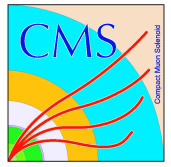

Multiple Scattering in FastSim, for Muon Alignment

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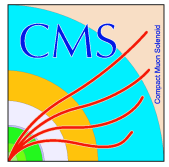
Texas A&M University

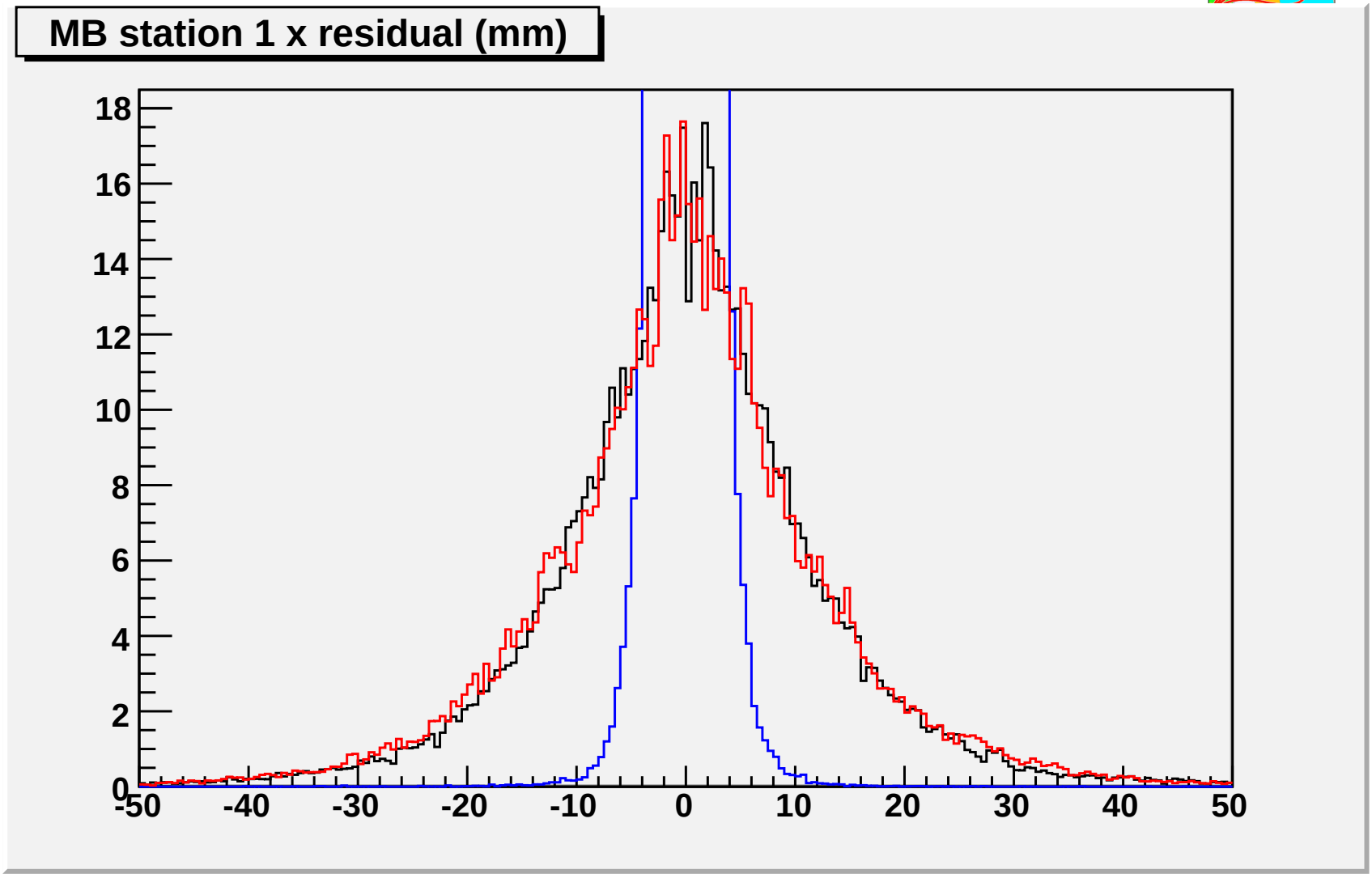
3 June, 2008

Why are we interested?



- Want to study track-based alignment procedures for muon system (tracker alignment group is interested, too)
- CSA08 FullSim only allows us to test 1 and 10 pb^{-1}, but alignments from up to 100 pb^{-1} are interesting for physics studies
- In real life, we would align with all muons above a given p_T cut, not just W and Z muons: prohibitive for FullSim (without a 10$\times$ CSA08!)
- All the simulation needs to get right for alignment: residuals distributions on each alignable
- Multiple scattering is essential!
  (Factor of N in stdev of chamber residual distribution fakes a factor of $1/N^2$ in statistics)

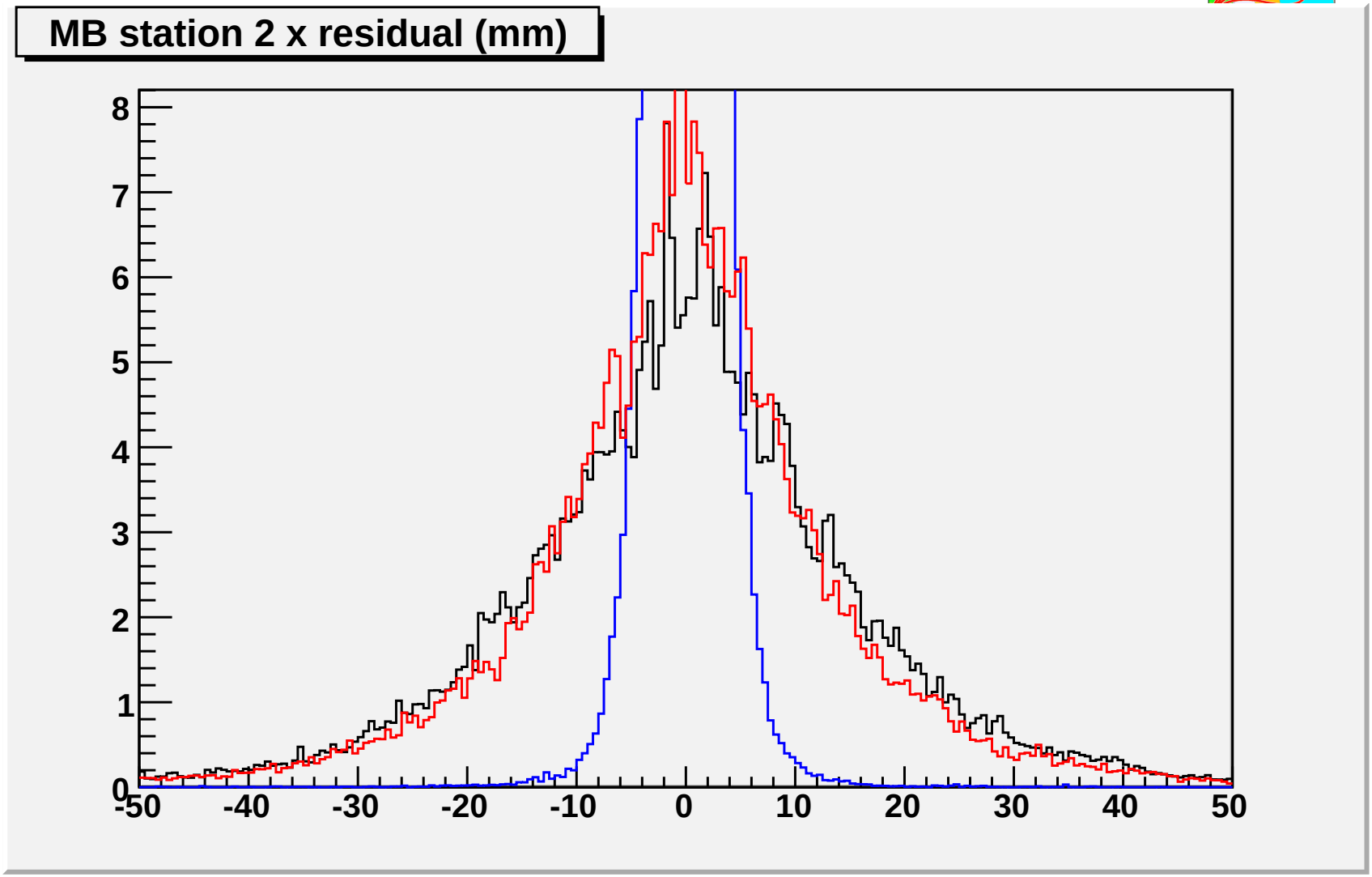
Tracker-to-muon residuals: MB1



Black: FullSim, Red: new FastSim, Blue: FastSim without MS

Local x (global $r\phi$) residuals for tracks propagated from tracker to MB1

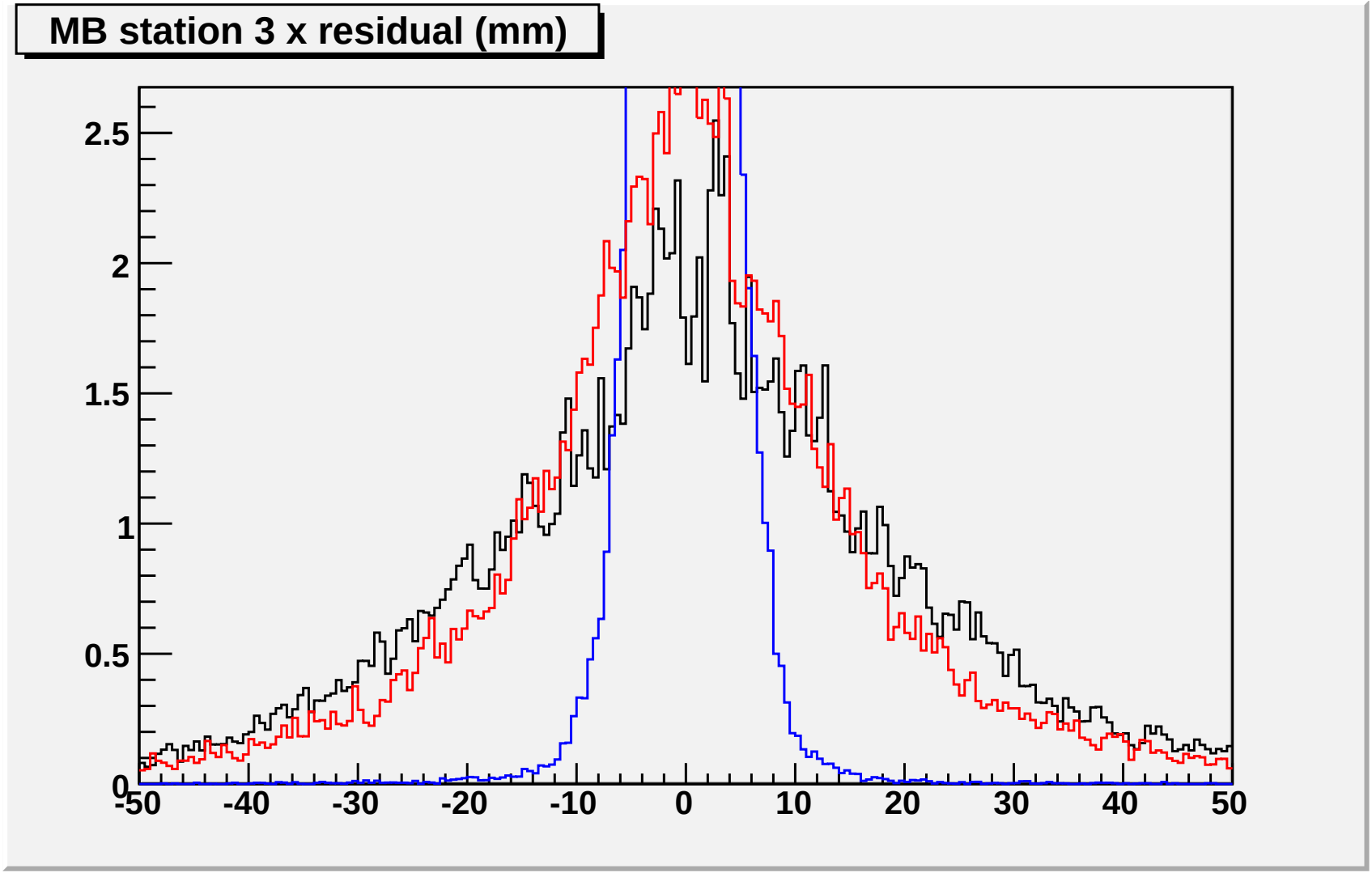
Tracker-to-muon residuals: MB2



Black: FullSim, Red: new FastSim, Blue: FastSim without MS

Local x (global $r\phi$) residuals for tracks propagated from tracker to MB2

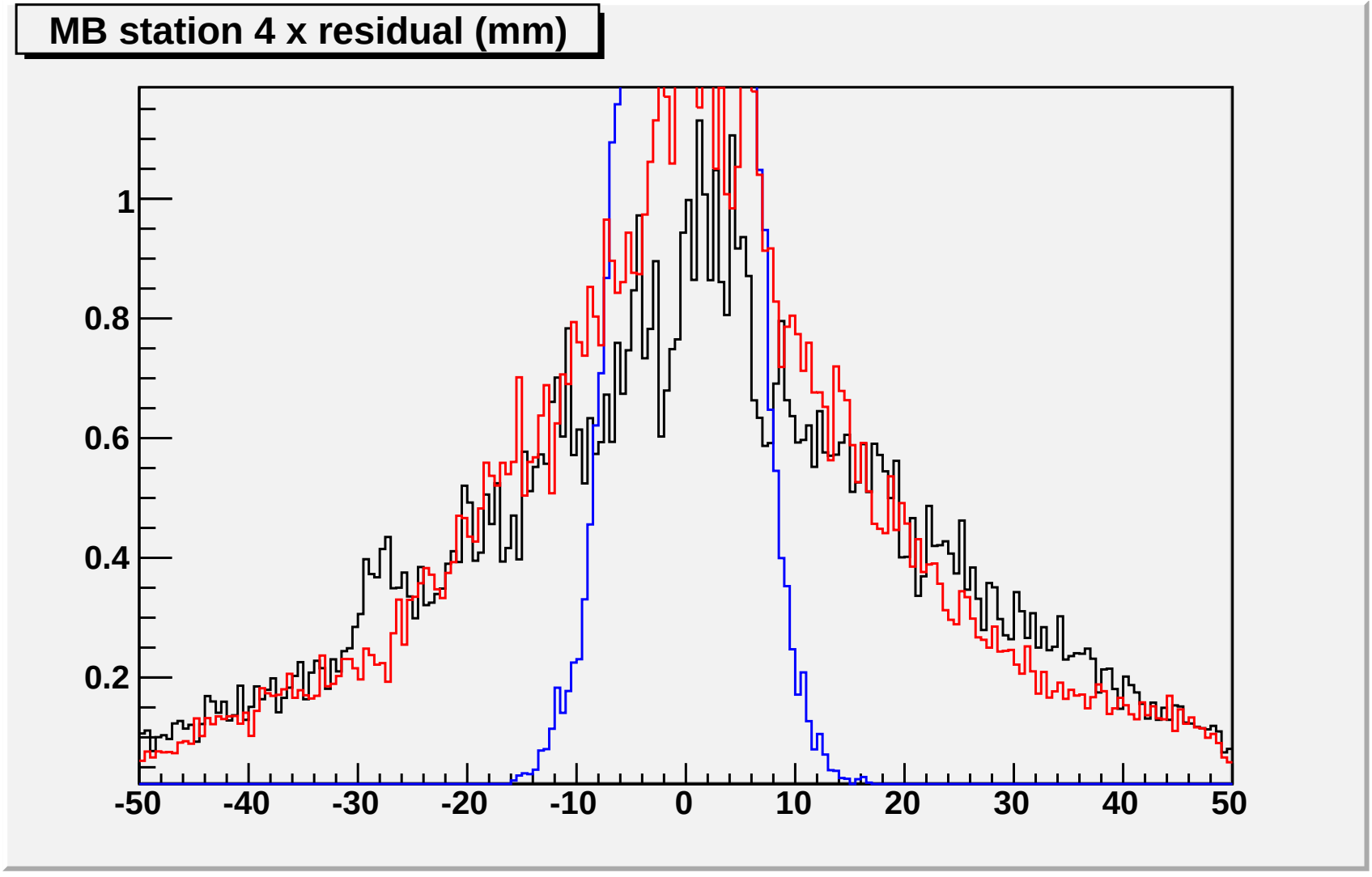
Tracker-to-muon residuals: MB3



Black: FullSim, Red: new FastSim, Blue: FastSim without MS

Local x (global $r\phi$) residuals for tracks propagated from tracker to MB3

Tracker-to-muon residuals: MB4

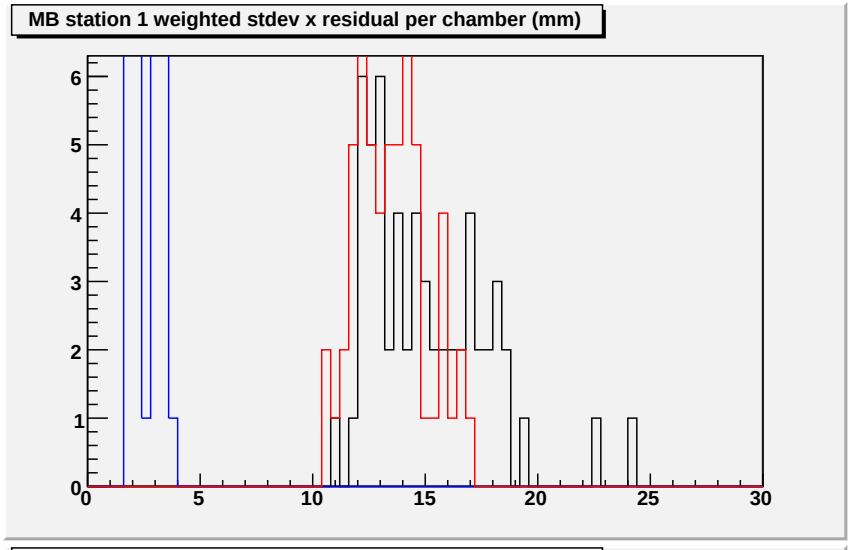


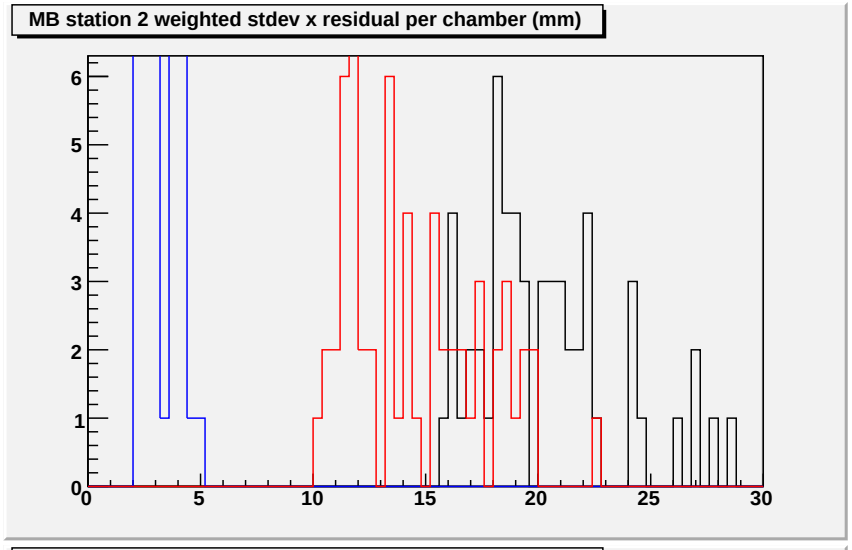
Black: FullSim, Red: new FastSim, Blue: FastSim without MS

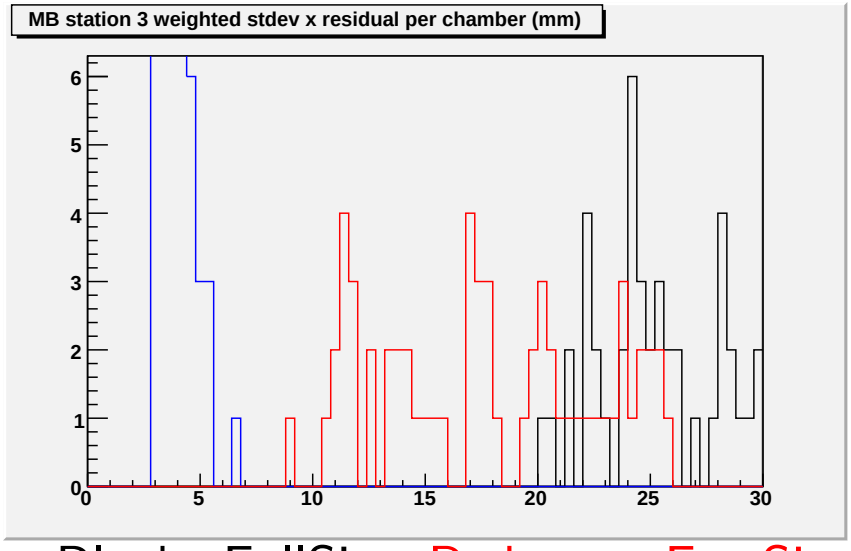
Local x (global $r\phi$) residuals for tracks propagated from tracker to MB4

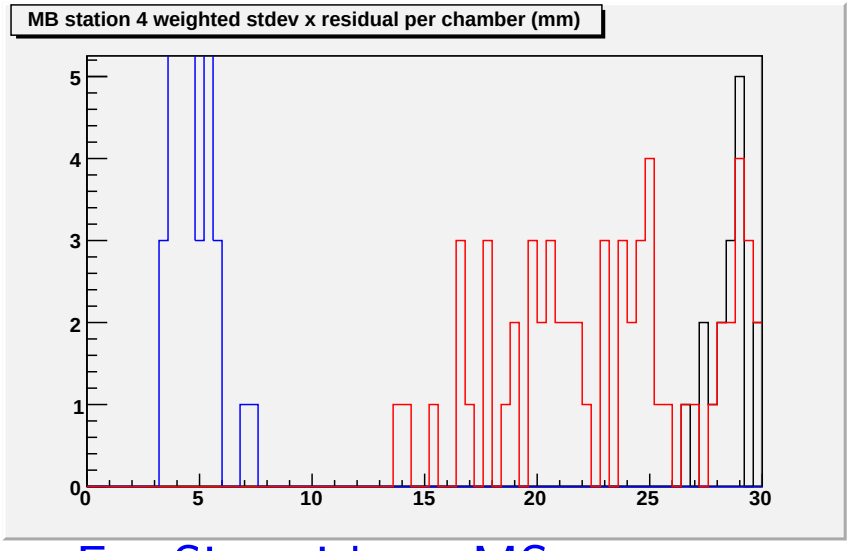
Chamber-by-chamber stdev

One histogram entry per chamber, one station per plot





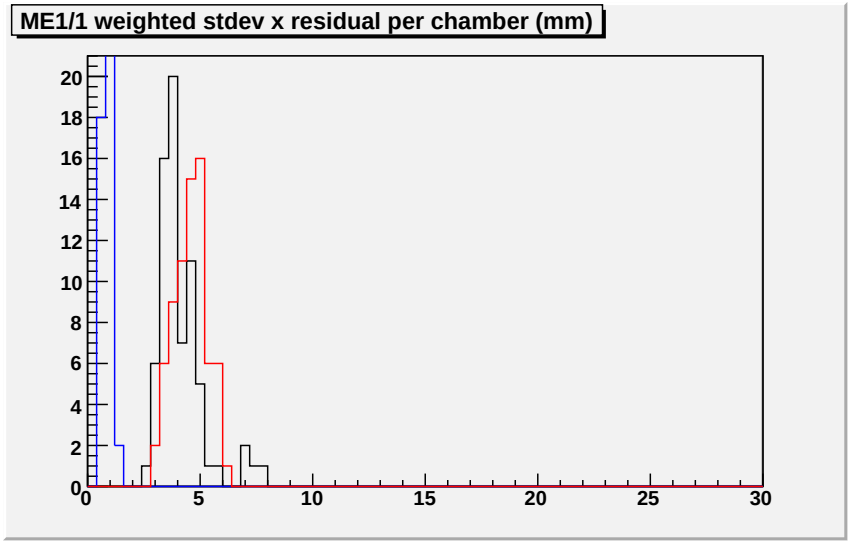


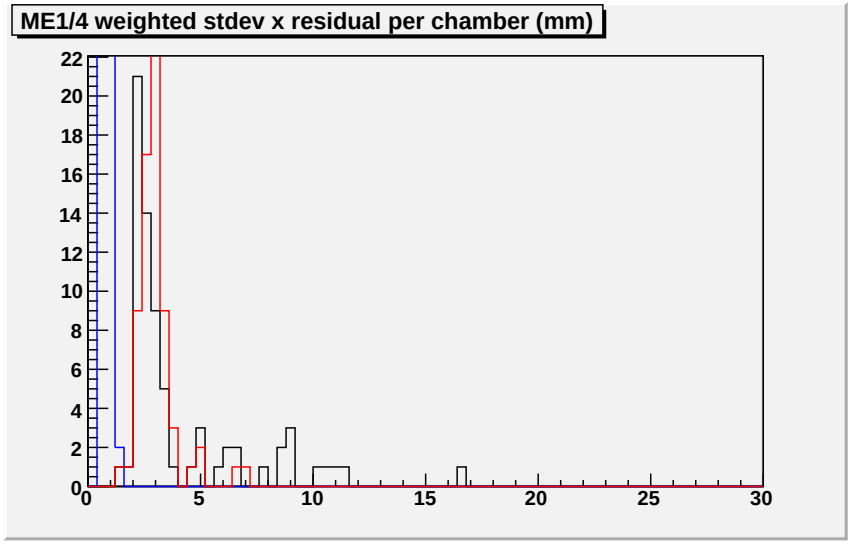


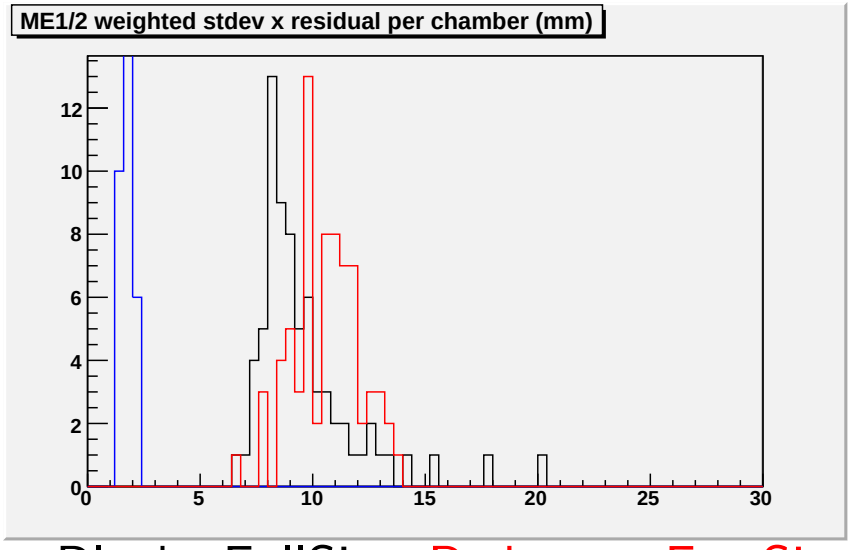
Black: FullSim, Red: new FastSim, Blue: FastSim without MS

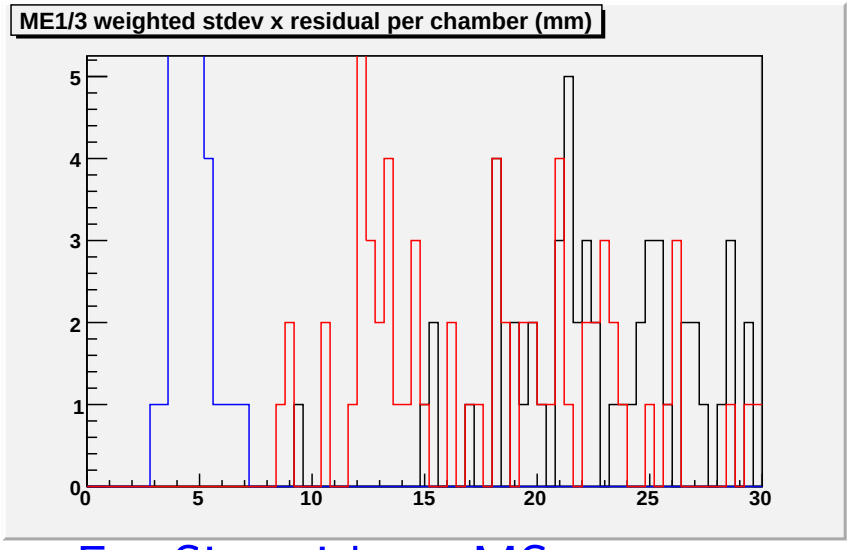
Endcap station 1

One histogram entry per chamber, one station per plot





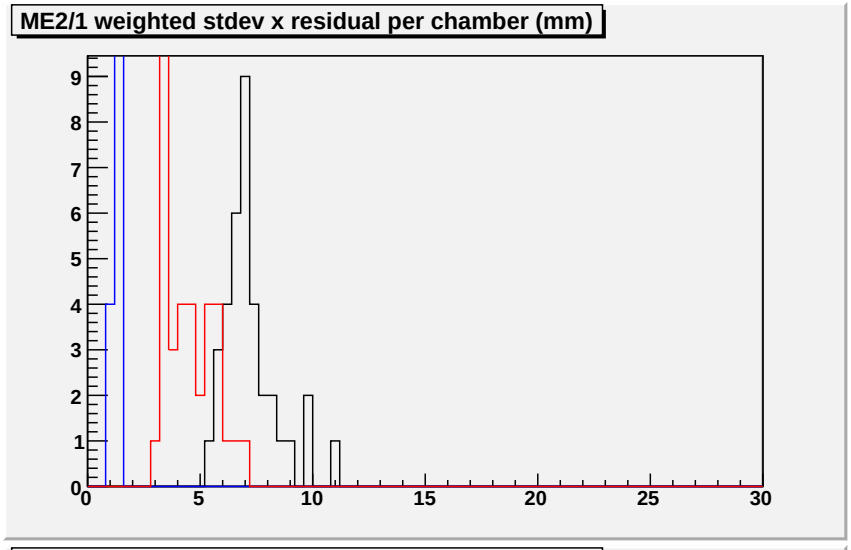


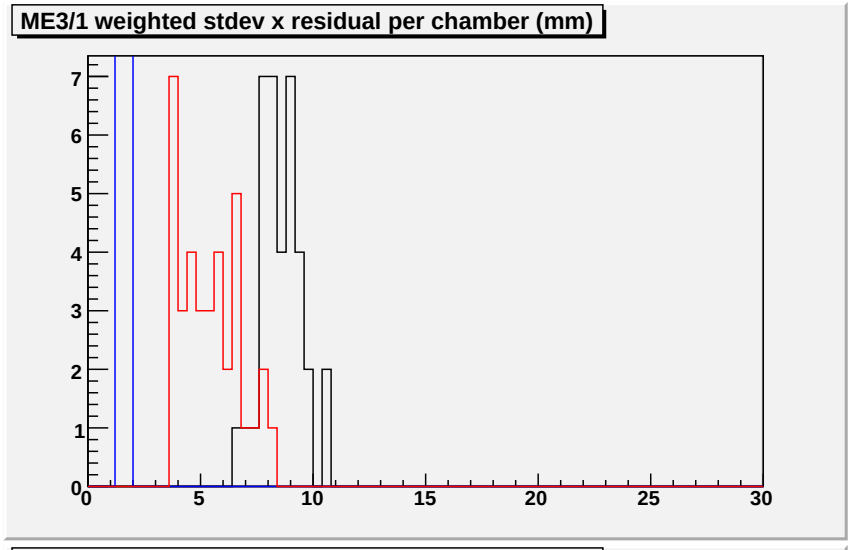


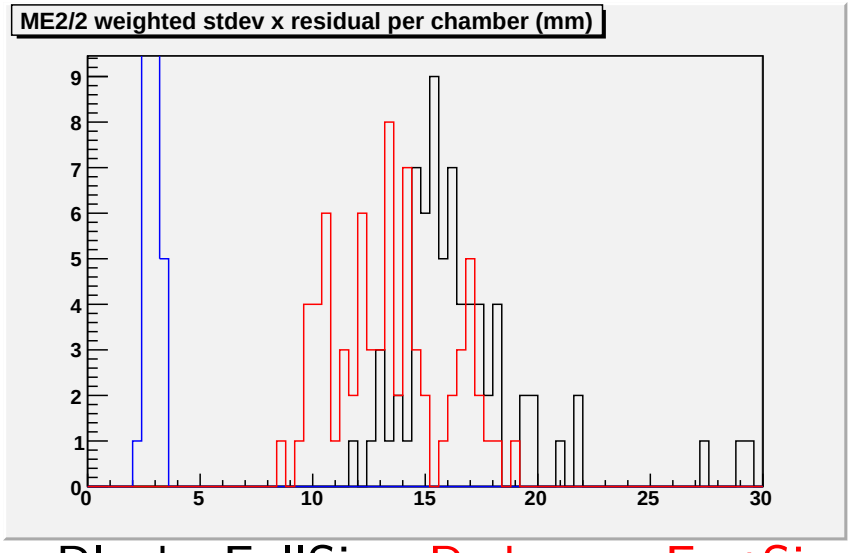
Black: FullSim, Red: new FastSim, Blue: FastSim without MS

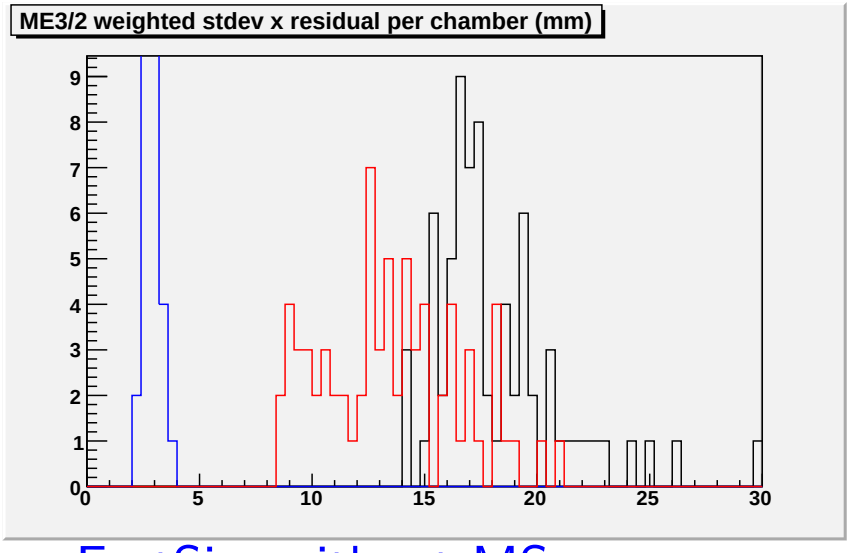
Endcap station 2 and 3

One histogram entry per chamber, one station per plot









Black: FullSim, Red: new FastSim, Blue: FastSim without MS

Conclusions

- First implementation of multiple scattering in FastSim is a big improvement over 1_8_4!
- Still underestimated in outer barrel
- Slightly underestimated in ME1/1 and ME1/2, slightly overestimated in some other endcap stations