# DT and CSC Alignments Proposed for 2nd CRAFT-09 Reprocessing

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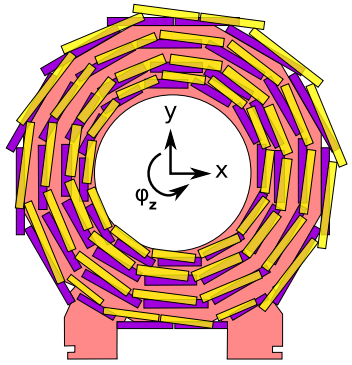
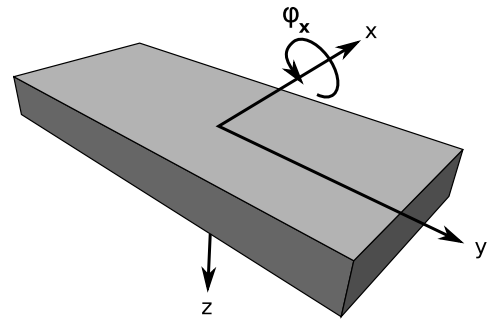
*On the behalf of the Muon Alignment Community*

4 November, 2009

# Muon alignment preparation





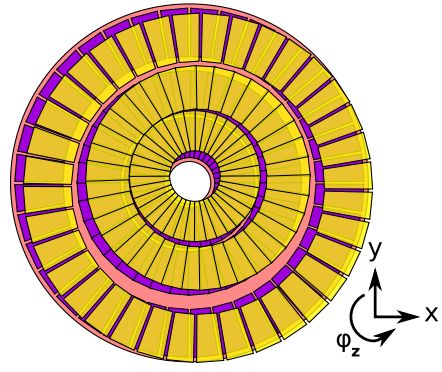




## DT:

1. Hardware alignment system sets all coordinates
2. Position whole barrel as a rigid body in global $x$, $y$, $\phi_z$ with tracks
3. Align all accessible chambers, all parameters except $\phi_x$ with tracks

## CSC:

1. Hardware alignment sets $z$, chamber $\phi_x$
2. Position whole rings as rigid bodies in global $x$, $y$, $\phi_z$ with tracks



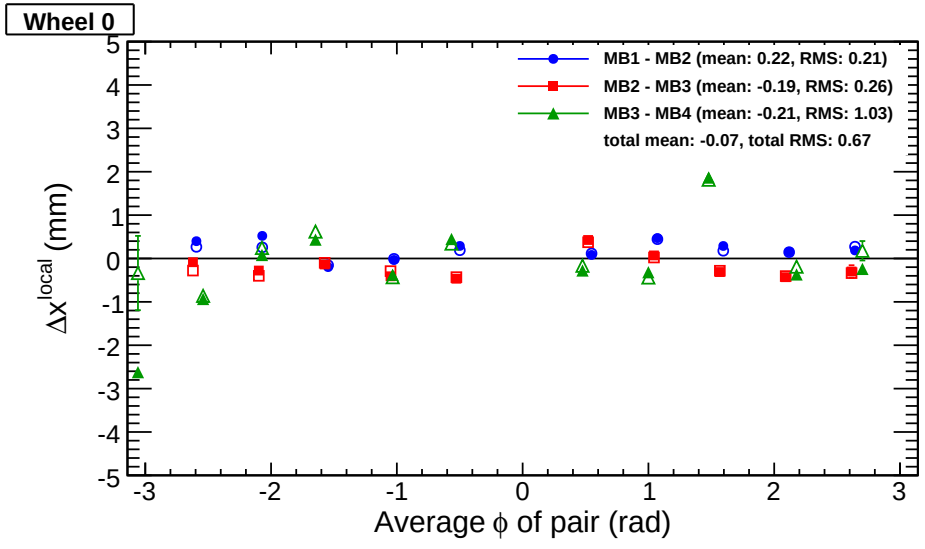

Any parameters unaligned by one step default to values from previous step
Final contributions are orthogonal, the best information each system provides

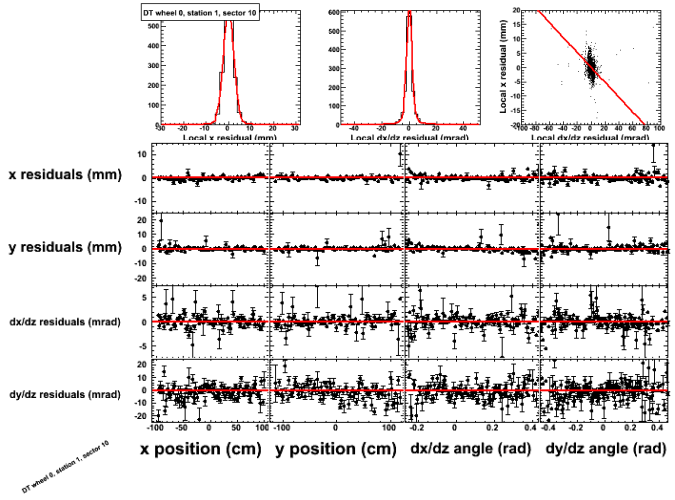
# DT validation plots

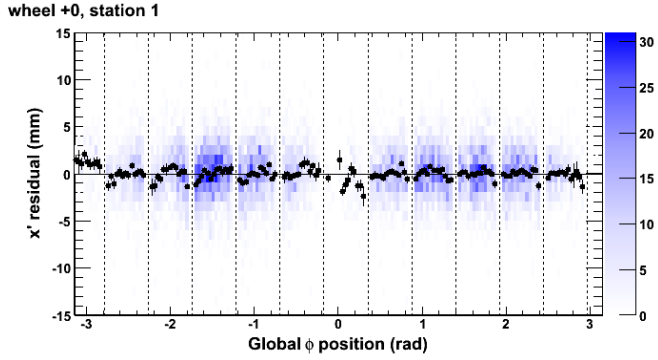


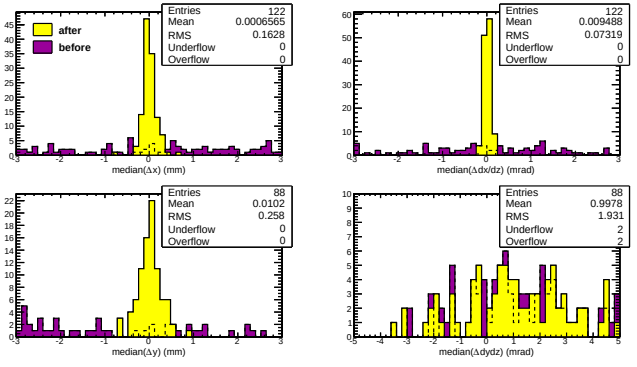
Repeated all checks developed in CRAFT-08:

- Fit functions overlaid on fitted distributions
- "Map plots" (residuals versus position)
- Distributions of medians of residuals
- Local segment check: 0.35 mm for stations 1–3



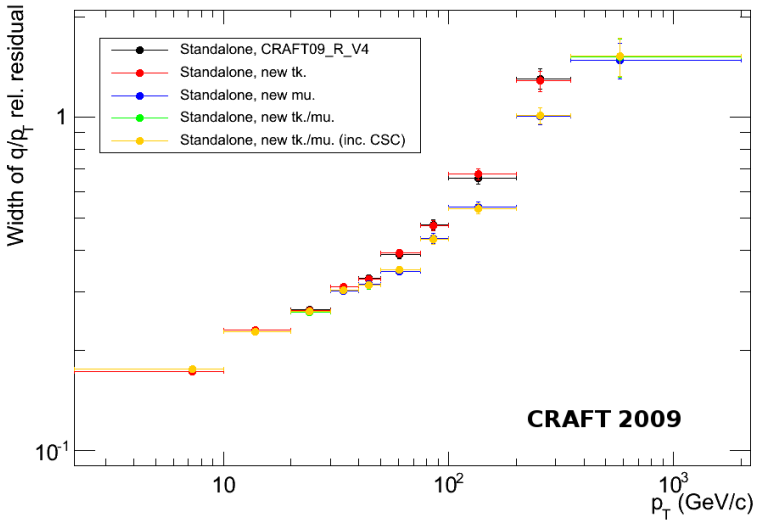



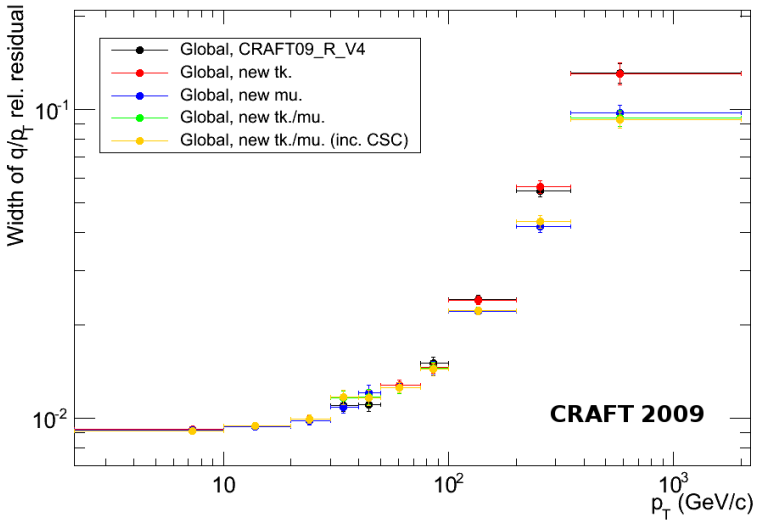



# Cosmic splitting





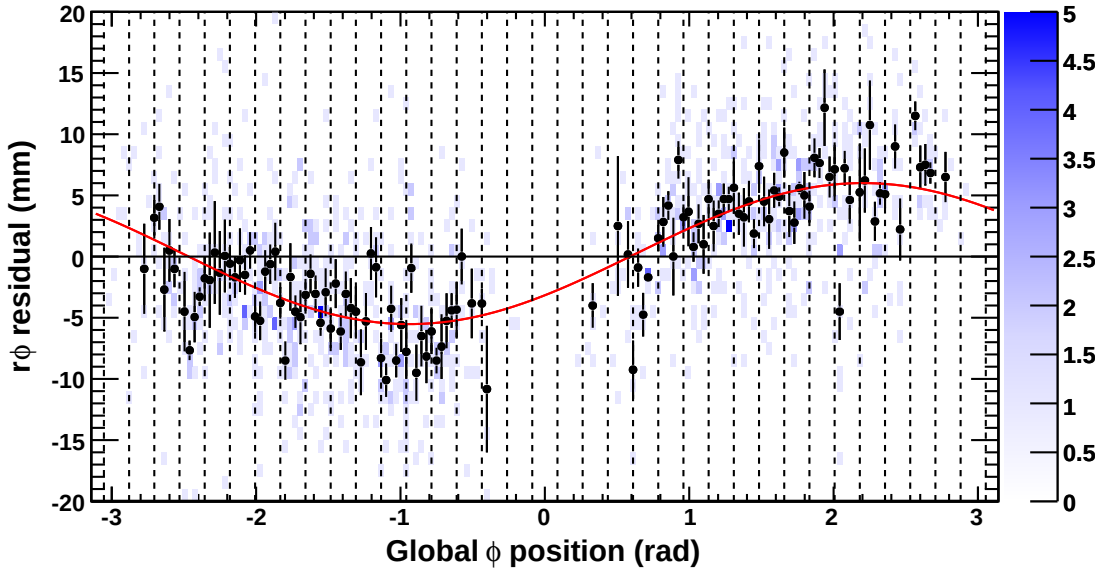

J. Tucker

- DT alignment yields improvements in standAloneMuons (left), globalMuons (right), and FirstMuonStation (not shown)
- All reconstructions with new CRAFT-09 muon geometry (blue, green, yellow) are significantly lower (better) than all reconstructions with old CRAFT-08 muon geometry (red and black)
- GlobalMuon $p_T$ resolution at 200 GeV: 4.2%
- FirstMuonStation $p_T$ resolution at 200 GeV: 4.0%

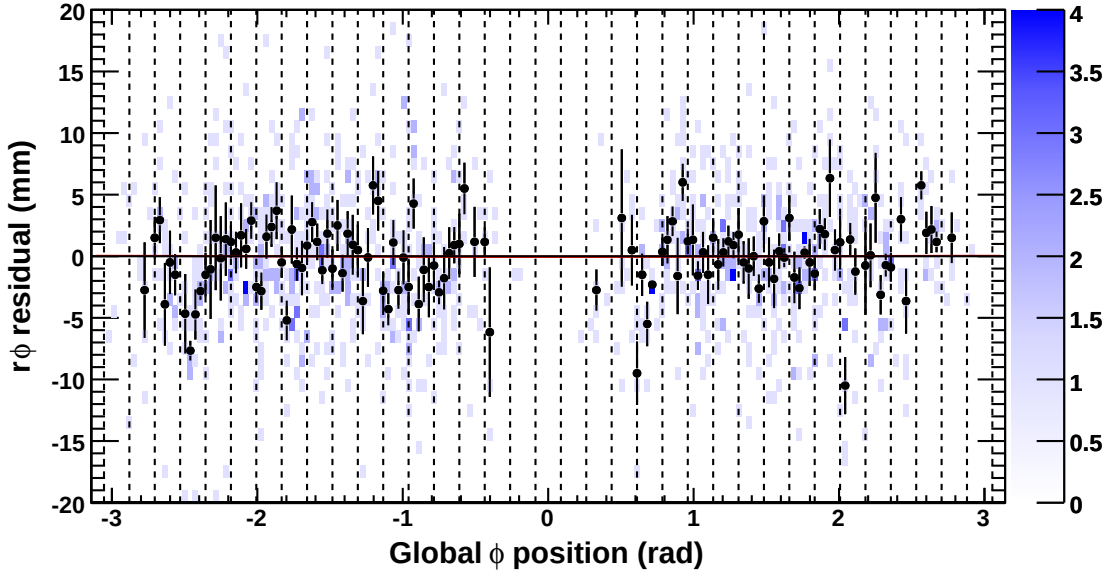
# CSC alignment



**ME+2/2 before ring alignment**




**ME+2/2 after ring alignment**




- Not enough tracks to align individual chambers
- Global ring offsets can be inferred from sinusoidal distribution of residuals
- Large corrections correlated by disk, as expected from closing

# Concluding remarks



- Milestone: barrel hardware geometry completely reconstructed, delivered to CMSSW
- Well-defined procedure agreed upon and implemented
- Track-based results are consistent with the tracker geometry presented in the previous talk
- Final muon geometries:

  DTAlignmentRcd and DTAlignmentErrorRcd

`/afs/cern.ch/user/p/pivarski/public/DTAlignmentRcd_CRAFT09_segments-hardware-globalMuons_3XY_v8_offline.db`

  CSCAlignmentRcd

`/afs/cern.ch/user/p/pivarski/public/CSCAlignmentRcd_CRAFT09_hardware-globalMuons_3XY_v4_offline.db`