


Summary of the First DT-CSC Joint Alignment Meeting and Alignment Progress Report

Jim Pivarski

Texas A&M University

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Two Topics

- Joint Meeting: barrel (Mattoras, Fernandez, Martinez) and endcap (Safonov, Pivarski, Yakorev, Kamon)
  - Definition of alignment stream: converging fast
  - Monitoring: largely overlapping ideas 
- Our alignment progress
  - Geometry-comparison tool
  - Layer-by-layer corrections $\longrightarrow$ DB
  - Stereo DT problem in track-based alignment
  - Survey constraints in alignment framework

Extended AlCaReco proposal

edmHepMCProduct_VtxSmeared	11.24 / 3.6 MB (compr: 3.1112)
DTMap_dt1DRecHits	291.3 / 47.8 kB (compr: 6.09154)
DTMap_dt2DSegments	177.2 / 66.8 kB (compr: 2.6503)
DTMap_dt4DSegments	309.4 / 73.9 kB (compr: 4.18759)
CSCMap_csc2DRecHits	185.9 / 81.4 kB (compr: 2.28444)
CSCMap_cscSegments	176.0 / 89.6 kB (compr: 1.96509)
RPCMap_rpcRecHits(?)	72.6 / 60.8 kB (compr: 1.19515)
TrajectorySeeds_MuonSeed	80.7 / 80.7 kB (compr: 1) (could be avoided)
recoTracks_standAloneMuons	84.9 / 84.9 kB (compr: 1)
Partial Sum:	1042.4 / 519.0 kB (compr: 1.9570)
TrackingRecHitsOwned_ctfWithMaterialTracks	8.0 / 1.5 MB (compr: 5.30484)
recoTrackExtras_ctfWithMaterialTracks	1.5 / 1.0 MB (compr: 1.45996)
recoTracks_ctfWithMaterialTracks	0.87 / 0.54 MB (compr: 1.61582)
recoTrackExtras_standAloneMuons	181 kB (compr: 1)
recoTracks_globalMuons	70 kB (compr: 1)
recoTrackExtras_globalMuons	166 kB (compr: 1)
recoMuons_globalMuons	92 kB (compr: 1)
SiPixelClusteredmDetSetVector_siPixelClusters	4.7 / 1.8 MB (compr: 2.59285)
SiStripClusteredmDetSetVector_siStripClusters	11.3 / 5.1 MB (compr: 2.20509)
TrackingRecHitsOwned_globalMuons	210 / 54 kB (compr: 3.90376)
TrackingRecHitsOwned_standAloneMuons	147 / 35 kB (compr: 4.19498)

~14MB / 100 EWK events

~150kB / EWK event

(compressed data)

Biggest dependency to be avoided: SiClusters

- Included to allow globalMuon track refitting
  - Essential for iterating with tracker-fit tracks (or partly tracker-fit tracks) ⌣̈
  - These are low-level tracker hits, and *all* of them ⌢̈
- Dropping it would cut the file size in half
- Dependency is due to a hit-cloning operation deep in KFFitter
- We should somehow remove this dependency
  (we'll bring it up at AlCaReco meeting tomorrow)

Alignment monitoring: roughly four categories

1. DQM-based monitoring upstream of alignment process (reports an error if alignment used online is wrong)

2. Sanity checks in AlignmentProducer (convergence, improvement in residuals, overlap plots, p_T)

3. Geometry Validation— compare output geometries from different alignments: have the chambers moved?

4. Validation with reconstructed tracks: is it better? (same plots as 1?)

Proposals by barrel, software group differ by merging 3 and 4, whether 2 is a part of AlignmentProducer

Sharing workload

1. DQM-based online monitoring — Javier Fernandez?
2. Sanity checks in AlignmentProducer — Jim Pivarski?
3. Geometry Validation — Dmitry Yakorev, Jim Pivarski
4. Validation with reconstructed tracks — Javier Fernandez?

Still under discussion. . .

Next topic: Our alignment progress

- Beginnings of a geometry-comparison tool
- Working on FAST layer-by-layer corrections → DB

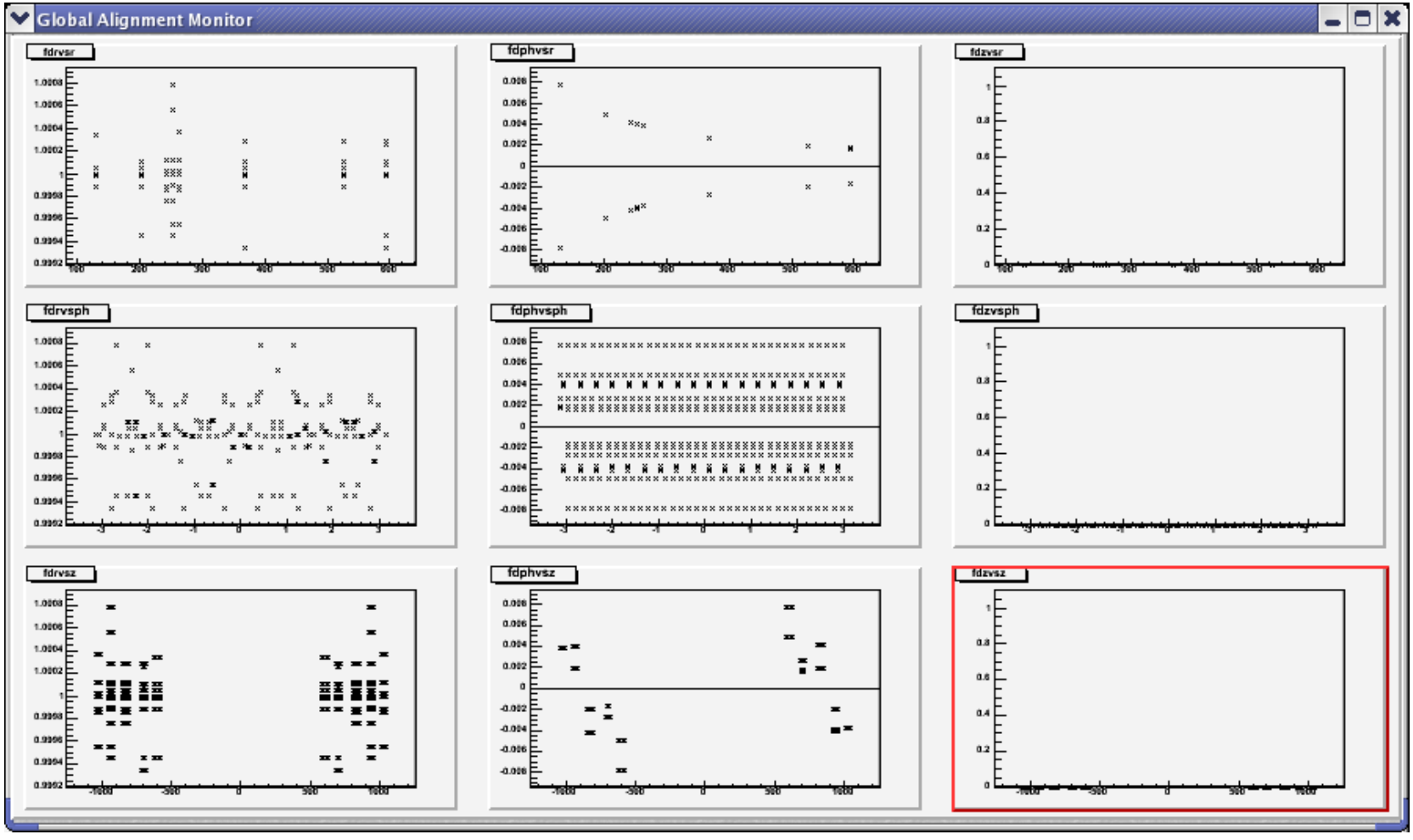
  (with Karoly and Andrey)
- Stereo DT problem in track-based alignment understood, soon to be fixed
- Survey constraints implemented in alignment framework

Geometry-comparison tool (Dmitry Yakorev)

vs. R

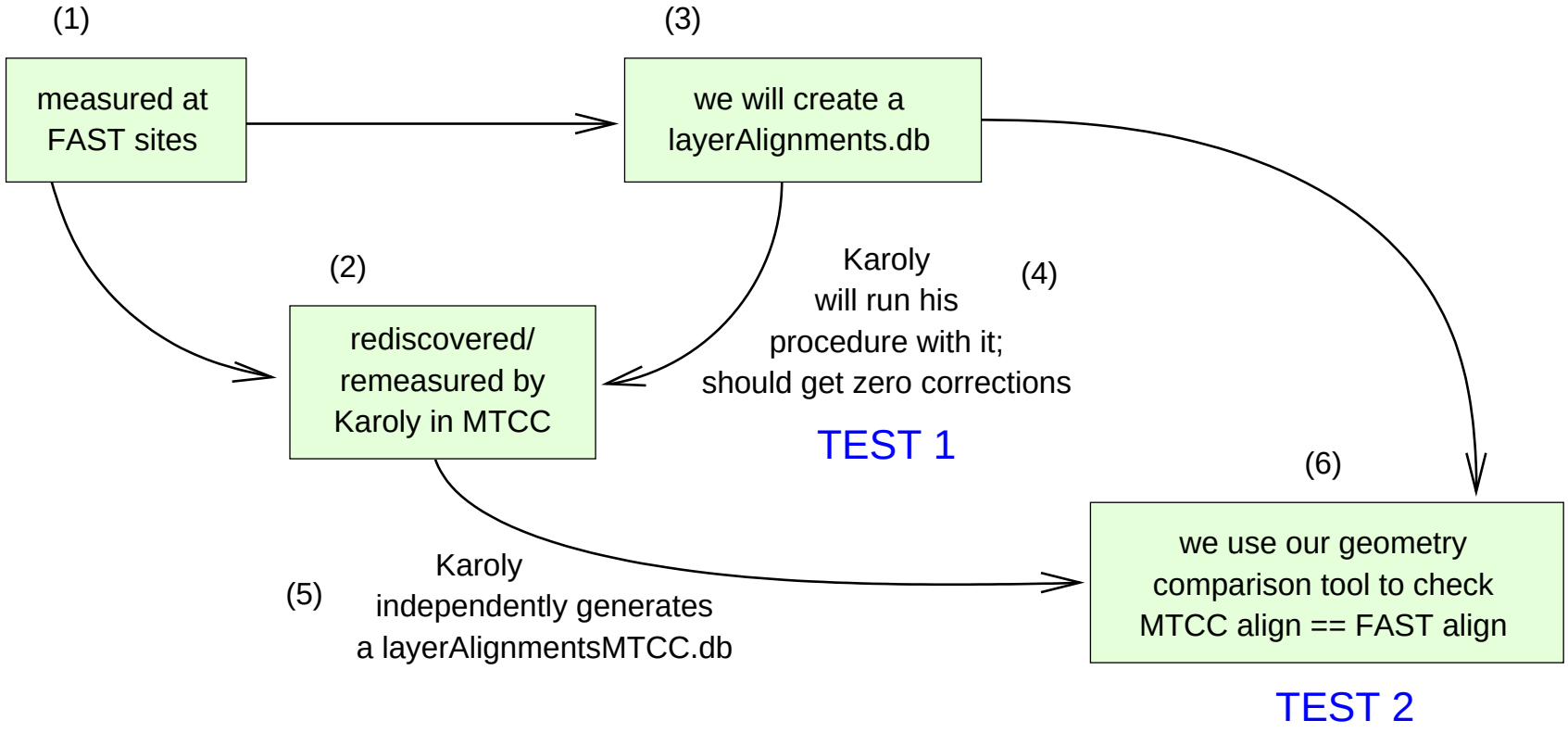
vs. ϕ

vs. Z



$(\vec{x_1} - \vec{x_2})$ $(\vec{x_1} - \vec{x_2}) \cdot \hat{\phi}$ $(\vec{x_1} - \vec{x_2}) \cdot \hat{Z}$

Layer-by-Layer corrections



- TEST 1 is an extension of Karoly's work to all chambers
- TEST 2 should be equivalent, and will stress the geometry comparison tool

Stereo DT problem in track-based alignment

This is the only known error in muon alignment procedure in CVS

What works:

- DT stereo angle (90°) is correctly represented by a rotated local coordinate system (local y is always parallel to wire)
- "Meaningful" residuals ($x_{\text{track}} - x_{\text{hit}}$) move chambers in the correct directions

What doesn't:

- "Meaningless" residuals ($y_{\text{track}} - y_{\text{wire midpoint}}$) move chambers

We need to set $1/\sigma_{yy}^2$ to zero, as I did in private code

Coordinating with tracker alignment to put this in

Survey constraints

- Successfully implemented in tracker alignment
- We should be able to inherit this work in muon alignment
- We'll make sure the interface works— who will apply and check the constraints?

Recap

- Joint DT/CSC Alignment Meeting
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- Alignment progress
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  - Working on FAST layer-by-layer corrections $\longrightarrow$ DB
  - Stereo DT problem in track-based alignment understood, soon to be fixed
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