Beam Halo tracks studies

Andrea Parenti (DESY)

Tracker alignment chat

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Datasets and selection

- /Cosmics/Run2010A-TkAlBeamHalo-v4/ALCARECO
  - Run range: 137437-144431 (10.06-01.09.2010)
  - AlCaRecoHLTpaths8e29_1e31_v7_hlt:
    - run < 142186: no BH HLT available
    - run >= 142186: HLT_L1Tech_BSC_halo available (but not used)
- Run selection
  - all runs with > 1000 events are taken
- Event selection
  - 1 ≤ nTracks ≤ 4 (not applied for event/track rates)

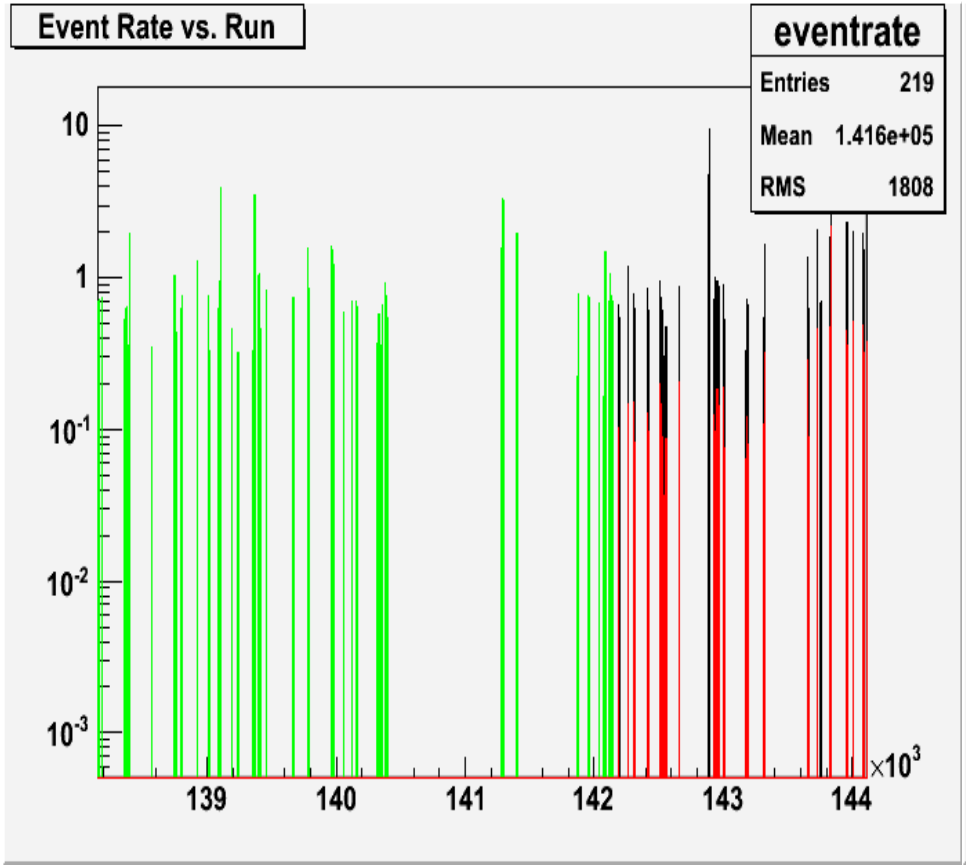
Track selection

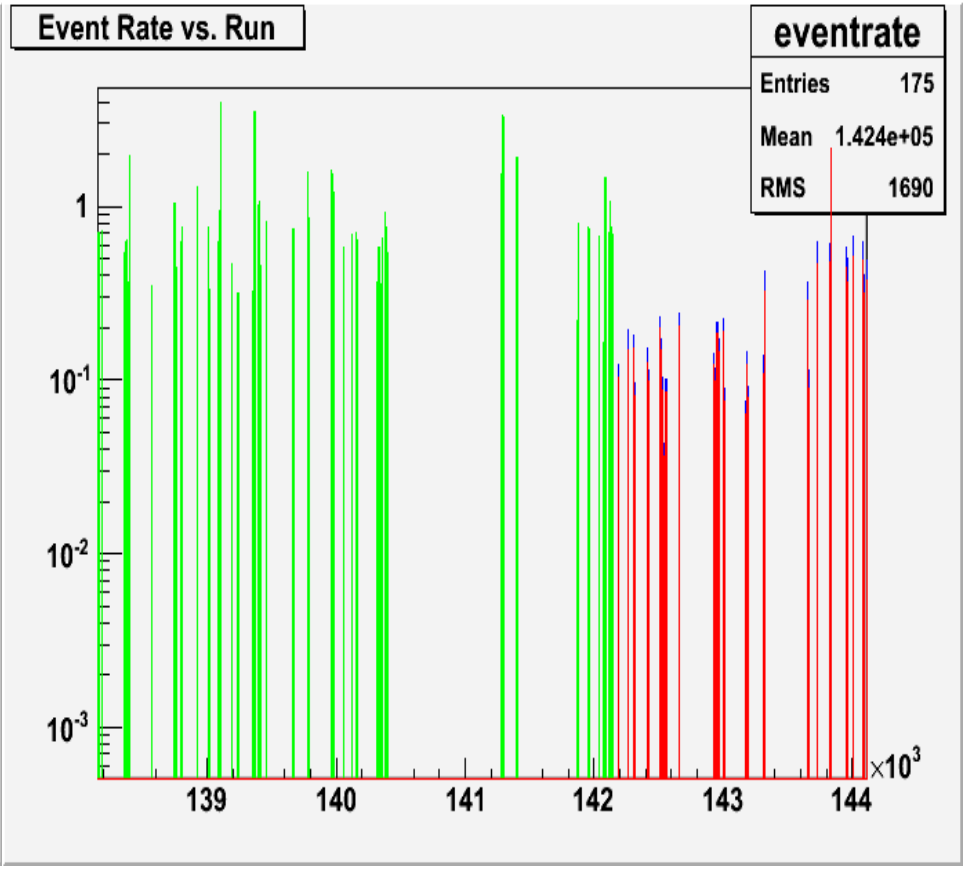
- Track selection
  - nHitMin = 8
  - minHitsinENDCAPplus = minHitsinENDCAPminus = 1
  - pMin = 2.5
  - nLostHitMax = 2
  - maxHitDiffEndcaps = 3
  - chi2nMax = 20.
- Selected data: 846,034 events - 50,343 tracks

Event and track rates

Event rates (Hz)

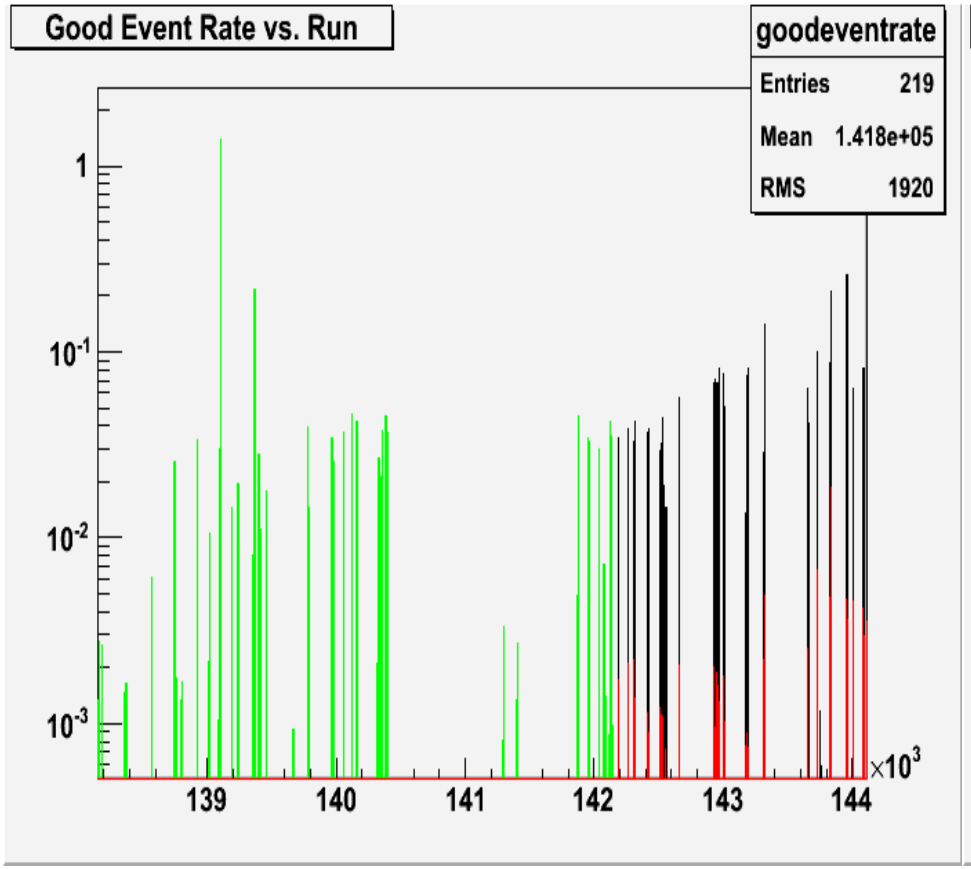
- Black: all runs (no Trg selection)
- Green: run < 142186 (no Trg selection)
- Blue: all runs (L1TechTrg: 36 || 37 || 38 || 39)
- Red: run ≥ 142186 (TkAlBeamHalo HLT path)

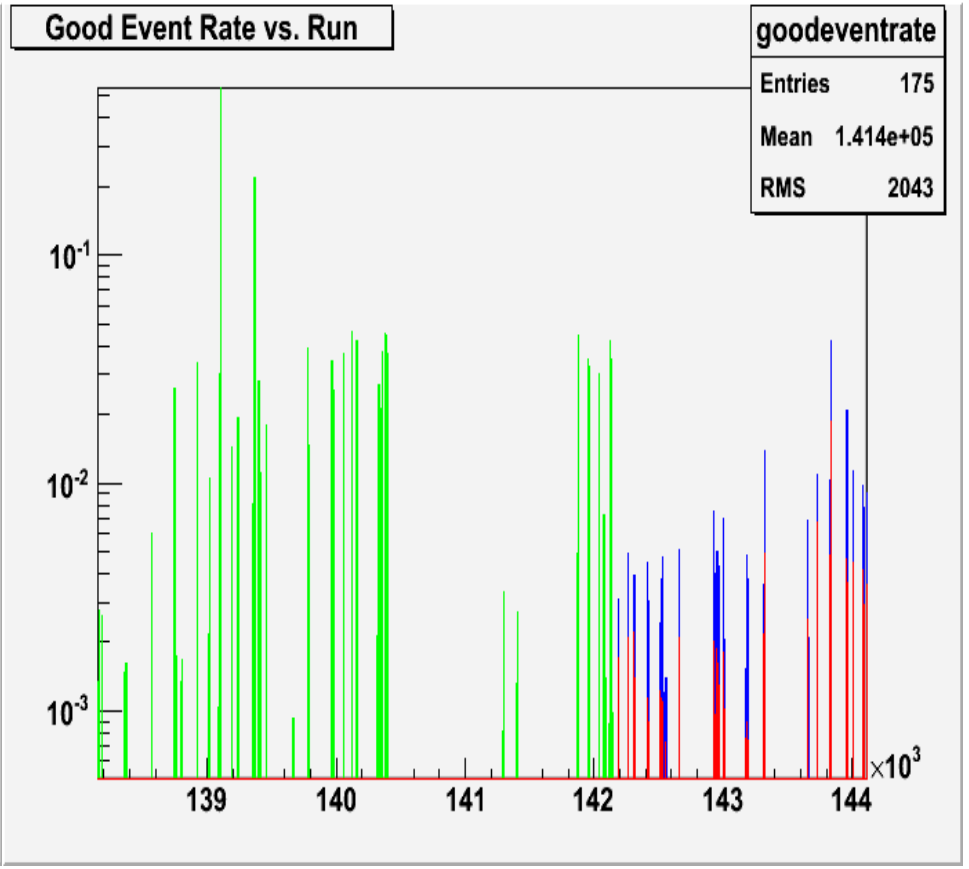




Good event rates (Hz)

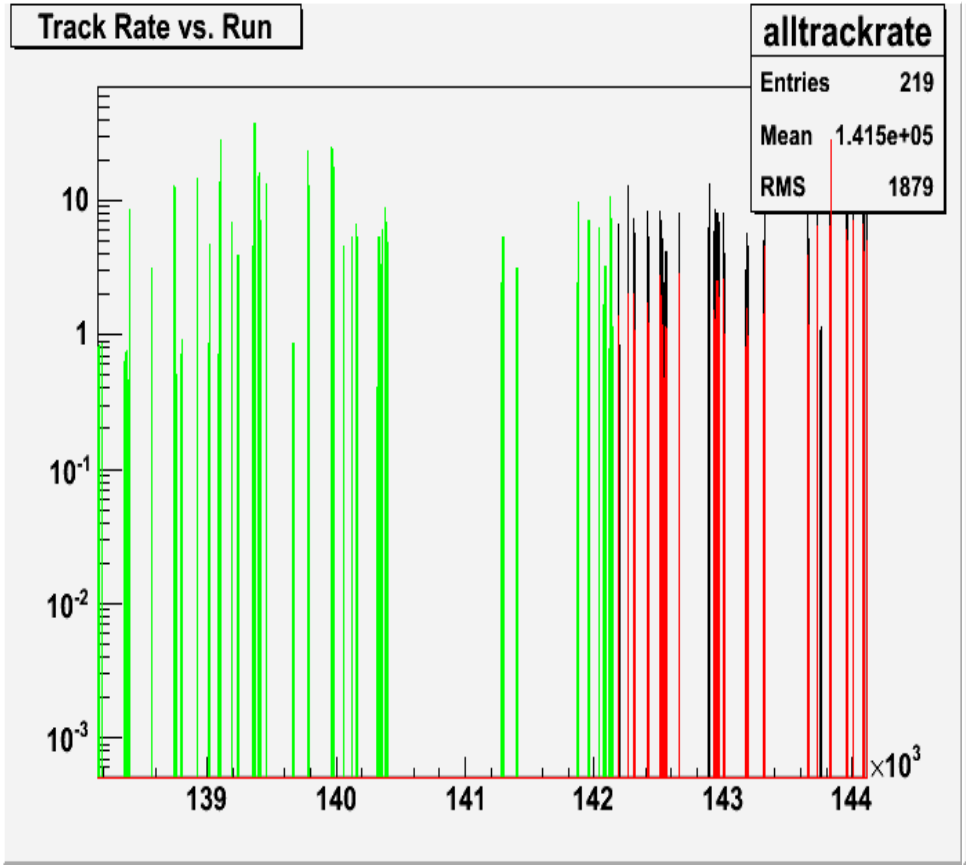
- Good event means: event with at least one “good” track

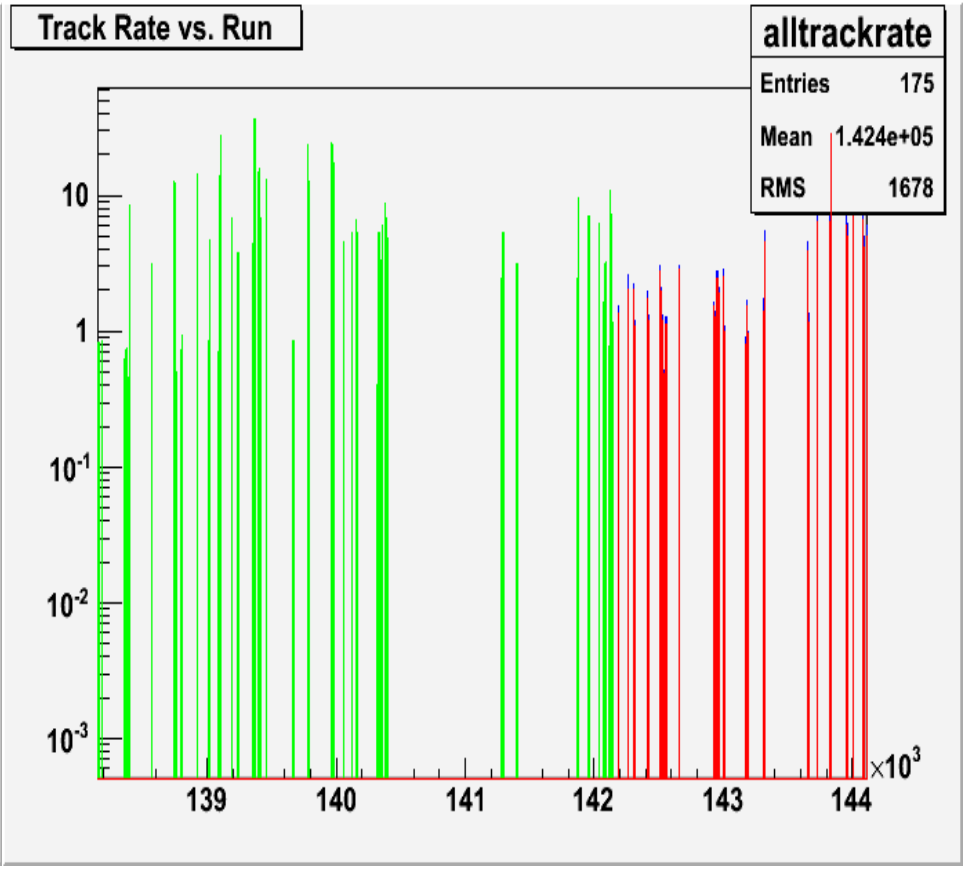




Track rates (Hz)

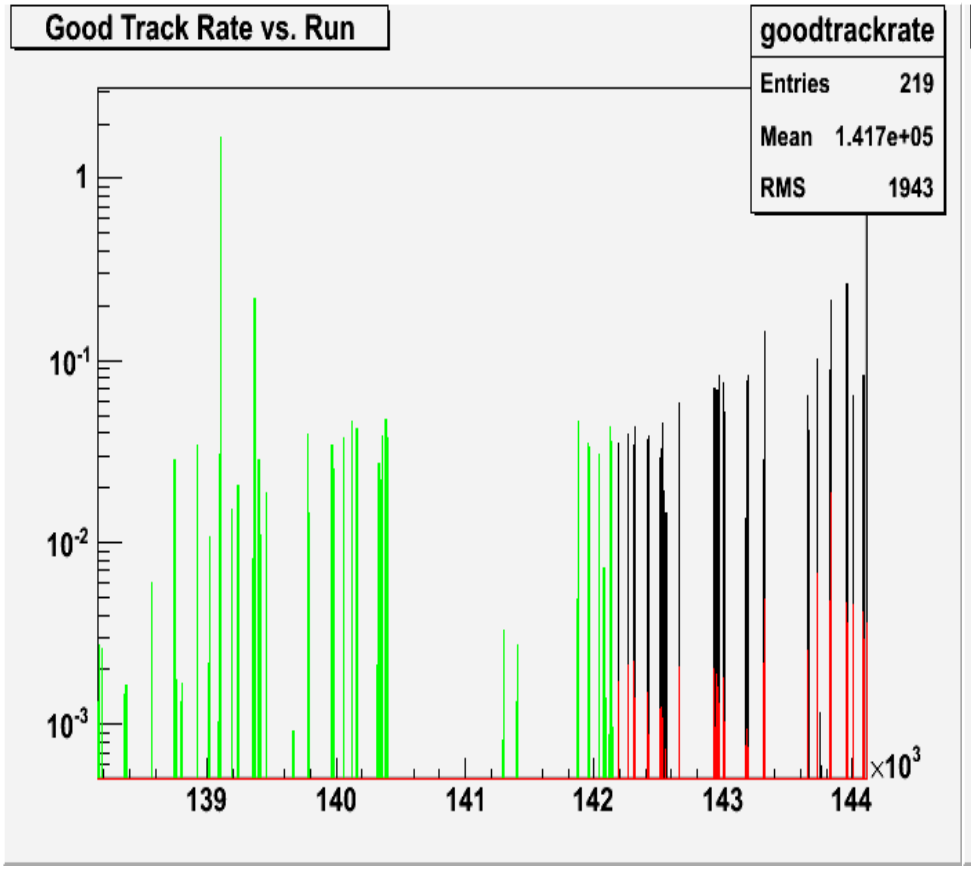
- Black: all runs (no Trg selection)
- Green: run < 142186 (no Trg selection)
- Blue: all runs (L1TechTrg: 36 || 37 || 38 || 39)
- Red: run ≥ 142186 (TkAlBeamHalo HLT path)

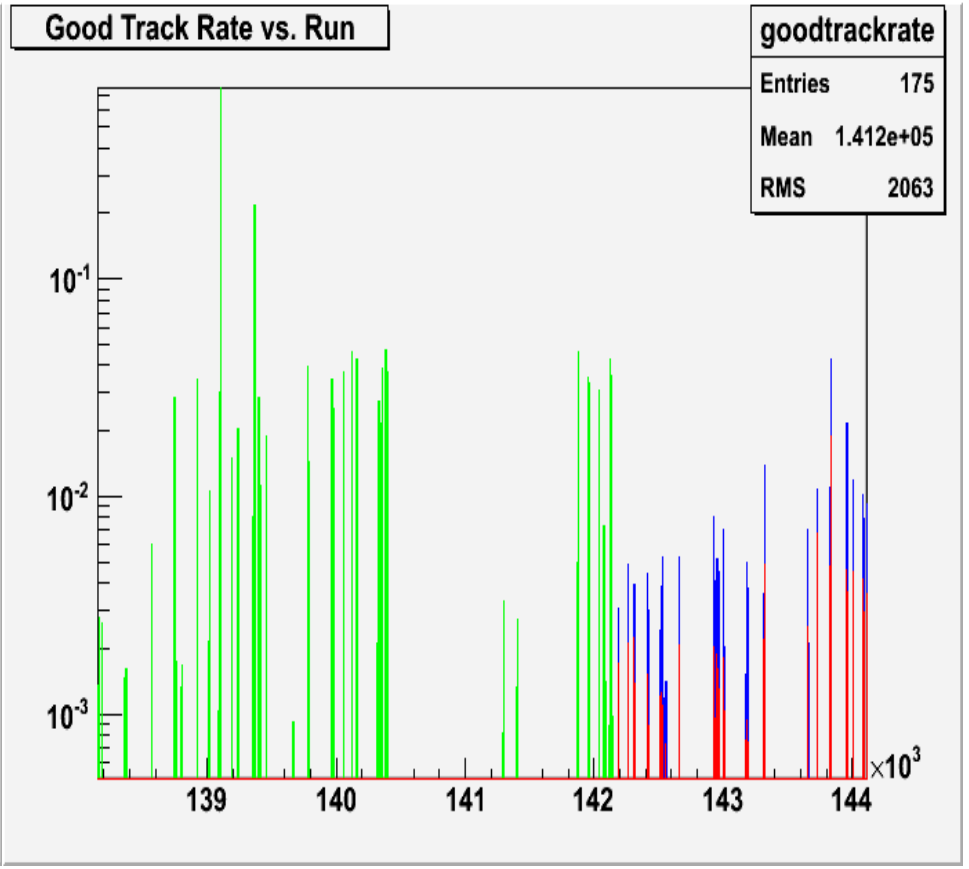




Good track rates (Hz)

- Good track: track surviving the Beam Halo selection cuts





... some numbers

- Number of events and tracks in the last runs:

Run Nr.	all events	good events	all tracks	good tracks
144114 (a)	3086	201	25145	203
(b)	729	20	8349	20
(c)	562	7	7170	7
144112 (a)	69595	3222	595755	3264
(b)	19673	366	242593	371
(c)	15136	145	203248	145
144089 (a)	61328	3298	527463	3337
(b)	16351	319	201107	323
(c)	13039	120	170897	120
144086 (a)	13487	435	119931	441
(b)	4383	67	54907	70
(c)	3393	29	46075	29

(a) no Trigger selection
(b) L1TechTrg: 36 || 37 || 38 || 39
(c) TkAlBeamHalo HLT path

- Smaller number of events with HLT than with L1
  - are there additional cuts in the HLT?

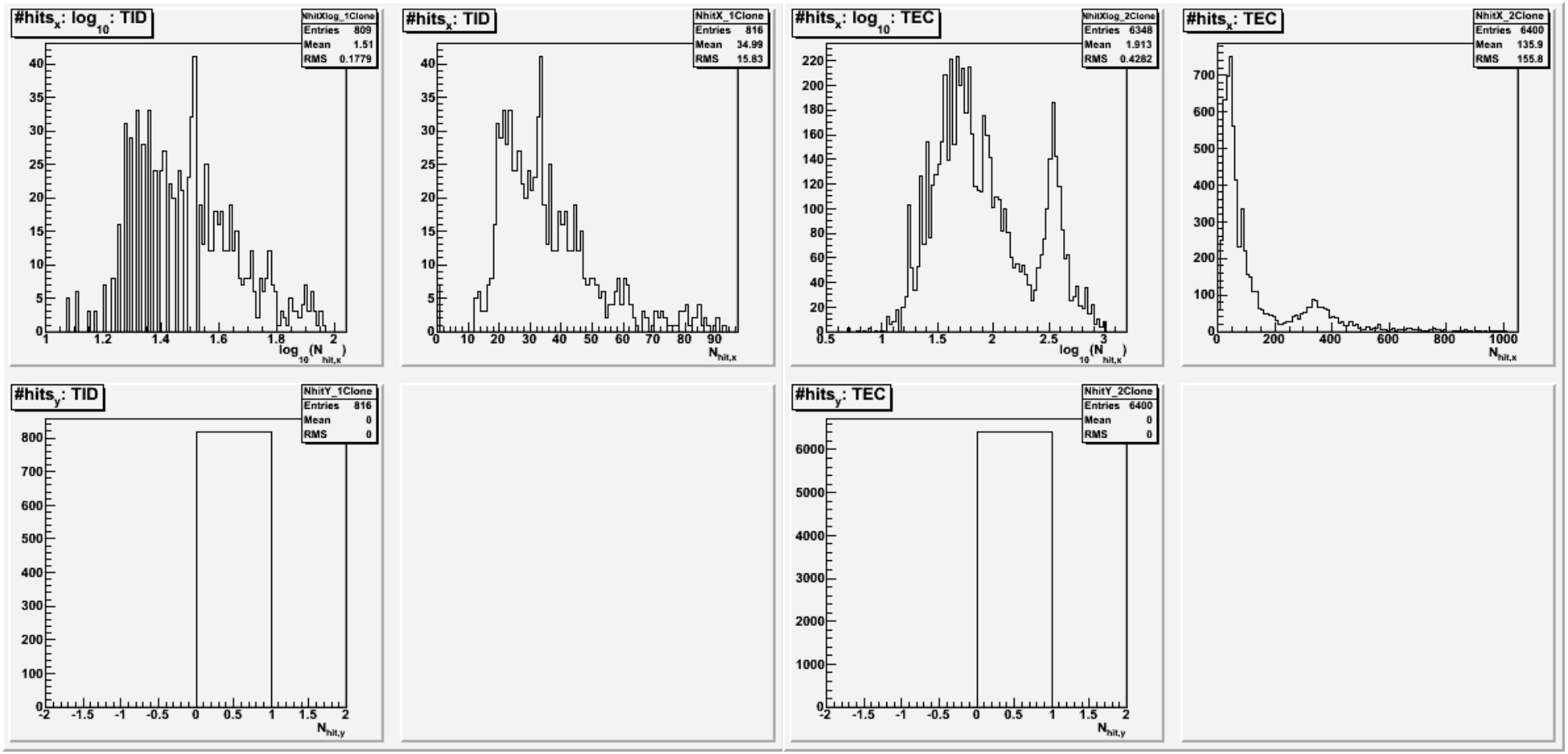
TID/TEC alignment test

Alignment test – excerpts from cfg

```
process.GlobalTag.globaltag = 'GR10_P_V4::All'

connect = cms.string
    ('sqlite_file:/afs/cern.ch/cms/CAF/CMSALCA/ALCA_TRACKERALIGN/data/common
    Validation/results/jdraeger/CosMinTestsAug/MPCosMinTOBCenteredObject.db'),

[...]))

process.AlignmentProducer.ParameterBuilder.Selector = cms.PSet(

   alignParams = cms.vstring( 'TrackerTIDEndcap,111111', 'TIDDets,101001,endCapSS',

      'TrackerTIDModuleUnit,101001,endCapDS', 'TrackerTECEndcap,111111,posZ',

      'TrackerTECEndcap,ffffff,negZ', 'TECDets,101001,endCapSS',

      'TrackerTECModuleUnit,101001,endCapDS'),

[...])

process.AlignmentProducer.algoConfig.pedeSteerer.pedeCommand = '/afs/cern.ch/user/
    c/ckleinw/bin/rev64/pede_8GB'
```

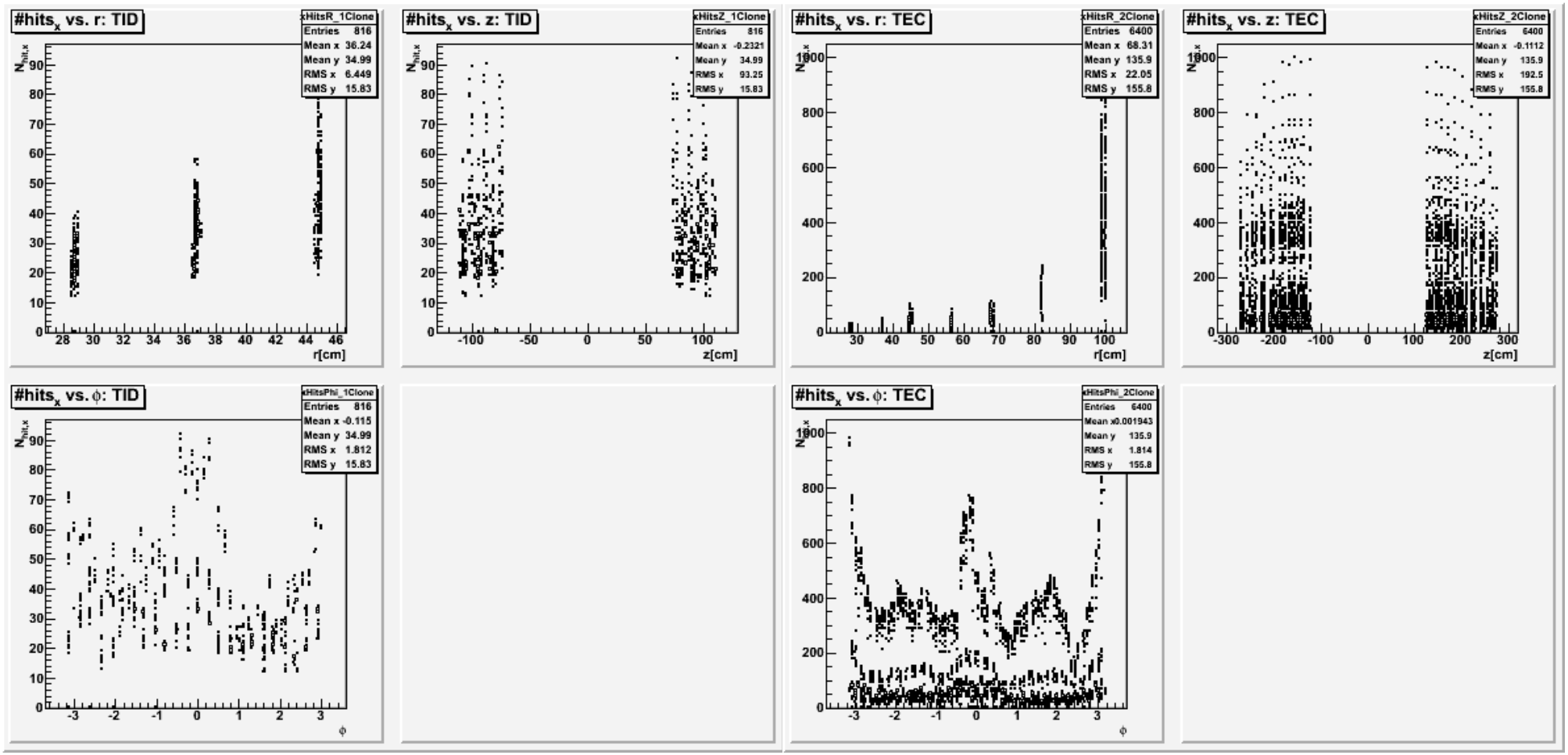
hits

- TID:
- TEC:


#hits$_x$: log$_{10}$: TID
NhitXlog_1Clone
Entries 809
Mean 1.51
RMS 0.1779
log$_{10}$(N$_{hit,x}$)
#hits$_x$: TID
NhitX_1Clone
Entries 816
Mean 34.99
RMS 15.83
N$_{hit,x}$
#hits$_x$: log$_{10}$: TEC
NhitXlog_2Clone
Entries 6348
Mean 1.913
RMS 0.4282
log$_{10}$(N$_{hit,x}$)
#hits$_x$: TEC
NhitX_2Clone
Entries 6400
Mean 135.9
RMS 155.8
N$_{hit,x}$
#hits$_y$: TID
NhitY_1Clone
Entries 816
Mean 0
RMS 0
N$_{hit,y}$
#hits$_y$: TEC
NhitY_2Clone
Entries 6400
Mean 0
RMS 0
N$_{hit,y}$

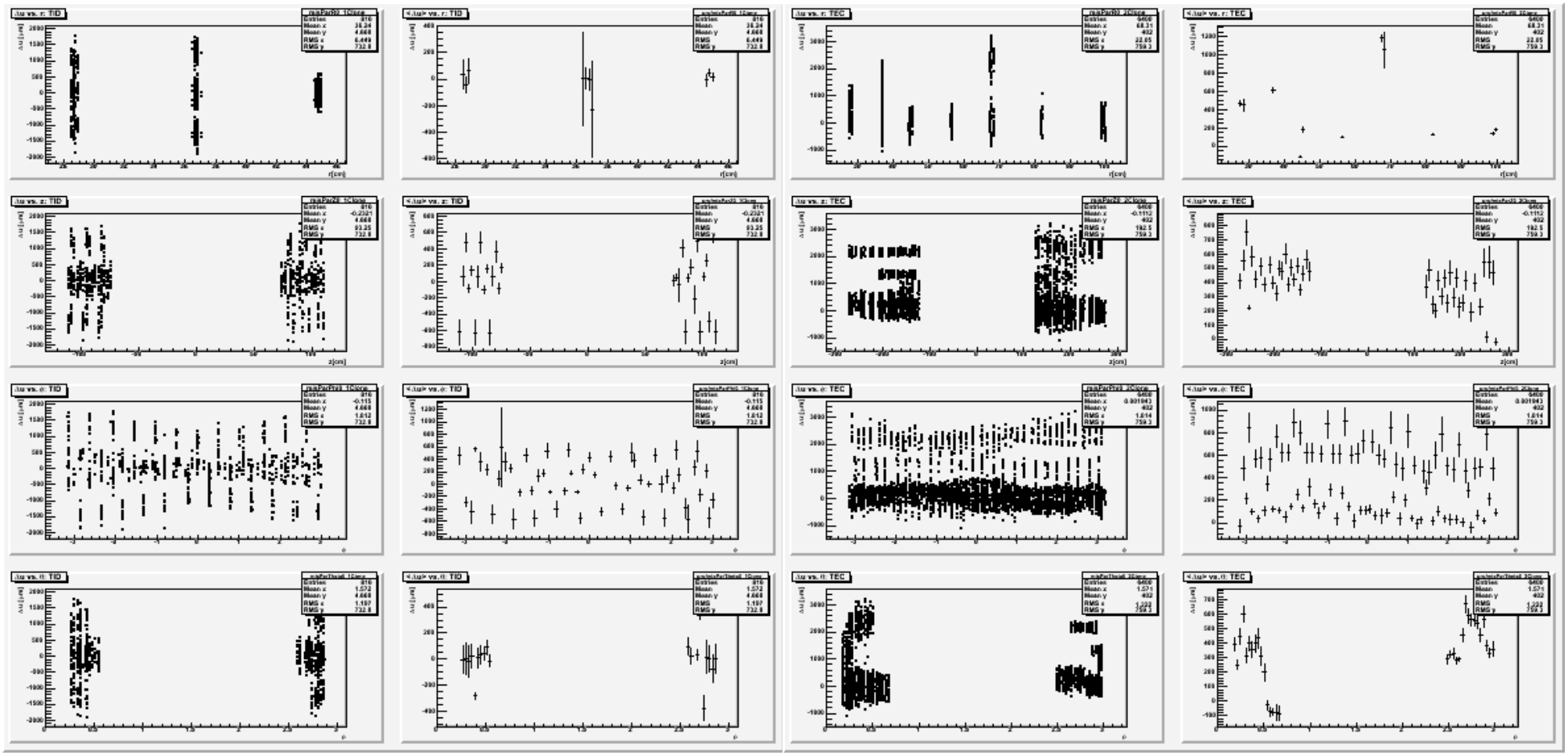
hits vs r, z, phi

- TID:
- TEC:



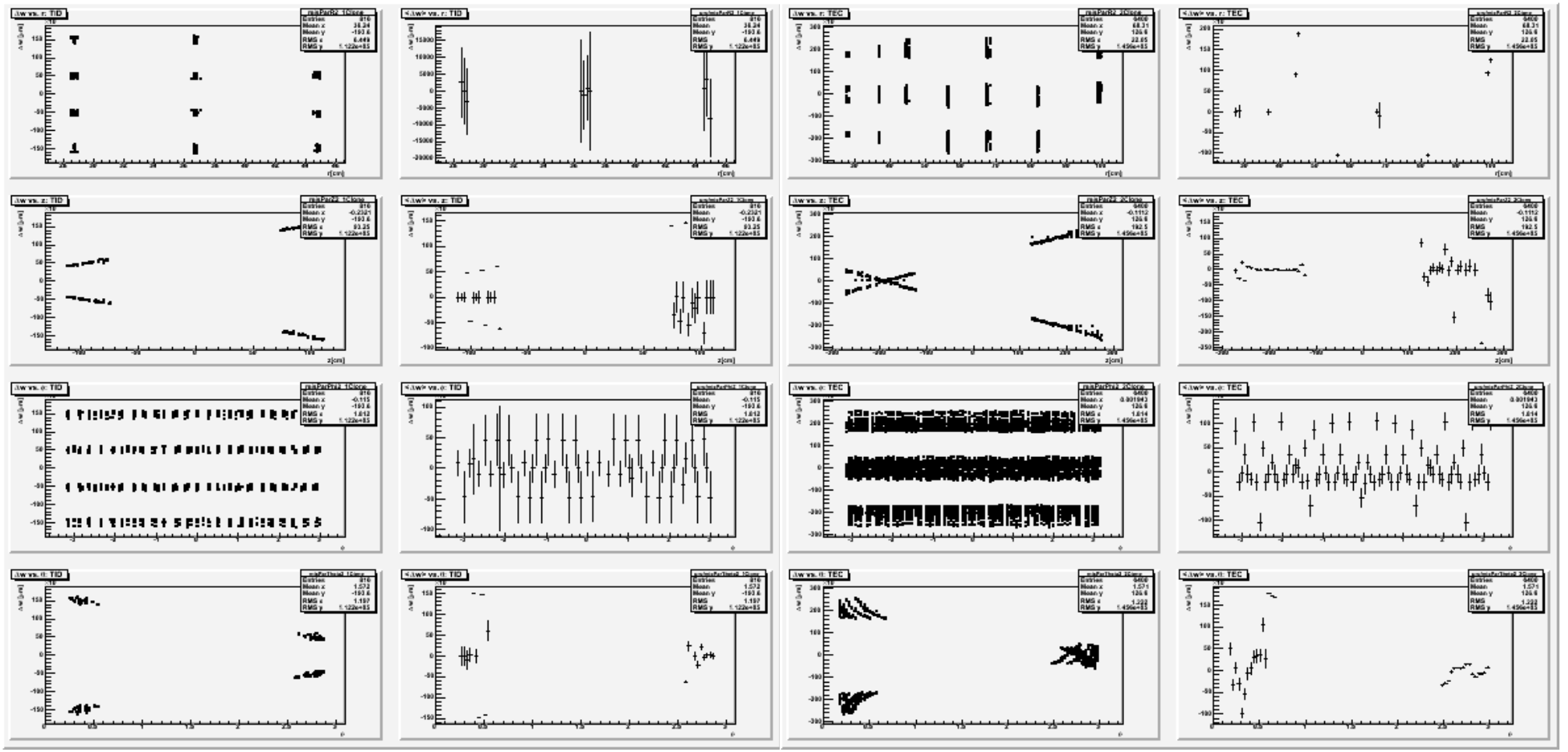
Delta u

- TID:
- TEC:



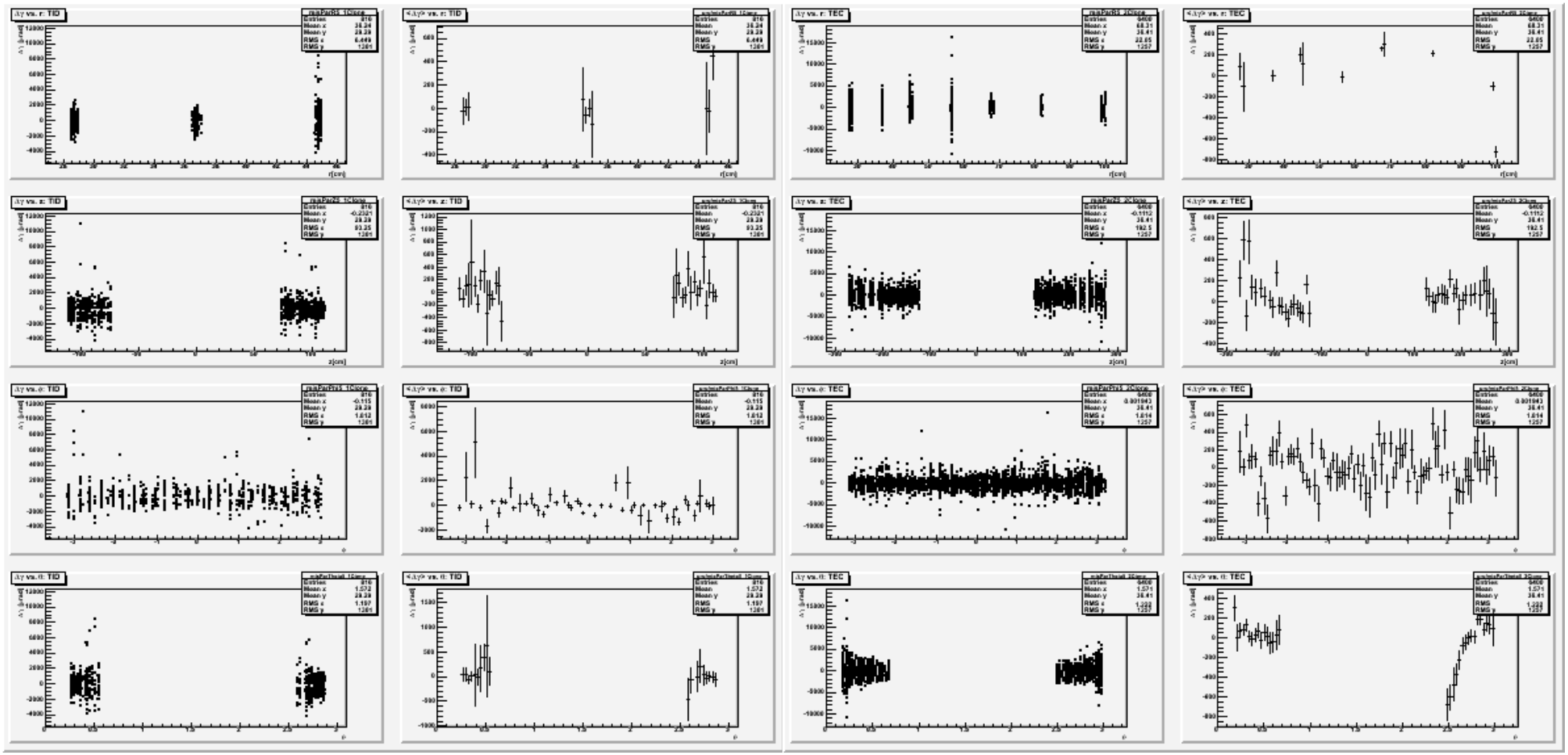
Delta w

- TID:
- TEC:



Delta gamma

- TID:
- TEC:



Track validation

Status

- Able to run the validation [/afs/cern.ch/cms/CAF/CMSALCA/ALCA_TRACKERALIGN/data/commonValidation] on Beam Halo tracks...
- ... but last release there is CMSSW_3_8_1_patch1!
- I need CMSSW_3_9_0 in order to apply the following cuts:
  - process.AlignmentTrackSelector.minHitsPerSubDet.inENDCAPplus = 1
  - process.AlignmentTrackSelector.minHitsPerSubDet.inENDCAPminus = 1
  - process.AlignmentTrackSelector.nLostHitMax = 2
  - process.AlignmentTrackSelector.maxHitDiffEndcaps = 3
- I just set-up the CMSSW_3_9_0 area in commonValidation
  - run over 50000 events: only 75 tracks selected
  - need to run on larger statistics

BH Track propagation to BSC surface

Status

- Code is ready (largely based on the GlobalTrackerMuonAlignment class by Sasha)...
- ... but crashes (I believe) when the propagated TSOS is freed.
- I cannot find the problem.
  - can anybody help?

Backup Slides

Config file excerpts

- L1TechTrg:

```
process.load('L1TriggerConfig.L1GtConfigProducers.L1GtTriggerMaskTechTrigConfig_cff')

process.load('HLTrigger/HLTfilters/hltLevel1GTSeed_cfi')

process.hltLevel1GTSeed.L1TechTriggerSeeding = cms.bool(True)

process.hltLevel1GTSeed.L1SeedsLogicalExpression = cms.string('36 OR 37 OR 38 OR 39')
```

- TkAlBeamHalo HLT path:

```
import HLTrigger.HLTfilters.hltHighLevel_cfi

process.ALCARECOTkAlBeamHaloHLT = HLTrigger.HLTfilters.hltHighLevel_cfi.hltHighLevel.clone(

    eventSetupPathsKey = 'TkAlBeamHalo',

    throw = False

)
```

TID/TEC alignment test

Alignment test – cfg file (1)

```
[...]

process.GlobalTag.globaltag = 'GR10_P_V4::All'

[...]

process.myTrackerAlignment =
    CalibTracker.Configuration.Common.PoolDBESSource_cfi.poolDBESSource.clone(

   connect = cms.string
    ('sqlite_file:/afs/cern.ch/cms/CAF/CMSALCA/ALCA_TRACKERALIGN/data/common
    Validation/results/jdraeger/CosMinTestsAug/MPCosMinTOBCenteredObject.db'),

   toGet = cms.VPSet(cms.PSet(

   record = cms.string('TrackerAlignmentRcd'),

   tag = cms.string('Alignments')

  ))

[...]
```

cfg file (2)

```
[...]
process.AlignmentProducer.ParameterBuilder.Selector = cms.PSet(
    alignParams = cms.vstring( 'TrackerTIDEndcap,111111', 'TIDDets,101001,endCapSS',
        'TrackerTIDModuleUnit,101001,endCapDS', 'TrackerTECEndcap,111111,posZ',
        'TrackerTECEndcap,ffffff,negZ', 'TECDets,101001,endCapSS',
        'TrackerTECModuleUnit,101001,endCapDS'),
    endCapSS = cms.PSet(rRanges = cms.vdouble(40.0, 60.0, 75.0, 999.0)),
    endCapDS = cms.PSet(rRanges = cms.vdouble(0.0, 40.0, 60.0, 75.0)),
    posZ = cms.PSet(zRanges = cms.vdouble(0.0, 999.0)),
    negZ = cms.PSet(zRanges = cms.vdouble(-999.0, 0.0)),
)
[...]
```

cfg file (3)

[...]

process.AlignmentProducer.algoConfig.pedeSteerer.pedeCommand = '/afs/cern.ch/user/c/ckleinw/bin/rev64/pede_8GB'

[...]

- problem with rev65/rev66: no convergence in case of uncompressed sparsity information

Hit Maps

- TID:
- TEC: