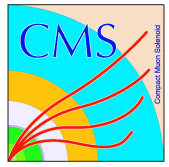


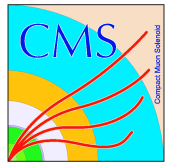
Miscellaneous track-based alignment updates

Jim Pivarski

Texas A&M University

25 September, 2009

Outline

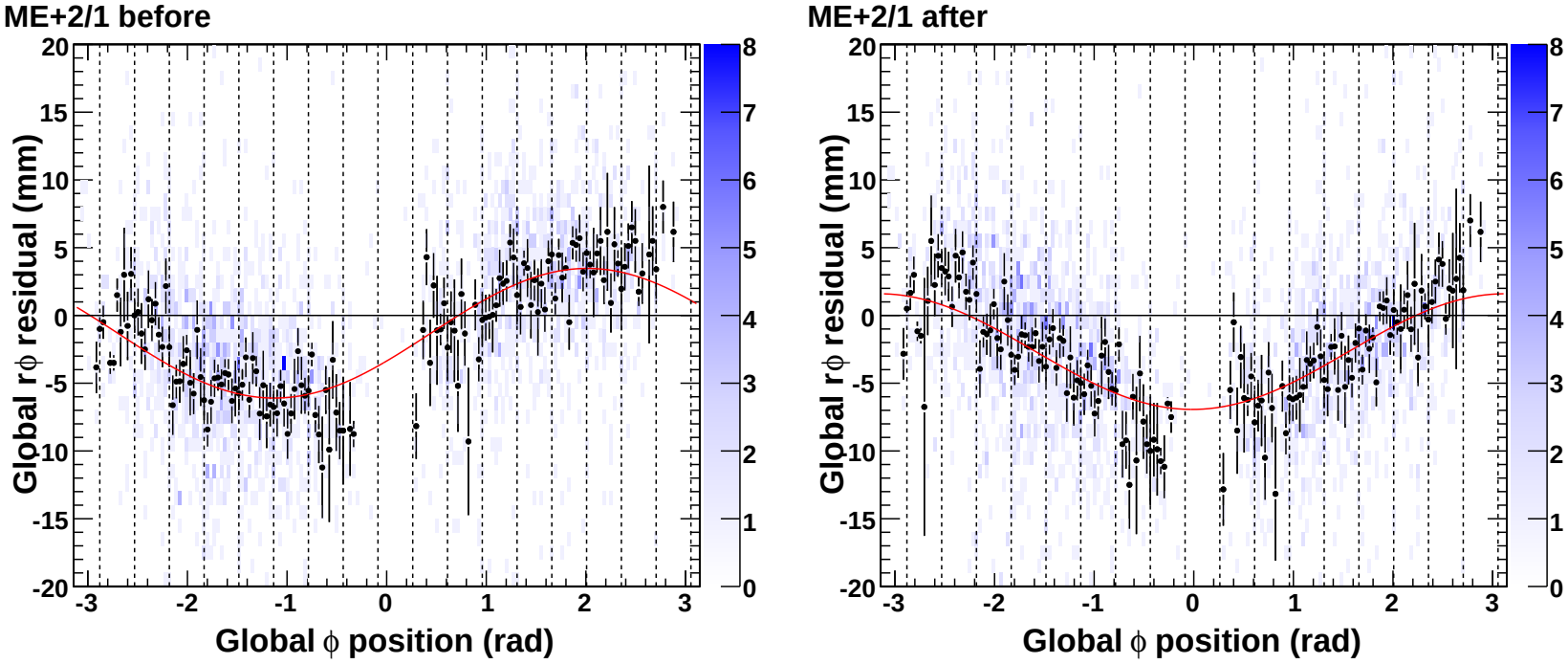


- Endcap alignment using ring-1
- Endcap residuals bug hunt
- Barrel alignment TEC study

Endcap alignment using ring-1

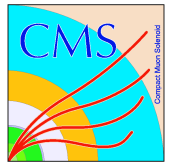
- Residuals bug affects rings 2 and 3 only, every disk has a ring-1, we can at least align the disks using ring-1 residuals
- Also an exercise in getting the sign conventions right:

  δ_x ($\sin\phi$) **corrected;** δ_y ($\cos\phi$) and δ_{ϕ_z} (const) **wrong sign**



- What are the prospects of getting DCOPS input? (δ_z and δ_{ϕ_x})

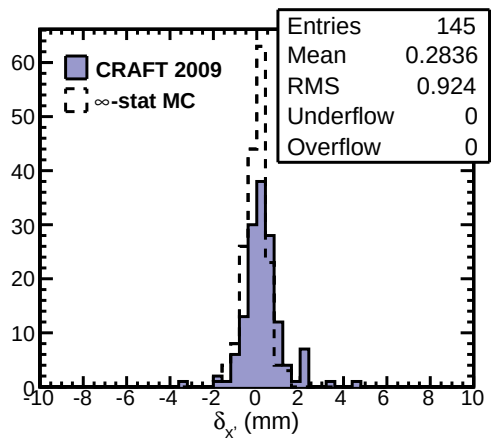
Endcap residuals bug hunt

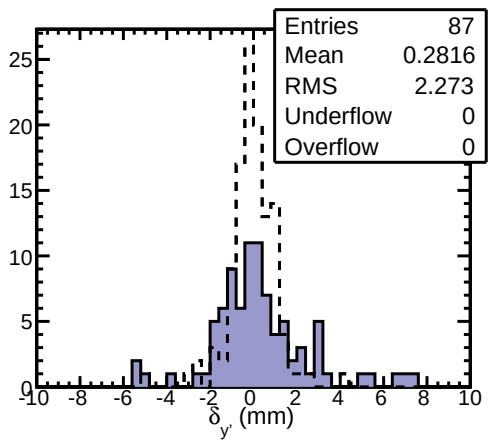


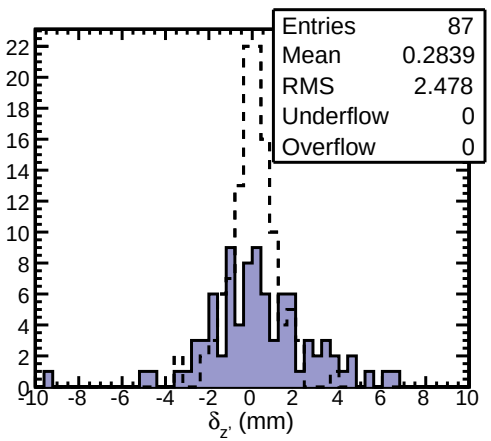
√	check all ideal chamber center positions (database and DDD)	no 22X → 3XY changes
√	check all strip positions relative to chamber centers (Tim Cox)	no 22X → 3XY changes
√	ask all reconstruction experts about other changes	no leads
√	create a CSC overlaps skim of CRAFT-2009	done, waiting for me to analyze
	dump all aspects of overlap discrepancies, determine at what level the error occurs	
	does it affect reconstruction in general?	
	re-reconstruct CRAFT-2008 data in 3XY: might this be a read-out issue in 2009, rather than reconstruction in 3XY? (hopefully not!)	

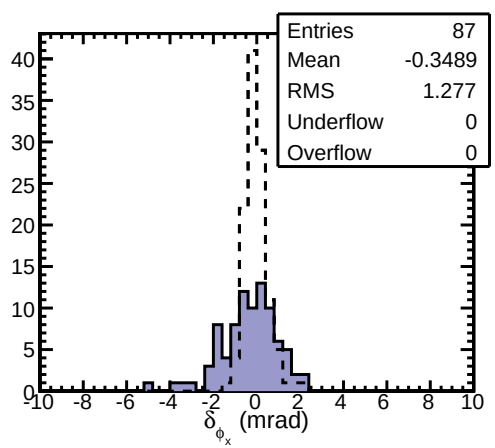
TID/TEC study (1/5)

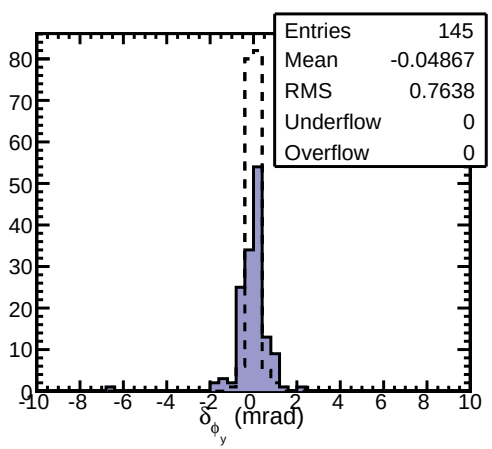
- Can we now use the tracker TID/TEC in muon barrel alignments?
- All of the following plots: difference in aligned positions using
  (a) tracks with zero TID/TEC hits (previous alignments)
  (b) tracks with one or more TID/TEC hits (statistically independent)
- Dashed reference is same in infinite-statistics ideal-tracker cosmics MC

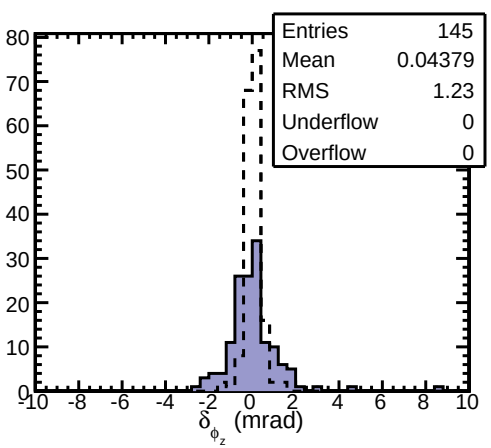








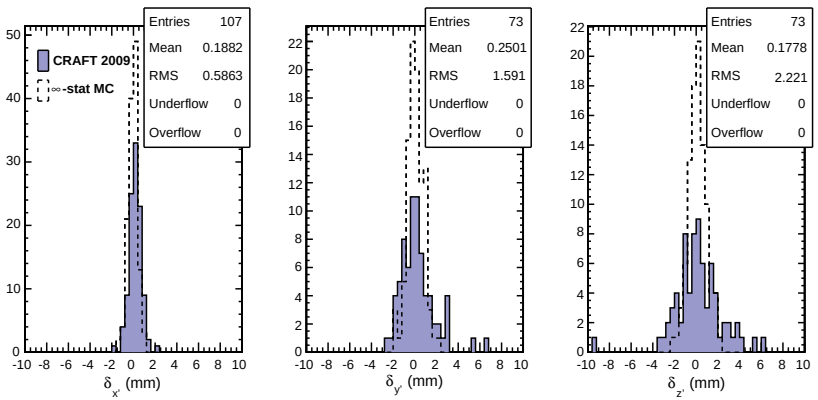


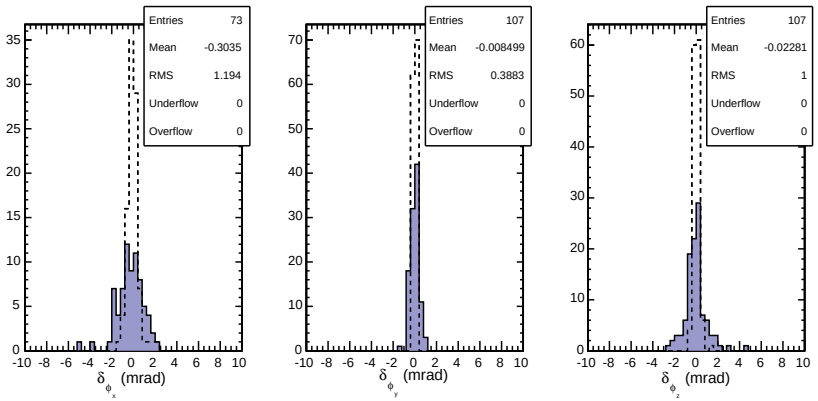


TID/TEC study (2/5)

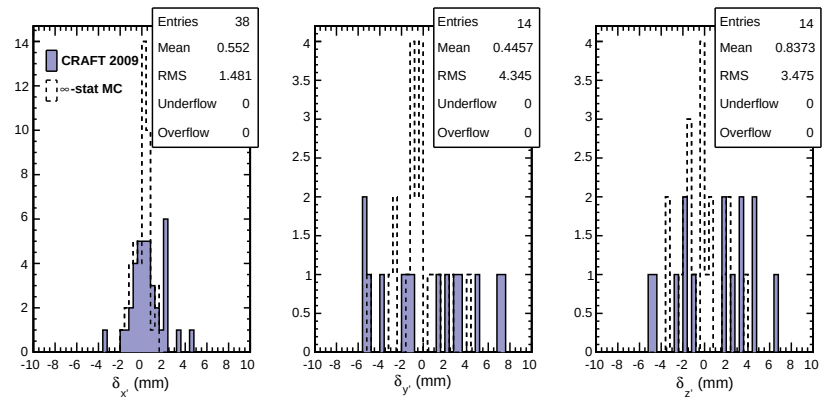
- Data: more spread than MC, with 0.28 mm bias (tracker TID/TEC vs. TIB/TOB misalignment?)
- More spread in wheels ± 2, but that is due to lower statistics

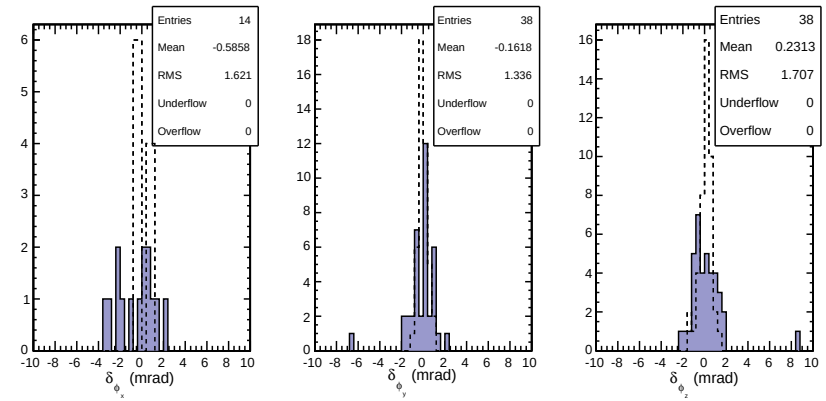
wheels -1, 0, $+1$





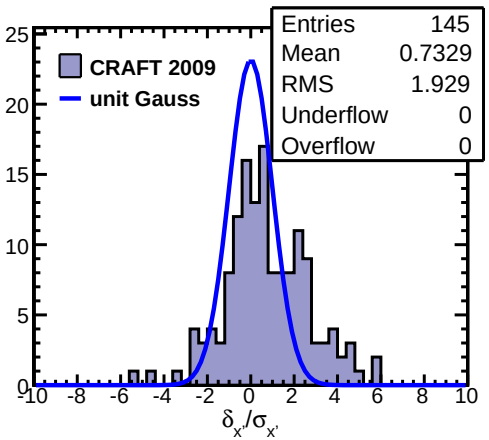
wheels -2, $+2$

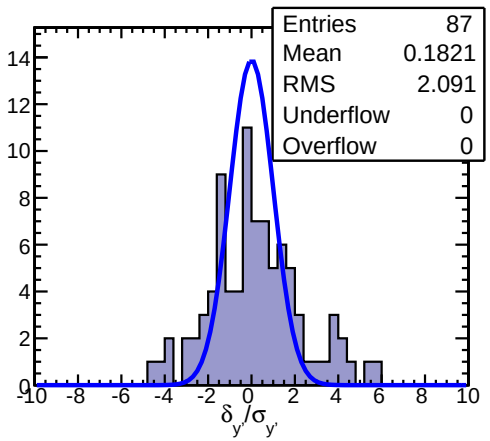


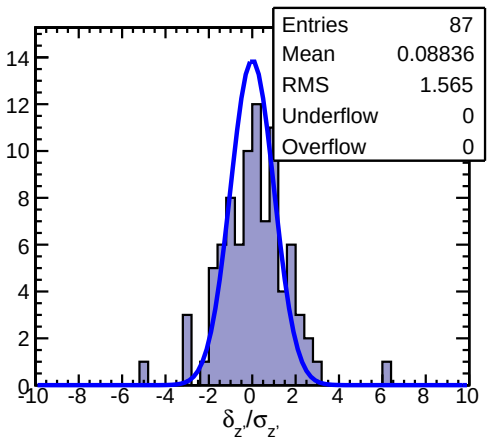


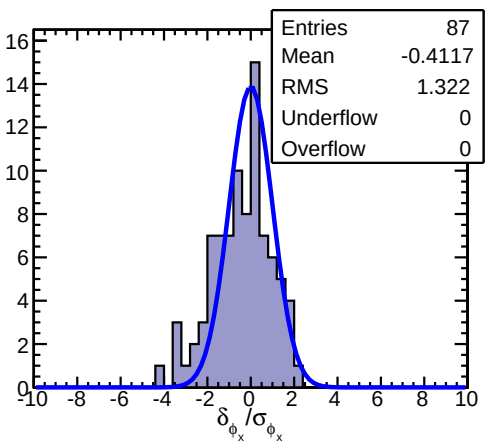
TID/TEC study (3/5)

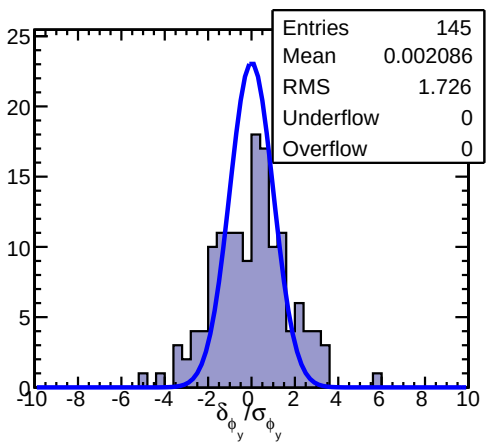
- To study statistics, plot position difference (δ_x) over statistical uncertainty (σ_x)
- Blue reference is a unit Gaussian (purely statistical deviations)
- Statistically significant excess at high δ_x

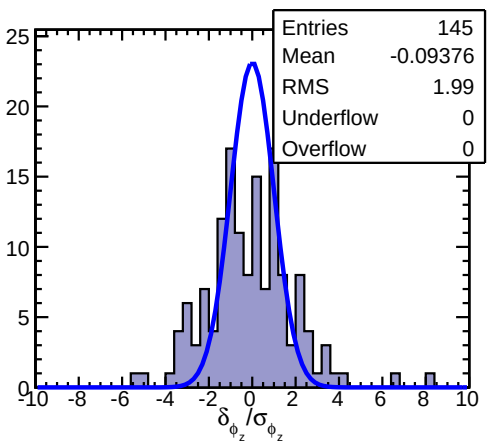








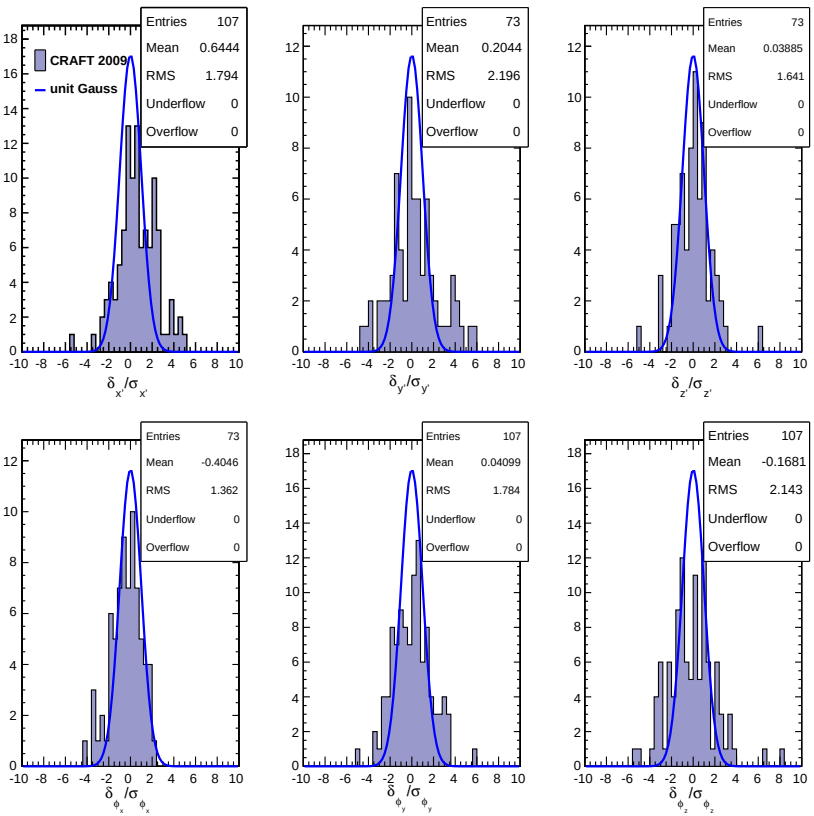




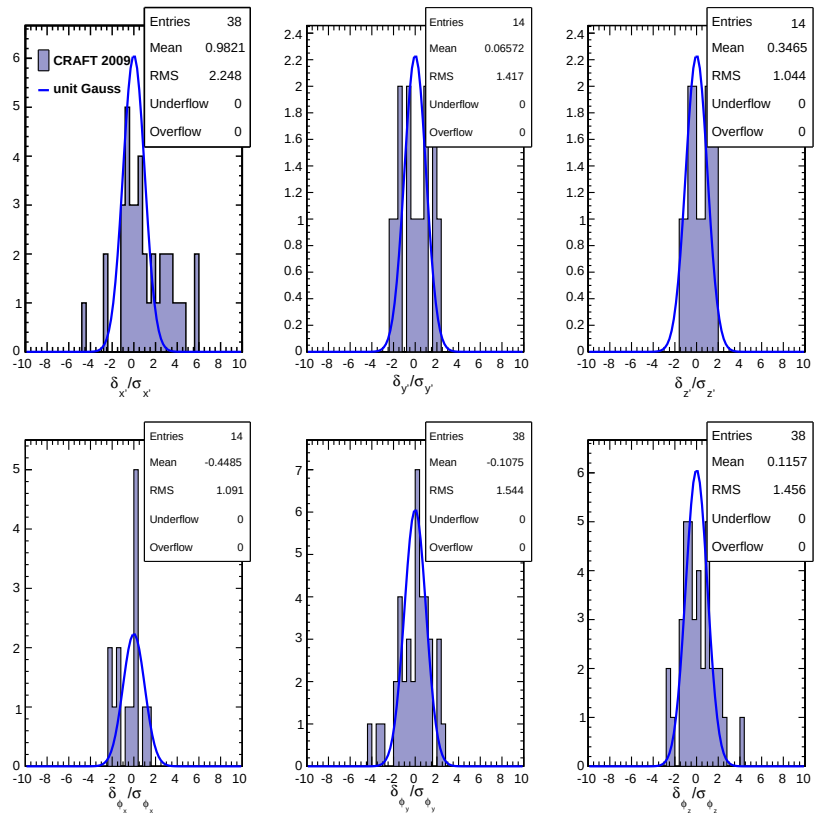
TID/TEC study (4/5)

- It's no more significant in wheels ± 2 than central wheels
- That's why we can conclude that the larger spread on p. 6 is statistical

wheels -1, 0, $+1$

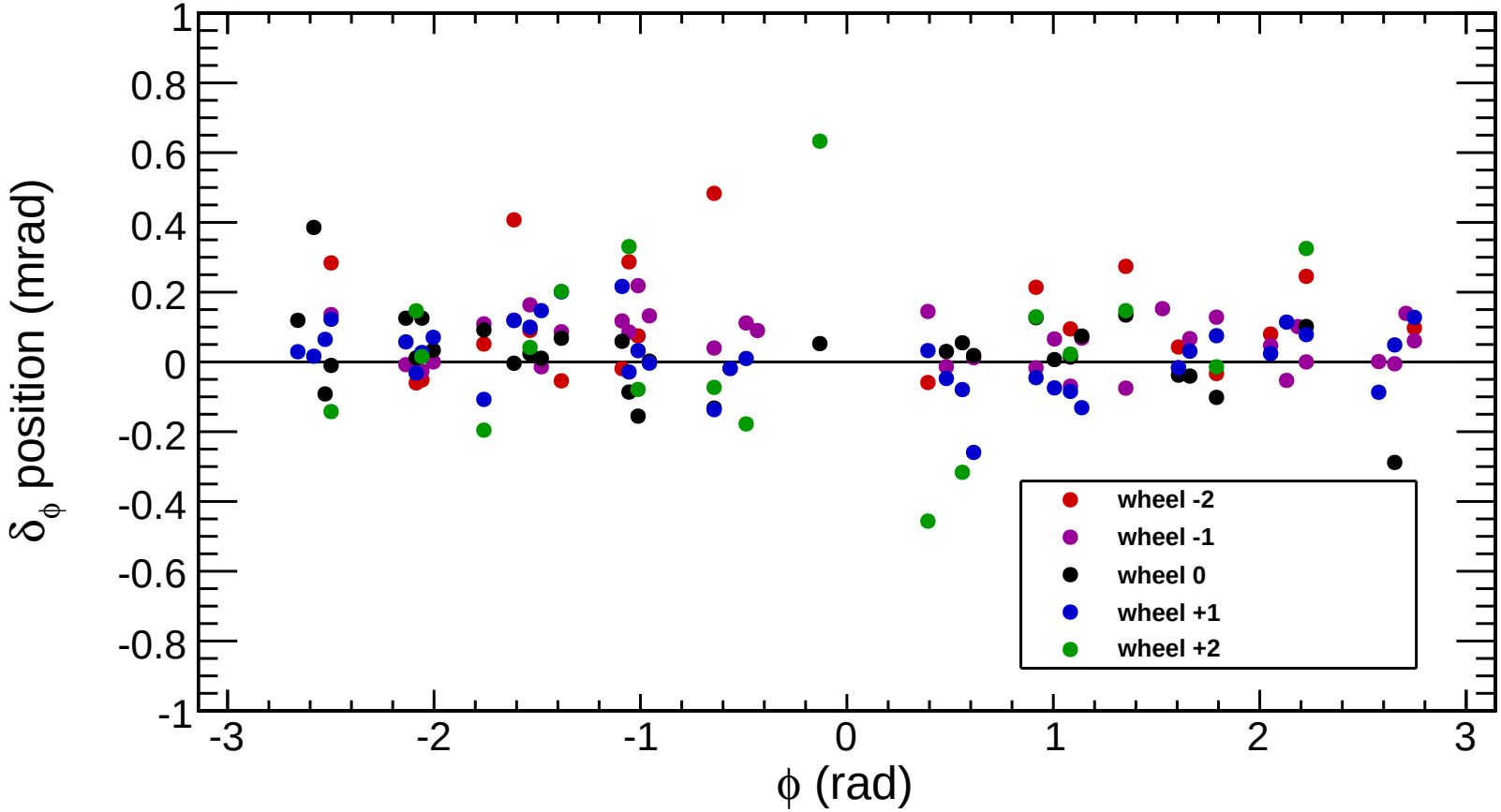


wheels -2, $+2$

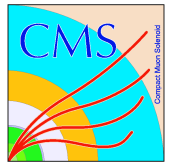


TID/TEC study (5/5)

- No global patterns in $\delta_\phi = \delta_x / R$ vs. ϕ
- Mean δ_ϕ is 0.04 mrad
- Can be more precisely studied by plotting muon residuals as a function of their origin in the tracker (old "tracker X-ray plots")



Summary



- Ring-1 chambers, unaffected by bug, allow us to align endcap disks
  - corrected sign and resubmitted
  - any news on DCOPS-based input, to make a merged alignment?
- Bug hunt continues: today I'll be looking at the overlap hits (and their strip numbers, position in strip, etc.)
- Statistically sensitive to a small bias from the TID/TEC
  - bias of 0.04 mrad rotation (0.28 mm δ_x translations) between tracks with no TID/TEC hits and tracks with at least one TID/TEC hit
  - spread in chamber positions (0.9 mm) dominated by statistical errors, especially in wheels ± 2
  - I would advocate using all tracker tracks in the next alignment
- The next track-based alignment will inherit δ_{ϕ_x} angles from a prior measurement. Will that prior measurement be photogrammetry, and is there an SQLite input geometry available?