Proposal for new MC scenario

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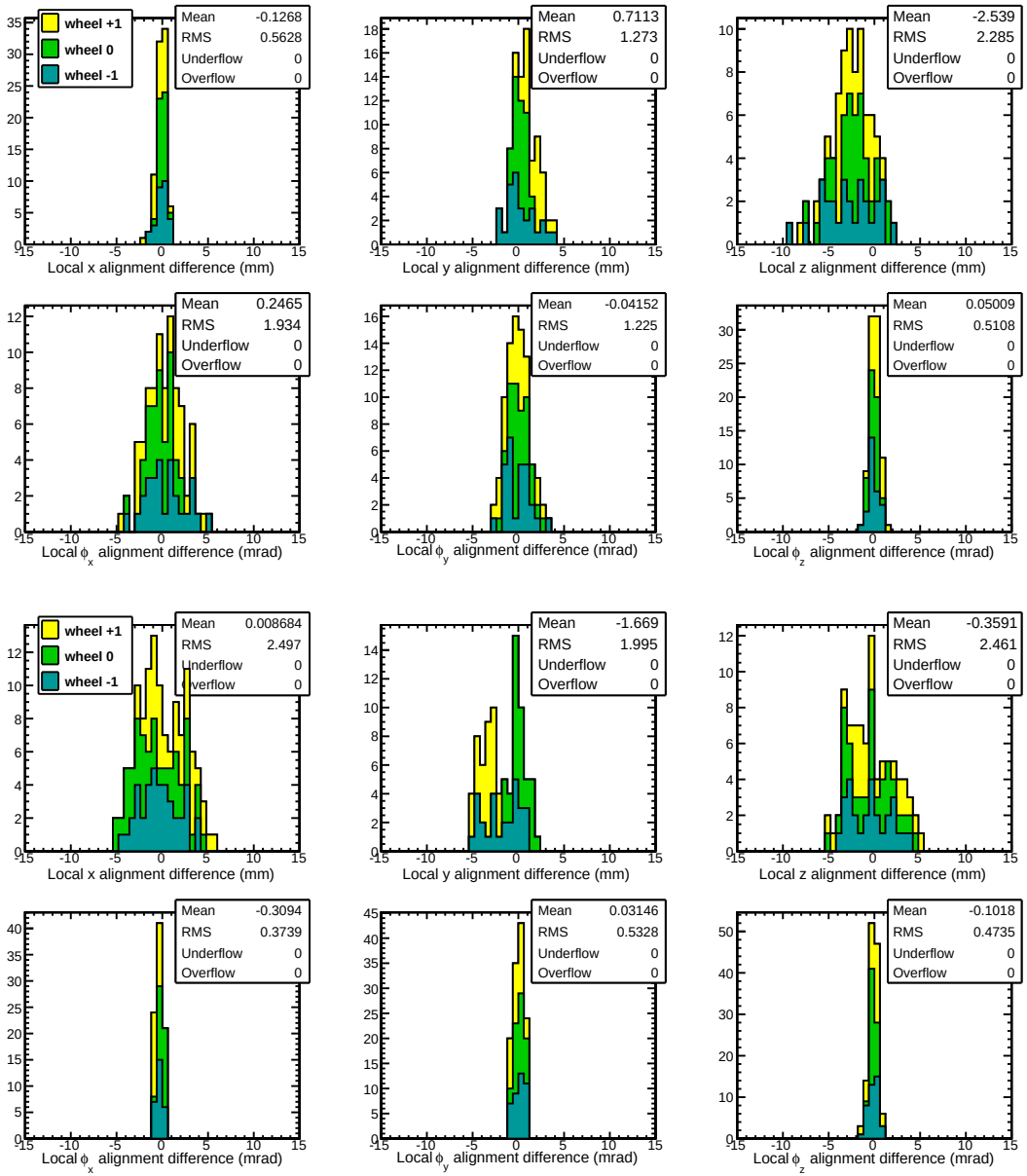
First, about the data-alignment

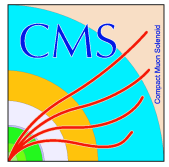
Plots I showed on Monday used CRAFT_V11 tracker geometry, rather than the new one



- Differences between HIP and MillePede, using the same (newest) tracker geometry
- Only 560 μm in δ_x!
- They are in basic agreement, biggest differences in higher-order parameters

- Differences between old (V11) tracker and new tracker (that which will be signed off for reprocessing)
- 2–2.5 mm translational differences, though angular differences are small
- Refit lost 20% of the tracks (another indication that this tracker differs significantly)

For more information



- Updated slides on Monday's Indico page, can view corrections side-by-side with the original

  `http://indico.cern.ch/conferenceDisplay.py?confId=59610`

- SQLite file with finalized tracker geometry *is* correct:

  `/castor/cern.ch/user/p/pivarski/`
  `DTCRAFTiter03_withCenteredTracker.db`

  (on CASTOR, use rfcp; tag name is "DTAlignmentRcd")

- I've asked for updated segment-extrapolation validation
  - I don't expect this to change: in past experience, alignment moves chambers correlated along line-of-sight of tracks (as would be expected)
  - updated plots can be sent around by HyperNews

- I recommend the alignment above for sign-off (with APE=0)
  - next Wednesday
  - DT alignment, CSC alignment, and MC scenario would be a combined package

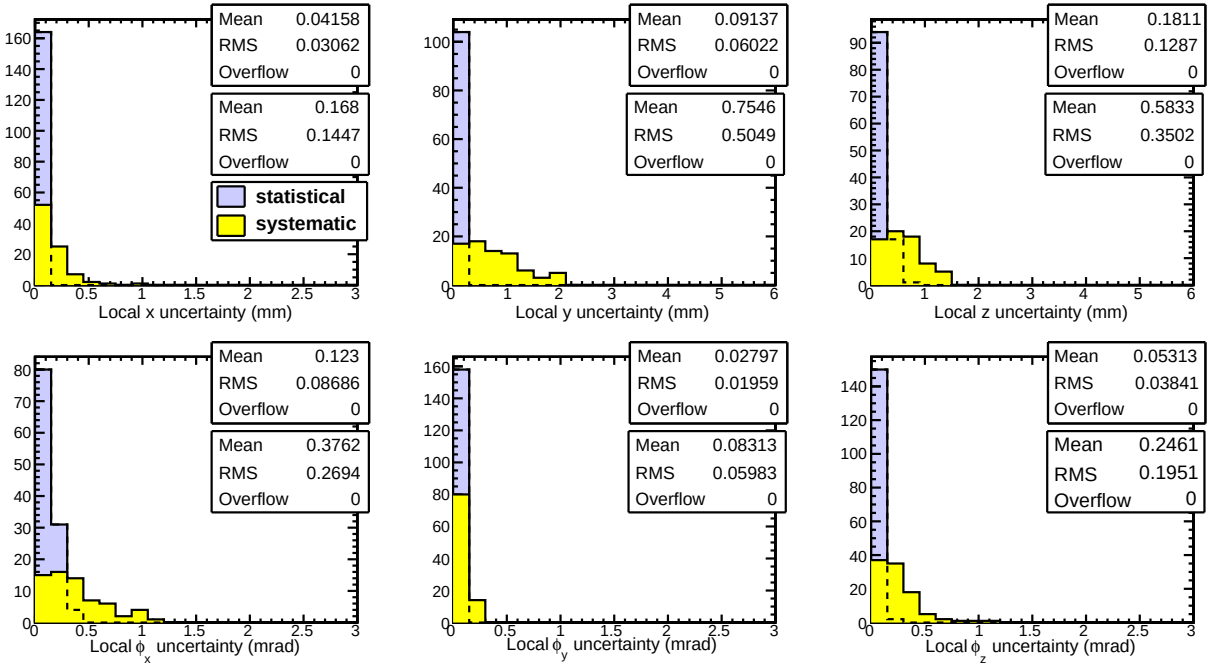
The MC scenario

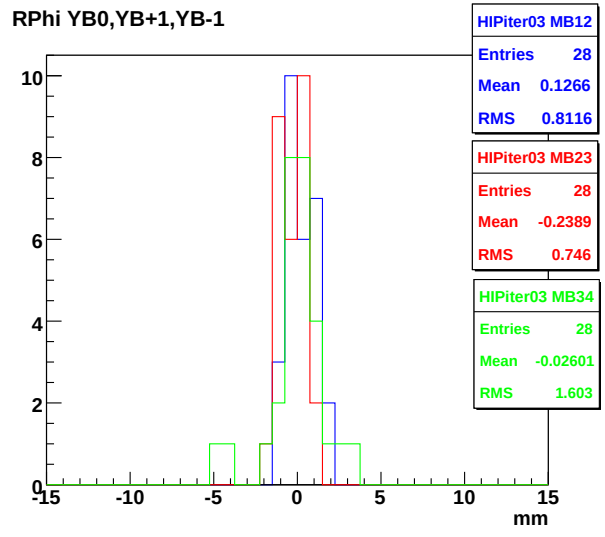
- Two levels of hierarchy for DT chambers: independent misalignment within sector-groups, correlated misalignment of sector-groups
- Two cases: aligned (wheels -1, 0, $+1$, except sec. 1 and 7) and unaligned
- Estimated from Monte Carlo, segment-matching, and p_T dependence
- Three levels for CSC chambers: chambers within disks (photogrammetry), disk-bending (SLM), and disk positions (tracks)
- Estimated from photogrammetry uncertainty, comparison of DCOPS with photogrammetry, ϕ_y from beam-halo measurements
- Also, layer uncertainties from DT track-survey comparisons and CSC beam-halo measurements

Aligned DT chambers

- Uncertainty within sectors

$x \sim 0.8$ mm	segment-matching	$\phi_x \sim 0.7$ mrad	from MC
$y \sim 1$ mm	from MC	$\phi_y \sim 0.7$ mrad	segment-matching
$z \sim 1$ mm	from MC	$\phi_z \sim 0.3$ mrad	from MC





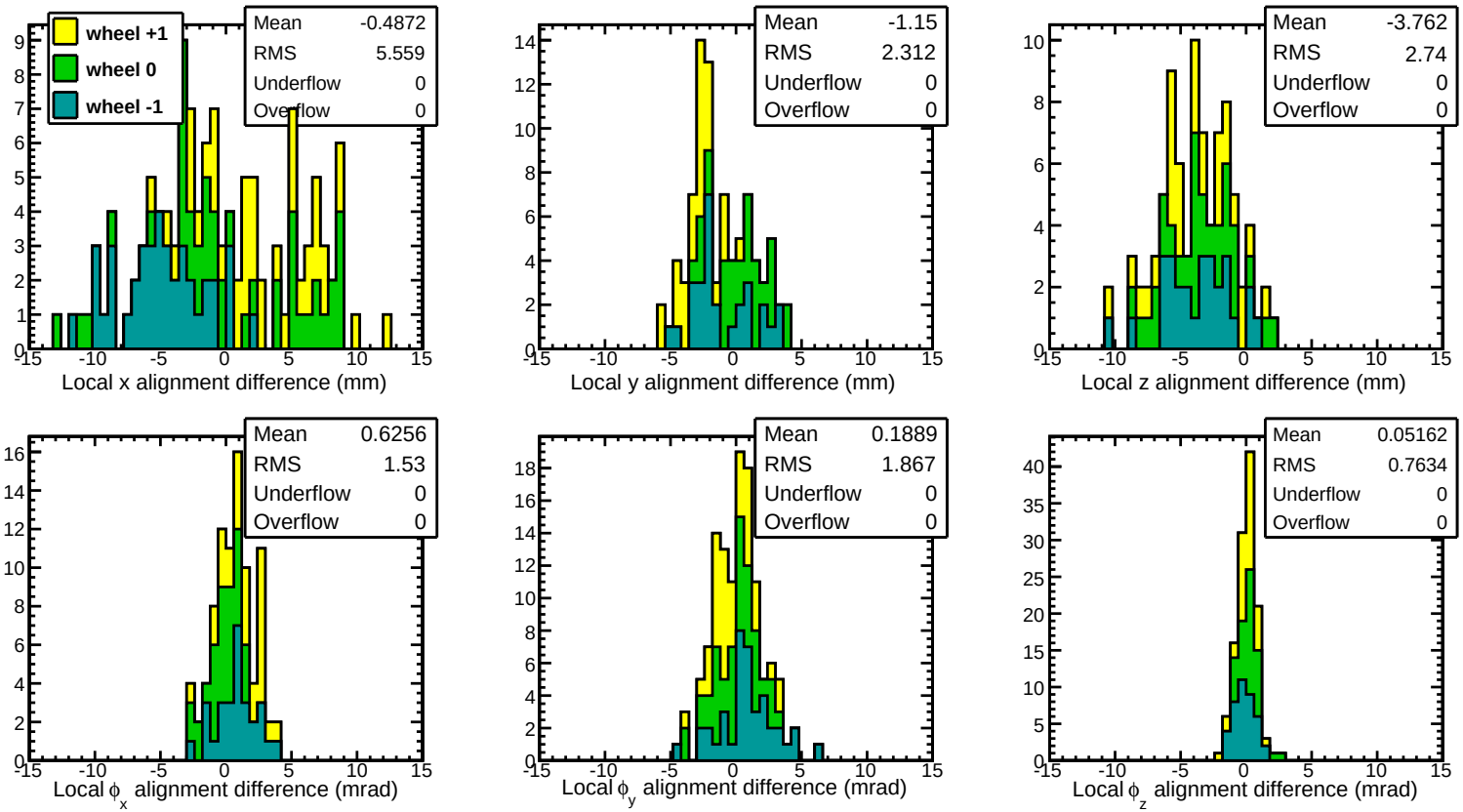
- Uncertainty of sector-groups: $x \sim 0.5$ mm from track source (e.g. p_T dependence)

Unaligned DT chambers

- Uncertainty within sectors

$x \sim 0.8$ mm	same as aligned	$\phi_x \sim 1.6$ mrad	from alignment
$y \sim 2.4$ mm	from alignment	$\phi_y \sim 2.1$ mrad	from alignment
$z \sim 4.2$ mm	from alignment	$\phi_z \sim 1$ mrad	from alignment

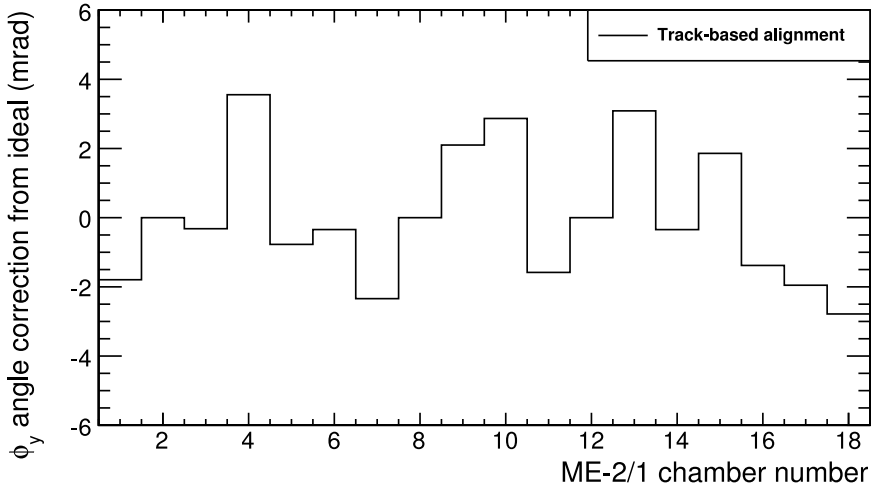
with -3.5 mm bias

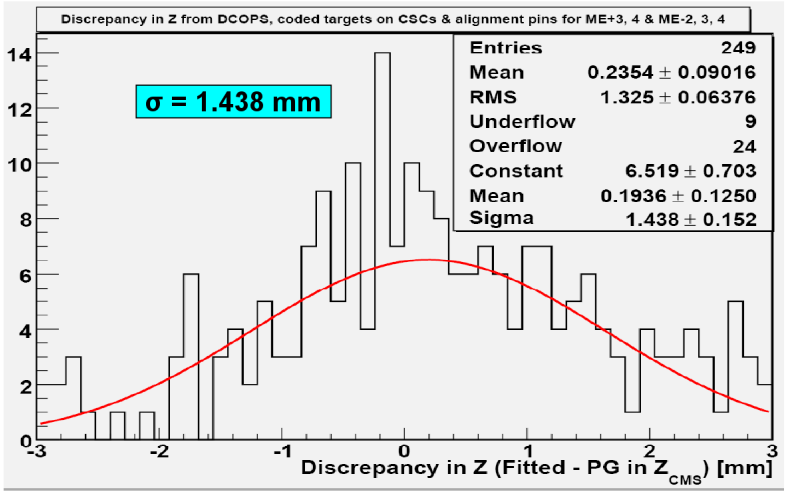


- Uncertainty of unaligned sector-groups: $x \sim 6.5$ mm

CSC uncertainty

- Chambers relative to disks: photogrammetry, 0.3 mm isotropic, 0.15 mrad ϕ_z rotations (from pins and length of chambers)
- 2.3 mrad ϕ_y rotations observed in beam-halo tracks

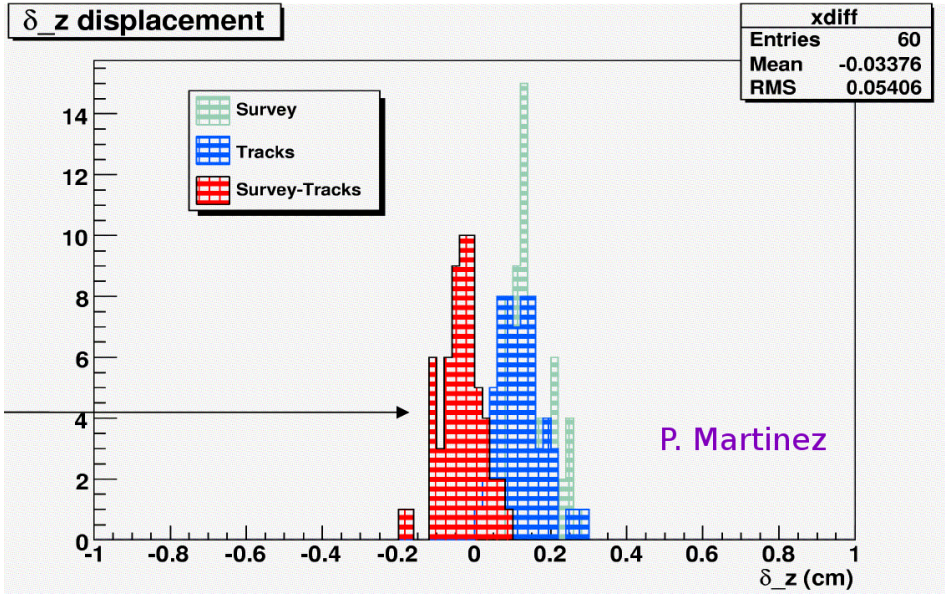


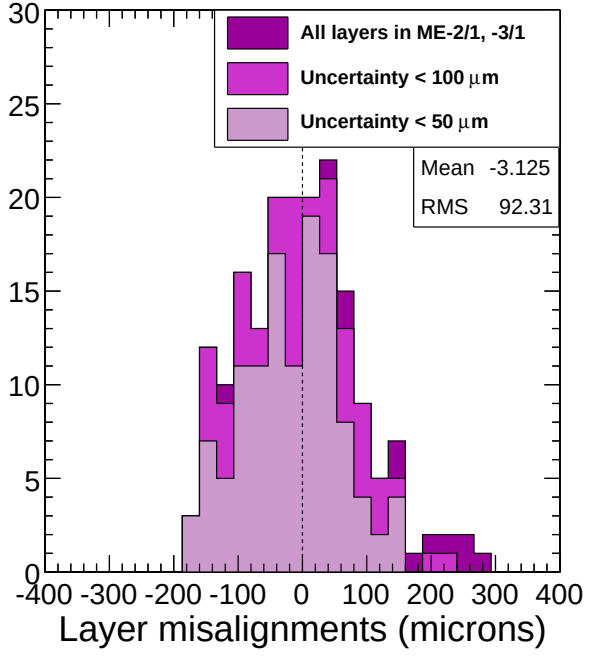


- Disk-bending (z and ϕ_x): 1.438 mm and 0.57 mrad uncertainty from agreement between DCOPS and photogrammetry at 0 T
- Disk position/rotation: 0.5 mm and 0.1 mrad (after track alignment)

Layer misalignments

- DT superlayer misalignment: 0.54 mm in z from track/survey comparison

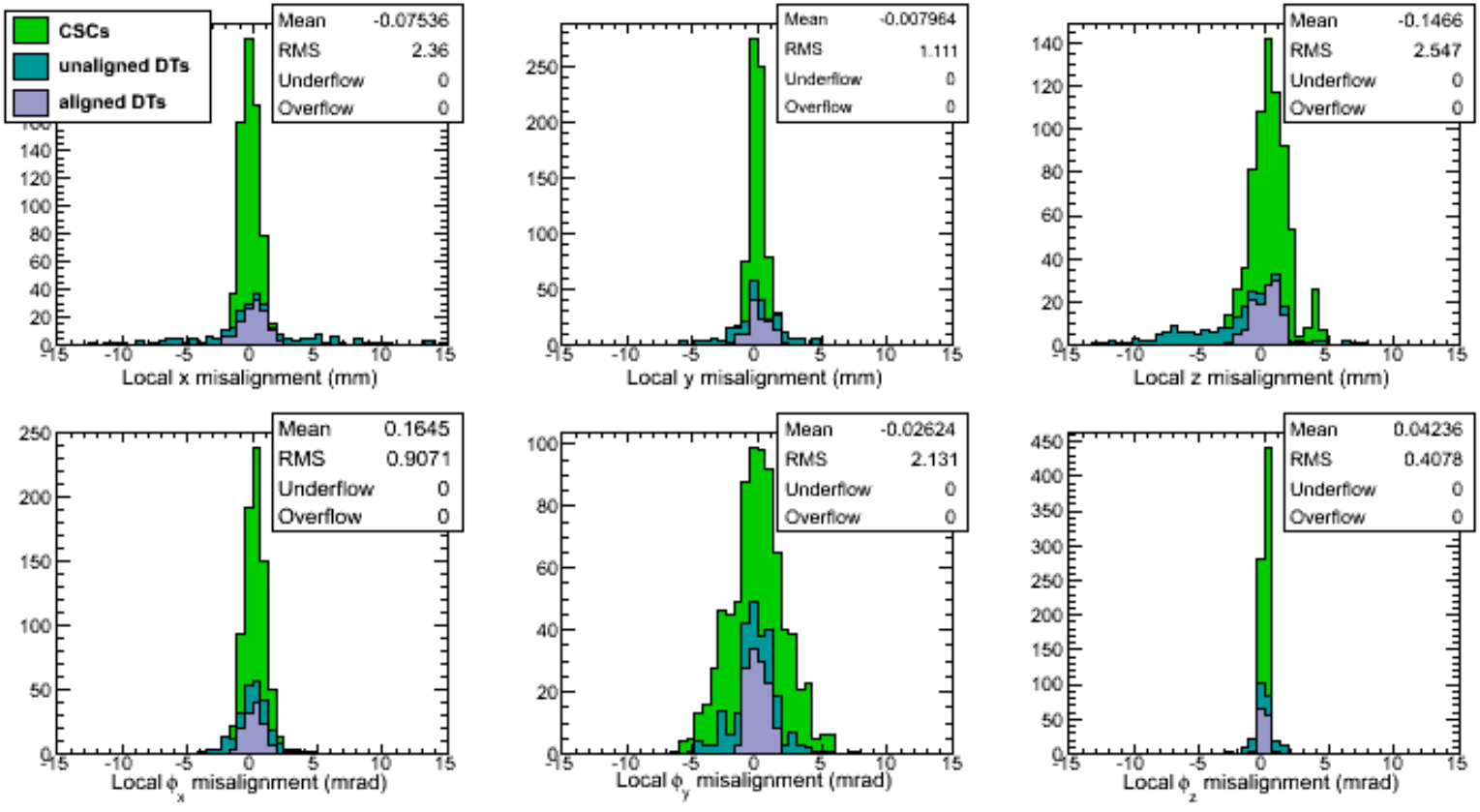




- CSC layer misalignment: 0.092 mm in x from beam-halo measurement

Conclusions

- Distribution of misalignment constants



- Location of SQLite files on CASTOR

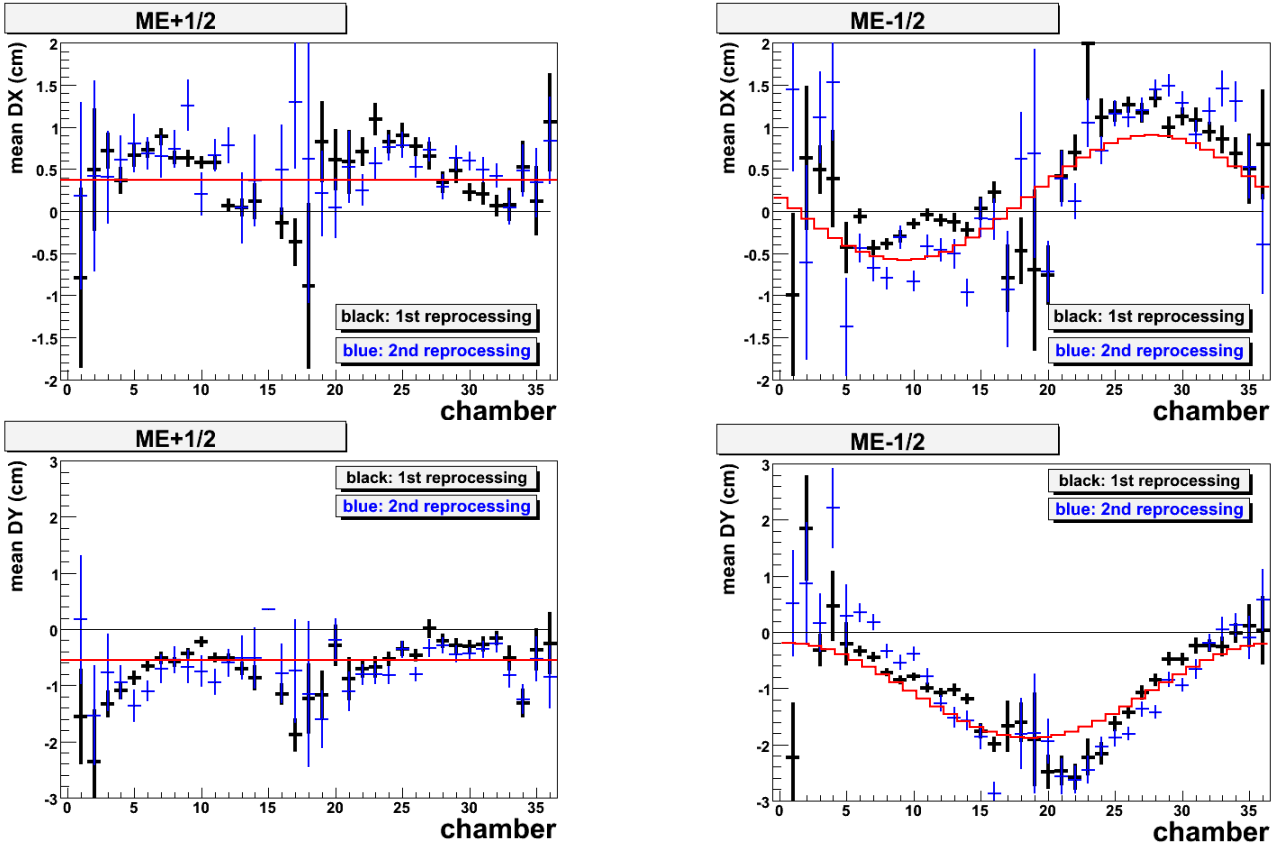
`/castor/cern.ch/user/p/pivarski/MCScenario_CRAFT1_22X_V02-09-04.db`

`/castor/cern.ch/user/p/pivarski/MCScenario_CRAFT1_31X_V02-09-04.db`

Real-data disk alignments (1/2)

- Optimized disk positions to reproduce plots shown by Michael Schmitt and myself
- Michael's plots: residuals in global coordinates

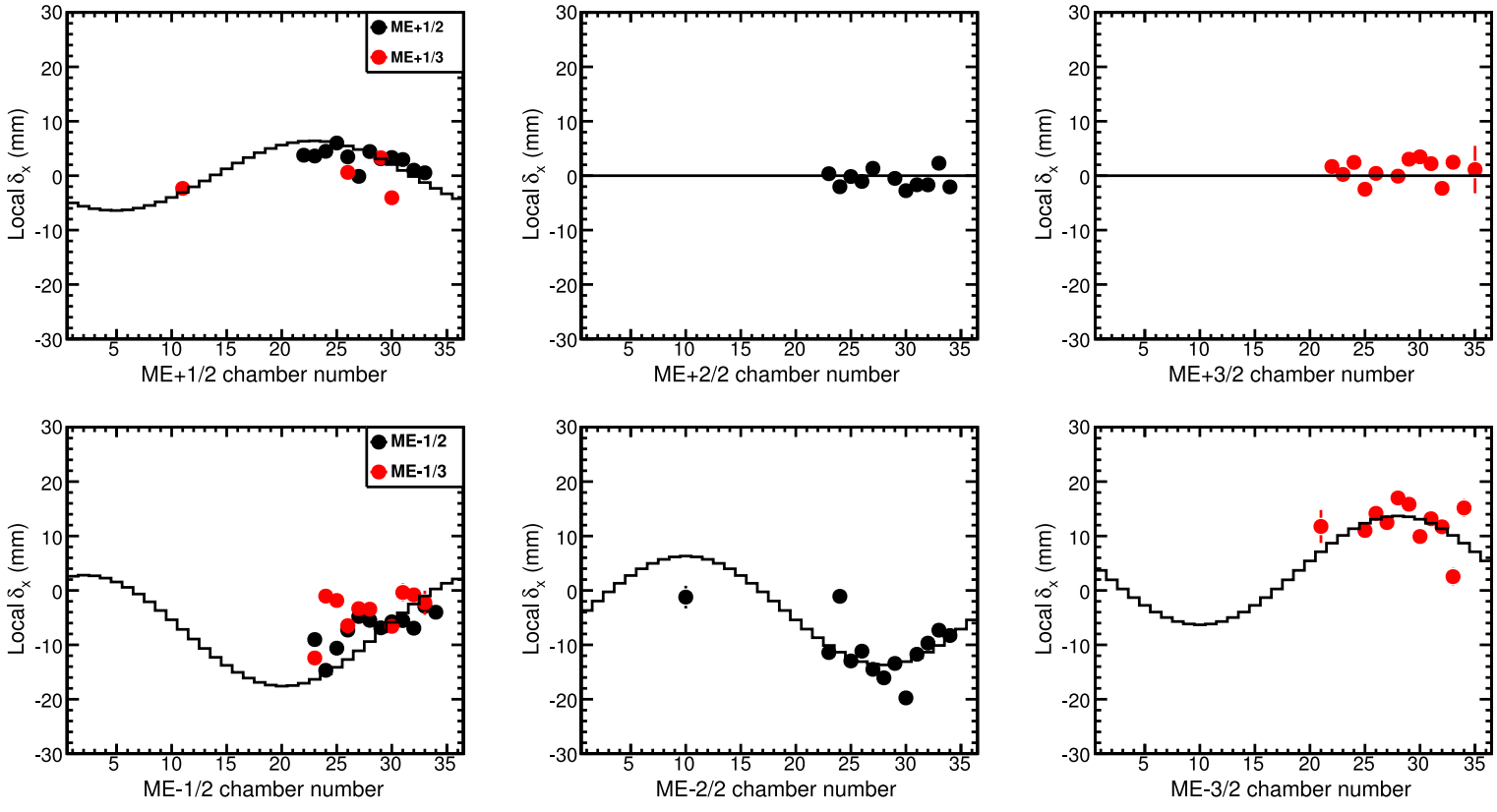
Disk alignment correction



- ME−1: 4 x, −5 mm y; ME+1: 2 x, −10 mm y, 2 mrad

Real-data disk alignments (2/2)

- My plots: local x coordinates



- Same ME±1, ME−2,3: 10 mm x, 0.7 mrad, ME+2,3: nothing
- Curves produced by actual alignment scenario implemented in CMSSW
- Disk corrections applied on top of signed-off photogrammetry and hardware alignment