



MuonHIP Alignment since CSA08

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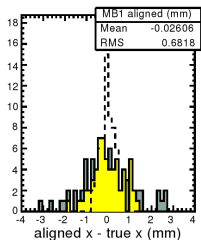
6 June, 2008



- ▶ Solved the two puzzles left at the end of the exercise
 - ▶ Why do we get such a large systematic error from the tracker?
 - ▶ Why did we see radial offsets in the outer endcap rings when we allowed them to float? (In CSA, we didn't.)
- ▶ CSC overlaps procedure status
- ▶ Future plans

DT systematic error quantified

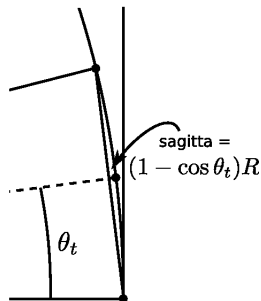
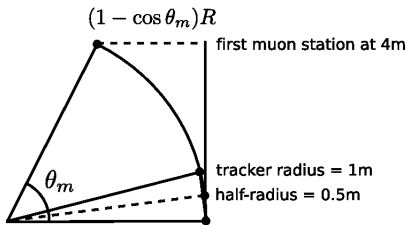
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Barrel muon alignment limited by tracker alignment

(grey is initial, yellow is aligned, dashed assumes a perfect tracker)

340 μm with perfect tracker \rightarrow 680 μm with S156 tracker is a 580 μm systematic

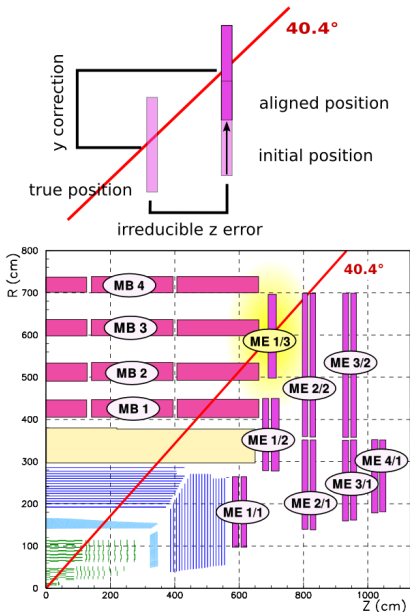


first station misalignment is $\left(\frac{4.25}{0.5} \right)^2 \times \text{systematic sagitta error}$

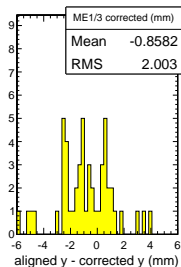
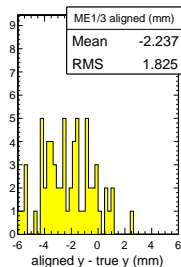
580 microns in muon barrel \rightarrow 8 micron sagitta systematics, or 0.5% p_T

Radial offsets in outer CSC rings

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- ▶ Only I.P. muons in CSA
- ▶ Chamber motion along line of sight cannot be determined
- ▶ Fix z and allow radial y to float
- ▶ Observed systematic shift in outer rings, also fixed y in CSA
- ▶ We now understand this shift
- ▶ Ideally, resolve with cosmic rays





- ▶ Made MuAlOverlaps skims of CSA08 beam-halo MC
- ▶ Solved some problems by looking at residuals with test-misalignments
 - ▶ e.g. two peaks when there should be one
 - ▶ large CSA statistics has helped
- ▶ Still some problems with convergence
 - ▶ standing waves along the CSC ring?
 - ▶ need a way to dampen them?
 - ▶ still speculative!
- ▶ New ideas on a mini-version of the algorithm that uses (and checks) hardware-alignment information
- ▶ Working with hardware alignment group to make a comparison in either April 1–3 or beginning of CRUZET-I



- ▶ Documentation
 - ▶ CSA08 twiki ✓
 - ▶ CSA08 note
 - ▶ Longer MuonHIP note
 - ▶ Effect on physics for Muon POG note
- ▶ Produce more physics-relevant scenarios (tracker and muon)
 - ▶ Re-run with samples in proportion (some CSA samples are a factor of 2 too big)
 - ▶ Does 100 pb^{-1} of $Z \rightarrow \mu\mu$ help tracker curvature measurement?
 - ▶ What happens if material budget/magnetic field description is wrong? Do I need to raise p_T cut?
 - ▶ Validating FastSim residuals distributions, maybe 100 pb^{-1} from FastSim (especially if p_T cut is higher)
 - ▶ Include cosmic rays! (2_0_9 tracker-enriched sample, $B_{\text{on}}/B_{\text{off}}$)
- ▶ Prepare for a *real* alignment with CRUZET-III and CRAFT
- ▶ More alignment quality checks with data (e.g. absolute \Rightarrow relative)
- ▶ Keep working on the CSC overlaps procedure
- ▶ Think about muon curvature constraint in tracker alignment