



Misalignment studies with the official scenarios

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Status of Alignment

- ▶ Alignment procedure: after discovering an error, we corrected and re-tuned our procedure (last few weeks). I am now setting it up to re-do a full CSA07 exercise.
- ▶ Quality of realistic procedure: slightly better than official scenarios in $r\phi$, especially in wheel/disk placement.
- ▶ Alignment studies with official scenarios: made all the relevant plots, but discovered a mistake in my configuration. Plots can be recreated in a matter of hours.
- ▶ Comparison with toy alignment: Ivan and I will talk offline?

Alignment studies with official scenarios

- ▶ Using official Z'_{SSM} and Z'_{ψ} datasets (1–3.5 TeV) in 1_6_7
- ▶ Full track reconstruction with each alignment configuration (misalignment can cause tracks to lose hits or not be found)
- ▶ 8 detector configurations:

tracker	muon system
ideal	ideal
100 pb ⁻¹ scenario	100 pb ⁻¹ scenario
10 pb ⁻¹ scenario	10 pb ⁻¹ scenario
100 pb ⁻¹ scenario	ideal
10 pb ⁻¹ scenario	ideal
ideal	100 pb ⁻¹ scenario
ideal	10 pb ⁻¹ scenario
startup (laser alignment)	startup (10 pb ⁻¹)

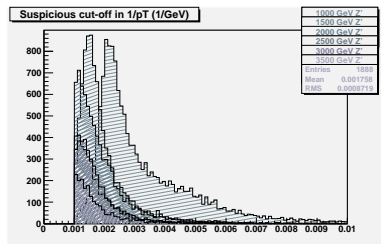
The plots I'm about to show are place-holders

I tracked a strange feature in the plots to a misconfiguration.

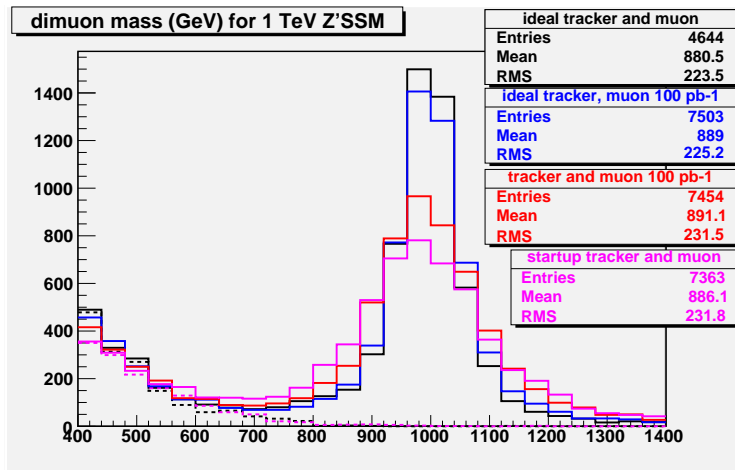
Detective story in reverse order:

- ▶ To conserve disk space, I'm saving re-reconstructed events in AICaReco format (only saves tracks and hits)
Default cut is track $p_T < 999$ GeV

- ▶ All samples cut off sharply at
 $\frac{1}{p_T} = 0.001 \text{ GeV}^{-1}$



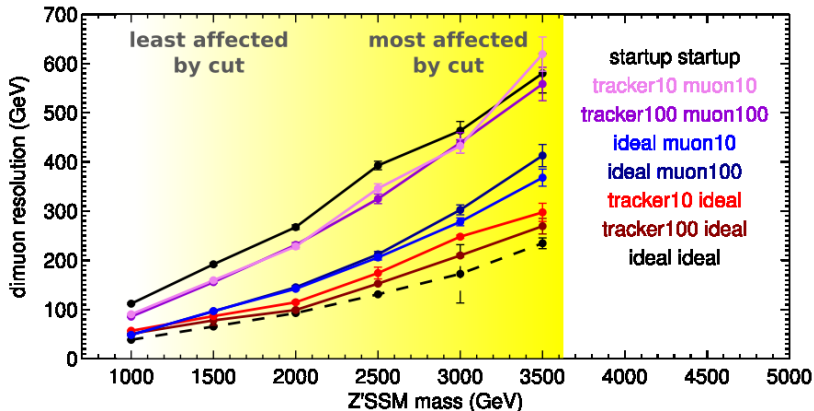
- ▶ Causes a bias in track resolution near 1 TeV, a bias in dimuon masses above 2 TeV, and an inefficiency above 2 TeV



- ▶ 1 TeV Z' is minimally affected by track cut
- ▶ Muon misalignment gets more interesting at higher energies
- ▶ For resolution studies, we cut out Drell-Yan at generator level

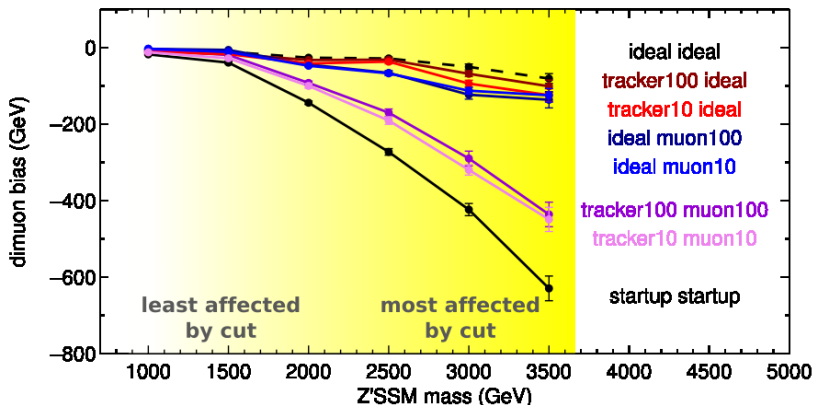
Dimuon mass resolution

- ▶ Resolution is width of {reconstructed mass minus generated}
- ▶ Double-Gaussian fit for width (probably unnecessary w/o cut)
- ▶ Expectations: increase with mass, **ideal tracker** better at low masses, **ideal muon** better at high masses



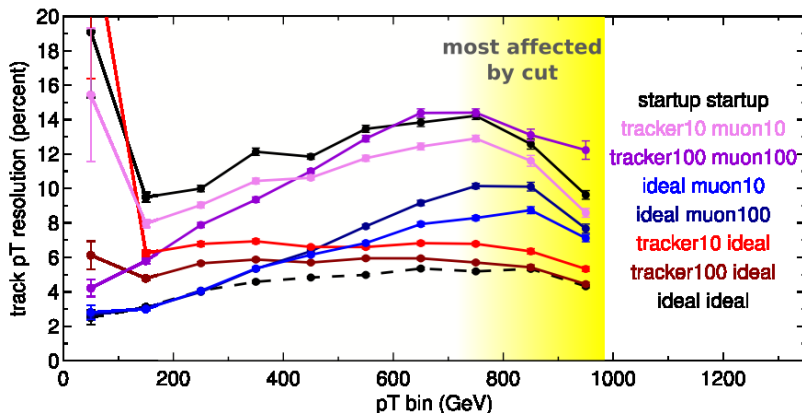
Dimuon mass bias

- ▶ Bias is centroid of {reconstructed mass minus generated}
- ▶ May be entirely due to cut: wide distributions have most bias



Individual tracks

- ▶ Resolution is width of $\frac{p_T^{\text{reco}} - p_T^{\text{gen}}}{p_T^{\text{gen}}} = \text{width of } \frac{\kappa^{\text{reco}} - \kappa^{\text{gen}}}{\kappa^{\text{gen}}}$
- ▶ **misaligned muon** matters above 400 GeV
- ▶ **misaligned tracker** is fairly constant



Conclusions

- ▶ Plot-making apparatus is in place, reconstruction takes 4 hours (plus resubmissions)
- ▶ Results independent of Z'_{SSM} versus Z'_ψ (good)
- ▶ Some things I should look into: η distributions, effect on charge misassignment, relative importance of wheel/disk misalignments and chamber misalignments
- ▶ Comparison with toy misalignment?

- ▶ reconstruction:

```
include "Configuration/StandardSequences/data/FakeConditions.cff"  
include "Configuration/StandardSequences/data/Reconstruction.cff"  
path p = {ckftracks, muontracking, muons, MyAnalyzer}
```

with tracker and muon geometry from Frontier database

- ▶ MC-matching: closest in ϕ for $p_T > 20$ GeV globalMuons