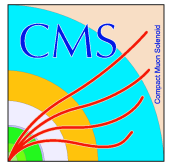

Tracker weak mode update

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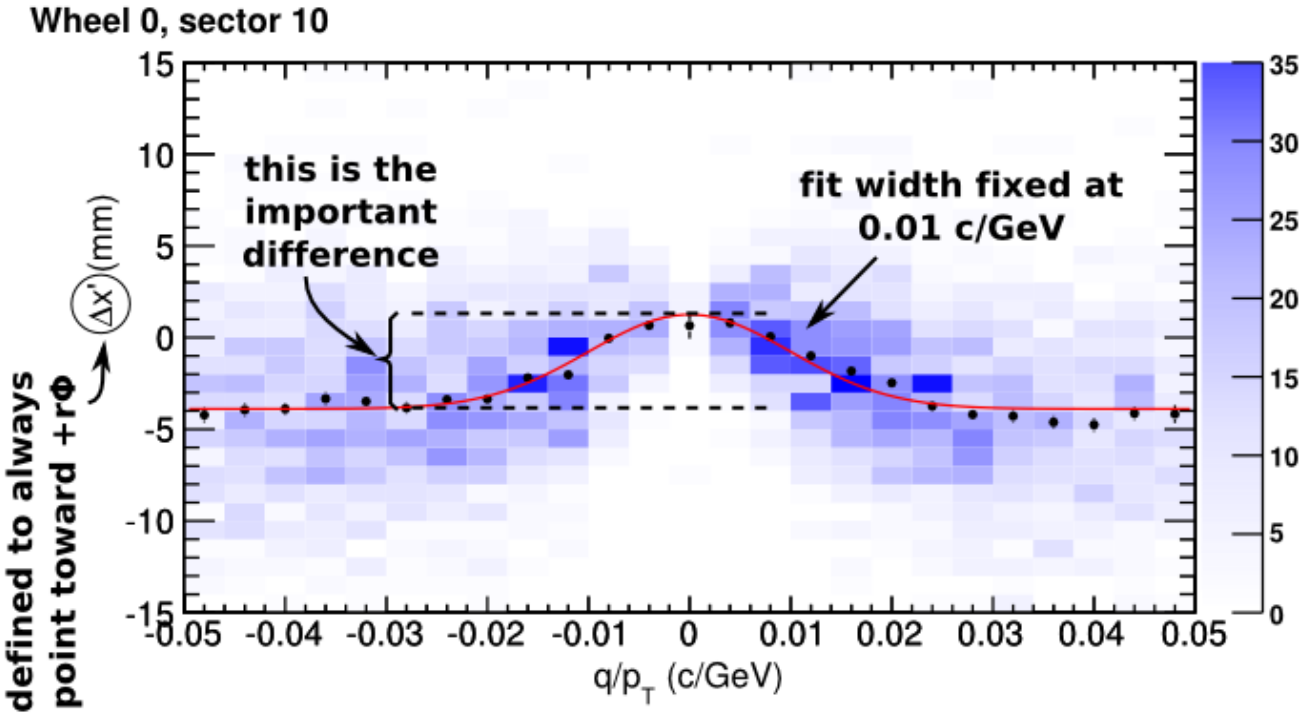
News

- I implemented a general module for making residuals vs. track curvature plots for all first-station chambers (and in relevant groups) in Alignment/CommonAlignmentMonitor
- These are for monitoring the tracker tracks that we get for alignment, to see if there is any inconsistency in them (there currently is)
- I've made some exploratory plots with the new package, and will be integrating this into CVS soon, then will add a twiki for long-term reference
- This should also be merged into Vadim's plotter, with a medium-term priority

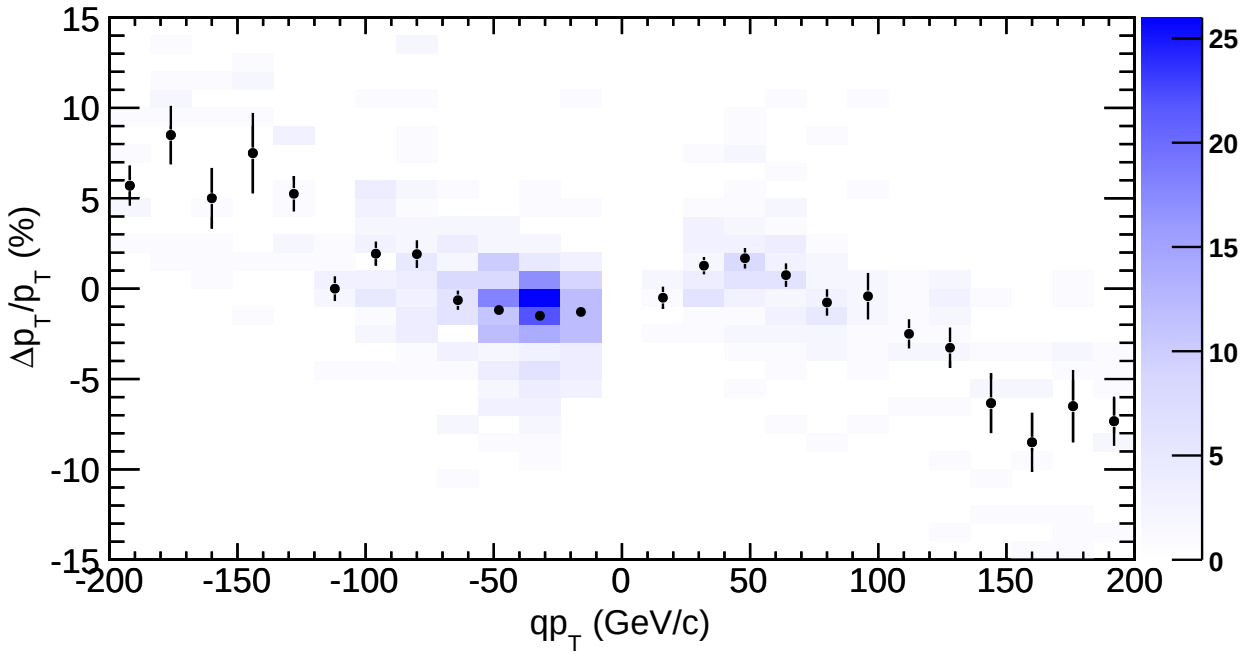
Example plot (with annotations)

- The $A + B\exp(-x^2/2/0.01^2)$ fit (red) is empirical, but fits all chambers well (100 GeV/c is special, probably tracker radius)
- There's a plot like this for all DT wheels, all sectors of station 1
- Similar plot for every CSC in ME1/1, 1/2, 1/3 (all 36 chambers), also grouped into pseudo-sectors (12 groups of 3 chambers, roughly aligned with barrel's sectors), and all-evens, all-odds



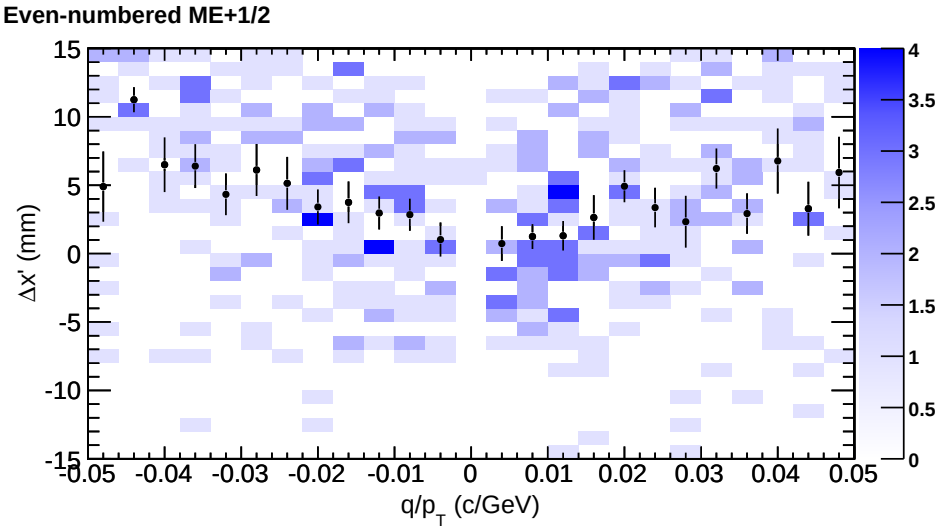
Another way to look at it

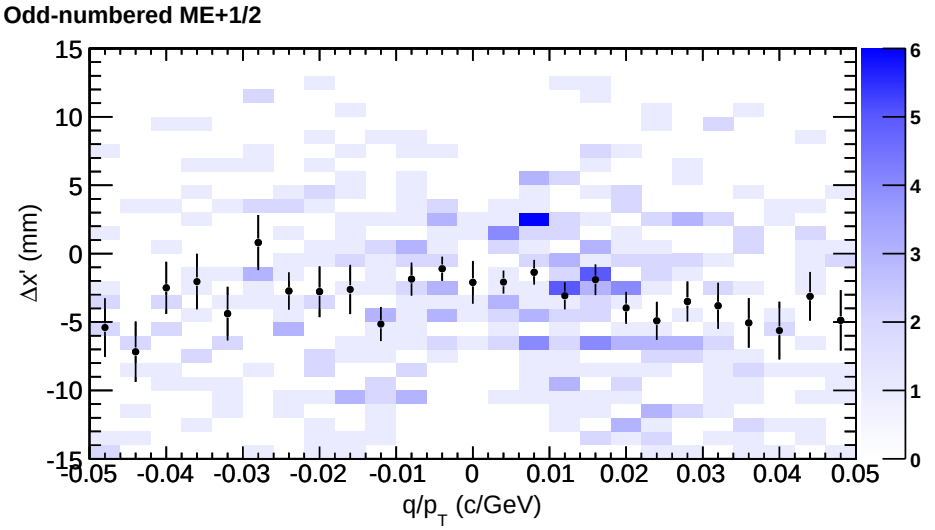
- By taking numerical derivatives with the propagator, we can compute the track momentum bias (assuming the chamber is well-aligned)
- Even if the chamber is not properly aligned, it gives a sense of the scale of momentum errors (in another study, varying chamber alignment just changes the lineshape, but not the typical scale)
- This is also in the set of plots, along with curvature bias $\Delta(q/p_T)$



CSC evens/odds (ME+1/2)

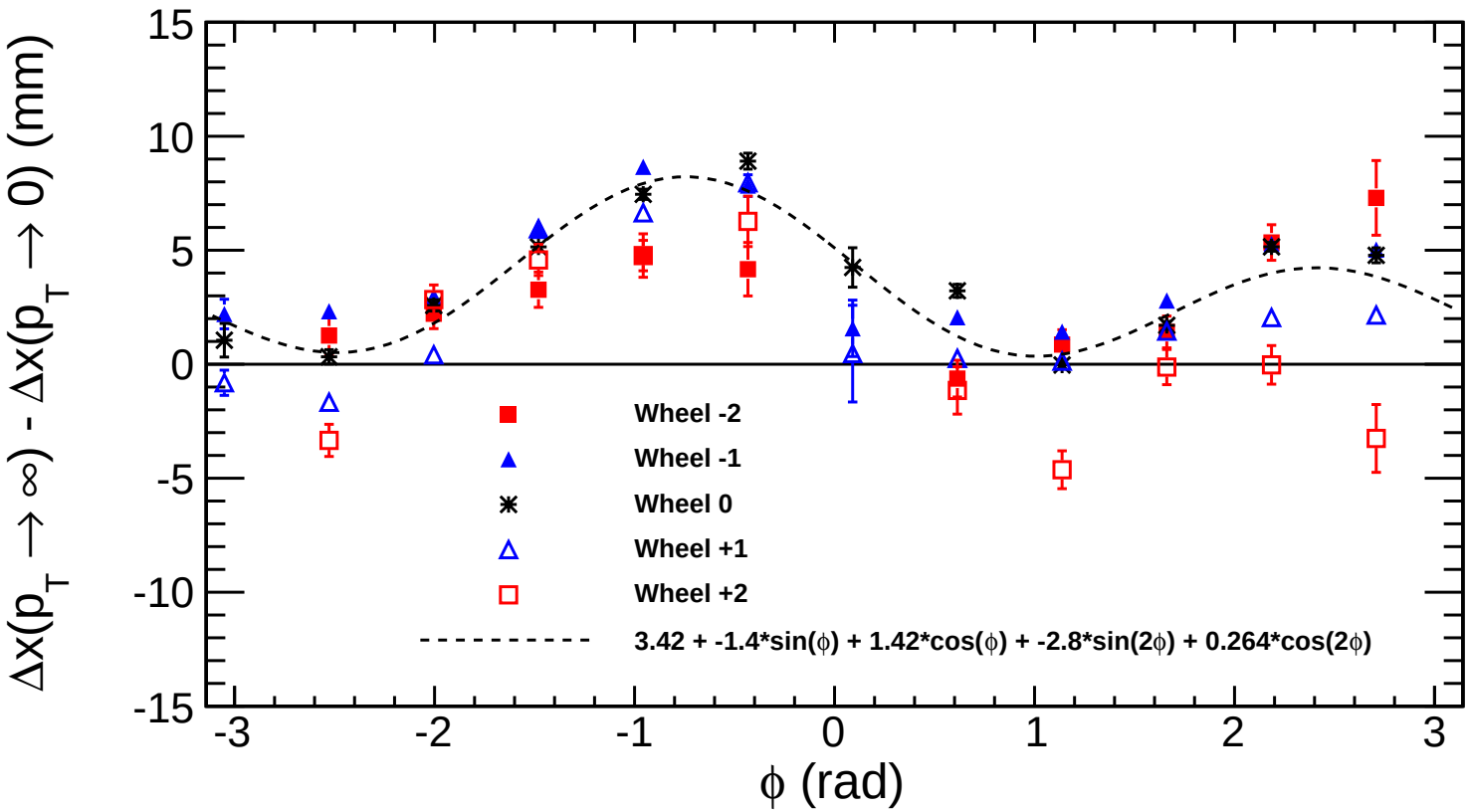
- This is the old CSC problem, seen for the first time since last fall
- The fact that the distribution is symmetric (demonstrated here for the first time) rules out magnetic field bias as the cause
- Not enough statistics to see this on a chamber-by-chamber basis (I'll dig further, to see if rebinning might make something visible)





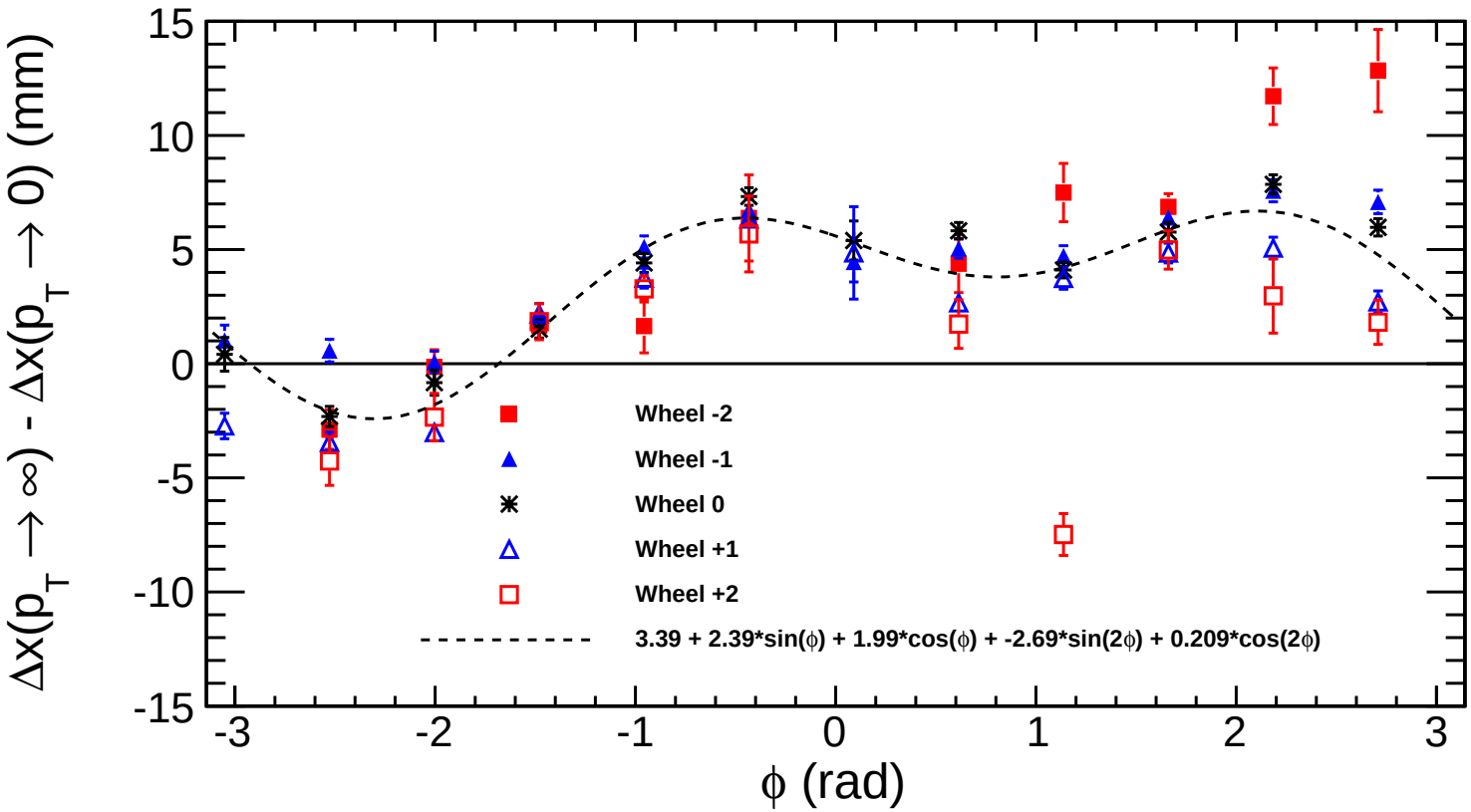
Summary plot: CRAFT09 tracker

- Put the fit results of all barrel chambers on one plot
- Insensitive to muon misalignment because it's a residuals difference
- Not much of a pattern vs. wheel (η)
- Clear pattern vs. ϕ, and it's quadrapole! (fit to second-order Fourier series)



Summary plot: distorted tracker

- This is the same thing with the tracker distorted to make the muon chamber at $\phi = -\pi/2$ flat (close to zero in this plot)
- It differs from the previous slide by an exact $\sin\phi$, which means that we've identified the dipole tracker distortion
- Now we just need a quadrapole ($\sin 2\phi$) and a monopole (1)



Where to go from here

- The tracker distortion that Markus found has a perfect $-3.79 \sin\phi$ mm effect on the summary plot: a to cancel the $-1.40 \sin\phi + 1.42 \cos\phi$ mm effect, we need only apply that distortion with $0.52\times$ the magnitude at a $\frac{3}{4}\pi$ angle
- To cancel the $-2.80 \sin(2\phi) + 0.264 \cos(2\phi)$ mm effect, we need to find a distortion which has a quadrapole shape (he thinks there are some examples in his thesis to try. . .), same for the 3.42 mm monopole effect
- In the long term, we would need something more automated, but doing it by hand now can make the first huge improvement: currently all $\mathcal{O}(50$ GeV$/c)$ and above tracks have the wrong momentum by several percent (not just muons)
- I think we should quickly find and make this correction now, so that it doesn't reveal itself as an embarrassing Z peak (ATLAS is not likely to have this problem)
- In muon alignment, we keep monitoring this; in tracker alignment, they find a long-term solution