2012 Reference Alignment — Status Report

Matthias Schröder

DESY

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Introduction

- Results of 2012 alignment mp1440 presented in CMS tracker-alignment meeting on May 15
- DMR validation plots for isolated- μ tracks
 - Relatively broad compared to 2011 legacy results
 - Double-peak structure in BPIX





- Inconsistent settings of LA-related parameter treatment in mille
 - Configured to use the 'template' method for pixel-hit reconstruction in the track fitting
 - * 'TTRHBuilder = "WithAngleAndTemplate"'
 - But LA parameter in alignment fit not set to take into account hard-coded LA value in pixel templates
 - * Needs 'DoLorentz = cms.bool(True)' in RecoLocalTracker/ SiPixelRecHits/python/PixelCPETemplateReco_cfi.py

New Aligment mp1451: Setup

- Release: CMSSW_5_3_16_patch1 + private modifications for latest alignment procedures incl. LA & BP corrections
 - MPproduction/CMSSW_5_3_16_patch1_mschrode
 - Recipe in presentation March 13
- MPS setup: MPproduction/mp1451
 - Global tag FT_R_53_V21::All
 - Alignment parameters / granularity as in mp1338
 - * Proposed by Nazar Bartosik in presentation Feb 13
 - ★ For LA coded in determineLA_simplified.txt
 - Starting geometry from 2011 legacy alignment mp1332 (last IOV)
 - Pede revision 125 with MINRES-QLP on 8 threads

Setup

Data

cosmics 0 T	857970
cosmics CRAFT	1073931
cosmics interfill	3716816
0 T collisions	320000
minimum bias	1952099
isolated μ	20514744
$Z \to \mu \mu$	3488739

- More events than in mp1440
 - $\blacktriangleright\,$ Factor ≈ 2 minimum-bias and isolated- μ data

Pede Performance



✓ Total run time 122 h 50 min 1.3 sec

Offline-Validation with Isolated- μ Tracks

- /SingleMu/Run2012A-TkAlMuonlsolated-22Jan2013-v1/ALCARECO
- /SingleMu/Run2012B-TkAlMuonIsolated-22Jan2013-v1/ALCARECO

DMR in BPIX



Distribution of the median of the residuals in BPIX



Distribution of the median of the y residuals in BPIX



DMR in FPIX



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DMR in TIB, TOB



✓ Same RMS as observed by Nazar for mp1338 produced with similar setup in older release with less data, see slide 10 in presentation Feb 13 in CMS tracker alignment meeting

DMR in TID, TEC



Distribution of the median of the residuals in TID

Distribution of the median of the residuals in TEC

Comparison of DMRs with 2011 Results

- Isolated- μ offline-validation results of different 2011 alignments shown by Tapio in CMS tracker-alignment meeting on July 11, 2013
- $\checkmark\,$ Presented 2012 DMRs have similar RMS as in 2011 in BPIX and FPIX
- $\checkmark \checkmark$ In other detector parts, presented 2012 DMRs are slightly narrower than in 2011
 - More detailed comparisons required

Normalised RMS in BPIX



Normalised RMS in FPIX



Normalised RMS in TIB, TOB



Normalised RMS in TID, TEC



Summary & Outlook

- Full-scale alignment mp1451 with 2012 data
 - ► In latest 53X release, including KB and LA & BP corrections
 - Starting from 2011 legacy alignment
- Using new MINRES-QLP minimisation method in pede
 - Alignment with large amount of 2012 data in reasonable time
- Offline validation plots with isolated- μ data
 - Previously observed double-peak structure in BPIX cured, i. e. was artecfact of inconsistent settings for pixel-hit reconstruction
 - Reproduction of earlier result by Nazar with similar setup in older release and less data
 - DMRs show similar performance as for 2011 legacy alignment
- Iteration of mp1451 is currently running
- Further validation plots to be producted
 - Parameter values before and after fit
 - ► Time dependence (IOV dependence) of fitted parameter values
 - LA & BP-parameter specific plots