



Preview of MC and MTCC track-based Alignments and observation of MTCC Noise

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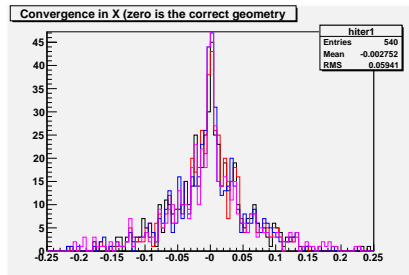
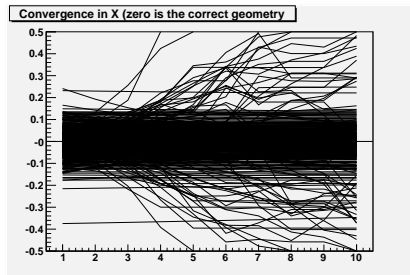
7 June, 2007



Ongoing Activities

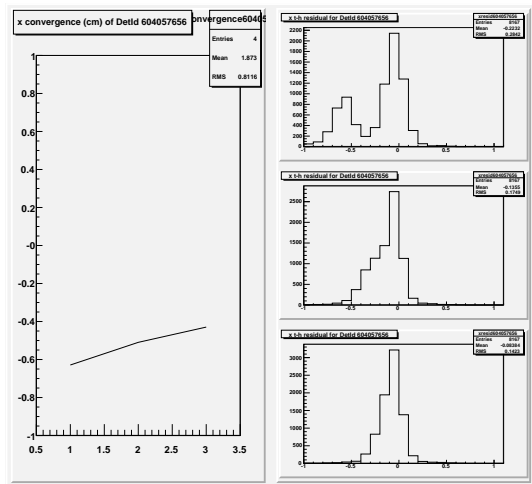
- ▶ Testing HIP alignment procedure on 26k- and 260k-event $Z \rightarrow \mu\mu$ MC samples to debug and optimize the procedure
 - ▶ Equivalent to 10 pb^{-1} and 100 pb^{-1} of $Z + W$ muons
 - ▶ Will extrapolate to low-energy muons using J/ψ residuals
 - ▶ New in this test:
 - ▶ random misalignments (1 mm RMS)
 - ▶ more ambitious precision goals (200 μm , rather than 1 cm)
 - ▶ fitting and aligning the same hits (e.g. standAloneMuons)
- ▶ Real alignment on MTCC data (with Karoly)
 - ▶ Chamber-by-chamber and layer-by-layer
 - ▶ We expect $\sim\text{mm}$ precision with this one-run test sample
 - ▶ (Re-?)Discovered wire noise in ME+1/3

MC status: poor convergence

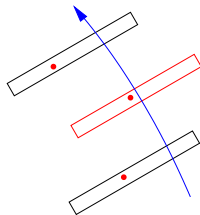


- ▶ Above are CSCs, units are centimeters
- ▶ Same behavior observed in standAlone and globalMuons
- ▶ But unbiased tracker-to-muon sample converged (see talk at UCLA EMU meeting): problem is related to track-fitting bias?

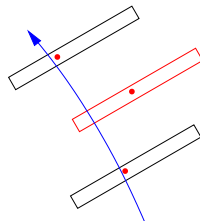
Double-peak structure in residuals



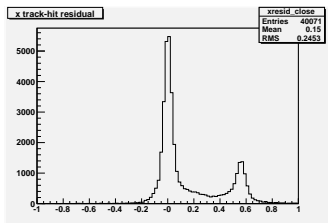
Tracking algorithm trusts the misaligned hit: peak at zero



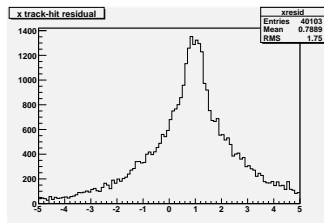
Tracking algorithm avoids the misaligned hit: peak near $-\Delta x$



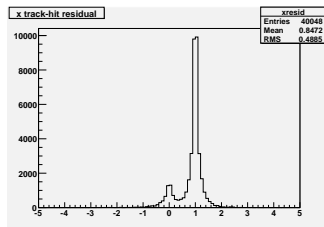
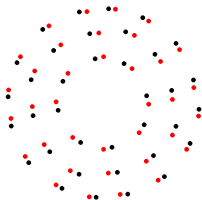
Test by misaligning all chambers $\Delta x = -1$ cm



globalMuons residuals



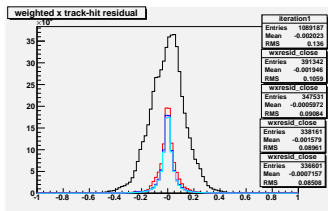
"tracker-to-muons"



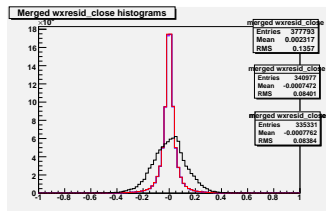
deweighted globalMuon



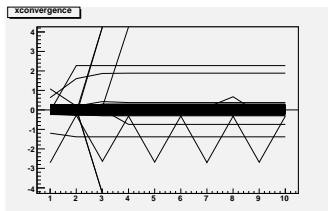
Update! 10 pb⁻¹ deweighted globalMuon alignment



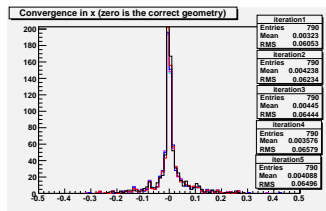
weighted x residual



endcap only (bug in DT)

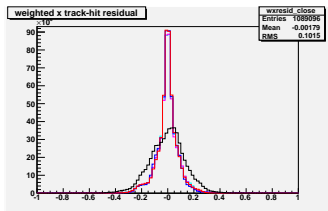


convergence still bad?



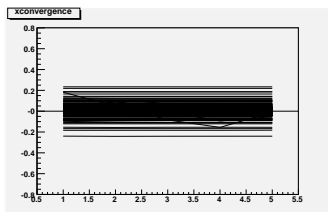


Updated update! 10 pb^{-1} deweighted globalMuon

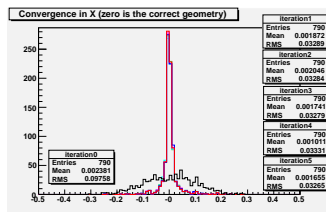


weighted x residual

(no bug in DT)



flat convergence



it's all in iteration 1



Raw output from this *super-preliminary* alignment

Alignment accuracy (RMS of aligned minus true)

	DT		CSC
x	$500\ \mu\text{m}$	x	$200\ \mu\text{m}$
y	$700\ \mu\text{m}$	y	$4\ \text{mm}$
z	$1\ \text{mm}$	z	$1.6\ \text{cm}$
ϕ_x	$16\ \text{mrad}$	ϕ_x	$10\ \text{mrad}$
ϕ_y	$3\ \text{mrad}$	ϕ_y	$2\ \text{mrad}$
ϕ_z	$0.5\ \text{mrad}$	ϕ_z	$1\ \text{mrad}$

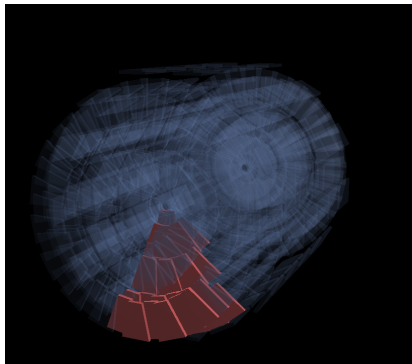
Alignment precision: self-evident bugs

x residuals, post alignment: 1 mm RMS in barrel, 750 microns endcap

MTCC alignments

Exercise AlignmentProducer monitoring (the “sanity checks” tool)

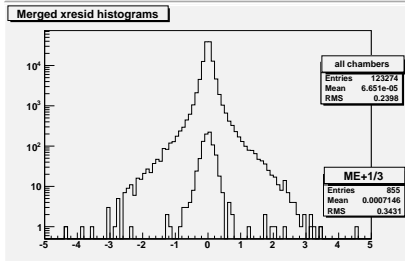
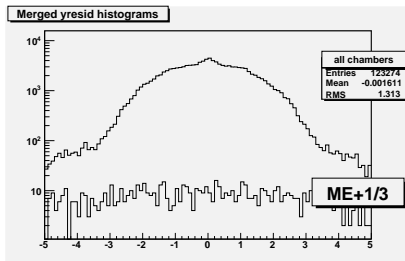
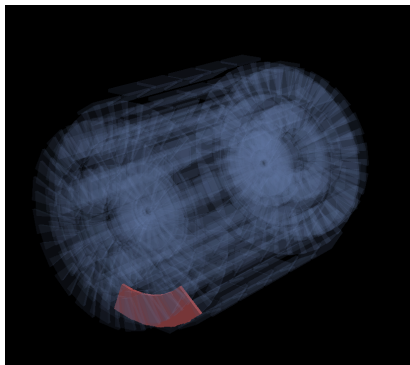
- ▶ e.g. select alignment monitoring histograms with > 0 entries:



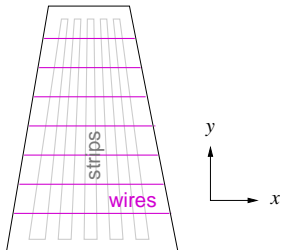
- ▶ searched for peculiar features. . . (skipping detective story)

Selected histograms with $\int_3^5 |y_{\text{resid}}| / \int_0^5 |y_{\text{resid}}| > 0.2$

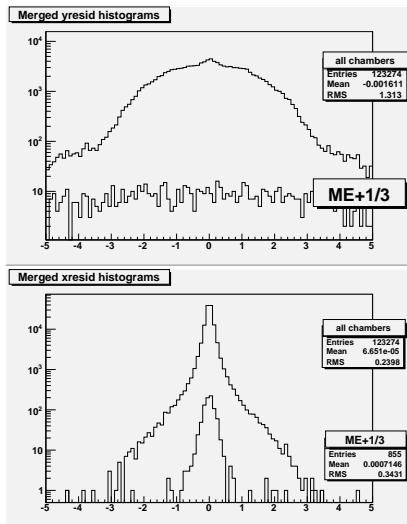
Result: all ME+1/3 and only
ME+1/3



Looks like noisy wires?

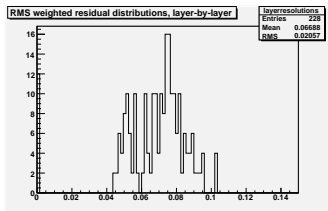


- ▶ Only one run tested: 00003797
- ▶ $\vec{B} = 0$
- ▶ x residuals look normal

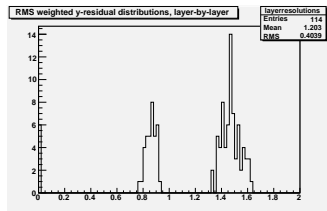




Update: intrinsic resolutions in MTCC



RMS of layer weighted x
residual distributions



RMS of layer weighted y
residual distributions

x residual RMS of $400\ \mu\text{m}$ to $1\ \text{mm}$

Clear distinction between broad and narrow y residual distributions



Short-term plans

- ▶ MC tests:
 - ▶ Align muon system to tracker: globalMuons with deweighted muon system (running)
 - ▶ Align muon system to itself: fit standAloneMuons to even-numbered stations, align odd, alternate
 - ▶ Layer-by-layer alignments should not suffer from tracking bias due to “smoothed residuals,” so align with no deweighting (running)
 - ▶ “New feature deadline” for CSA07 is next Wednesday! Deweighting is a new feature!
- ▶ MTCC analysis:
 - ▶ Try a simple layer-by-layer alignment
 - ▶ Try even/odd chamber-by-chamber alignment
 - ▶ Compare AlignmentProducer results with ToyAlignment? (Non-trivial due to different constraints. . .)