Pixel template + LA calibration

- alignment/calibration
- validation

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Tracker Alignment Meeting

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Introduction

- Generic hit reconstruction previously used in LA calibration with Millepede.

- New code for pixel templates provided by pixel group:

  `[cvs co –r ls1_current RecoLocalTracker/SiPixelRecHits]`

- Code didn't compile out of the box. Some files had to be removed.

- Allows to use standalone LA correction in template hit reconstruction.

- Should improve precision of alignment/calibration compared to generic hit reconstruction.

Alignment setup: mp1296

Alignment starting from CRAFT12 , GT: FT_R_53_V21

Data used in alignment (no weights applied):

- MinimumBias | A+B+C+D
- SingleMuon | A+B+C+D
- ZtoMuMu | A+B+C+D
- Cosmics interfill | A+B+C+D
- Cosmics CRAFT12 | A
- Cosmics CRUZET | A (10 GeV P estim.)
- Cosmics 0T | C (10 GeV P estim.)
- 0T Collision | C (3 GeV P estim.)

No Kinks&Bows

Number of used tracks: ~60 M

Alignables: large structures, all modules: 111111

Calibration setup: mp1296

Generic hit reconstruction

```
connect = 'frontier://FrontierProd/CMS_COND_31X_PIXEL',
  toGet = cms.VPSet(
    cms.PSet(
      record = cms.string('SiPixelLorentzAngleRcd'),
      tag = cms.string('SiPixelLorentzAngle_v03_offline')
      )
    )
```

Pixel LA payload

<u>LA calibration setup:</u>

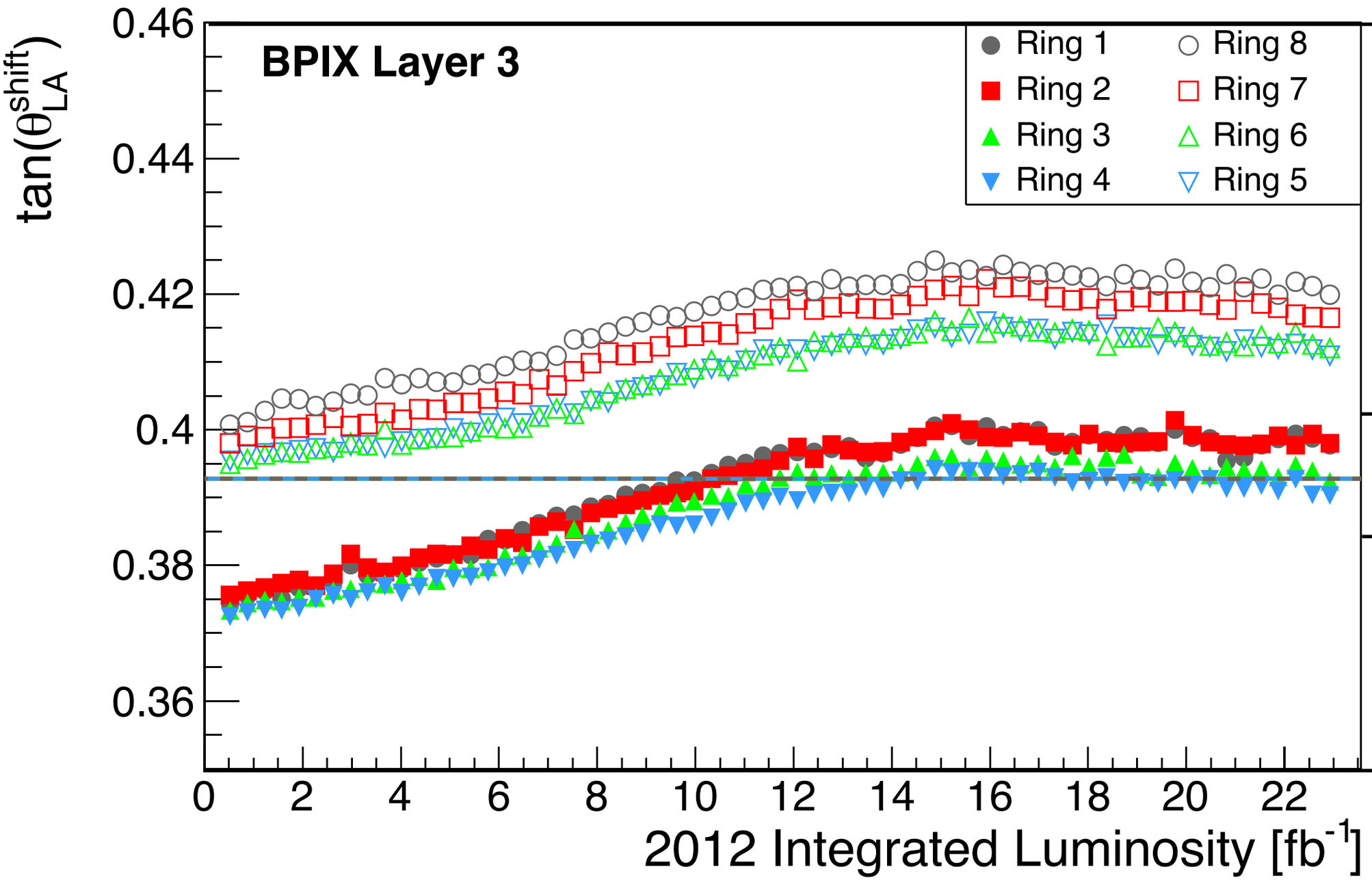
- BPIX granularity:
  24 parameters: 3 layers x 8 rings
- FPIX granularity:
  2 parameters: left side, right side
- TIB granularity:
  24 parameters: (4 layers x 6 rings) x 2 [strip/deco]
- TOB granularity:
  36 parameters (6 layers x 6 rings) x 2 [strip/deco]
- Time granularity:
  Pixel: 65 IOVs
  Strip: 20 IOVs

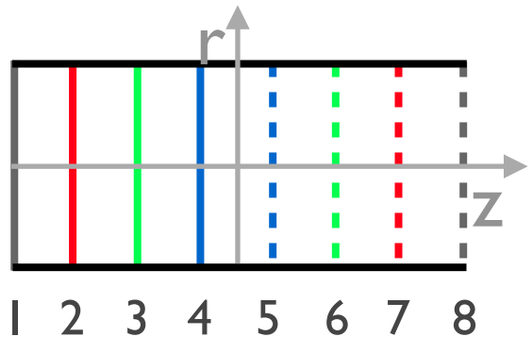
Alignment setup: mp1302

Identical to mp1296, except:

- CMSSW release modified with patch from Pixel group
- Using template hit reconstruction
- Pixel template from GT (8 IOVs)

LA evolution: BPIX: mp1296 (Layer 3)



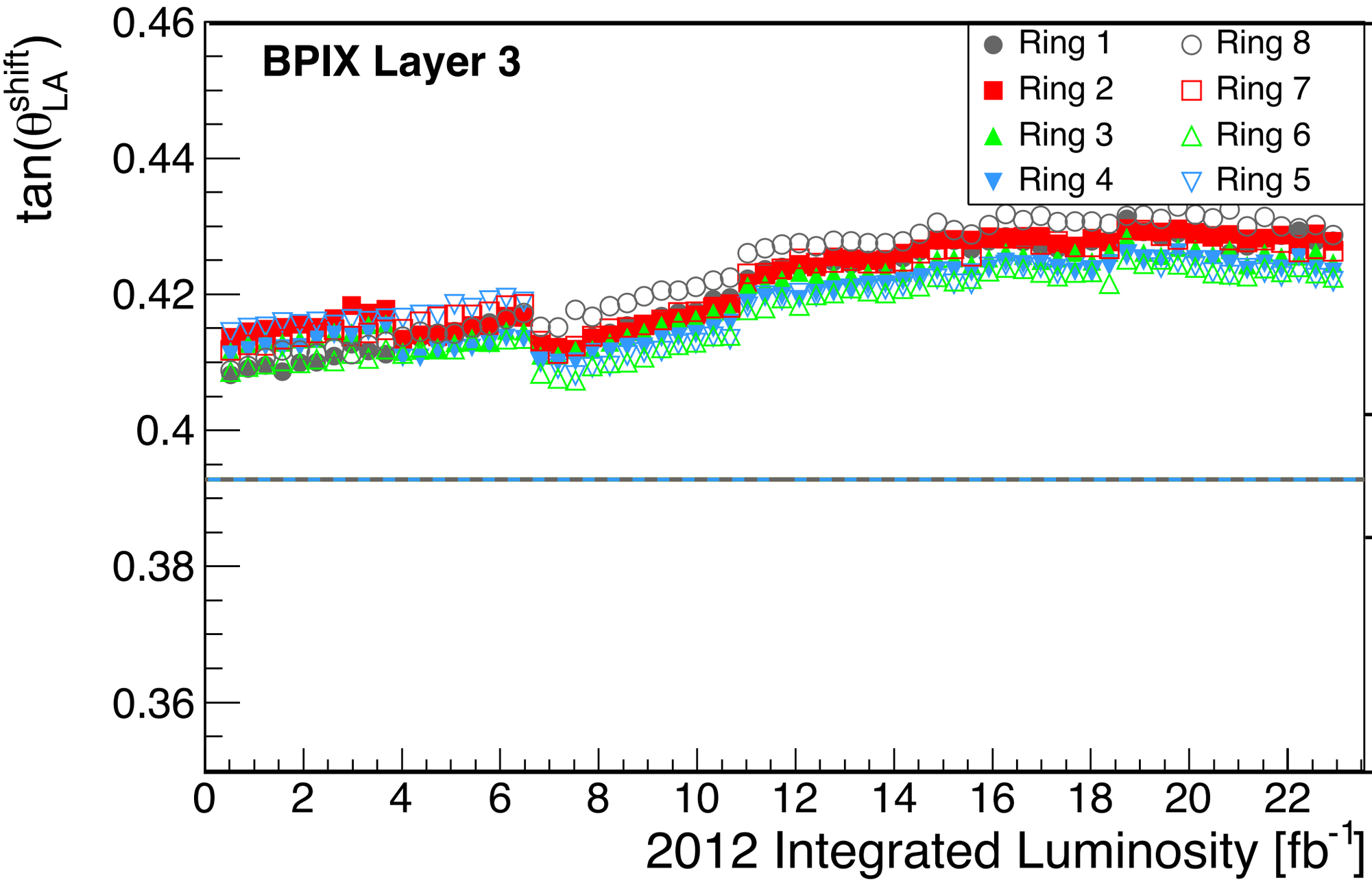


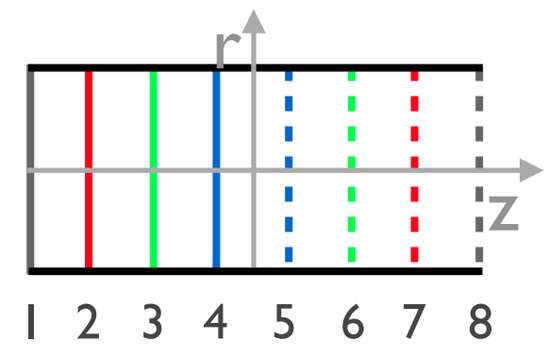
RINGS

- input value

- Consistent development in all rings.
- Smooth evolution due to fixed module alignment.

LA evolution: BPIX: mp1296 (Layer 3)





RINGS

- input value

- 8 IOVs in pixel template
- Jumps at the edges of IOVs are expected

Validation setup

mp1296 (Generic):

- Common CMSSW_5_3_5_Dev
- Generic hit reconstruction
- LA correction from mp1296

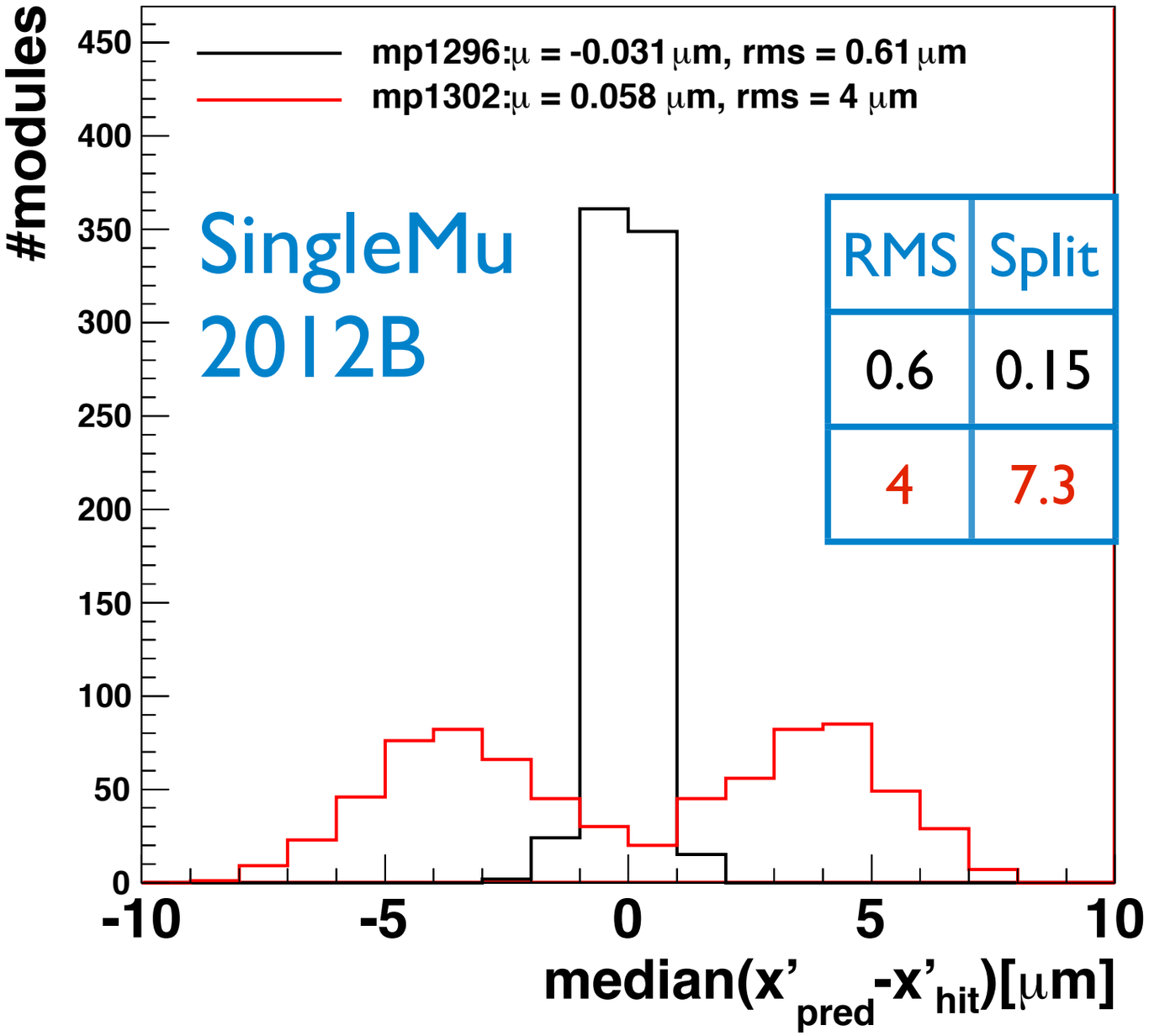
mp1302 (Template):

- Patched common CMSSW_5_3_5_Dev
- Template hit reconstruction
- LA correction from mp1302

All other conditions are the same.

Validation of LA calibration: BPIX

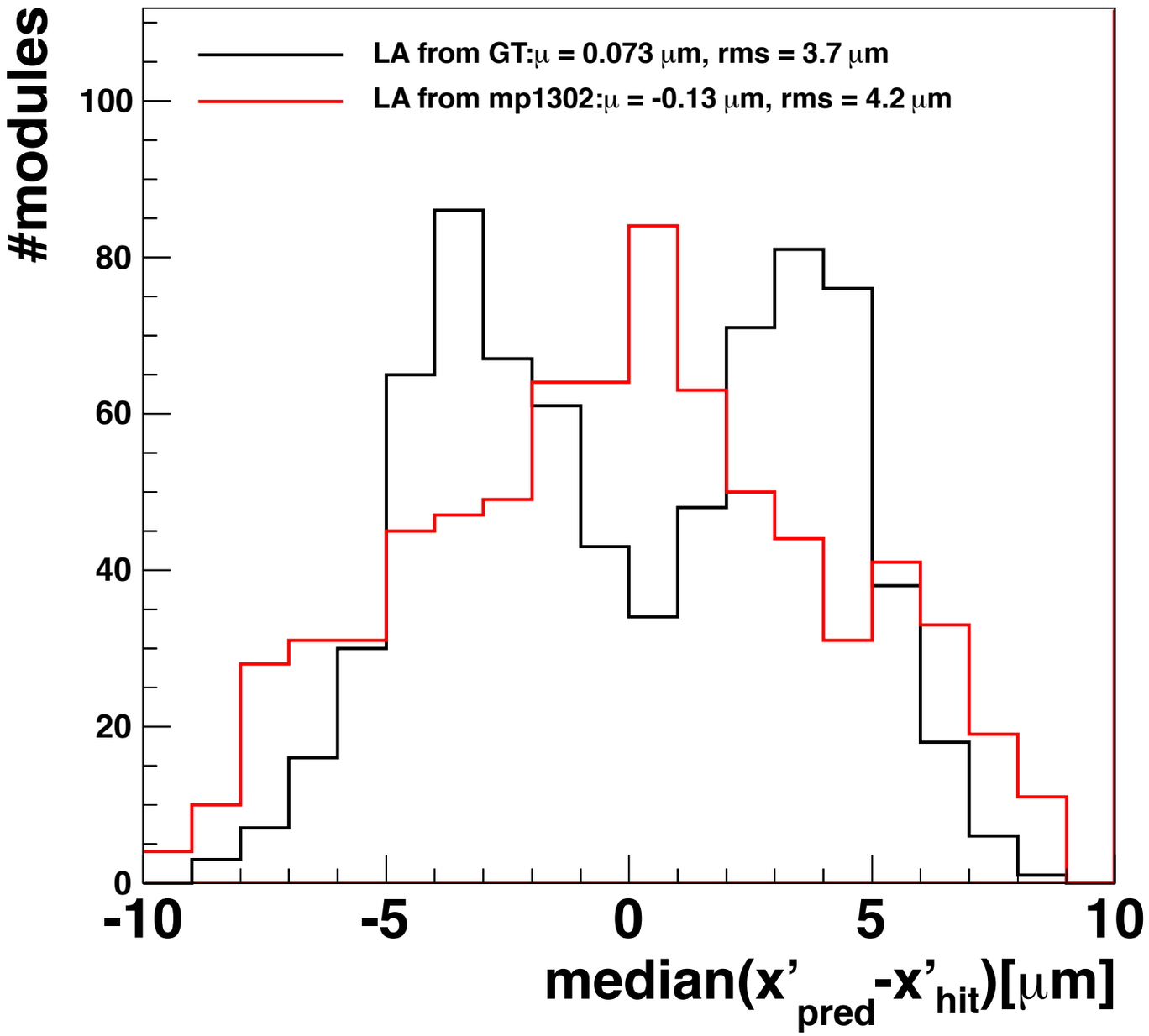
Distribution of the median of the residuals in BPIX



- Either wrongly determined in alignment or wrongly applied in validation.

Validation of LA calibration: mp1302

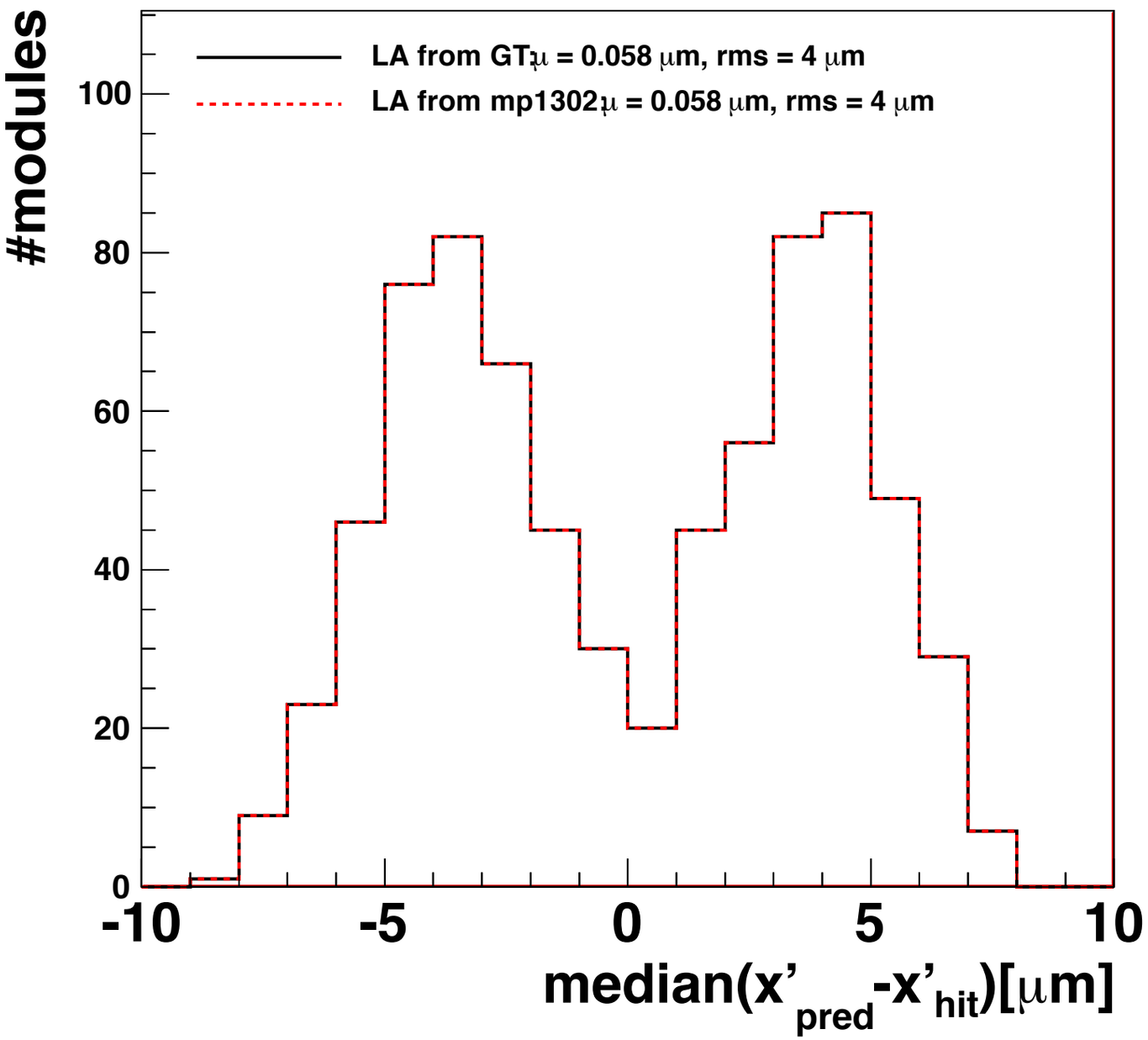
Distribution of the median of the residuals in BPIX



From GT
From mp1302

- Patched release.
- Generic hit reconstruction.
- LA in mp1302 is different from LA in GT.
- Calibration worked but not perfectly.

Validation of LA calibration: mp1302



Template only
Template + LA from mp1302

- Patched release.
- Template hit reconstruction.
- No difference between raw pixel template and template with applied LA correction.
- Looks like standalone LA correction isn't applied on top of pixel template.
- Code from pixel group might not work.