



CMS Tracker 2012C+D alignment az offline rekonstrukció számára

Hidas Pál

CMS Tracker DPG Budapest csoport

Wigner FK NFO – SM, új fizika kutatócsoport

CMS Budapest–Debrecen munkaértekezlet



A nyomdetektorról és a helyzetmeghatározásról (alignment) lásd

http://grid.kfki.hu/twiki/pub/CMS/WeeklyBudapestDebrecenMeetings/120423_alignment.pdf

Időfüggő alignment a 2012 C+D időszakra

- Jó minőségű fizikai adatokkal (JSON) az adott időszakból
- Az eredményt az adatok újrarekonstrukciója (rereco) használja

Szoftver

- Millepede 2 (“ezerlábú”)
- Track alapú alignment, trackek és modulok együttes illesztése
- Khínégyszet minimalizálás egyetlen lépésben, nincs iteráció
- Mátrixinverzió -> korrekt hibabecslés



Körülmények



A kalibrációs konstansok és állapotparaméterek időfüggőek, főleg a pixel detektor esetén

- **SiPixelQuality** nem működő detektorelemek listája
- **SiPixelLorentzAngle** elektromos térben driftelő részecskék eltérülési szöge mágneses tér hatására
- **SiPixelGain** ADC összeg – energia kalibráció (pedestal, gain)
- **SiPixelDBTemplate** pixelklaszter alakelemek, klaszter sorfejtése, track irányára nyerhető belőle információ
- **Kiinduló geometria**



Pixel tags



SiPixelTemplateDBObject_38T_v6_offline

SiPixelLorentzAngle_v4_offline

- ...
- 197749-200960, 2012/IOV3, Run 2012C
- 200961-203367, 2012/IOV4, Run 2012C
- 203368-204600, 2012/IOV5, Run 2012D
- 204601-206445, 2012/IOV6, Run 2012D
- 206446-inf, 2012/IOV7, Run 2012D

SiPixelGainCalib_2009CollRuns_offline & SiPixelGainCalibHLT_2009Runs_offline

- ...
- 197749-203367, Run 2012C
- 203368-inf, Run 2012D

SiPixelQuality_v04_offline

- 193998- several IOVs, but most of the time [SiPixelQuality_v16_bugfix_mc](#)



Lorentz Angle – Template IOVs in 2012



2012 IOVs for 2012A+B+C+D alignment and offline reprocessing:

- **IOV1:** 186500 – 195359 (2012.03.05) – also gain IOV – **Run 2012A**

Technical stop: 2012.04.23–27

- **IOV2:** 195360 – 197748 (2012.06.01) – **Run 2012B**

Technical stop: 2012.06.25–29

- **IOV3:** 197749 – 200960 (2012.06.29) – also gain IOV – **Run 2012C**

- **IOV4:** 200961 – 203367 (2012.08.15)

Technical stop: 2012.09.17–21

- **IOV5:** 203368 – 204600 (2012.09.21) – also gain IOV – **Run 2012D**

Alignment and AlCaDB uses 203768 – instead

- **IOV6:** 204601 – 206445 (2012.10.07)

Machine development: 2012.10.07–11

Technical stop: 2012.10.22–26

Machine development: 2012.10.26–30

- **IOV7:** 206446 – inf (2012.10.31)



Datasets 2012C



4 datasets are used from Collisions2012/RunC

- SingleMu_Run2012C_TkAlMuonIsolated_v1_ALCARECO_Nov_06_2012_14_57.txt
- SingleMu_Run2012C_TkAlMuonIsolated_v2_ALCARECO_Nov_06_2012_14_57.txt
- DoubleMu_Run2012C_TkAlZMuMu_v1_ALCARECO_Nov_06_2012_14_57.txt
- DoubleMu_Run2012C_TkAlZMuMu_v2_ALCARECO_Nov_06_2012_14_57.txt

51.6 million events

Cert_190456-206098_8TeV_PromptReco_Collisions12_JSON_MuonPhys_template.txt

→ [Cert_IOV3_IOV4_8TeV_PromptReco_Collisions12_JSON_MuonPhys_template.txt](#)

(RunC = IOV3 + IOV4, RunD=IOV5 + ...)



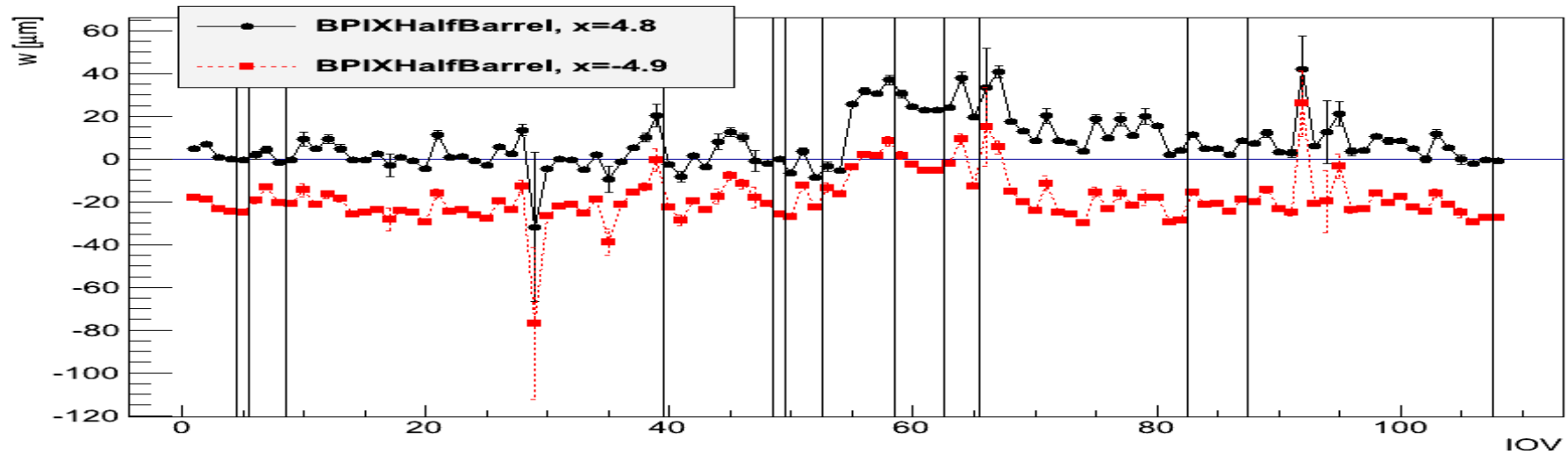
Millepede fit

- /afs/cern.ch/cms/CAF/CMSALCA/ALCA_TRACKERALIGN/MP/MPproduction/mp1279/
- Results: <./jobData/jobm/>
- Pixel IOVs: [198050](#), 198230, 198249, [198346](#), 199319, 200041, 200229, [200368](#), 200532, 201159, 201191, [201535](#), 202012, 202074, 202972
- Strip IOVs: [198050](#), [198346](#), [200368](#), [201535](#)

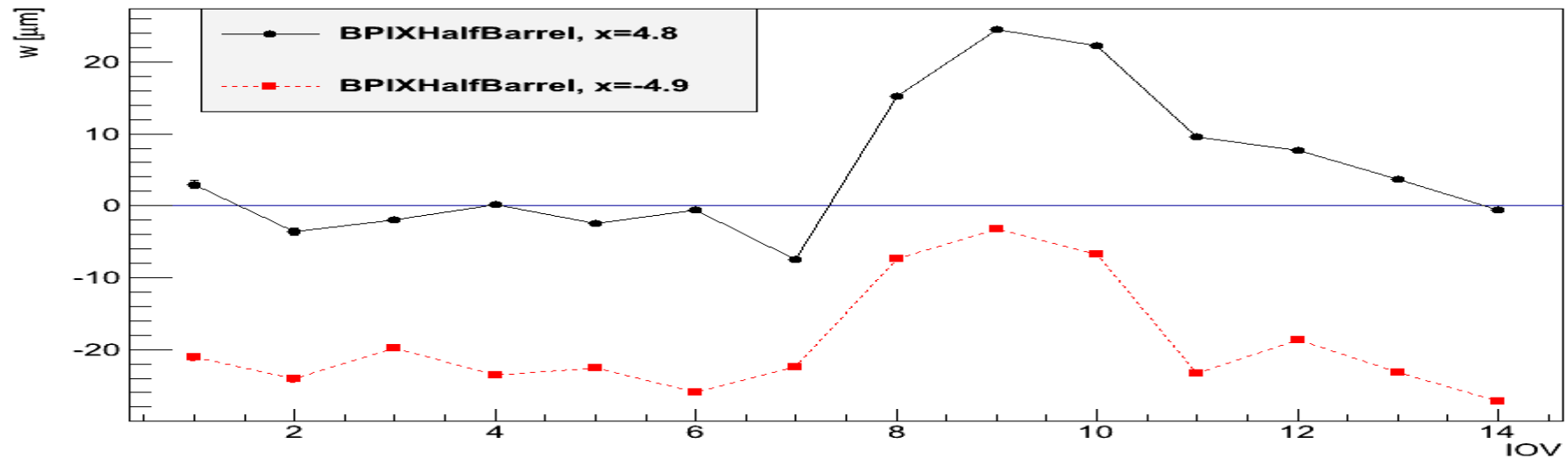
Root scripts of final plots:

- /afs/cern.ch/user/h/hidaspal/public_cms/tracker/mp1279_plotting/
- [myplots.C](#) for final plots
- [myplots_IOV_sections.C](#) for IOV sections in an early stage of merging runs into IOVs

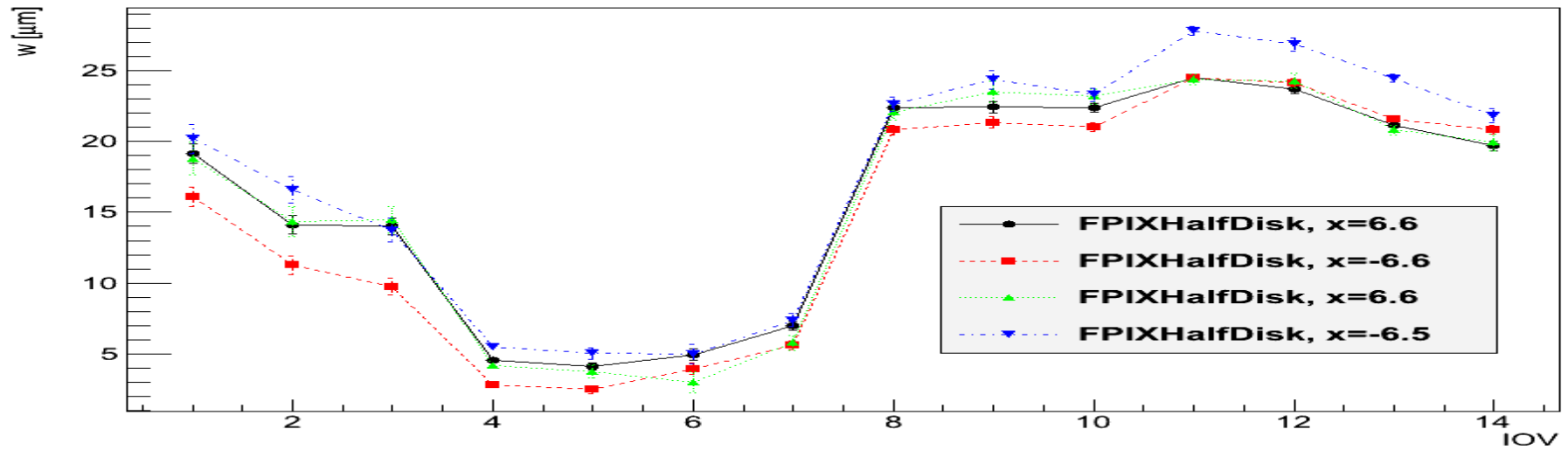
w IOVs: BPIX



w IOVs: BPIX



w IOVs: FPIX, $0 \leq z < 1000$





Data sets 2012D



4 datasets are used from Collisions2012/RunD

- SingleMu_Run2012D_TkAlMuonIsolated_v1_ALCARECO_Jan_07_2013_10_52.txt
- DoubleMu_Run2012D_TkAlZMuMu_v1_ALCARECO_Jan_07_2013_10_52.txt

~ 53 million events

Cert_190456-208868_8TeV_PromptReco_Collisions12_JSON_MuonPhys_template.txt

→ Cert_190456-208868_IOV5_8TeV_PromptReco_Collisions12_JSON_MuonPhys_template.txt

Starting geometry: [.../mp1280/jobData/jobm/alignments_split_MP_fixed.db \(tag:Alignments_13\)](#)



Millepede fit

- /afs/cern.ch/cms/CAF/CMSALCA/ALCA_TRACKERALIGN/MP/MPproduction/mp1281/
- Results: [./jobData_iter_11/jobm/](/afs/cern.ch/cms/CAF/CMSALCA/ALCA_TRACKERALIGN/MP/MPproduction/mp1281/./jobData_iter_11/jobm/)

Root scripts of final plots:

- /afs/cern.ch/user/h/hidaspal/public/myrsync/public_cms/tracker/mp1275_plotting/
- [myplots.C](#) for final plots
- [myplots_IOV_sections.C](#) for IOV sections in an early stage of merging runs into IOVs



Iteration 0

- 1 run ~ 1 IOV except 2 IOVs, where some very low statistics runs (2 and 5) were joined at the beginning
- 192 runs IOVs
- Run range: 203709 – 208686 (197 runs in JSON file)
- Mille jobs ~2-3 hours, pede job ~10 hours

Iteration 11

- Pixel: 7 IOVs (4+3)
- Strip: 2 IOVs

Zooming and reviewing the plots of iteration 0 there are 2 jumps in the first pixel IOV, so it was divided into 3 ones thus increasing the number of pixel IOVs from 5 to 7 since last week as a result of an email discussion.



1st strip IOV = 4 pixel IOVS

2012D



(203709 203777 very few events) | pixel-strip IOV starting

203830 203832 203833 203834 203835 203853 203894 203909 203912 203980 203981 203985 203986 203987 203991
203992 203994 204100 204101 204113 204114 204238 204250 204511 204541 204544 204552 204553 204554 204555
204563 204564 204565 204566 204567 204576 204577 204599 204601

205086 | pixel IOV starting

205111 205158 205193 205217 205233 205236 205238 205303 205310 205311 205339 205344 205515 205519

(1 IOV: 205526 205595 205598 205599 205605 very few events)

205614 | pixel IOV starting

205617 205618 205620 205666 205667 205683 205690 205694 205718 205774 205777 205781 205826 205833 205834
205908 205921 206066 206088 206102

206187 | pixel IOV starting

206188 206199 206207 206208 206210 206243 206245 206246 206257 206258 206302 206303 206304 206331 206389
206391 206401 206446 206448 206466 206476 206477 206478 206484 206512 206513 206539 206542 206550 206572
206573 206574 206575 206594 206595 206596 206598 206605 206744 206745 206859 206866 206867 206868 206869
206897 206901 206906 206939 206940 207099 207100 207214 207217 207219 207220 207221 207222 207231 207233
207269 207273 207279



2nd strip IOV = 3 pixel IOVS 2012D



207320 | pixel | strip IOV starting

207371 207372 207397 207398 207454 207469 207477 207487 207488 207490 207491 207492 207515 207517 207518

non JSON 207779 instead of JSON 207882 | pixel IOV starting

207883 207884 207885 207886 207887 207889 207898 207905 207920 207921 207922 207924

208300 | pixel IOV starting

208304 208307 208339 208341 208351 208352 208353 208357 208390 208391 208407 208427 208428 208429 208487

208509 208538 208540 208541 208551 208686

