


Misalignment and Track-based Alignment

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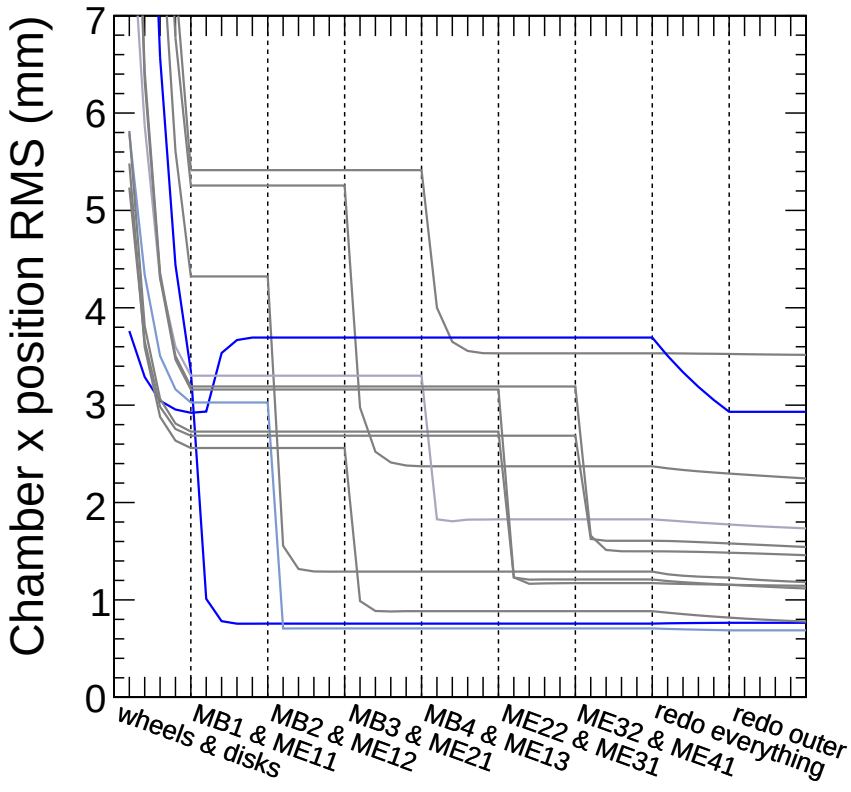
- Scaled 10 pb^{-1} to 100 pb^{-1}, updated all plots
- Results did not show anticipated improvement: began investigation
- Lead to improvements in the alignment procedure, but that's for a different meeting
- The new plots

Side-by-side comparison (alignment position error)

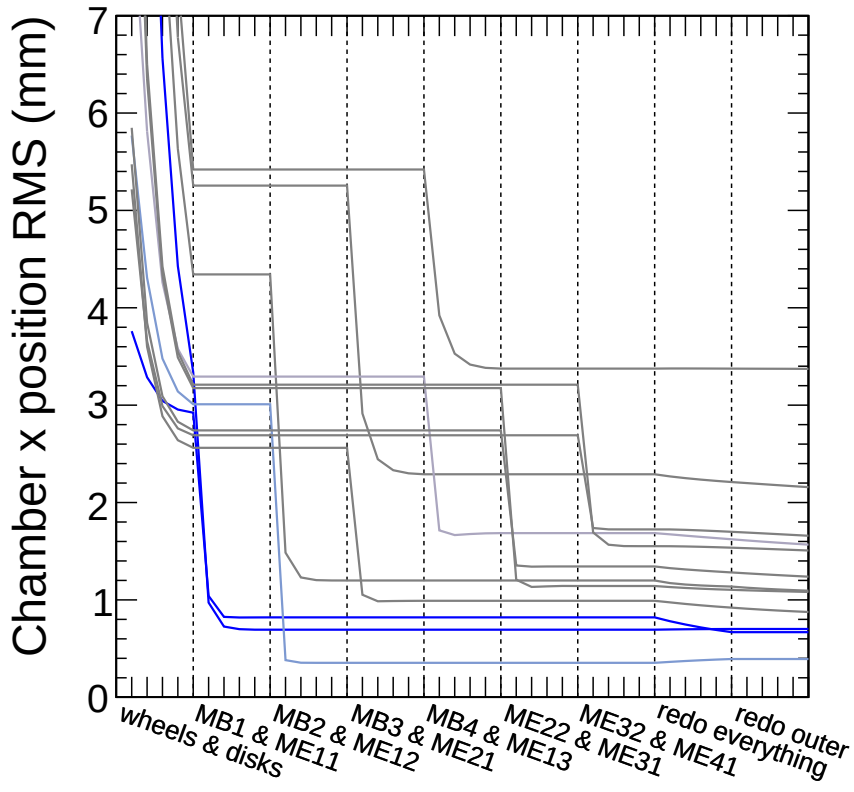
9 passes $\times$ 5 iterations, only 2 stations aligned per pass

"Chamber x position RMS" is $\sqrt{\overline{(x_{\text{true}} - x_{\text{aligned}})^2}}$, includes offsets

10 pb^{-1} alignment

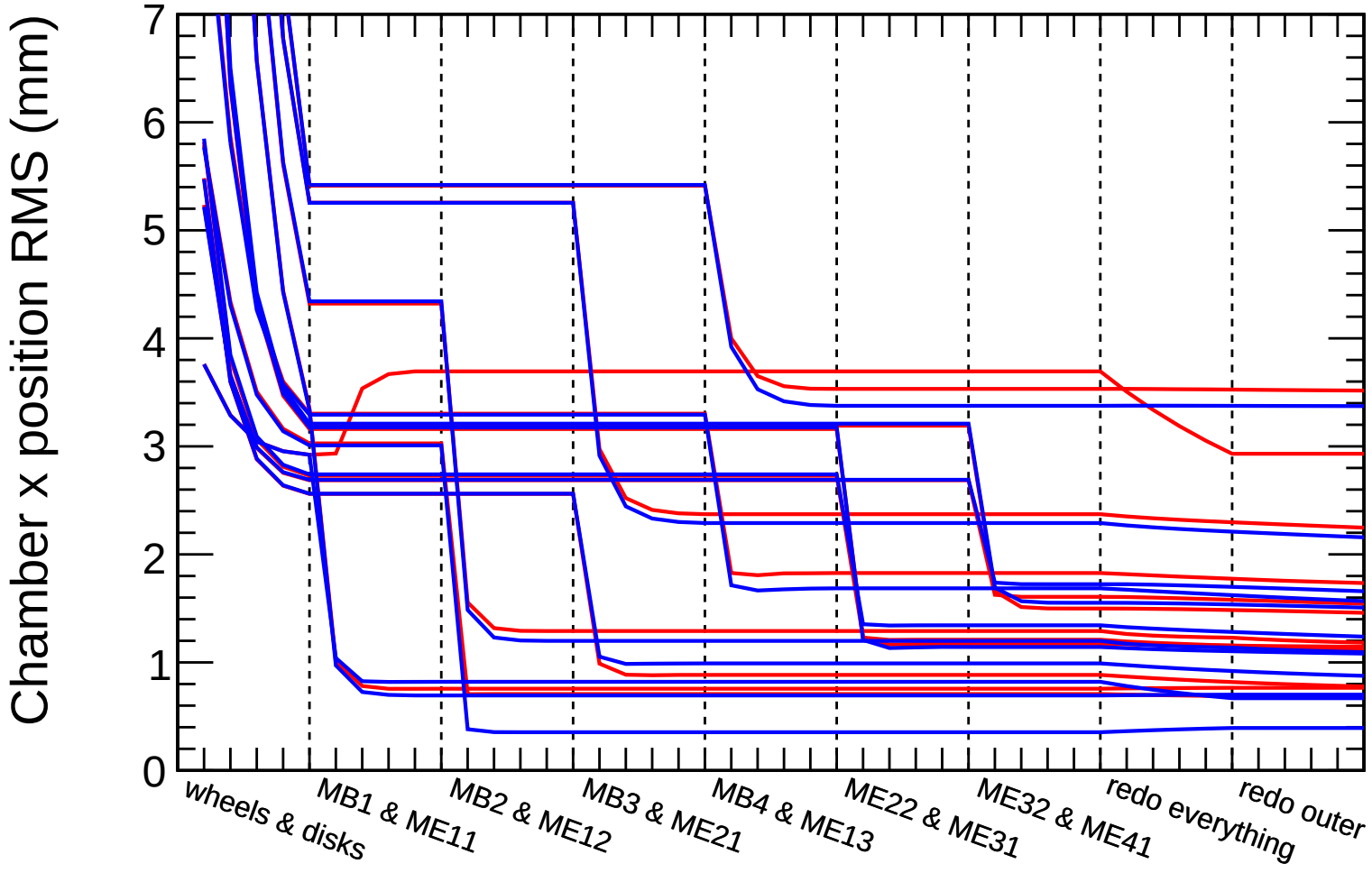


100 pb^{-1} alignment



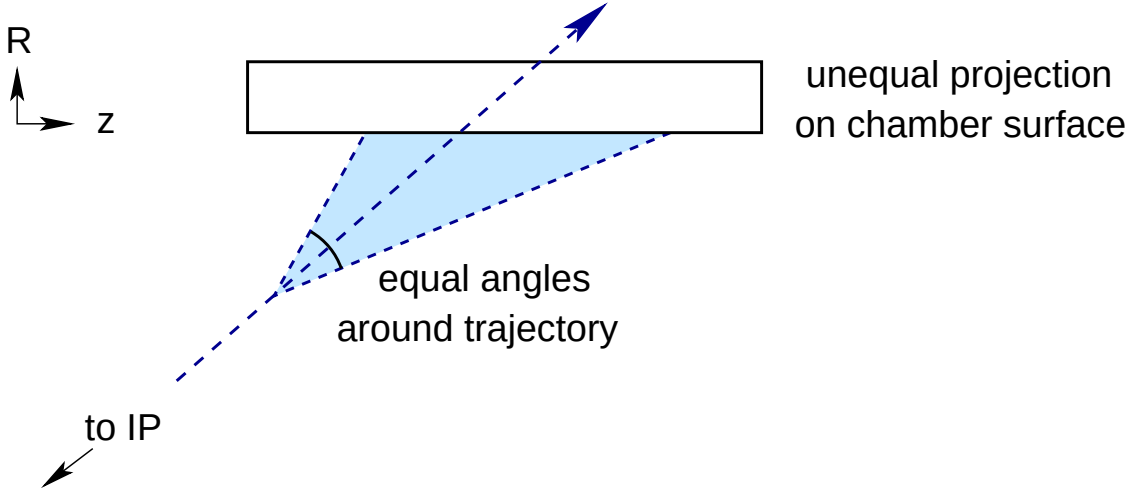
Overlaid comparison (alignment position error)

red: 10 pb^{-1} blue: 100 pb^{-1}



Why doesn't this error scale as $\sqrt{10}$?

- Systematic error: means of residual distributions are well-measured, but don't correspond to chamber positions
- *Example* scattering effect which can lead to bias:



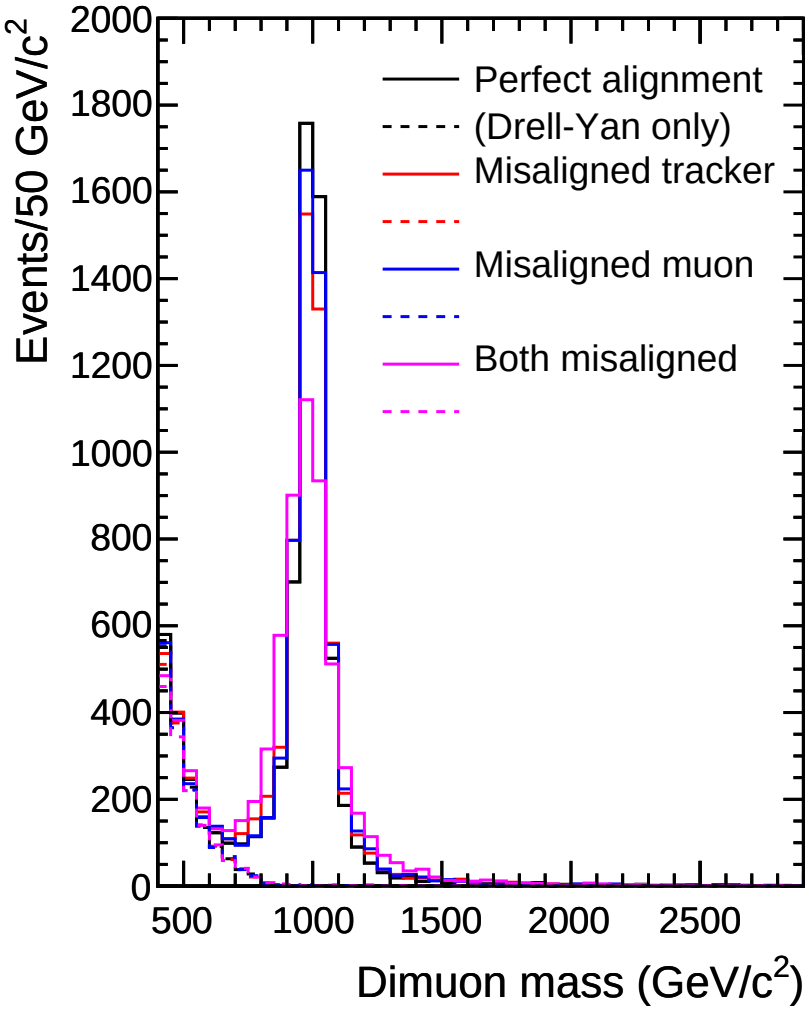
- Errors compounded by fitting tracks to misaligned chambers
- Tuning parameters (muon hit weight in fit) greatly reduces systematic error in 100 pb^{-1} alignment and increases statistical error; can get close to $\sqrt{10}$ scaling

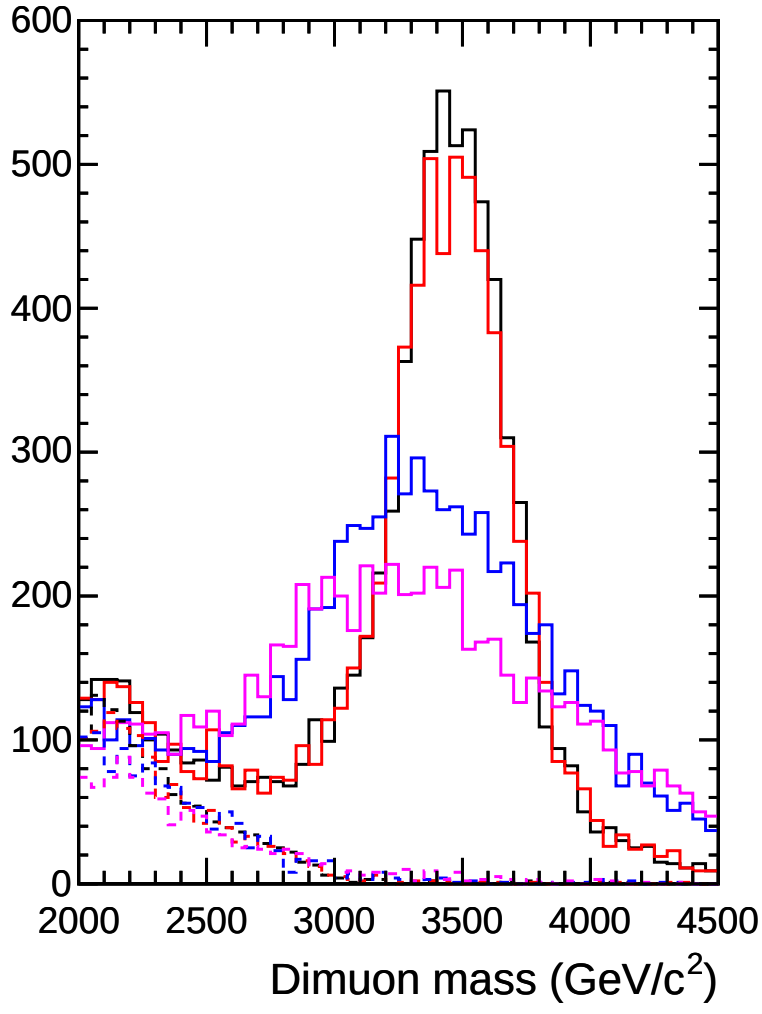
What next?

- I optimize parameters for high-statistics procedure as a part of ongoing alignment work
- Our testing method is valid, though it has been applied to a non-optimal alignment procedure
- Text of the note makes it clear that we expect improvements to alignment procedures
- Let's see the new plots (already commited to CVS)

Dimuon spectra for lowest and highest mass

Largely unchanged because alignment position errors are so similar

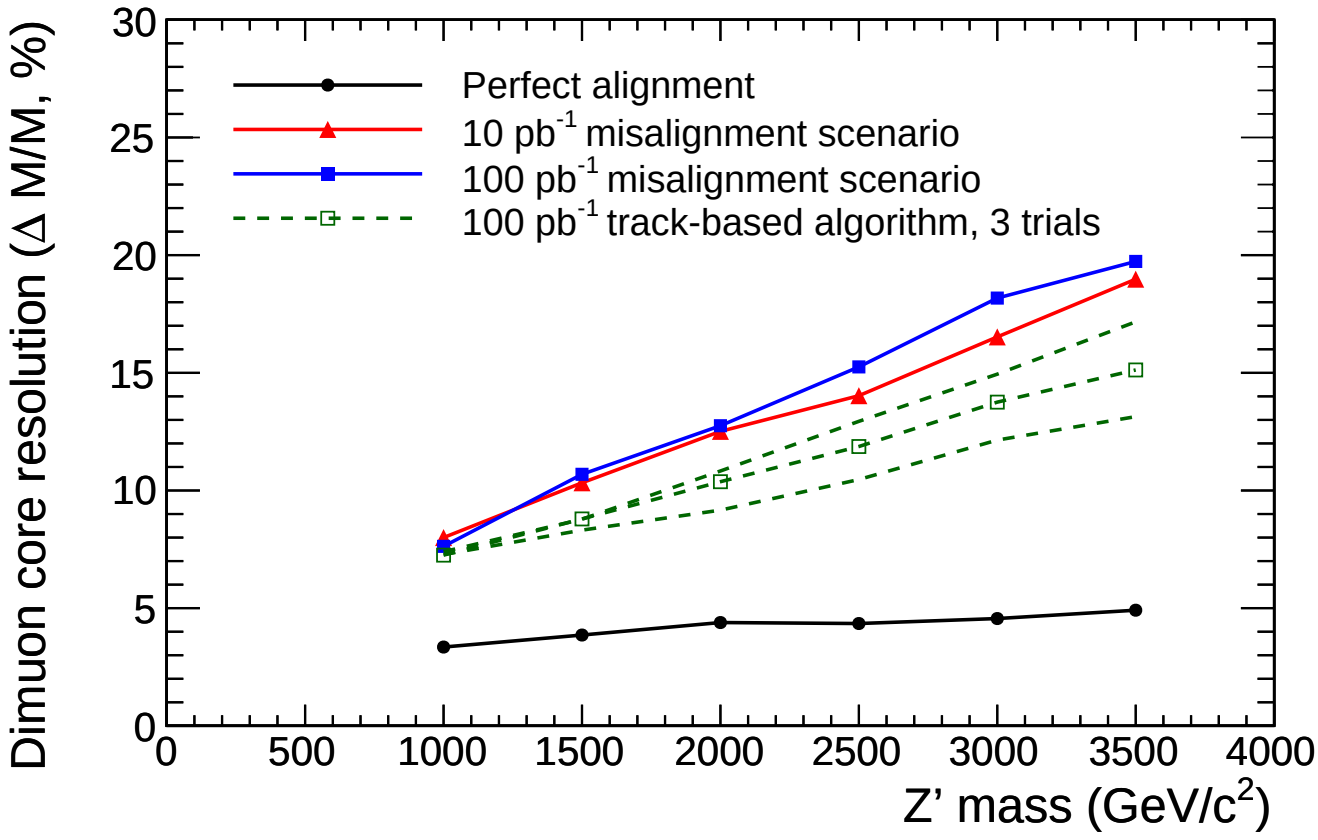




Resolution versus mass

Largely unchanged because alignment position errors are so similar

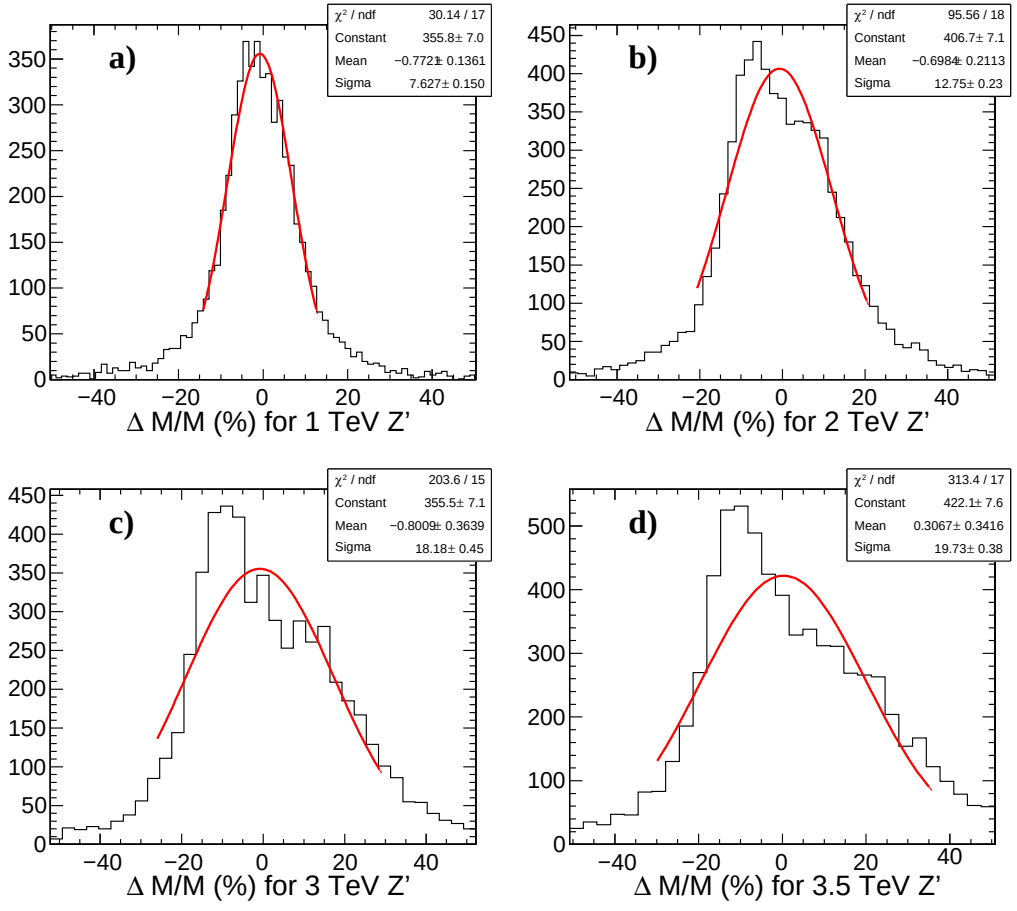
New: tested procedure with three starting configurations, gives us a sense of the uncertainty



Raw resolution plots

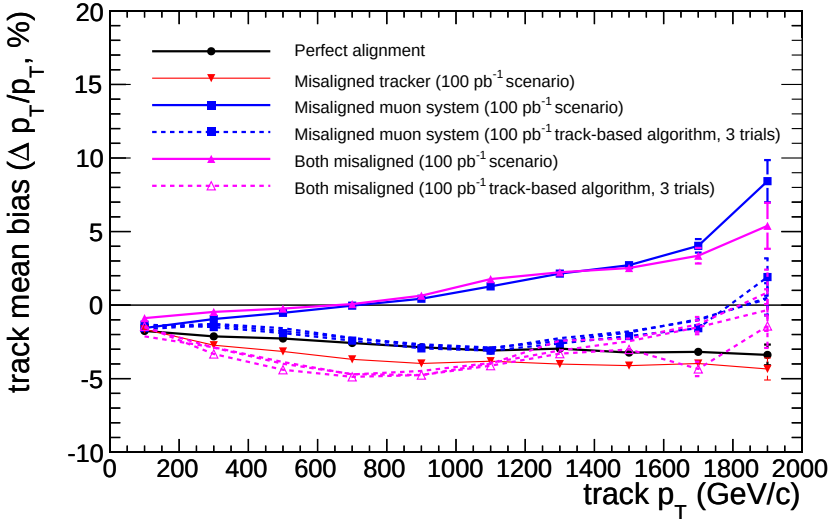
These are the fits that go into the plot on the previous page

100 pb^{-1} misalignment scenario (worst case)

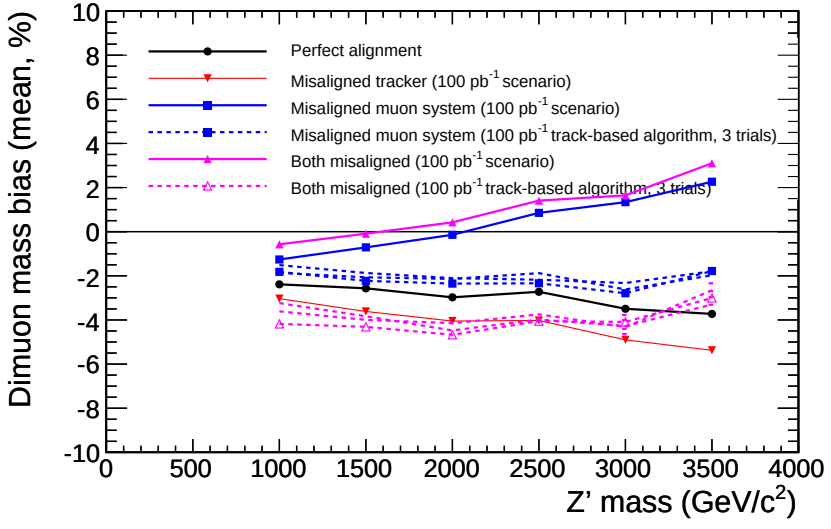


Bias can be seen on the level of tracks

Bias in track p_T



Bias in dimuon mass



In both cases, we are looking at the mean of the (reconstructed − generated)/generated distribution

No more than 5%

Conclusions

- Measured effect of a non-optimal track-based alignment procedure on TeV dimuons, verifying that the standard scenarios are in the right ballpark (and may even be conservative)
- Updated all the plots and the relevant text; answered all FIXME's; everything has been committed to CVS
- I'm still ready to answer questions and fill in more FIXME's