


Proposed Track Filter for AlCaRecoMu

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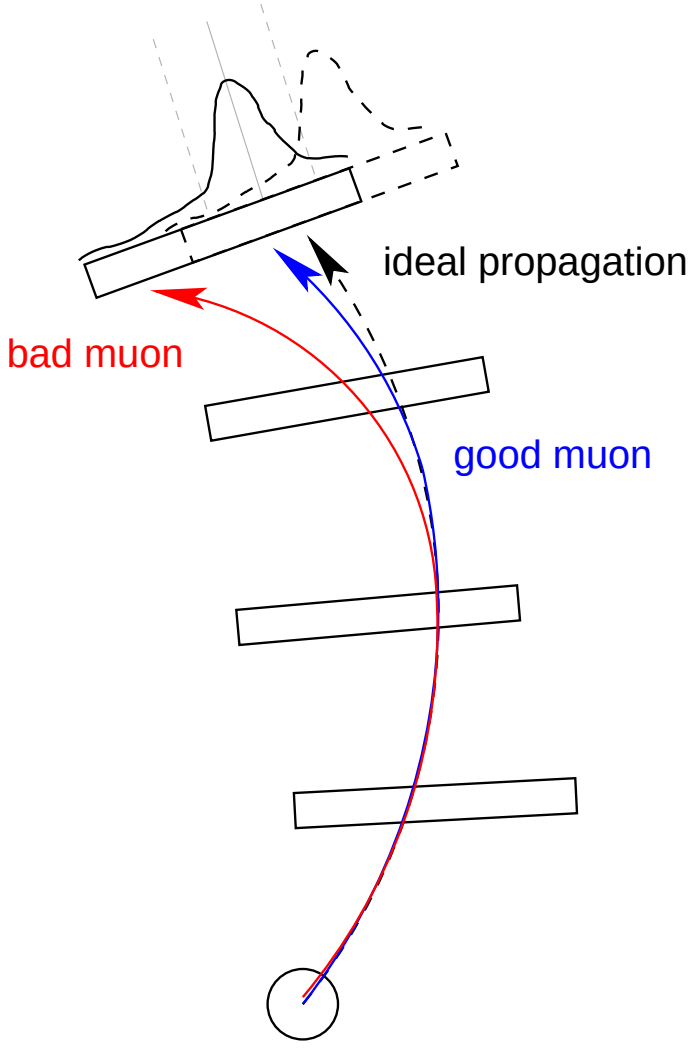
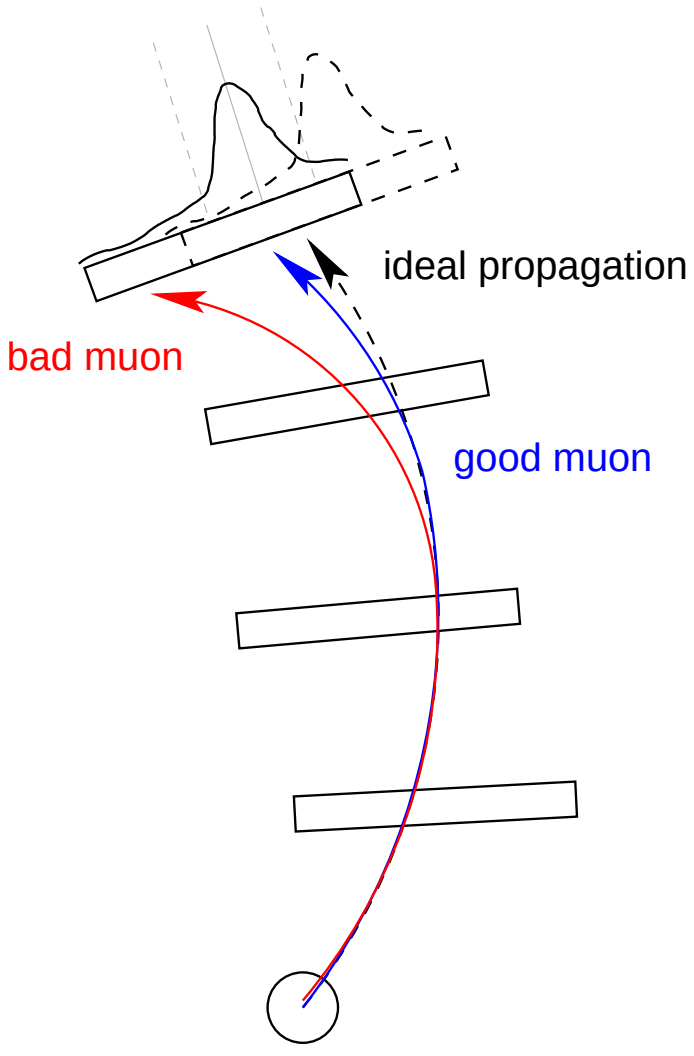


Loop over subsample:

1. Use Propagator to extrapolate from reco::Muon's tracker track to outermost muon station (MB4, ME1/3, ME3/2, ME4/1)
2. Fill "propagated minus hit" histograms for each chamber
3. Define window to be mean $\pm n$ stdev (e.g. $n = 3$)

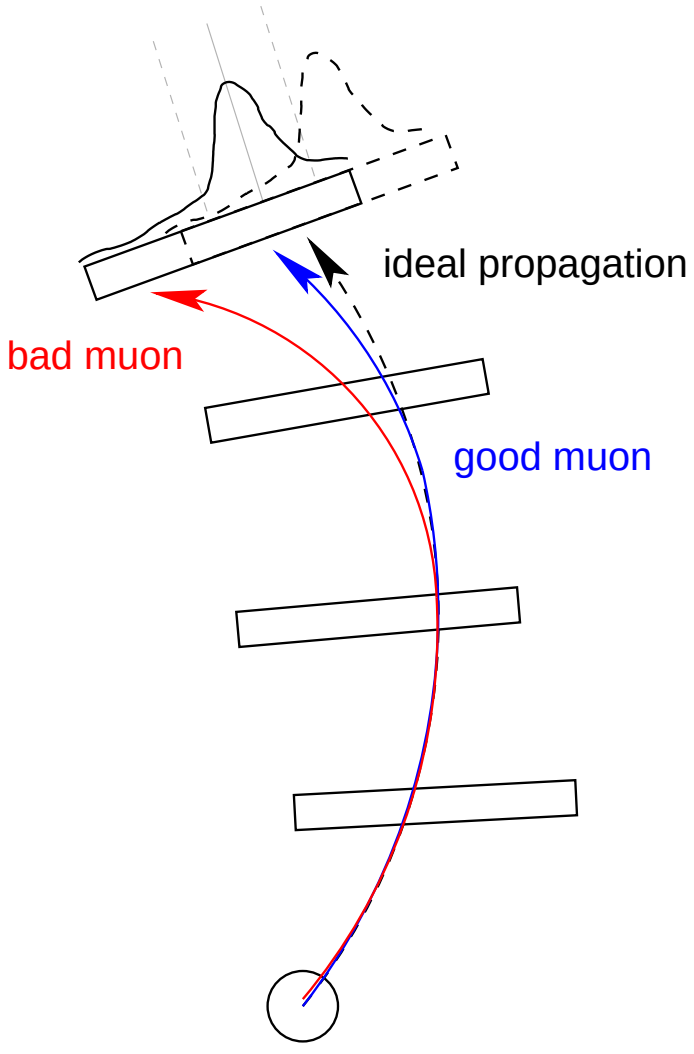
Loop over whole dataset:

1. Use Propagator to extrapolate from reco::Muon's tracker track to outermost muon station
2. If "propagated minus hit" is within window, keep the track



Features:

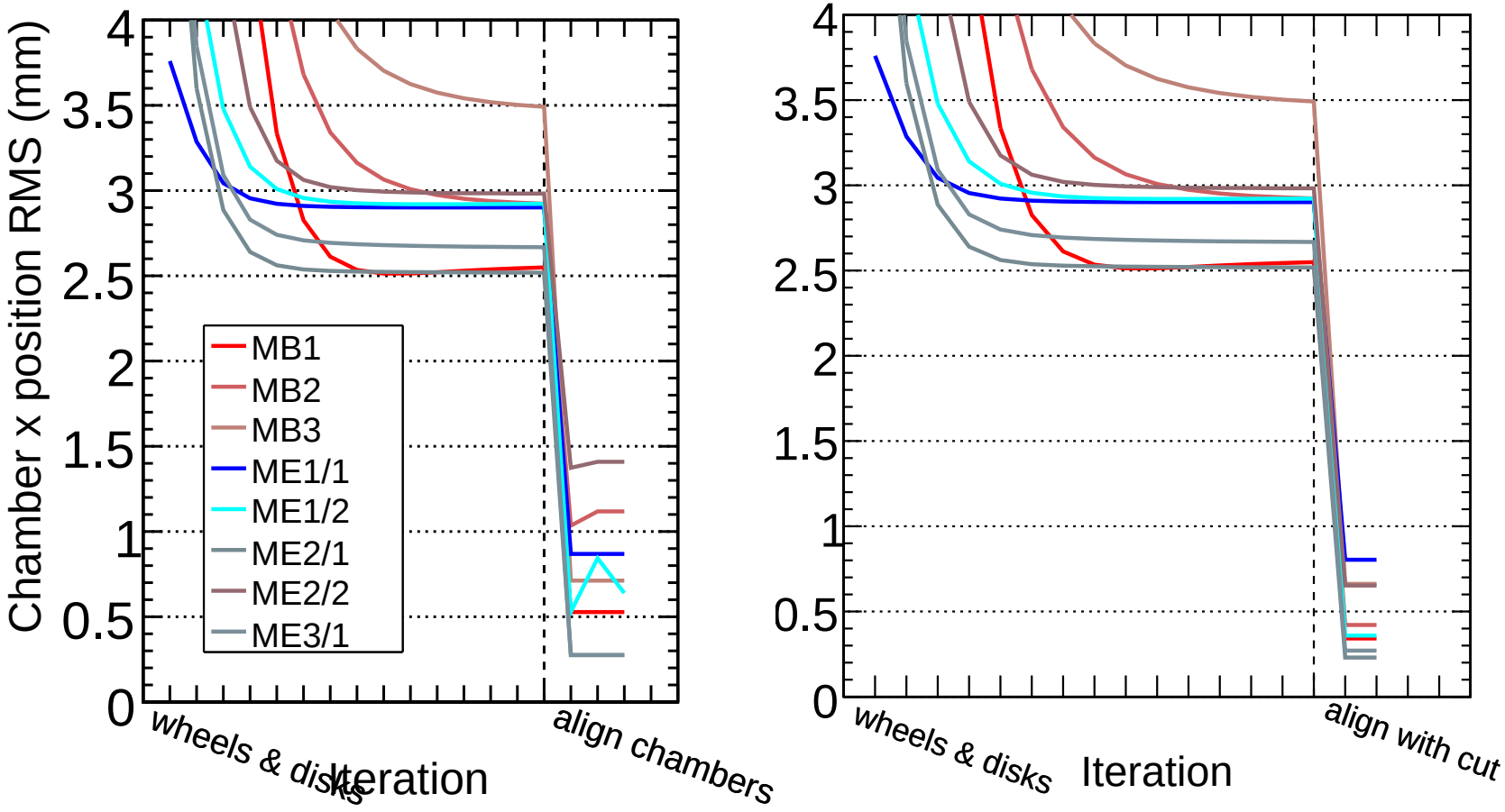
- Cut criteria are independent of how the track is fitted in alignment procedure
  - By contrast, a cut on residuals depends strongly on the weight of a muon hit in the fit (APE) and how much outside information is used (globalMuon/standAlone/segment)
- This is a cut on the consistency of the real muon (represented by the hit) with the zero scattering hypothesis (represented by the propagation)
- Cut criteria are independent of the alignment of the outermost muon station (that's why we need two loops: the first finds the chambers)



Disadvantages:

- We need two loops (though the first one only needs to be long enough to determine the mean and stdev of the residual distribution on each chamber in MB4, ME1/3, ME3/2, and ME4/1)
- Every muon needs to be propagated one more time (additional CPU time $\leq$ a full track fit)

- Full 6-dof misalignment/realignment scenario
- Simplified method for generic test:
  1. align wheels/disks
  2. align chambers with muon APE $= \infty$ globalMuons (100 pb^{-1})
- Most improvement in MB2 and ME ring 2



Option #1: special filters used only by HIP method

- AlCaRecoMu and AlignmentMuonSelectorModule unaffected
- We make a private, filtered copy of AlCaRecoMu stream (nearly the same size as full stream)

Option #2: define cut in AlignmentMuonSelectorModule, but don't use it for official AlCaRecoMu

- We make a private, filtered copy of AlCaRecoMu stream using AlignmentMuonSelectorModule with the cut turned on
- Safe: easy to verify `applyScatteringFilter = false`

Option #3: apply the cut to AlCaRecoMu for both methods

- Requires careful testing, because it's irreversible
- Doesn't significantly impact quantity of data for high momentum ($p_T > 20$ GeV)
- Possible to implement two event loops in Express Stream?
- Don't need to decide between #2 and #3 for CMSSW_2_0_0

Conclusions

- We do not claim that the cut is fully tested (it should be applied to MB4, ME1/3, ME3/2, ME4/1, and in our baseline "one station at a time" procedure)
- These are early indications that it can be very helpful (factors of 2 and 3, depending on station)
- We want to present it now, so it won't be a surprise later