Magnetic Field from a Muon Alignment Perspective

Errata

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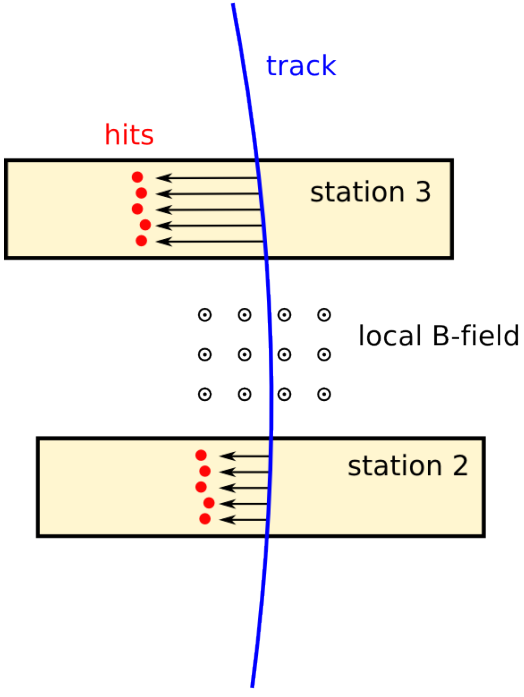
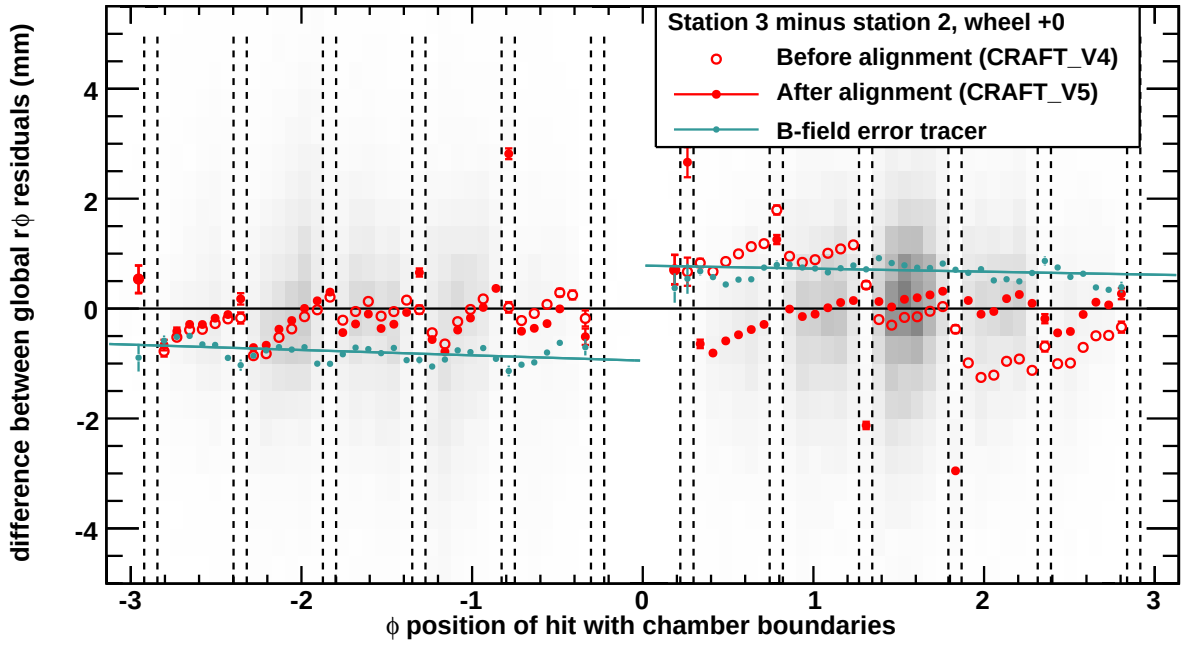
Residuals differences plots

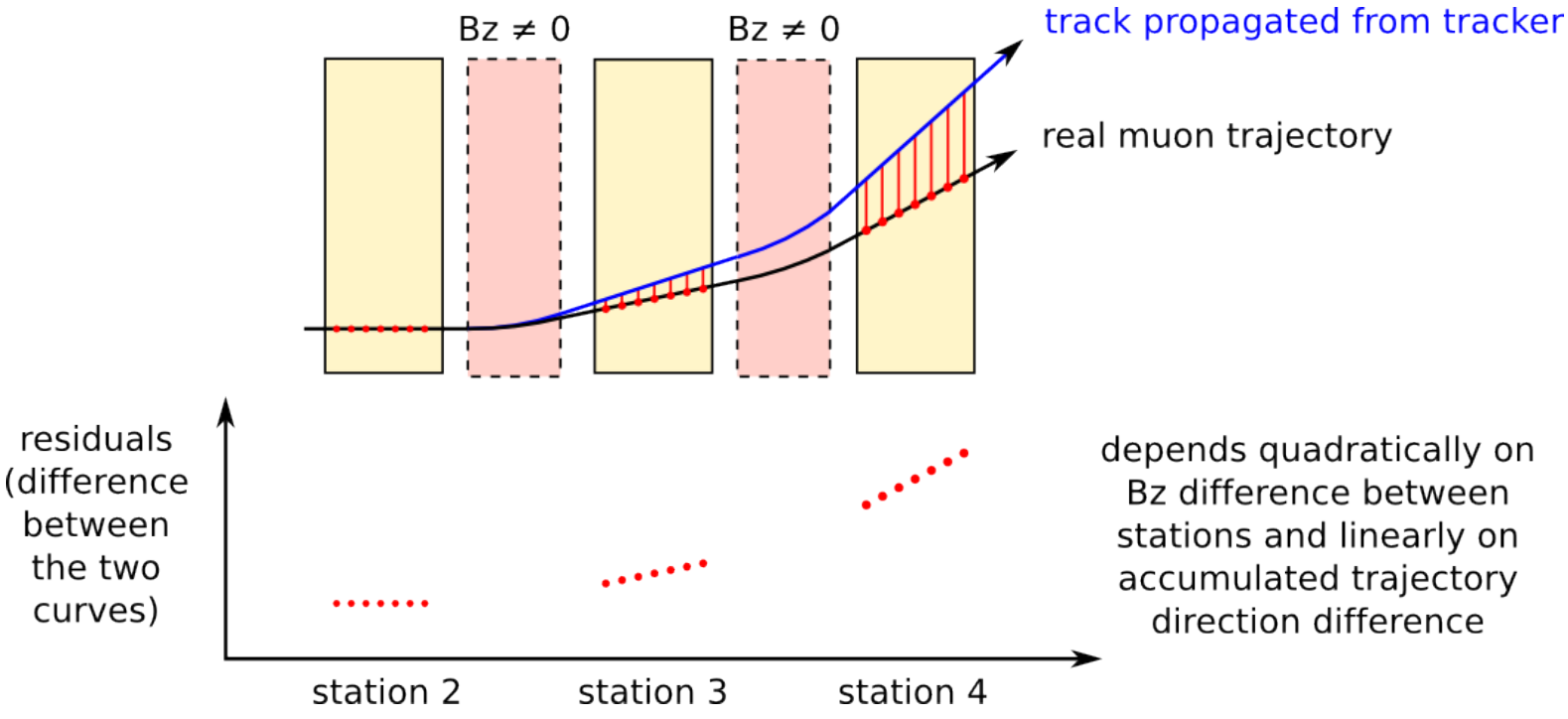




- ~~Also sensitive to local $\vec{B}$-field error, rather than integral over path~~
- Not exactly: see diagram on next page

Extra notes for page 8

- Difference between propagated track and real muon grow quadratically in regions where the B_z is mismodelled
- But they also grow linearly in between



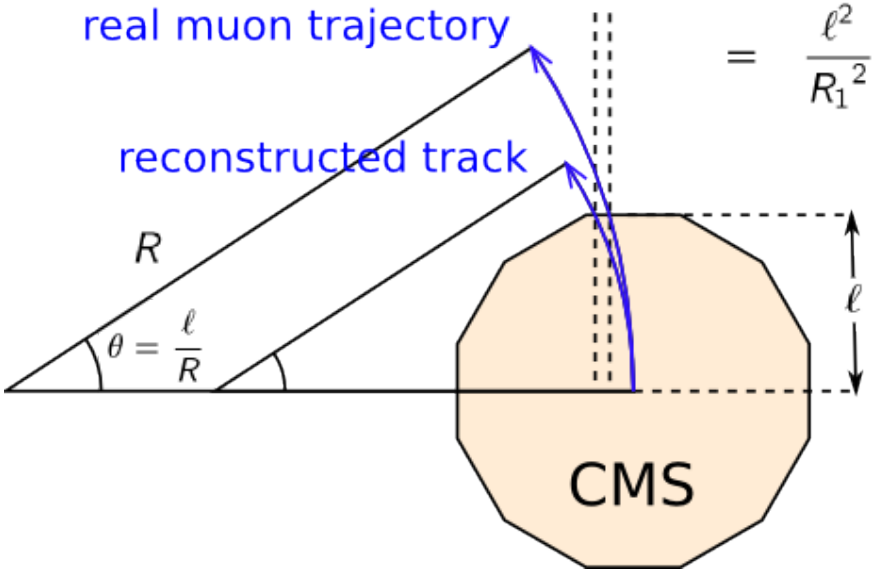
- Residuals differences method only sets the "initial displacement" to zero, it does not set the "initial velocity" to zero, as would be needed to make the station 3 residuals independent of $\vec{B}$-field errors already accumulated in station 2

Calculating B_z error in Tesla

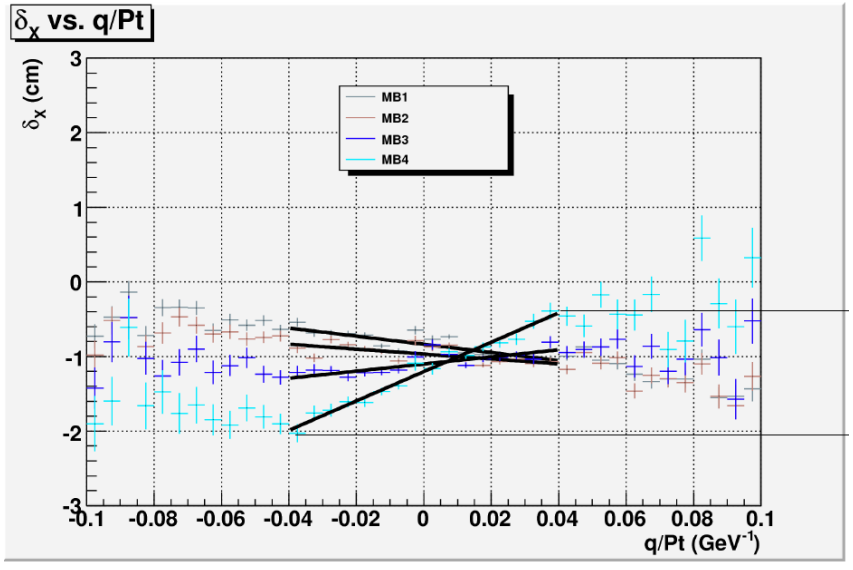
$$\text{residual} = R_1(1-\cos\theta_1) - R_2(1-\cos\theta_2) = R_1{\theta_1}^2 - R_2{\theta_2}^2$$

$$= \frac{\ell^2}{{R_1}^2} - \frac{\ell^2}{{R_2}^2} = \left(\frac{\ell^2}{300\text{ cm}}\right)\frac{\Delta B}{p_T}$$

$$\Delta B = \text{residual}\left(\frac{300\text{ cm}}{\ell^2}\right) p_T$$



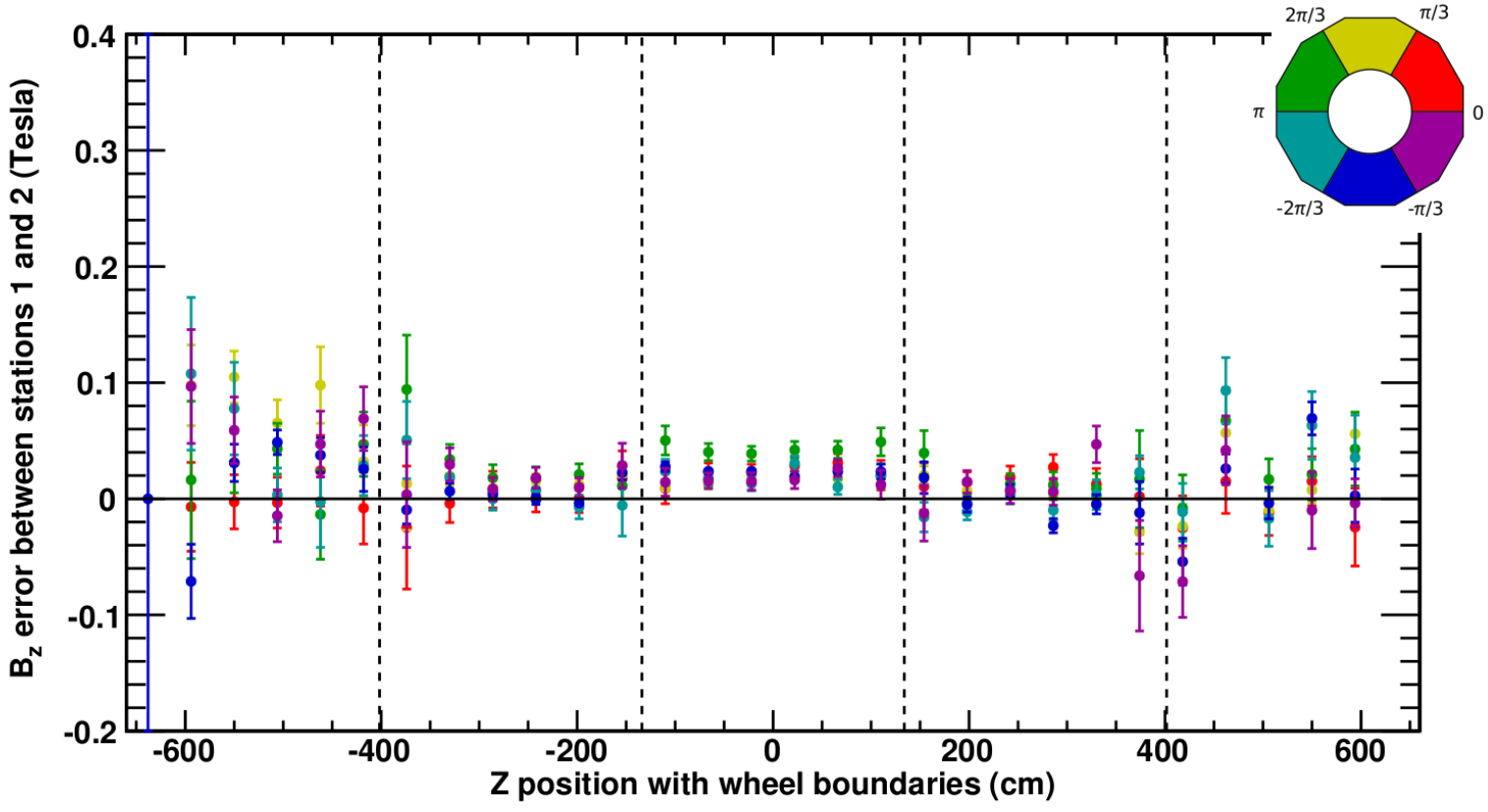
P. Martinez: $r\phi$ residual vs. q/p_T by station



- only problem here: $(1-\cos\theta) \approx \theta^2/2$, not θ^2
- this multiplies all ΔB calculations by a factor of two (*worse* discrepancy)

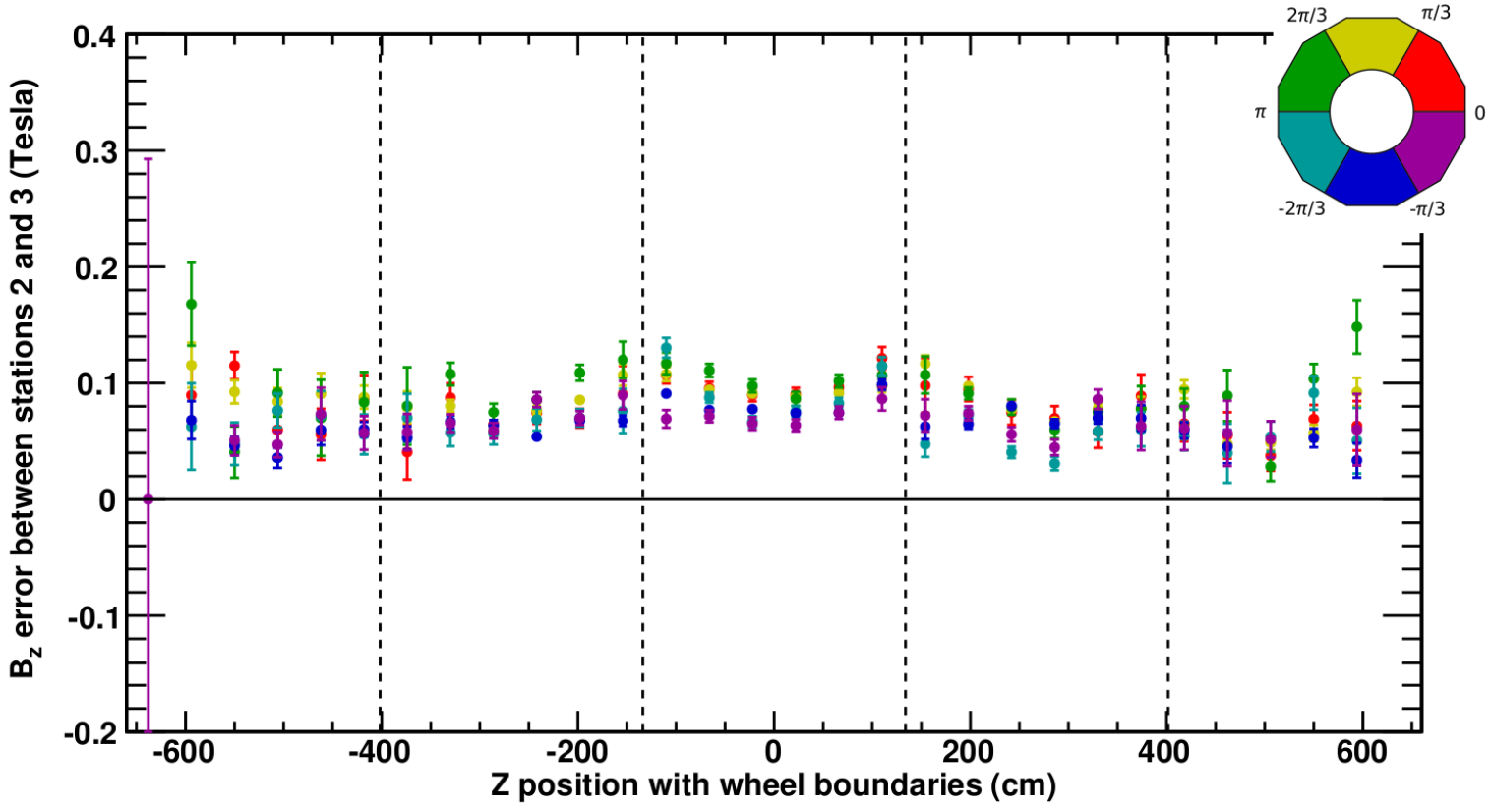
B_z error between stations 1&2

- As stated on slide 9, these ΔB values need to be *doubled*
- But they are also susceptible to accumulated track-direction errors, so the ΔB are increasingly exaggerated with station number
- I'm looking into ways of correcting for this



B_z error between stations 2&3

- As stated on slide 9, these ΔB values need to be *doubled*
- But they are also susceptible to accumulated track-direction errors, so the ΔB are increasingly exaggerated with station number
- I'm looking into ways of correcting for this



B_z error between stations 3&4

- As stated on slide 9, these ΔB values need to be *doubled*
- But they are also susceptible to accumulated track-direction errors, so the ΔB are increasingly exaggerated with station number
- I'm looking into ways of correcting for this