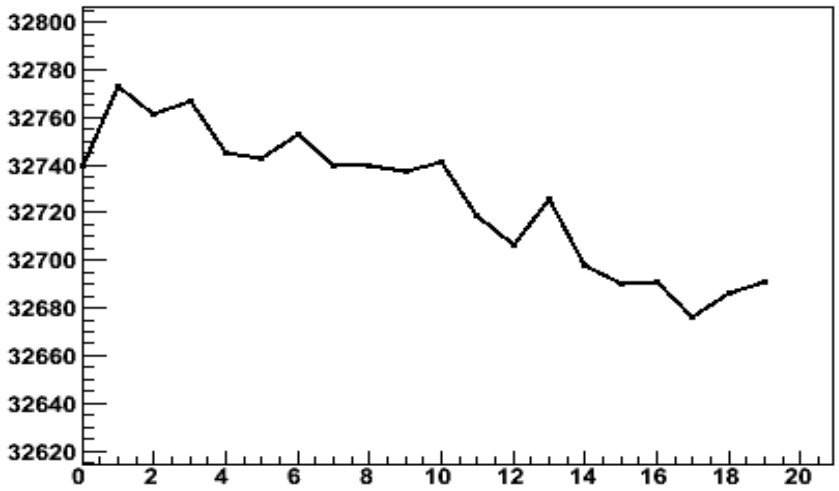
- A TRT only based alignment can be a very useful tool in debugging/validating the full Inner Detector alignment
- New track selection strategy greatly improves the quality of the TRT only Alignment
- Allows the TRT alignment to be independent of weak modes present in Si

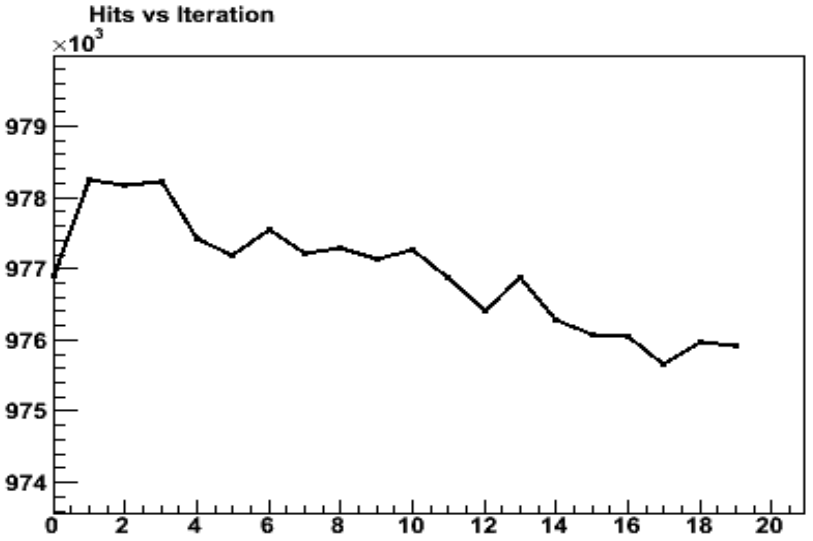
reinforcements

Convergence With Segments









Convergence With BS Constraint