Misalignment Results from Zprime2MuAnalysis

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Alignment studies in common framework

Added new functions to Zprime2MuAnalysis to apply misalignment
Allows us to revist misalignment studies with

- standard cuts
- standard dimuon mass reco (with brem photons)
- treatment of widths (RMS? sigma? restricted Gaussian fit? sigma.)
- new track reconstruction (CMSSW_2_0_9)
- quantify effect on TeV muon reconstructors (also in common framework)

What has changed since my last presentation on misalignment?

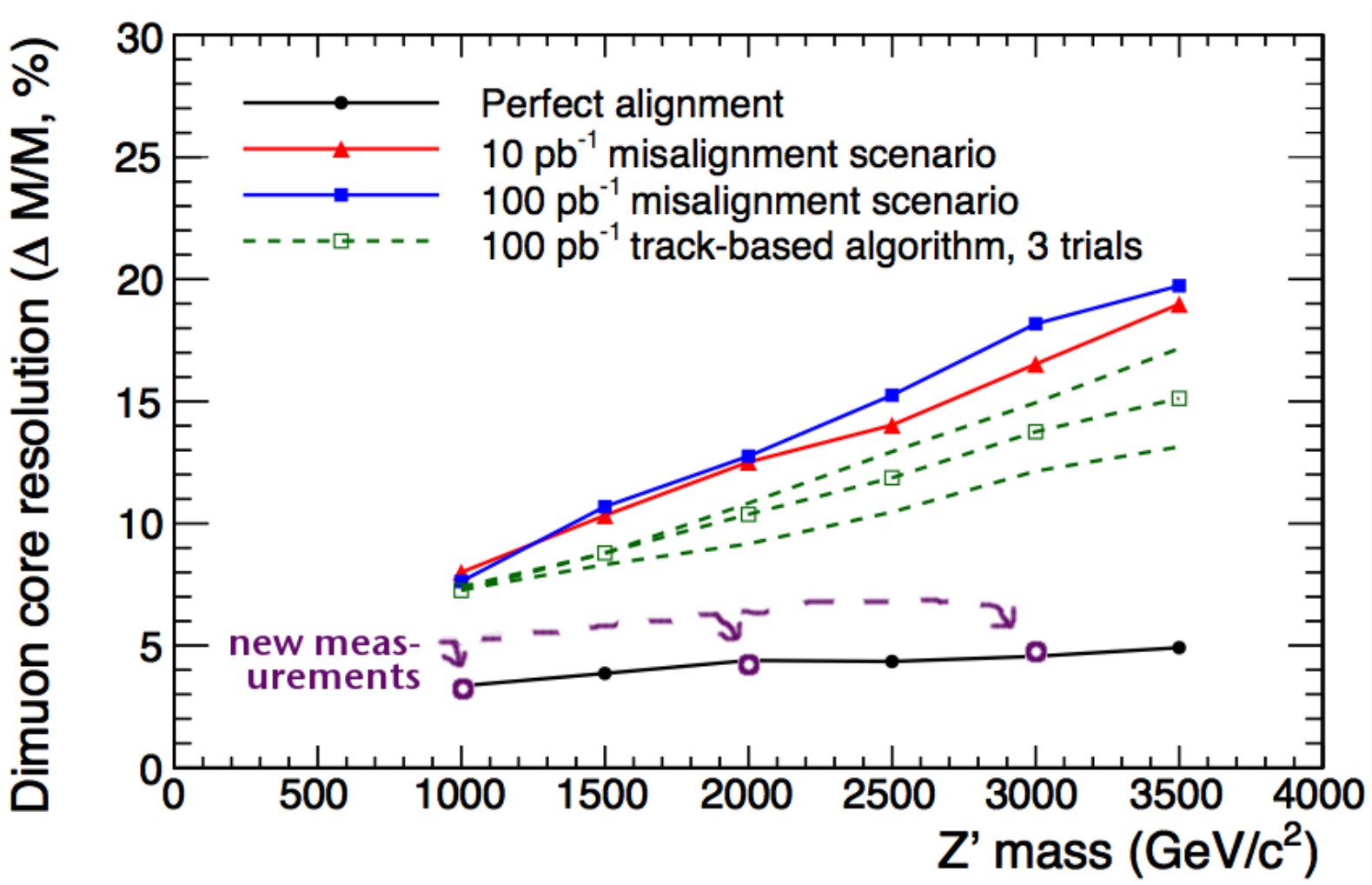
- (now using Zprime2MuResolution, for starters)
- startup and 10 pb-1 Estimated Scenarios were made more realistic
- CSA08 exercise: much more realistic tracker and muon alignment studies (alignment workflows coupled, inclusive muon spectrum, ...)
- improvements in muon alignment procedure (details in DPG)
- only 10 pb-1, no 100 pb-1 study (insufficient MC)

First: connect new study to old

Only new result expected to be the same as old: ideal geometry

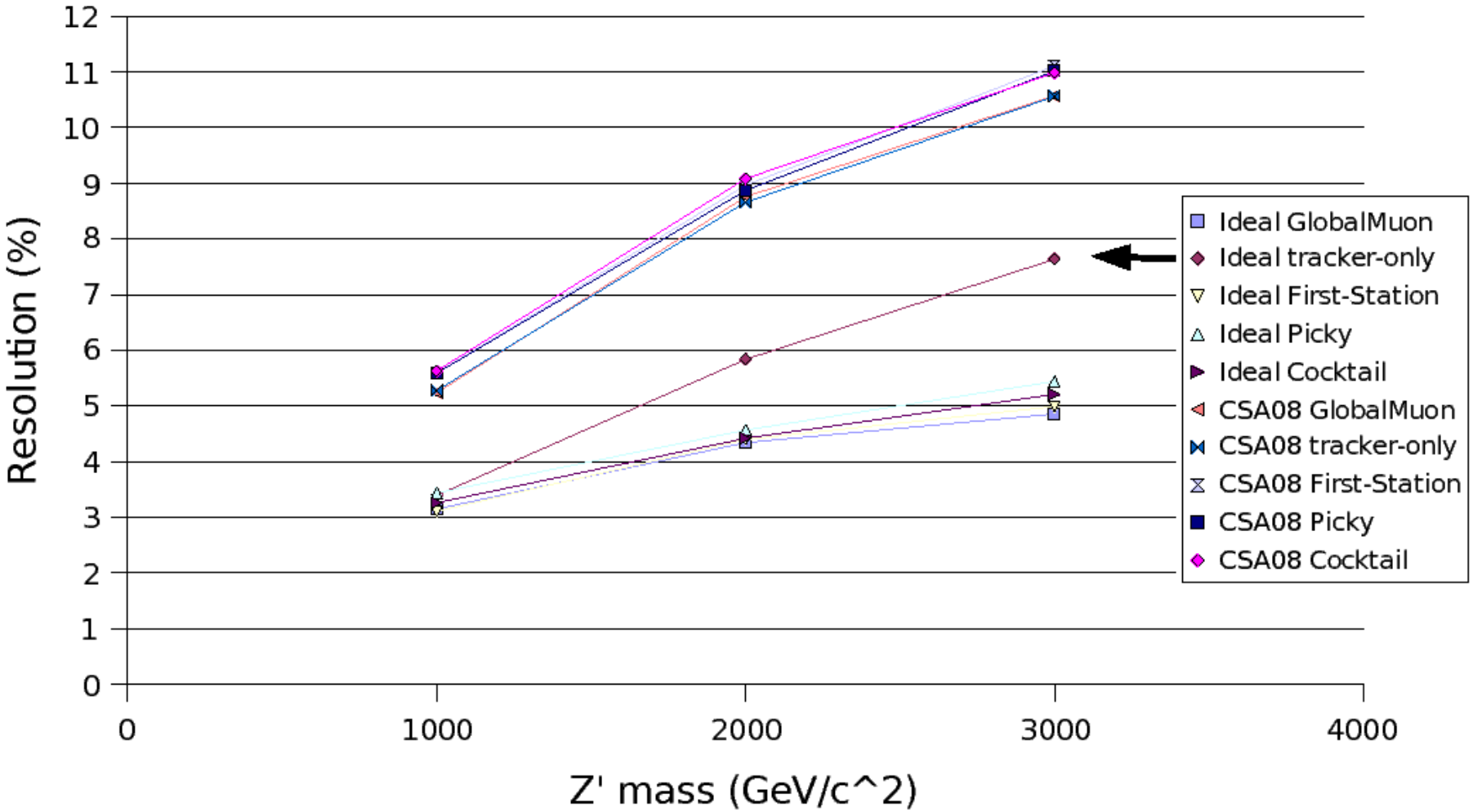
- Verifies that difference in cuts, muon reco, etc. are not too significant

Old plot with new ideal values overlaid:



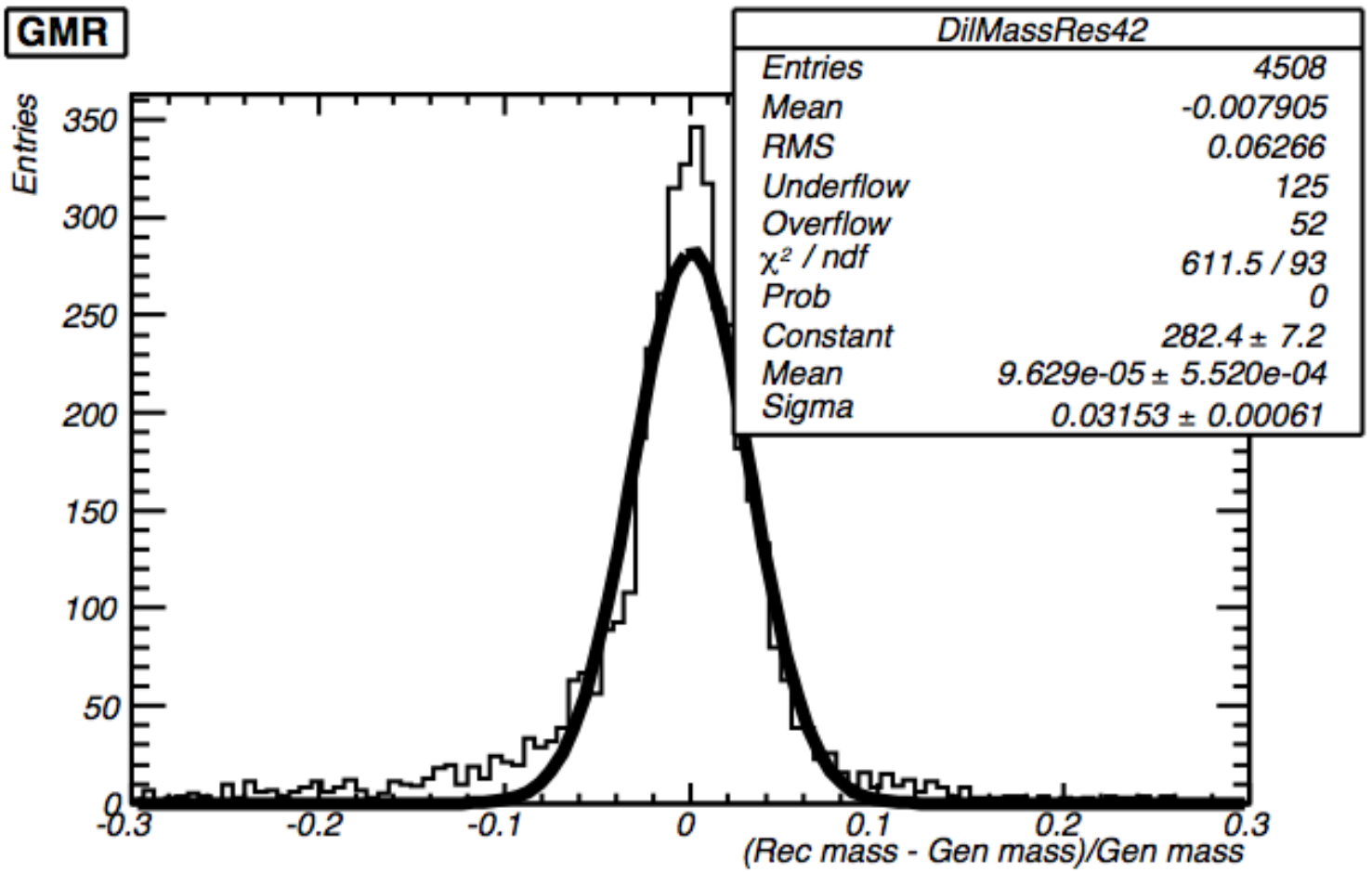
New dimuon resolution results

- Not much difference between the TeV reconstructors (this is gross width, not shape of tails)
- Benefit of adding muon system clear in ideal case, not in misaligned
- New 10 pb-1 alignment about 30%bettter than old 100 pb-1 (expected)



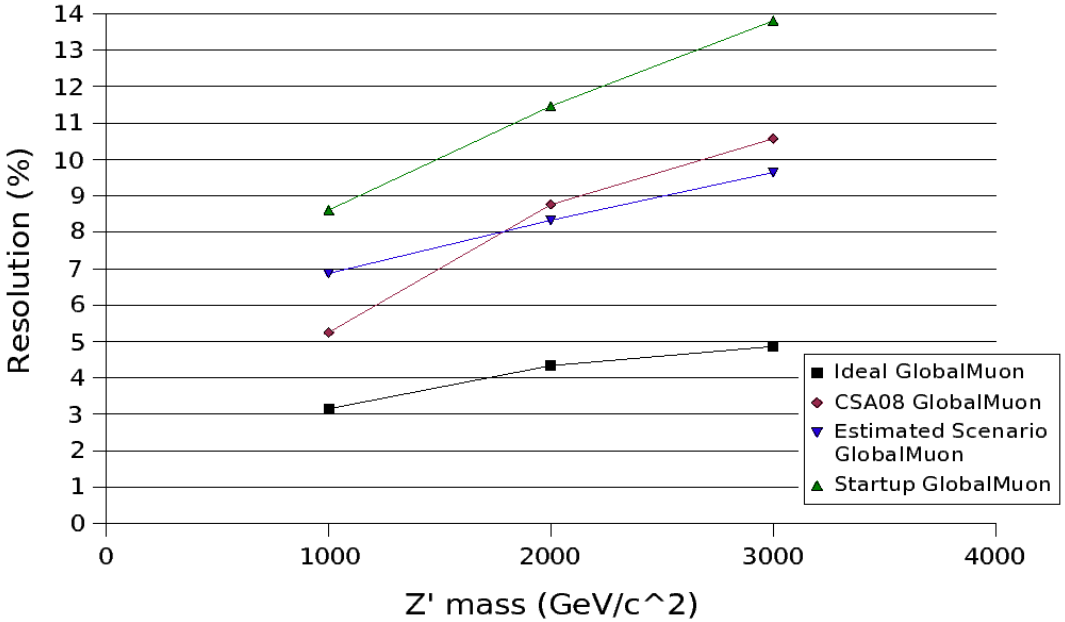
Typical dimuon resolution histogram

- Simple Gaussian fit with no restricted window is not an ideal representation of the width (missing photons in mass reco?)
- All histograms had this basic shape, with broadest distributions being the most Gaussian
- Low- resolution widths are overestimated (relative to a "core width")



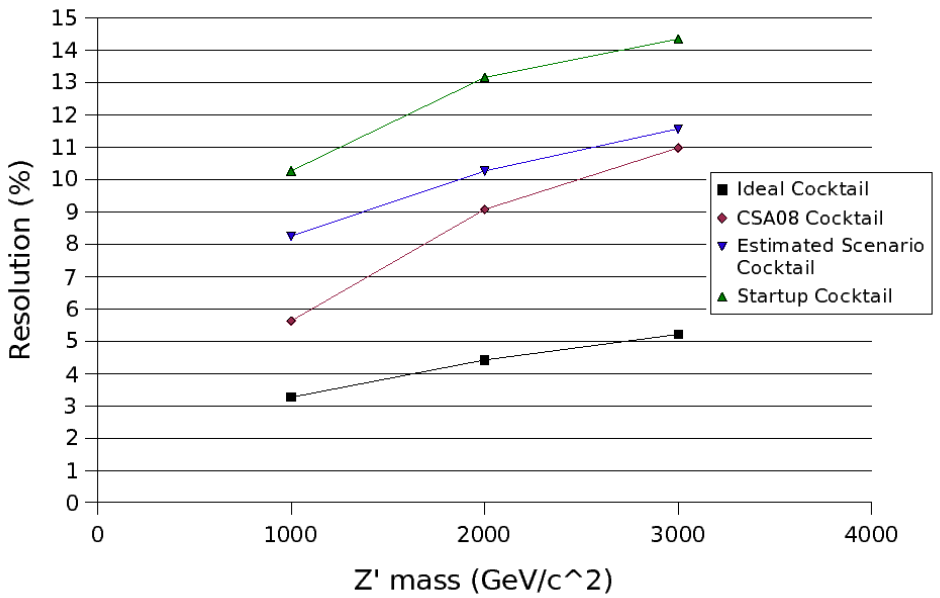
Closer look at GlobalMuon vs. TeV-reco

GlobalMuon curves



Cocktail curves

- stand-in for all TeV reconstructors (they're nearly the same as one another)

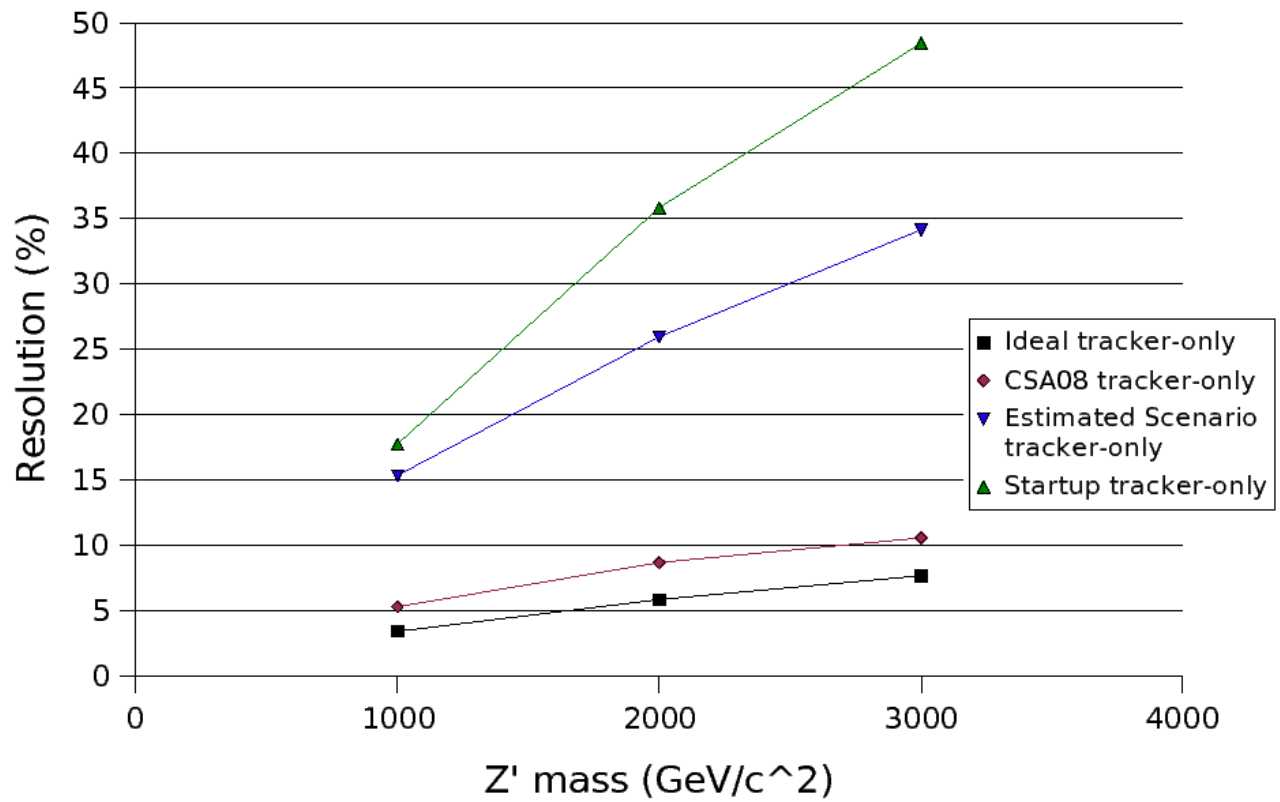


- No huge difference between GlobalMuon and Cocktail
- Muon Estimated Scenario is about right (intended to represent state of alignment after 10 pb-1: rough agreement with CSA08 result)
- 10 pb-1 is a clear improvement over startup (survey-only)

Closer look at tracker-only

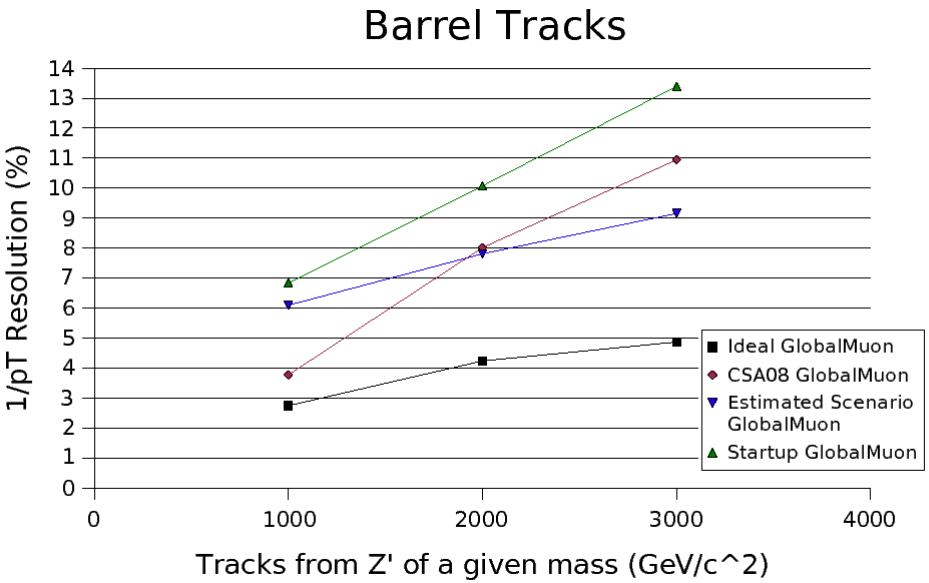
Reveals a huge difference between tracker Estimated Scenario and CSA08 tracker alignment

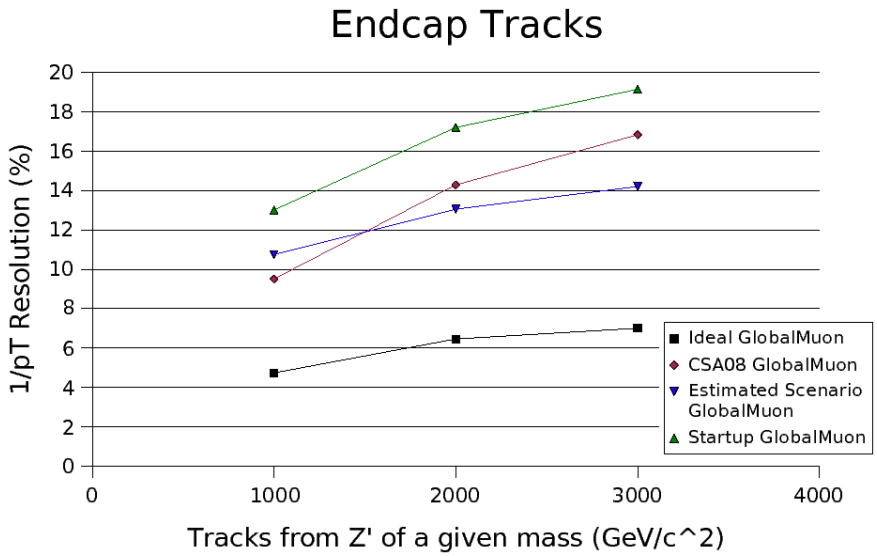
- High quality of alignment from MinBias was a surprise to tracker alignment community

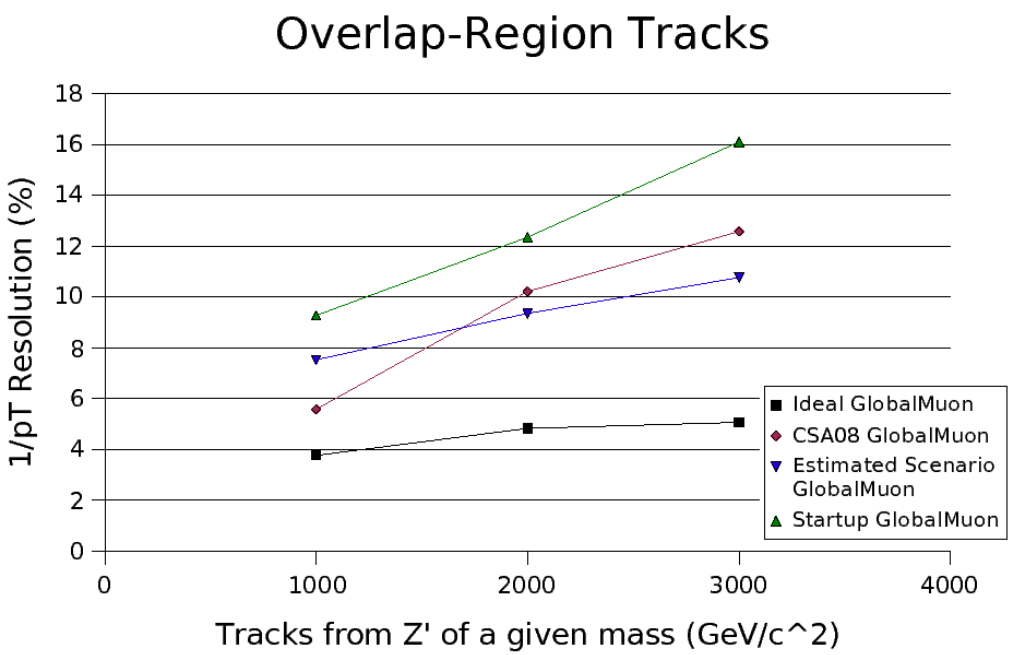


1/ pT resolution of individual tracks

Mostly the same story, though curvature is best determined at low eta







Conclusions

- Functions to study misalignment are now a standard part of Zprime2muAnalysis
- We see the muon alignment improvements we were expecting relative to 2007 analysis note
- Tracker Estimated Scenario is not representative of the alignment that was achieved
- There are a lot more plots in the package, including charge misassignment
- I'll be using Zprime2muResolution for a more general study of effect of resolution on low momentum muons (e.g. at Z mass)
- Thanks, Jordan!