LA in BPIX and strip detector

- alignment & calibration setup
- validation plots (BPIX, TIB, TOB)
- mobility evolution

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Tracker alignment meeting

DESY, Hamburg

16.04.2013

Alignment setup: mp1287 (Pixel)

Alignment starting from CRAFT12;

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 (mp1276_0T) | C (3 GeV P estim.)

No Kinks&Bows

Number of used tracks: ~60 M

Alignables: large structures, all modules: 111111

Alignment setup: mp1287 (Pixel)

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
- Time granularity:
  65 IOVs : ~330 pb^{-1} per IOV
- Plus 1 LA parameter per TIB, TOB

Alignment setup: mp1295 (Pixel+Strip)

Same as mp1287 except:

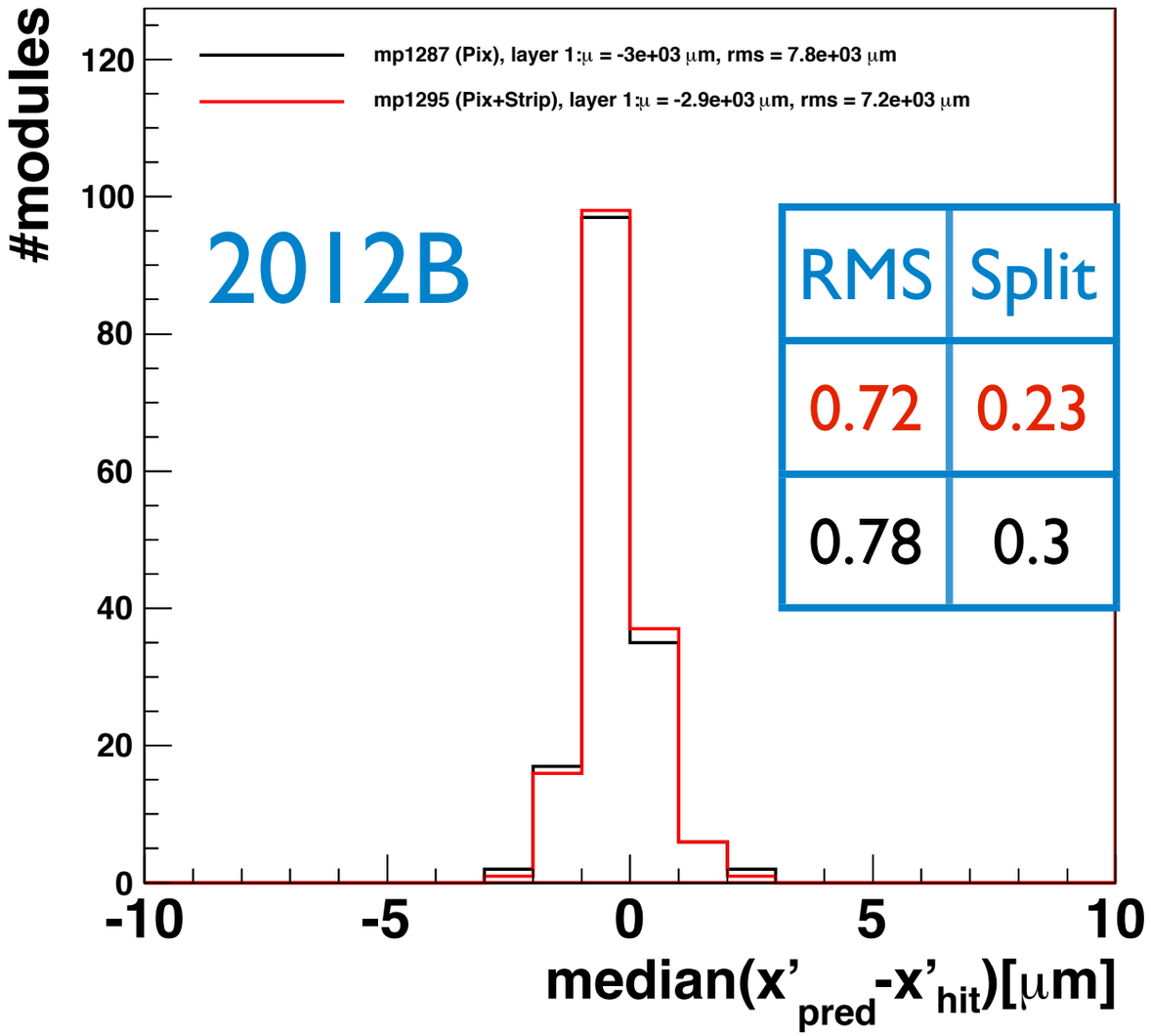
- Tighter selection of 0T Collision tracks
- LA granularity in strip detector (20 IOV):
  - TIB: 24 parameters (4 layers x 6 rings)
  - TOB: 36 parameters (6 layers x 6 rings)

Validation of Lorentz angle calibration

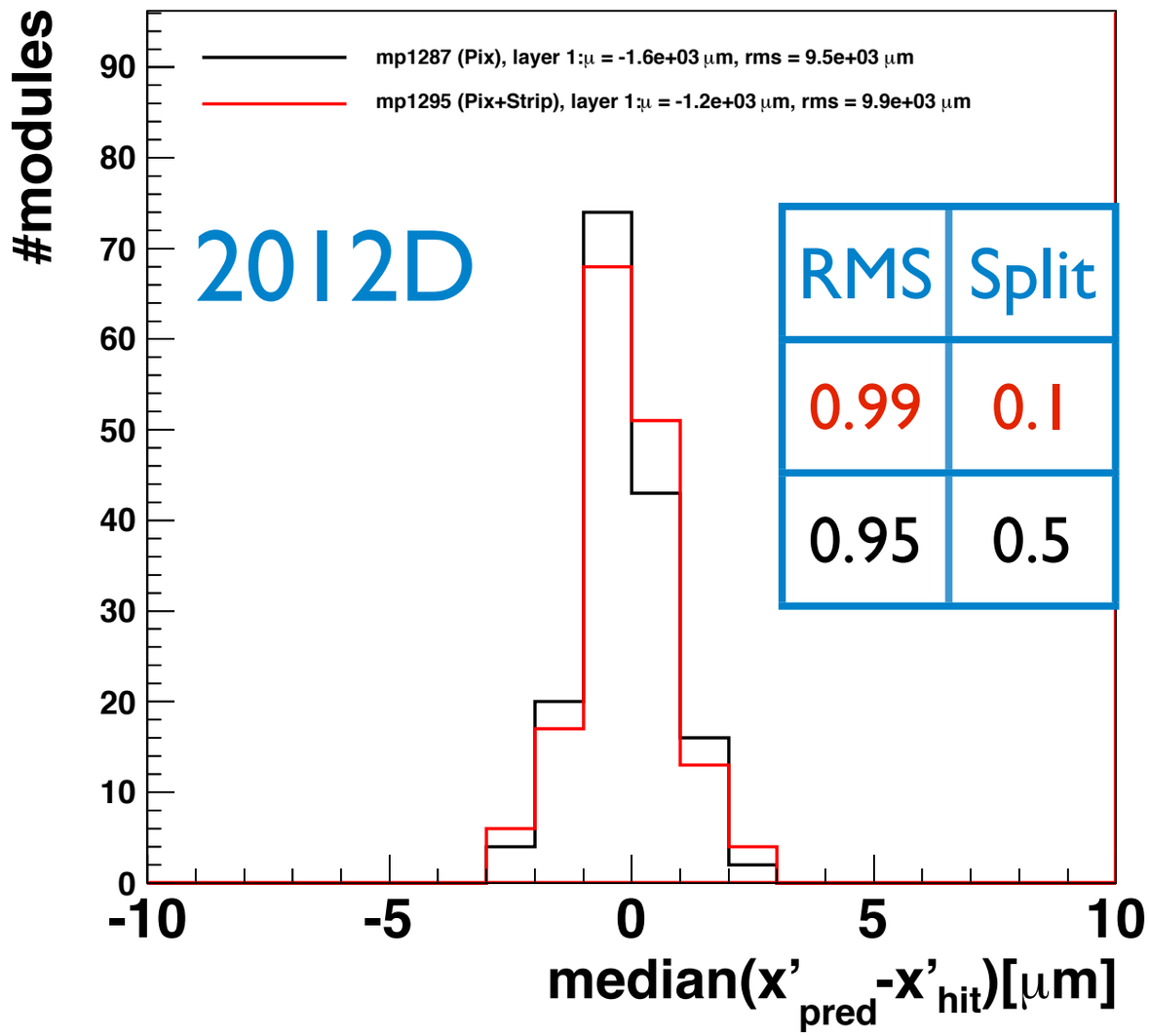
- Track-hit residuals analyzed using 2M SingleMuon tracks.
- Compared 2 geometries: mp1287 (Pix), mp1295 (Pix+Strip)
- Compared 2 periods: 2012B, 2012D
- Same conditions used as in alignment:

Validation of LA calibration (Layer 1)

Distribution of the median of the residuals in BPIX



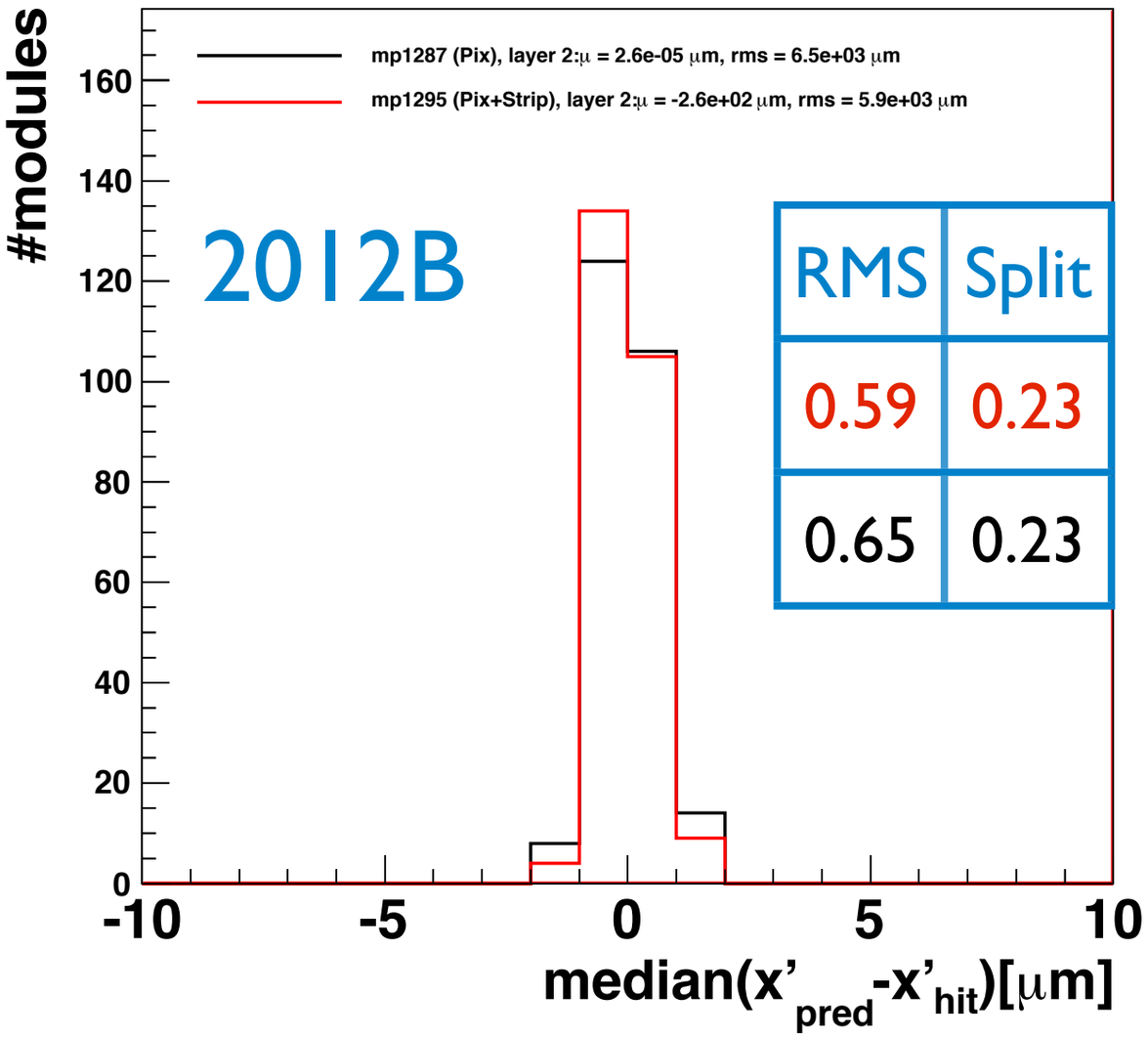
Distribution of the median of the residuals in BPIX



- Slightly worse performance in BPIX with simultaneous calibration in pixel and strip.

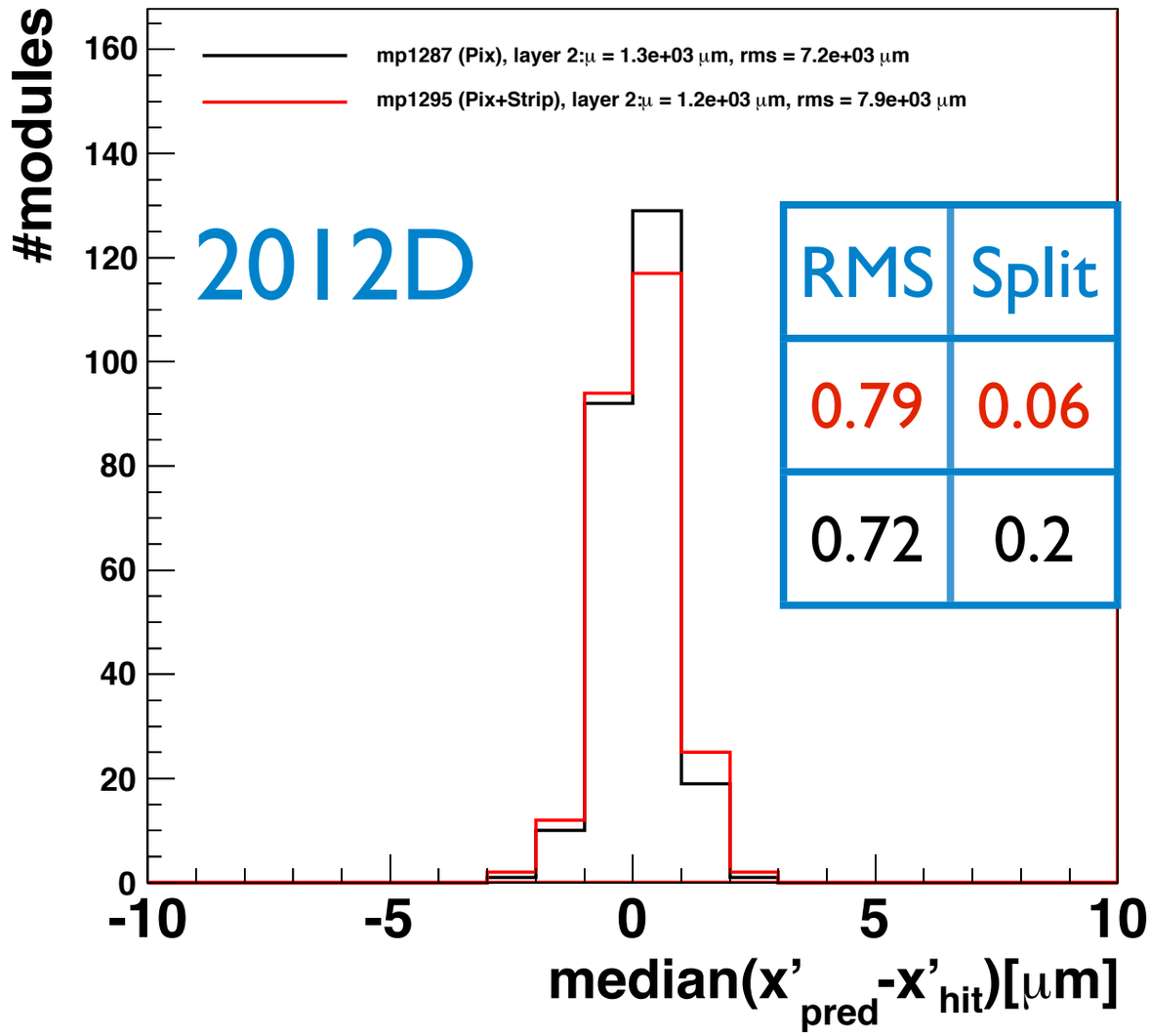
Validation of LA calibration (Layer 2)

Distribution of the median of the residuals in BPIX



RMS	Split
0.59	0.23
0.65	0.23

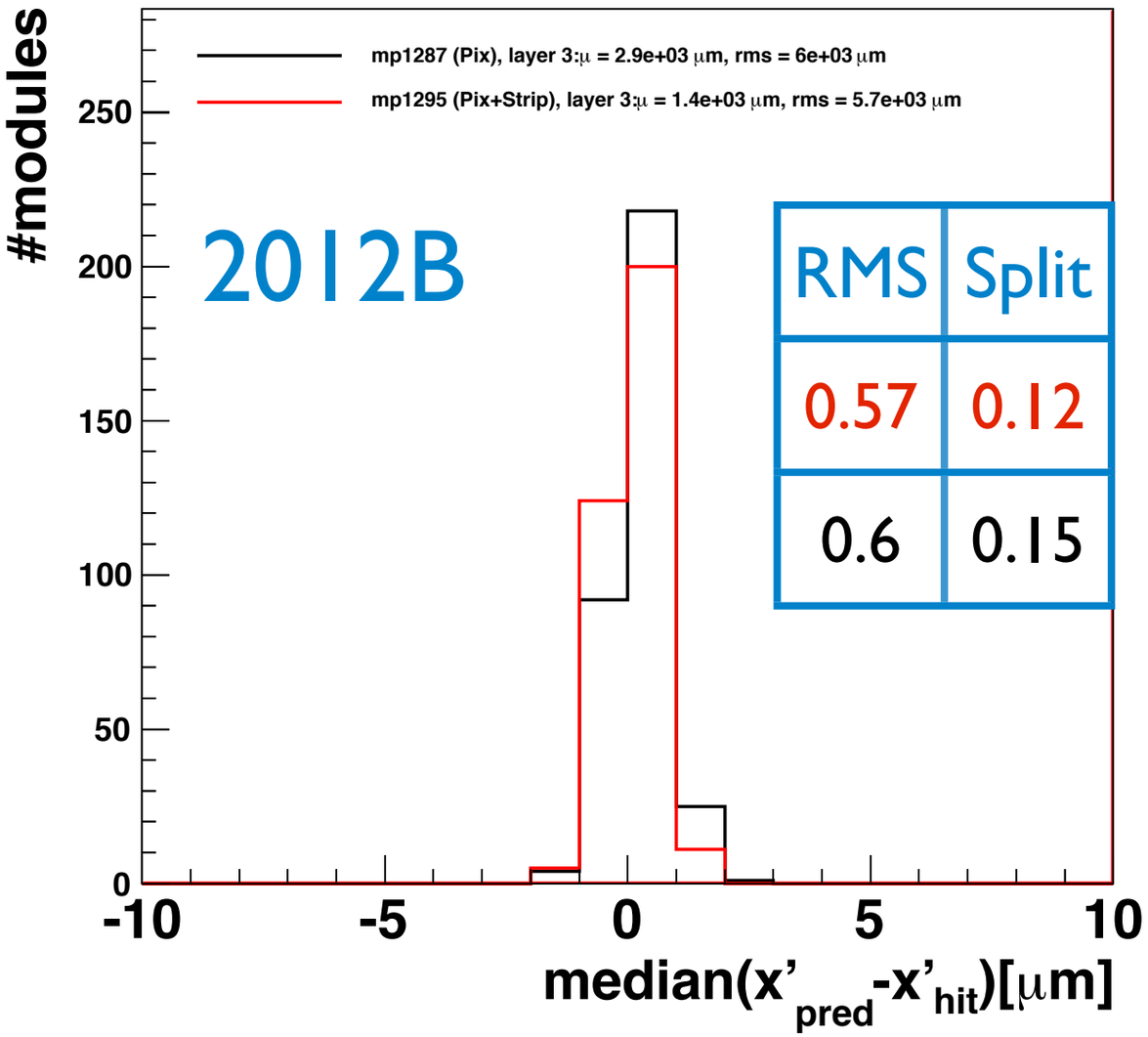
Distribution of the median of the residuals in BPIX



RMS	Split
0.79	0.06
0.72	0.2

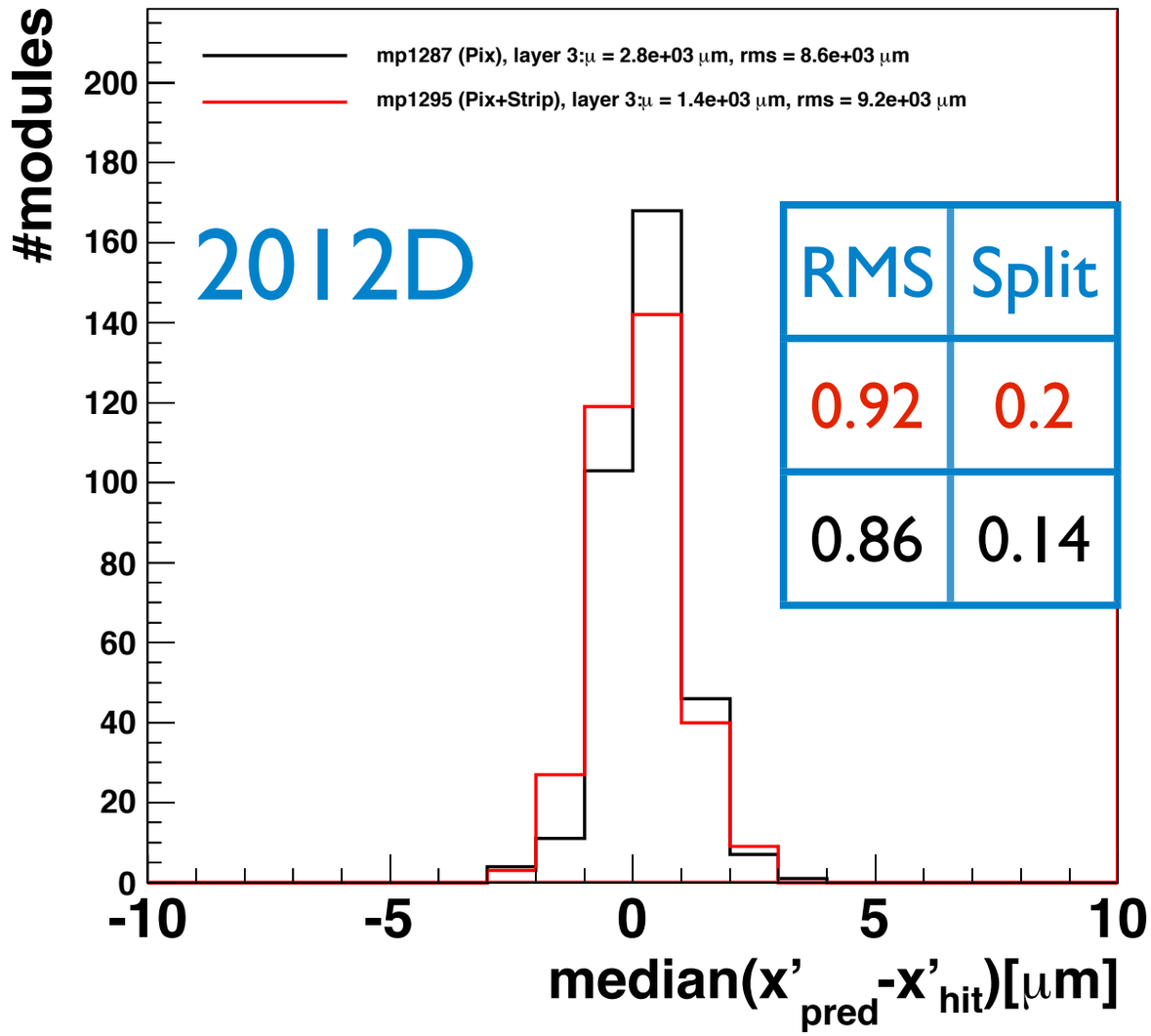
Validation of LA calibration (Layer 3)

Distribution of the median of the residuals in BPIX



RMS	Split
0.57	0.12
0.6	0.15

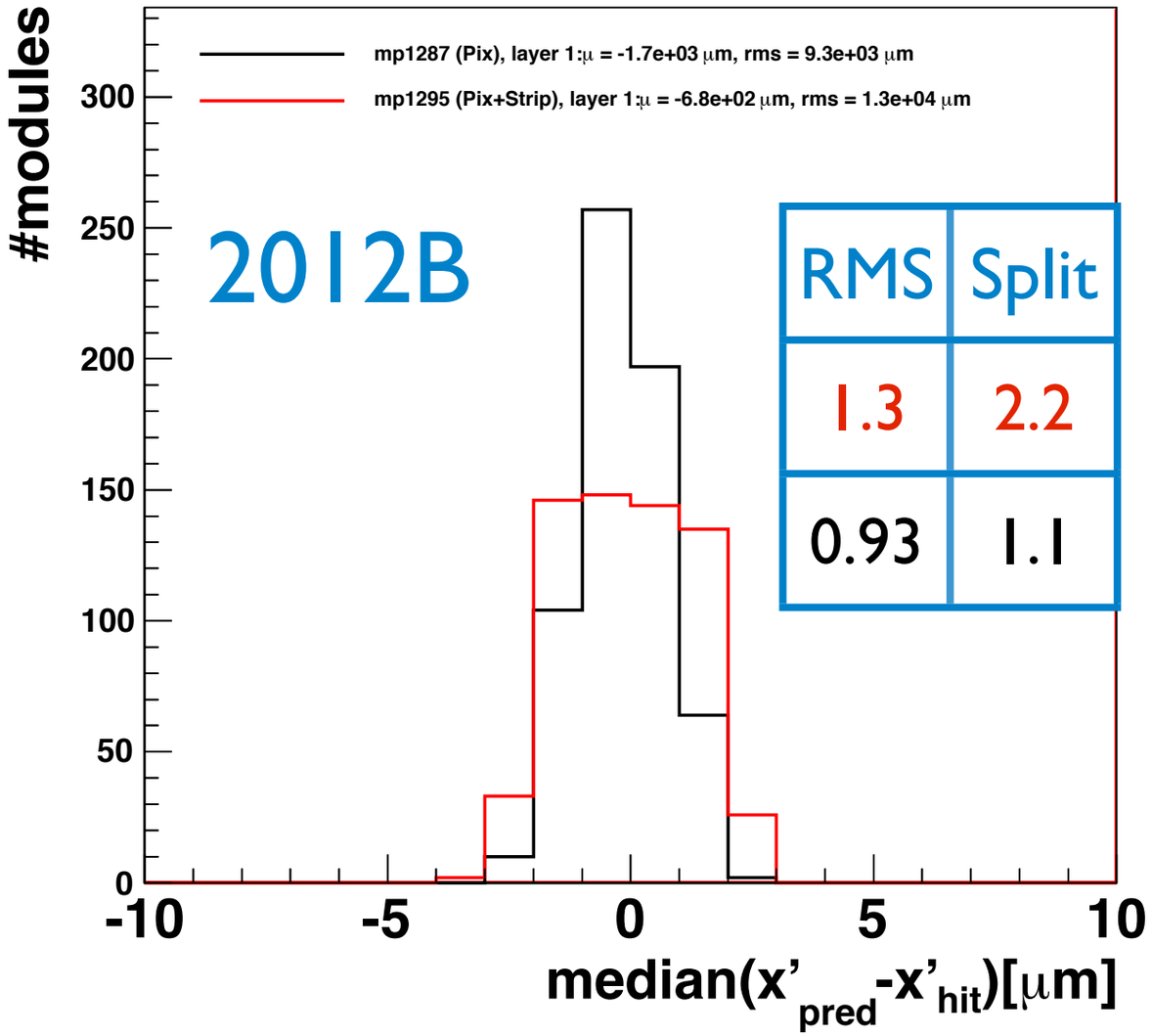
Distribution of the median of the residuals in BPIX



RMS	Split
0.92	0.2
0.86	0.14

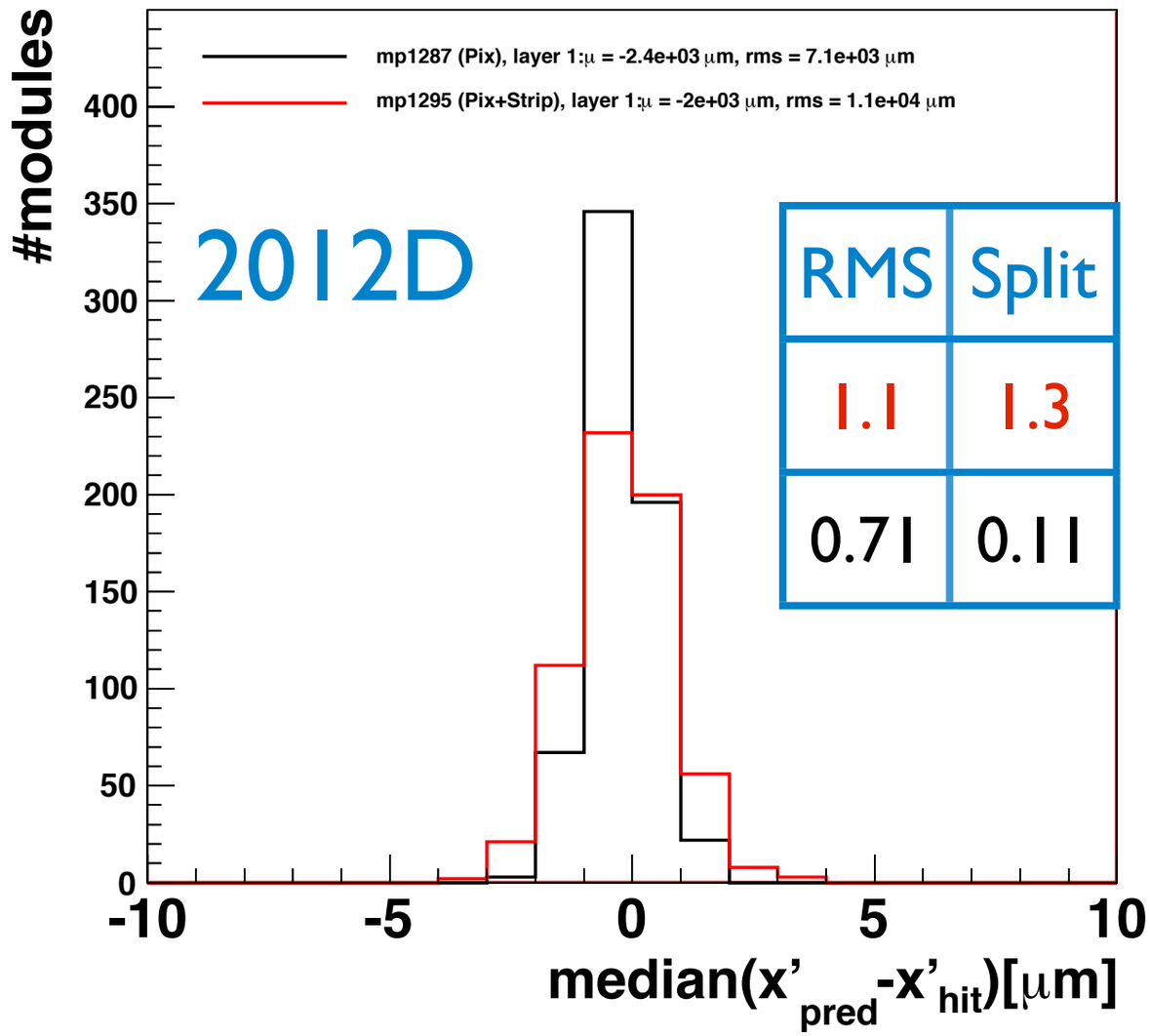
Validation of LA calibration (Layer 1)

Distribution of the median of the residuals in TIB



RMS	Split
1.3	2.2
0.93	1.1

Distribution of the median of the residuals in TIB

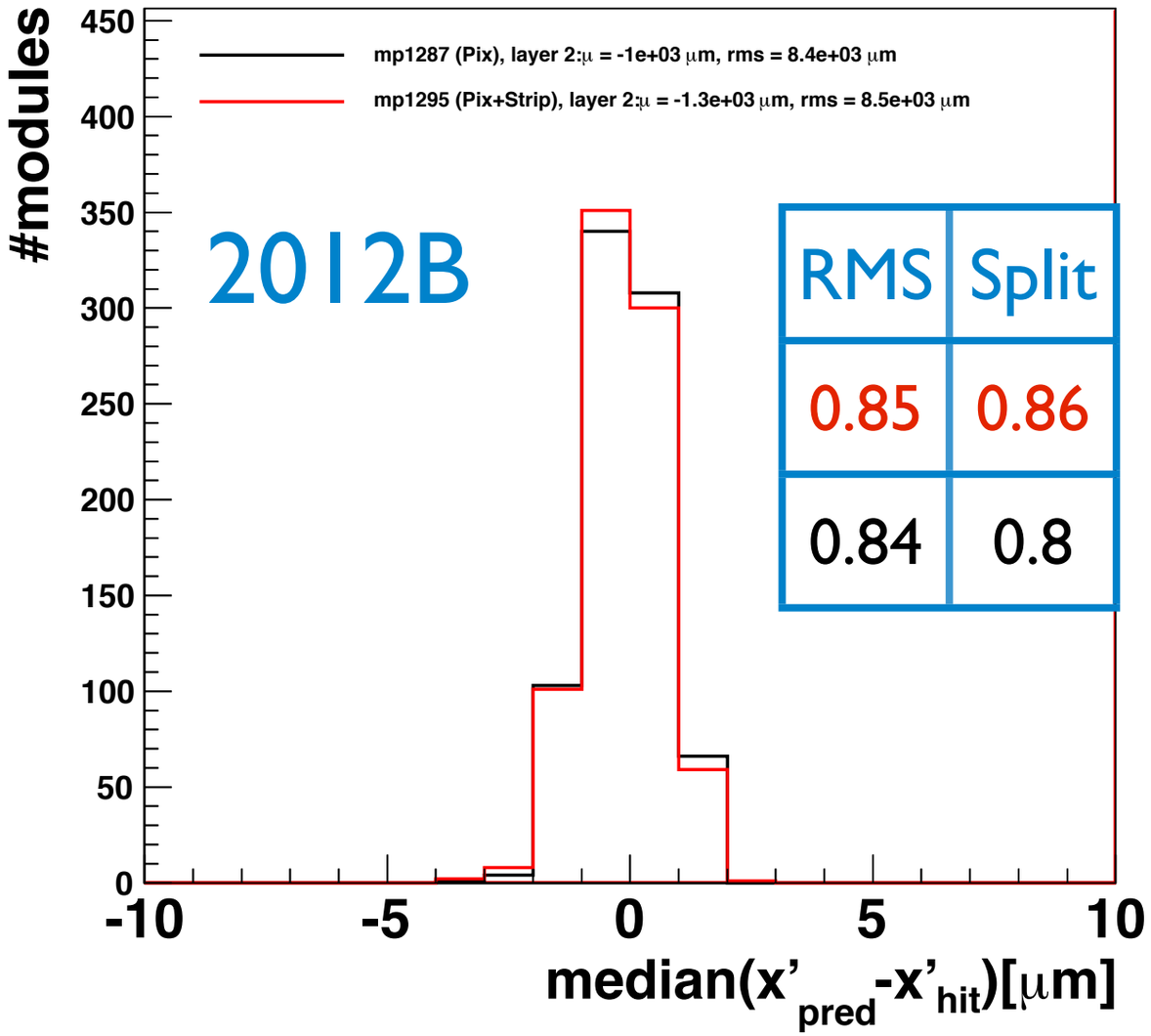


RMS	Split
1.1	1.3
0.71	0.11

- Significantly worse performance in TIB.

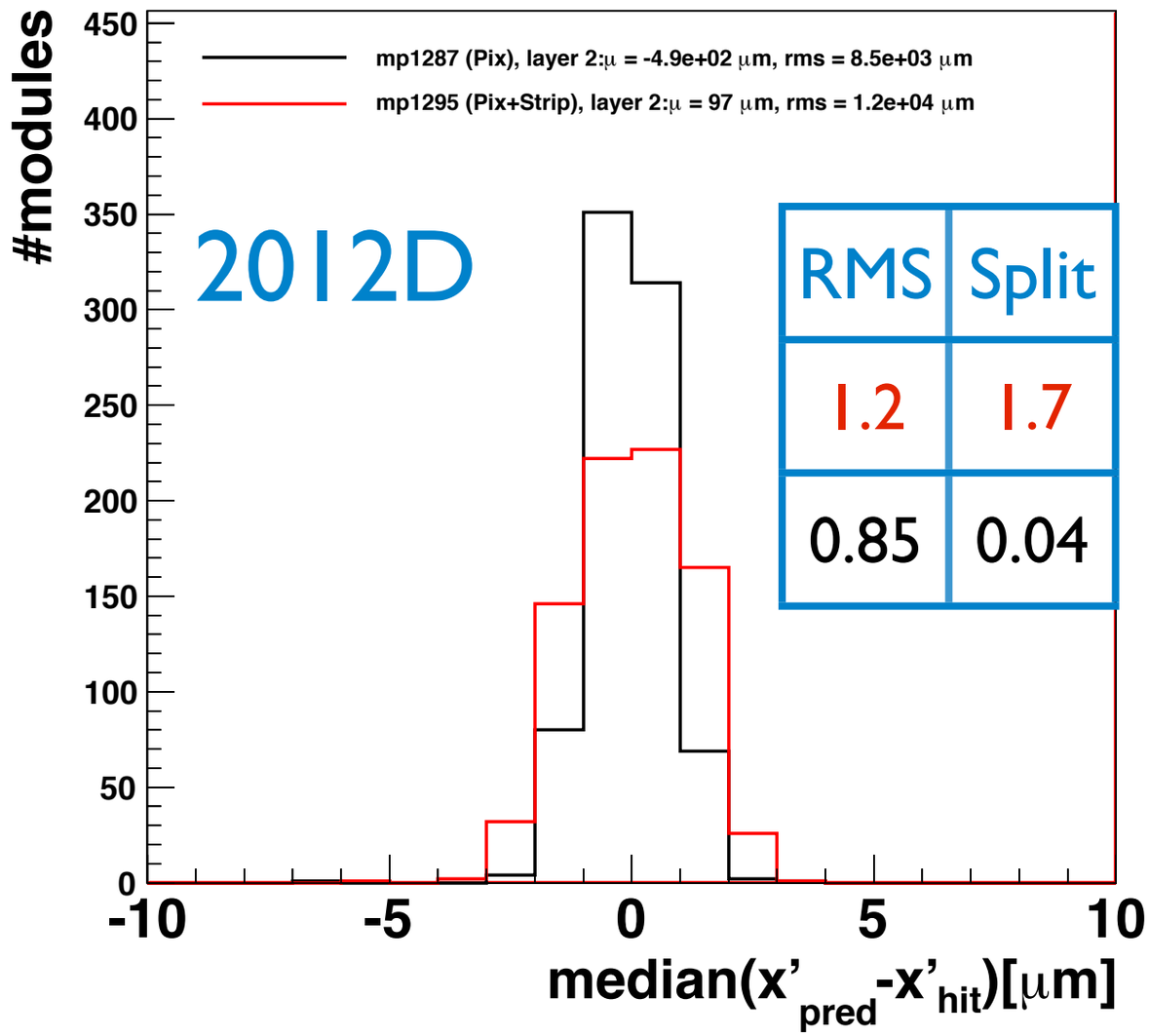
Validation of LA calibration (Layer 2)

Distribution of the median of the residuals in TIB



RMS	Split
0.85	0.86
0.84	0.8

Distribution of the median of the residuals in TIB

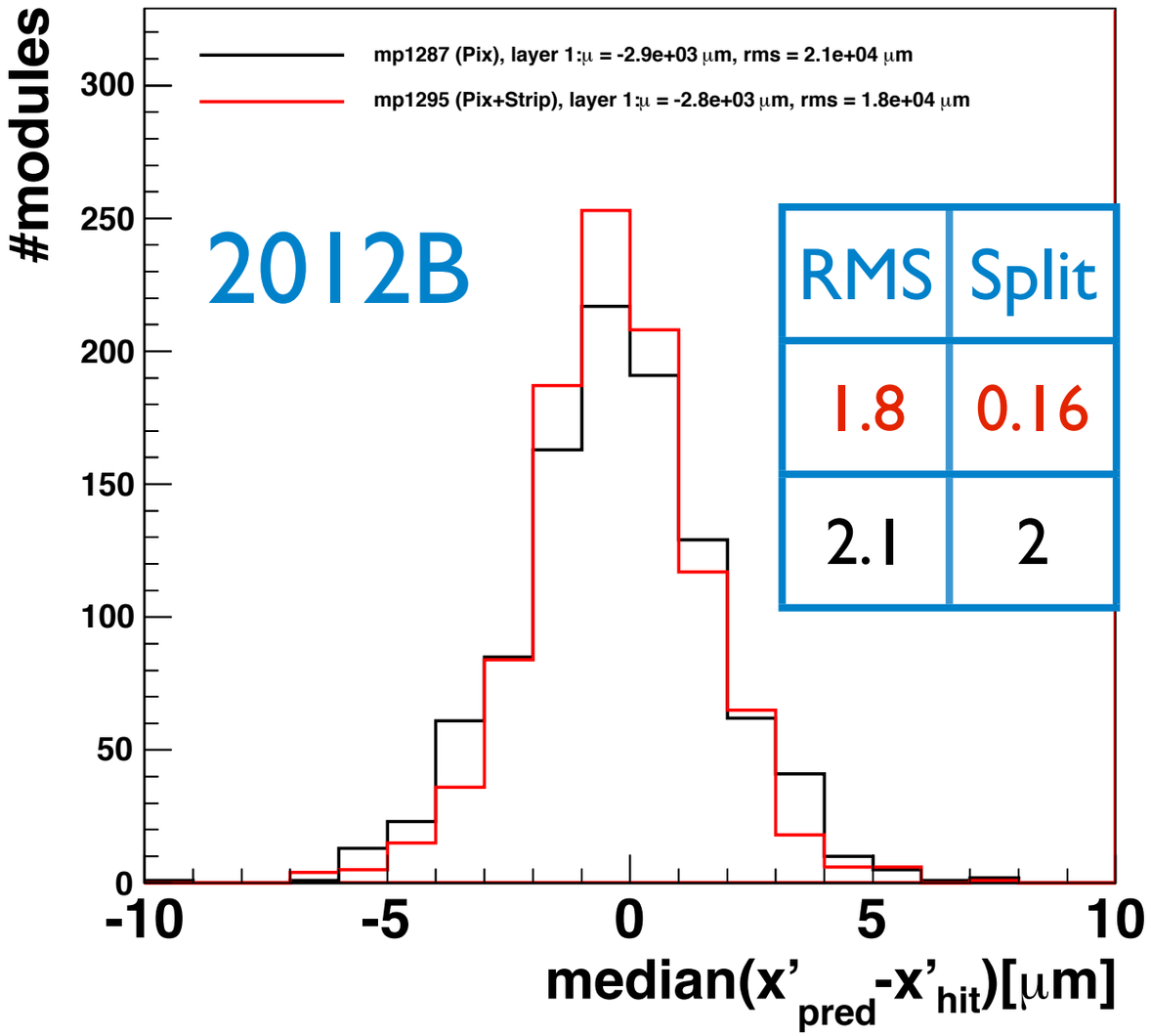


RMS	Split
1.2	1.7
0.85	0.04

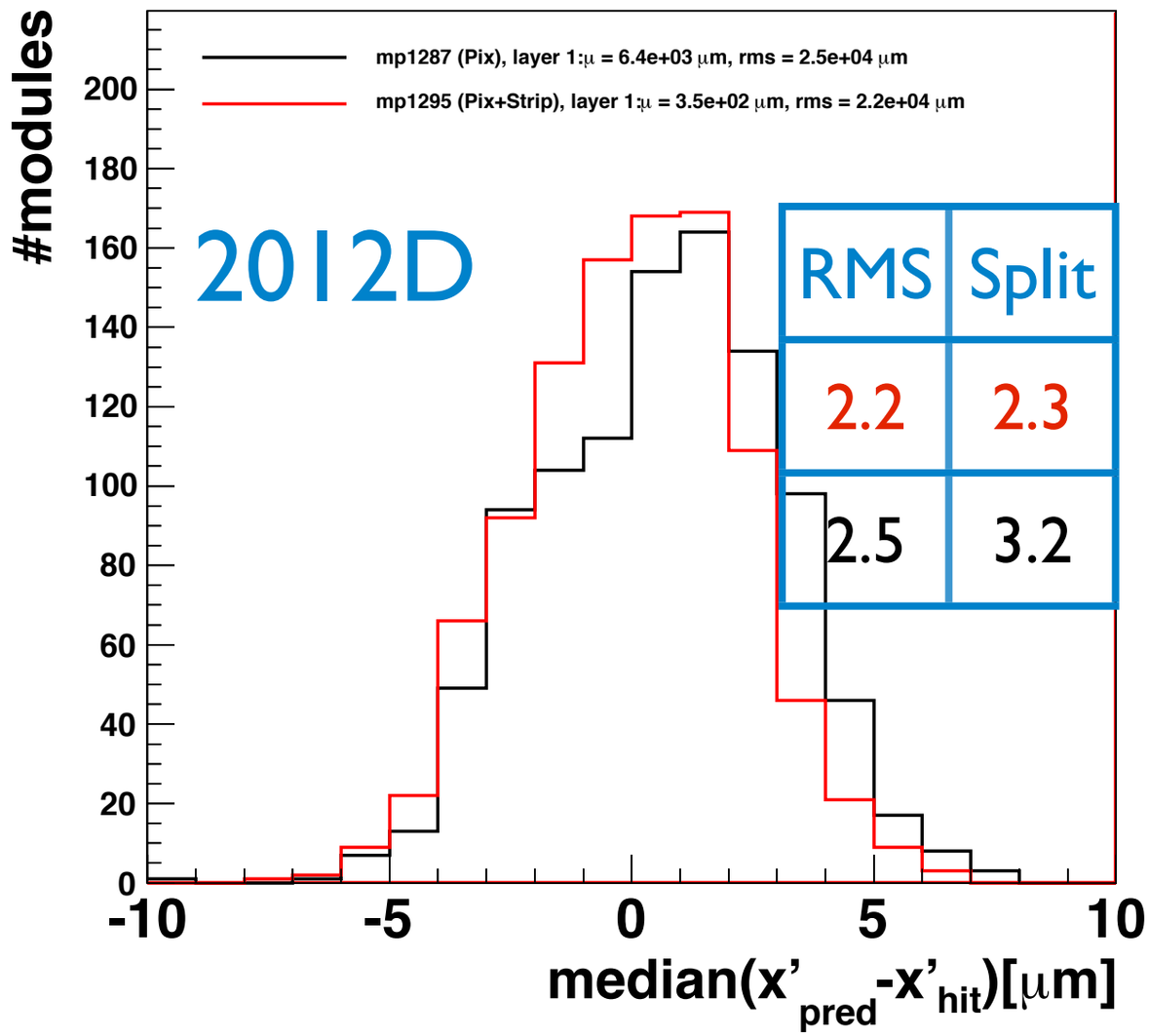
- Significantly worse performance in TIB.

Validation of LA calibration (Layer 1)

Distribution of the median of the residuals in TOB



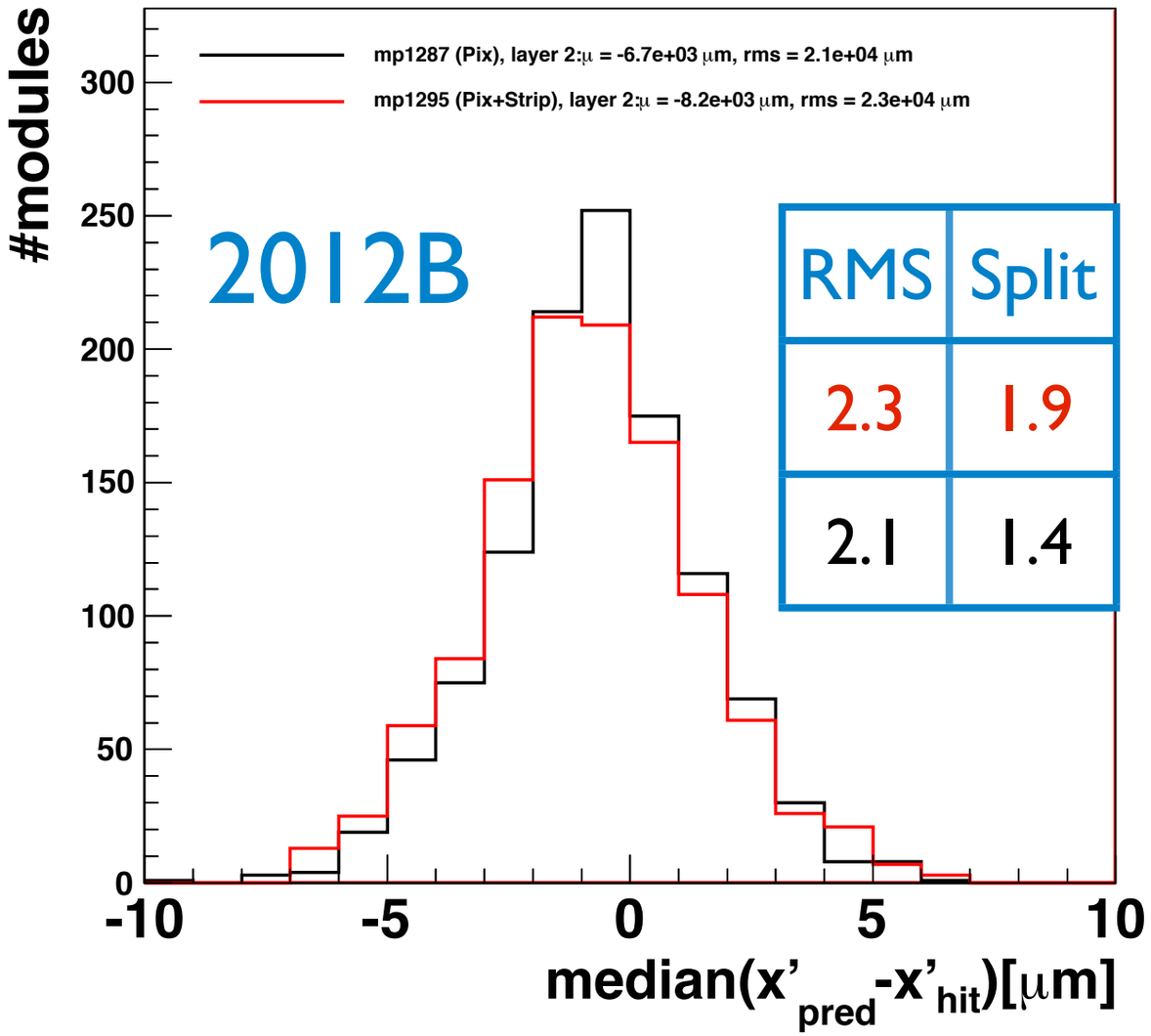
Distribution of the median of the residuals in TOB



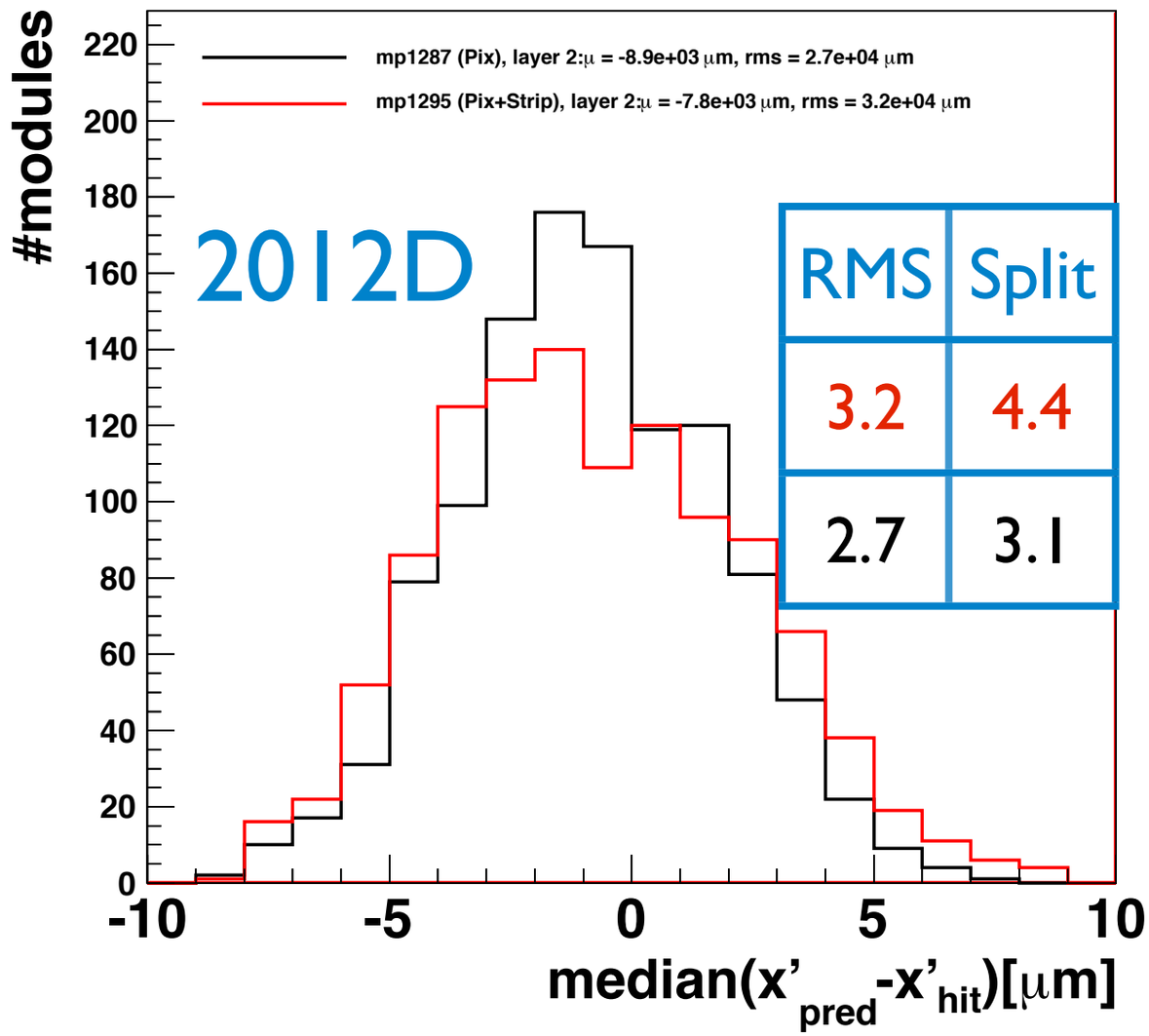
- Slightly better performance in TOB layer 1.

Validation of LA calibration (Layer 2)

Distribution of the median of the residuals in TOB



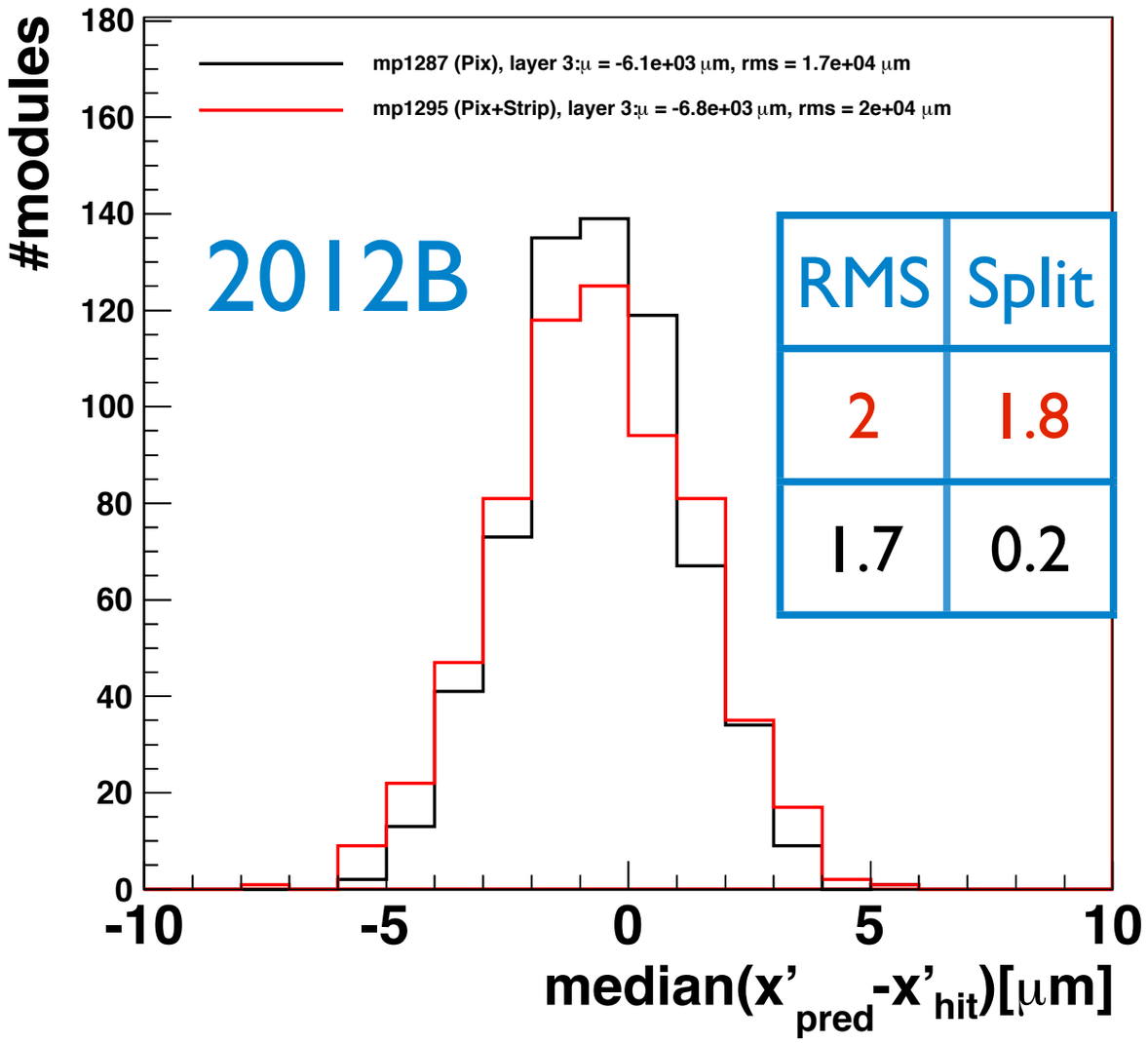
Distribution of the median of the residuals in TOB



- Worse performance in TOB layer 2.

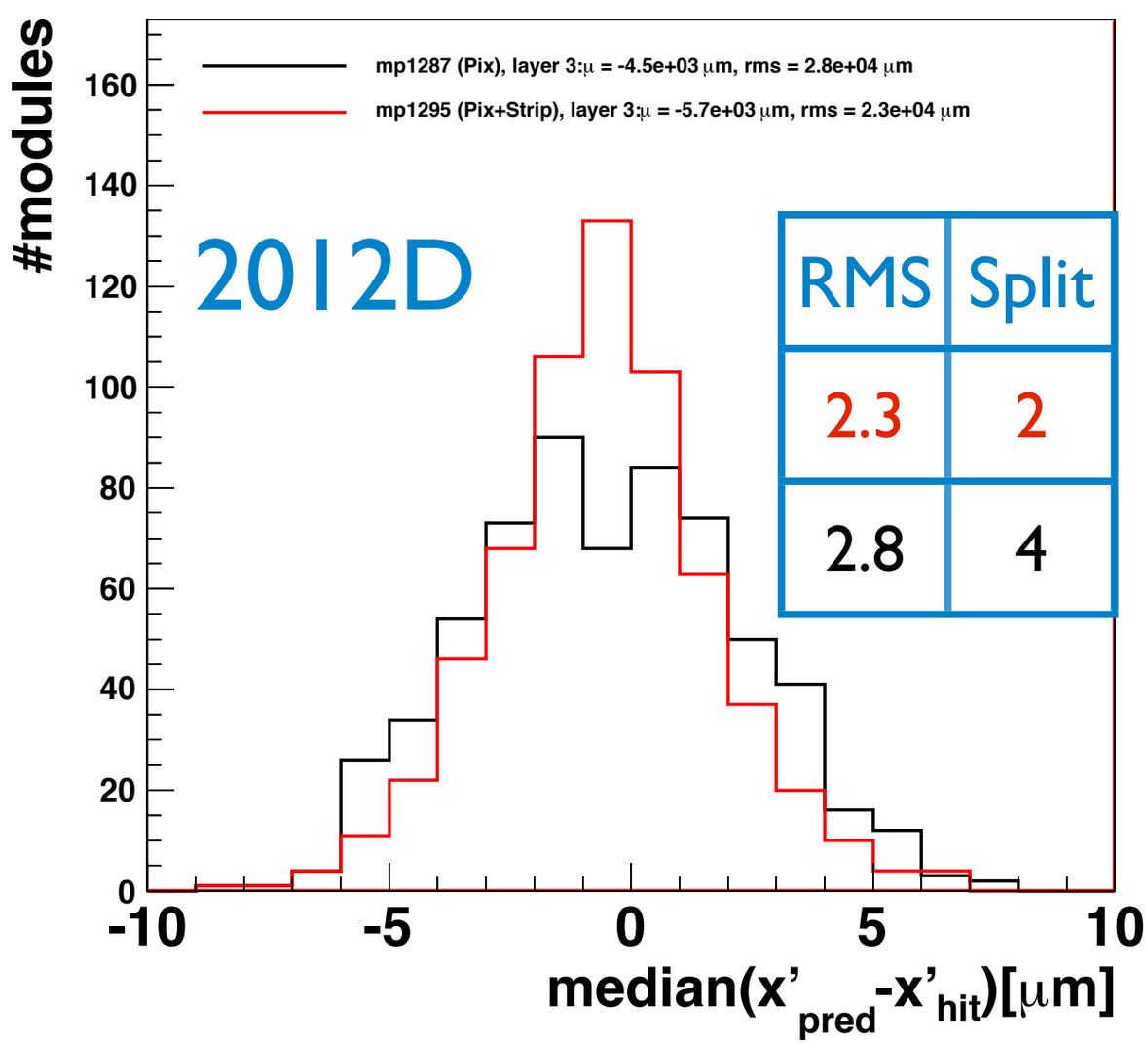
Validation of LA calibration (Layer 3)

Distribution of the median of the residuals in TOB



RMS	Split
2	1.8
1.7	0.2

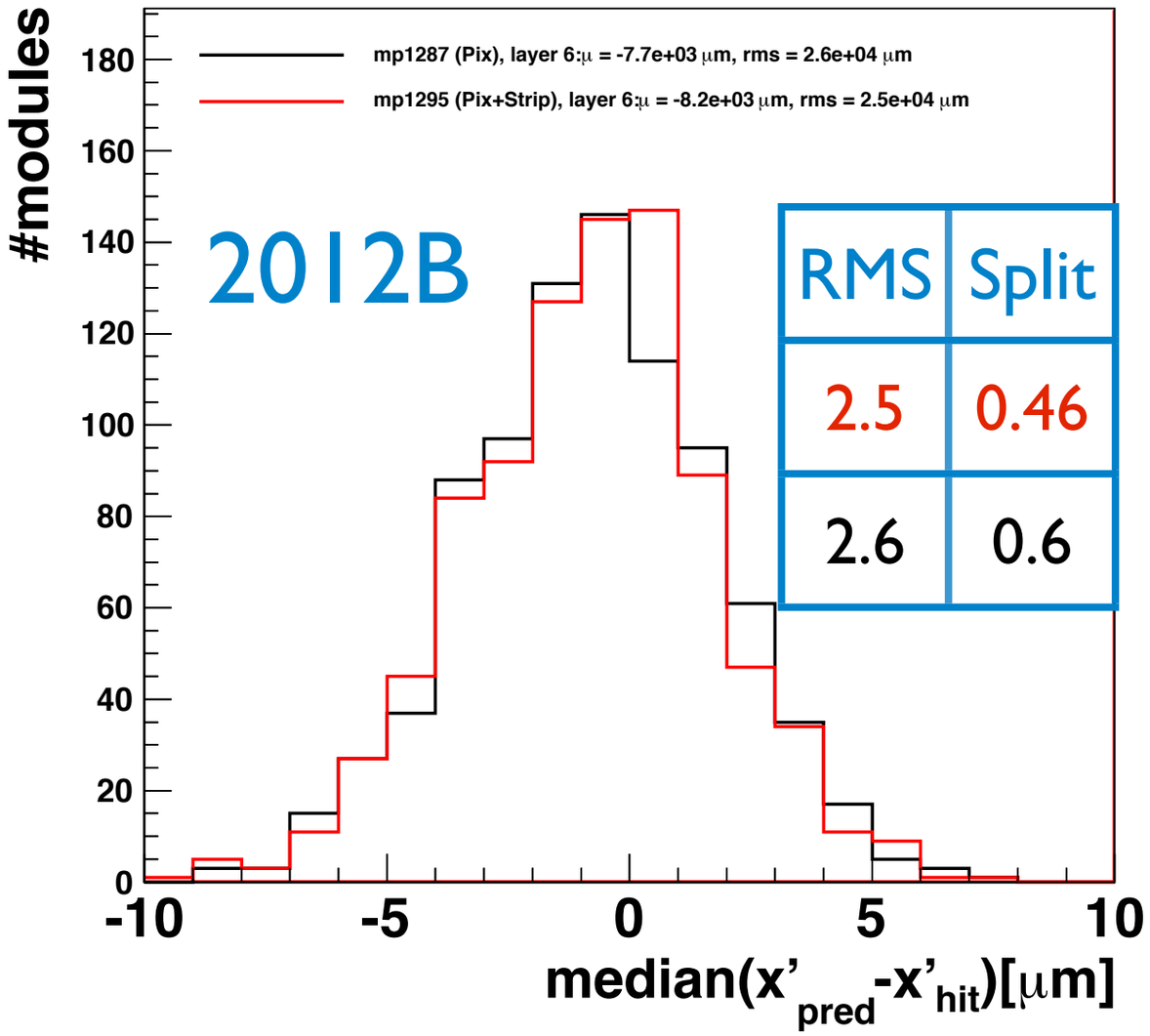
Distribution of the median of the residuals in TOB



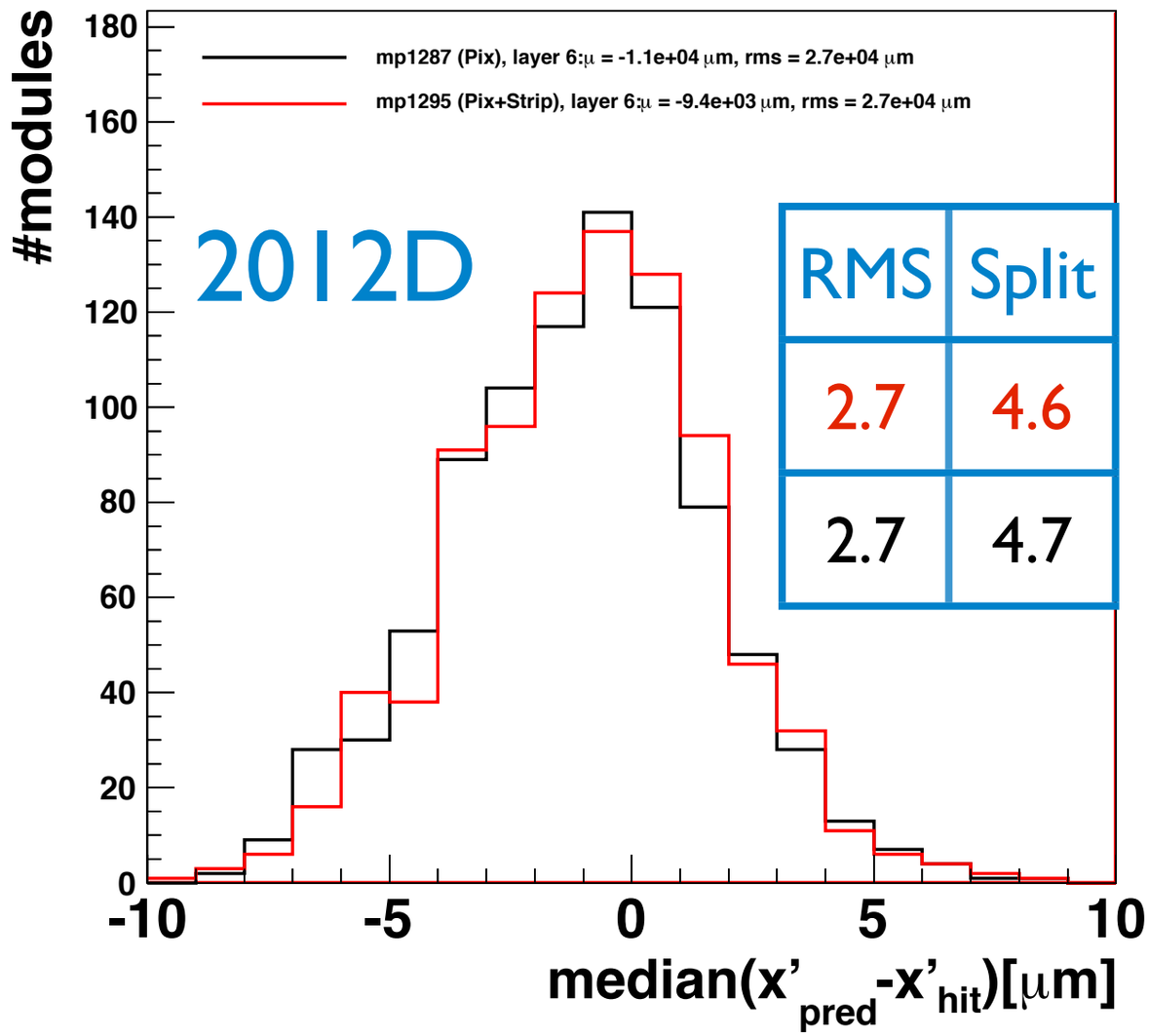
RMS	Split
2.3	2
2.8	4

Validation of LA calibration (Layer 4)

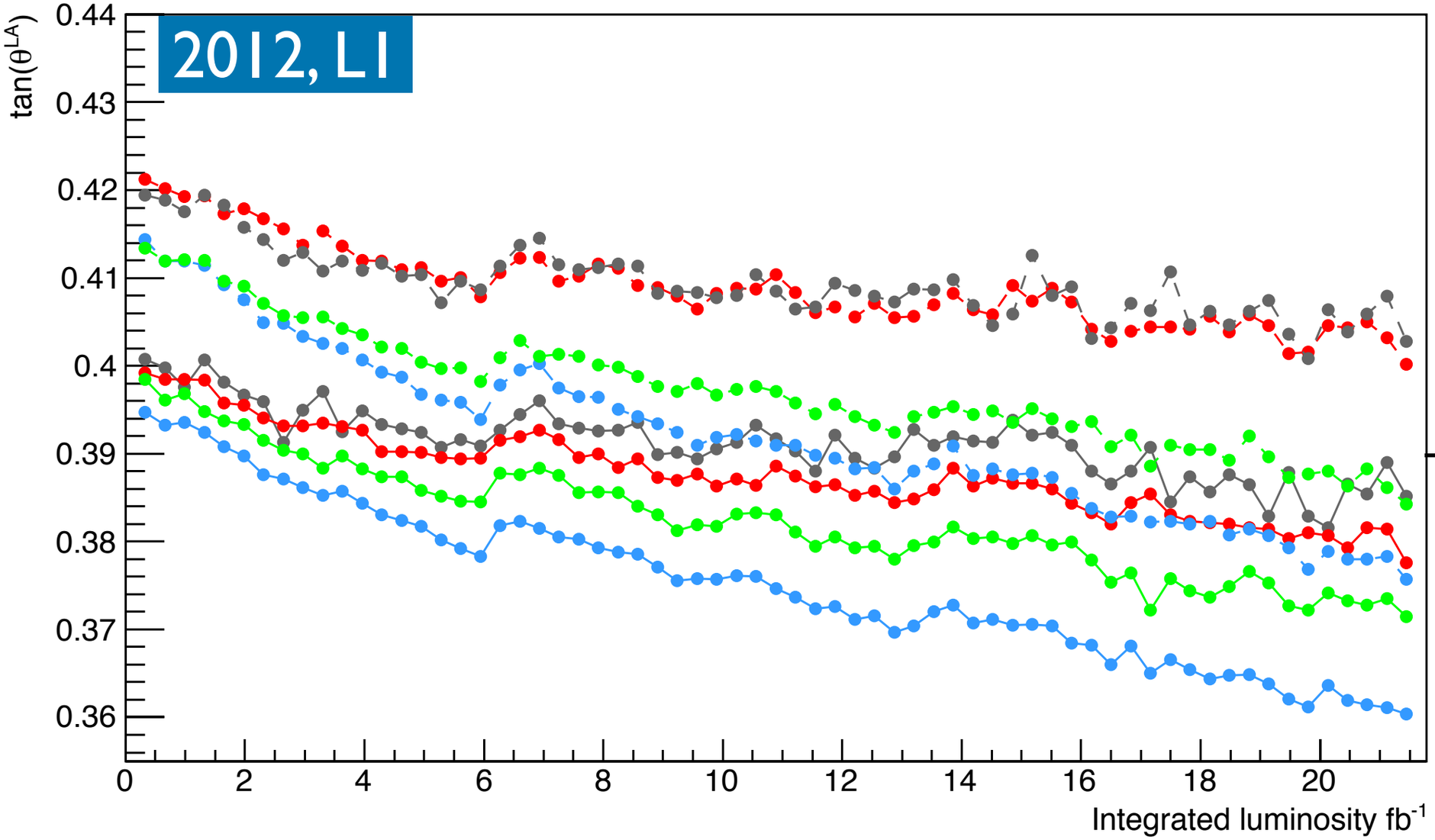
Distribution of the median of the residuals in TOB

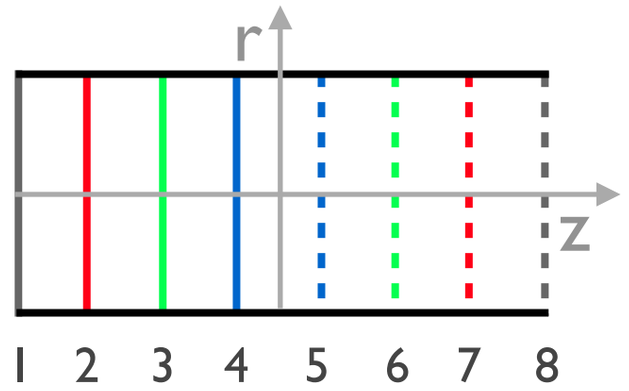


Distribution of the median of the residuals in TOB



Mobility evolution: BPIX (Layer 1)



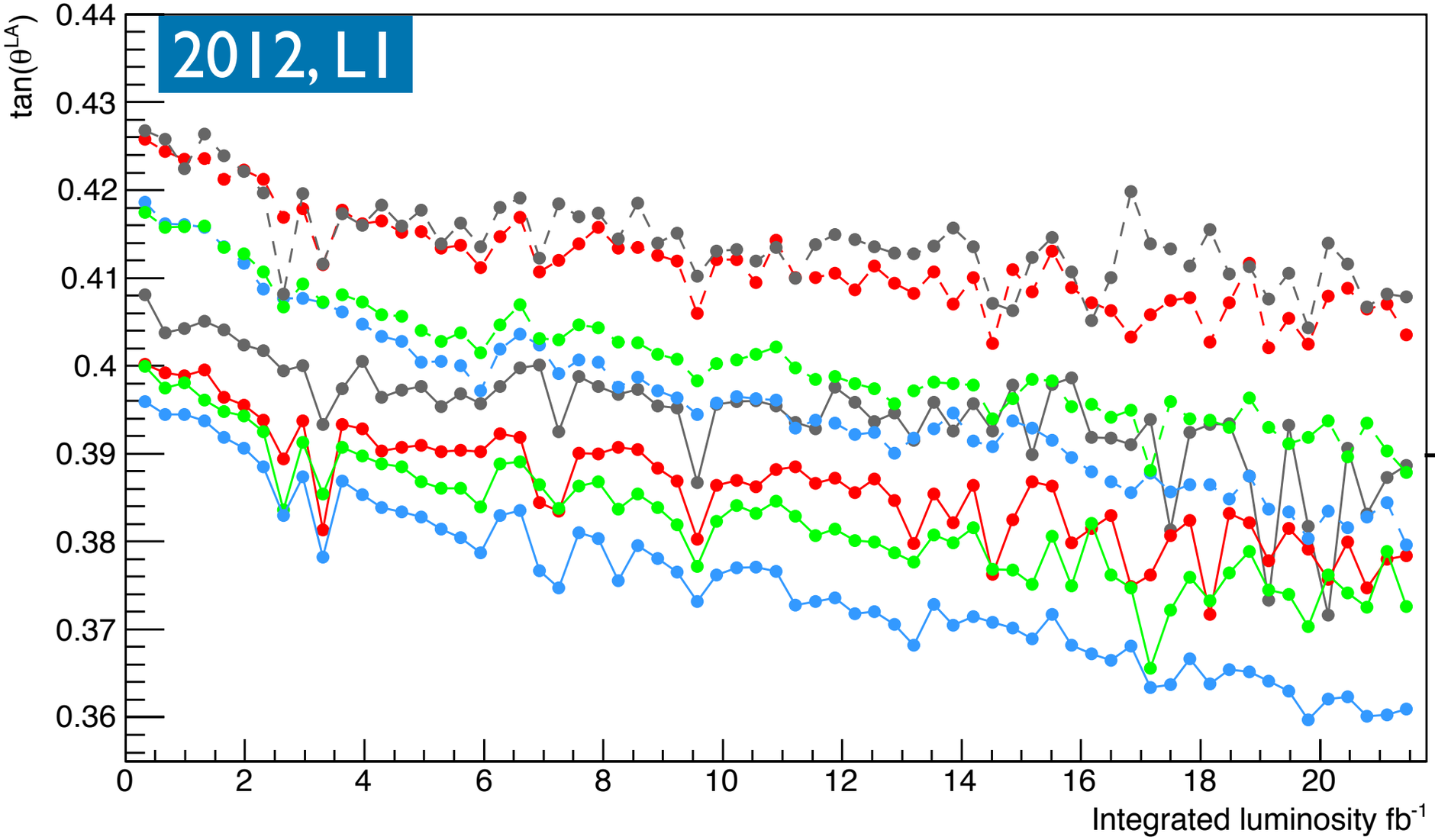


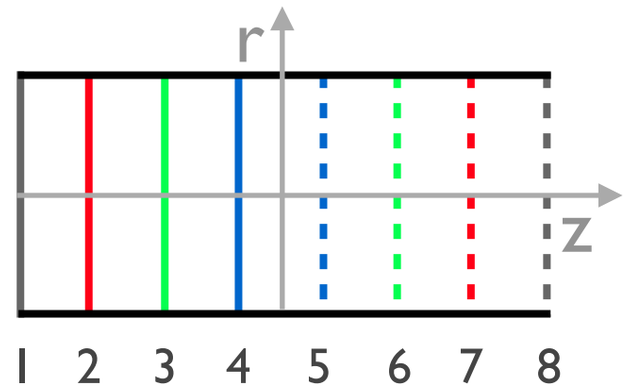
mp1287

Pixel

- Uncertainties are underestimated (as expected)
- This is first iteration (pede in GMRES mode)

Mobility evolution: BPIX (Layer 1)



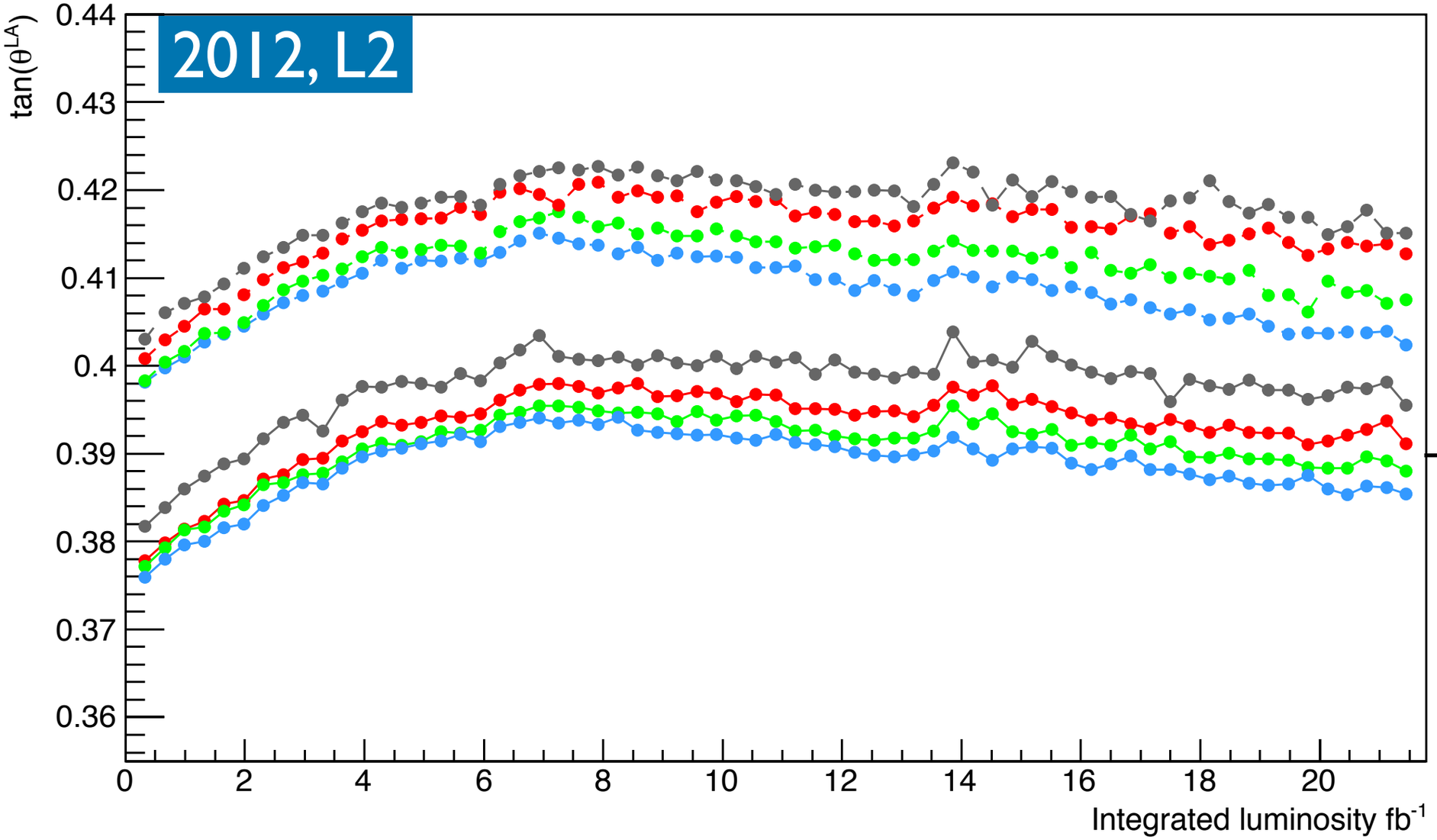


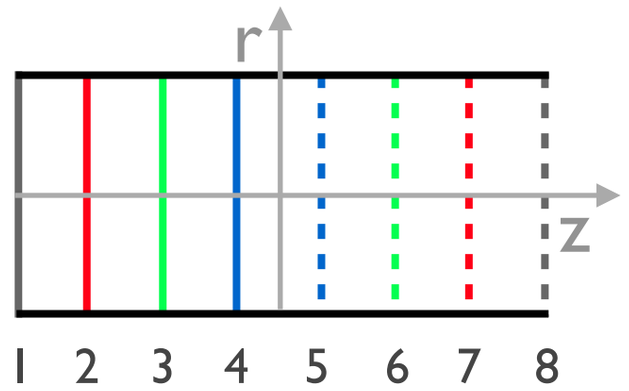
RINGS

mp1295
Pixel+Strip

- Much larger fluctuations

Lorentz angle evolution: BPIX (Layer 2)



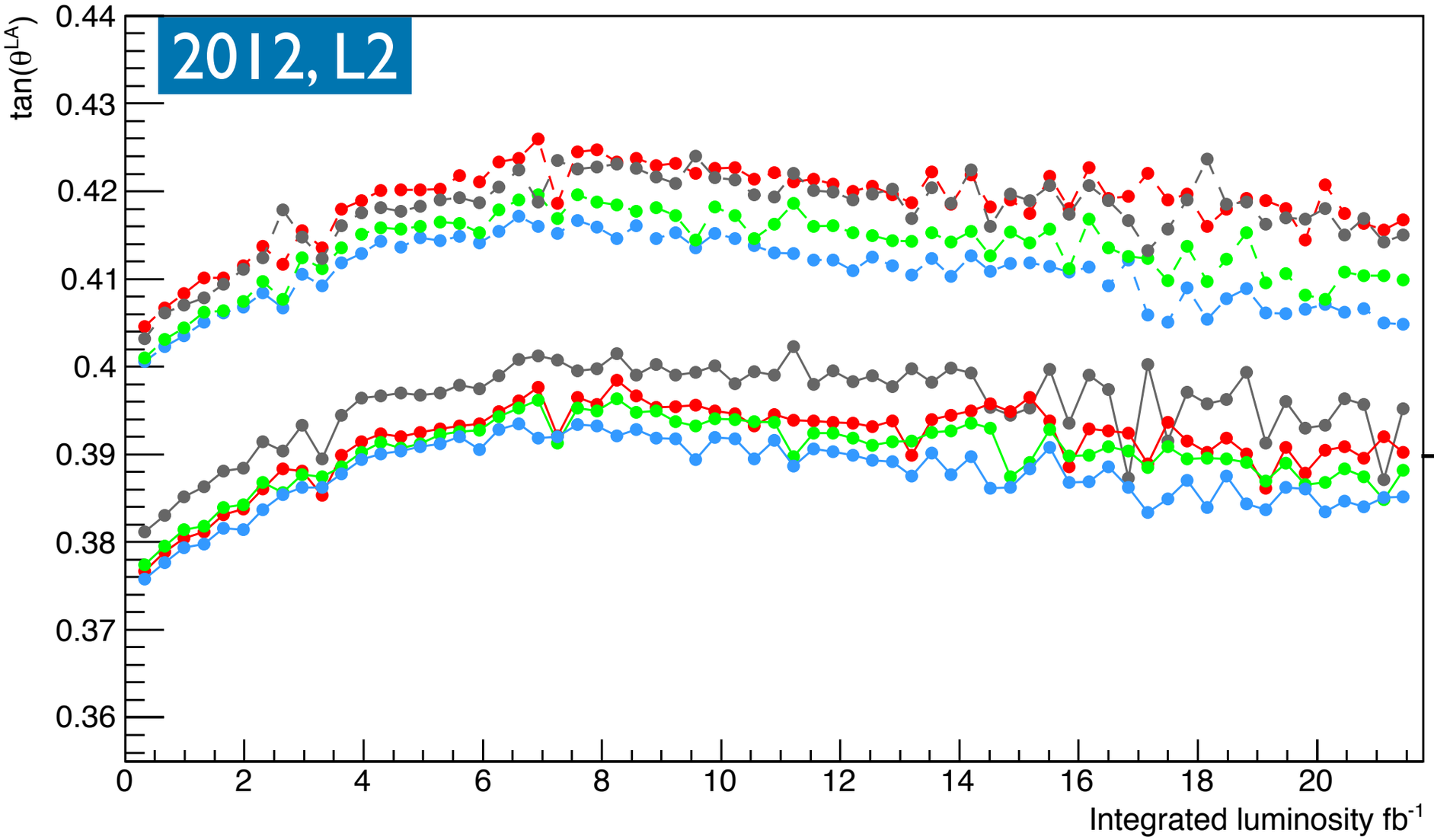


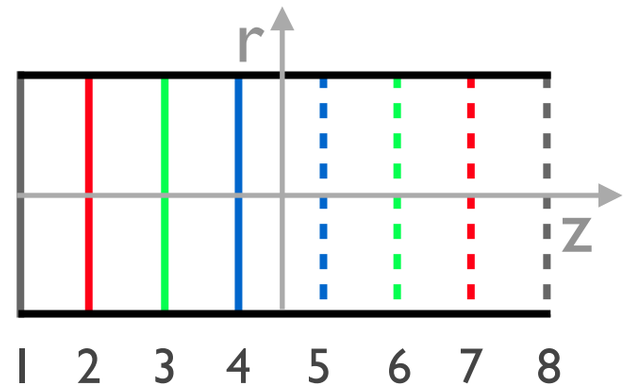
RINGS

mp1287

Pixel

Lorentz angle evolution: BPIX (Layer 2)





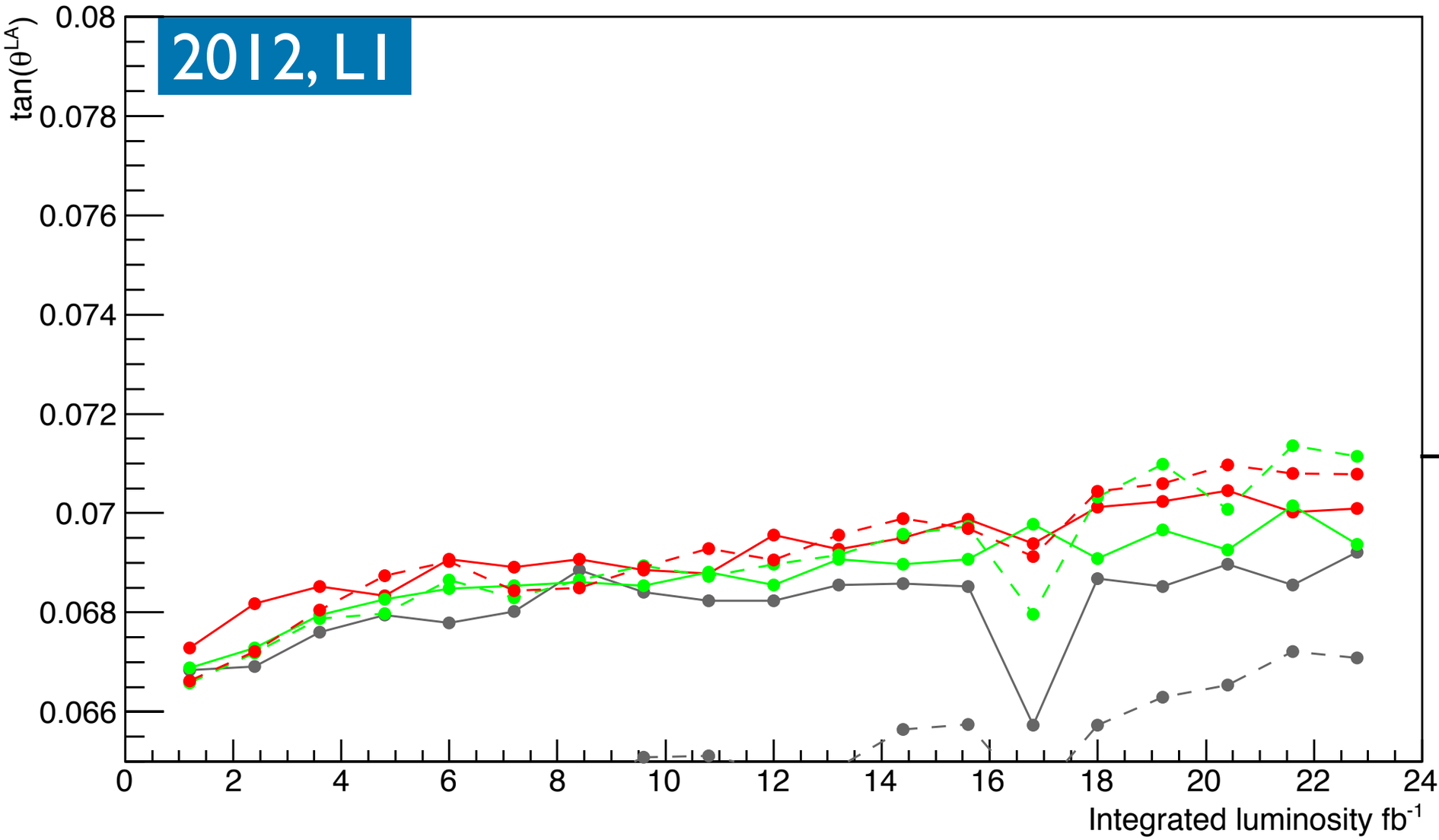
RINGS

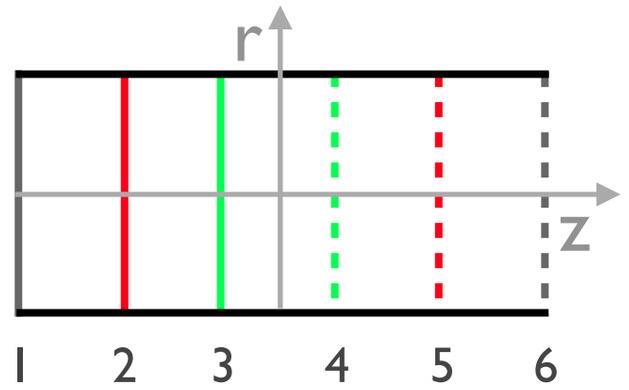
mp1295

Pixel+Strip

- Looks like an effect from low statistics

Lorentz angle evolution: TIB (Layer 1)

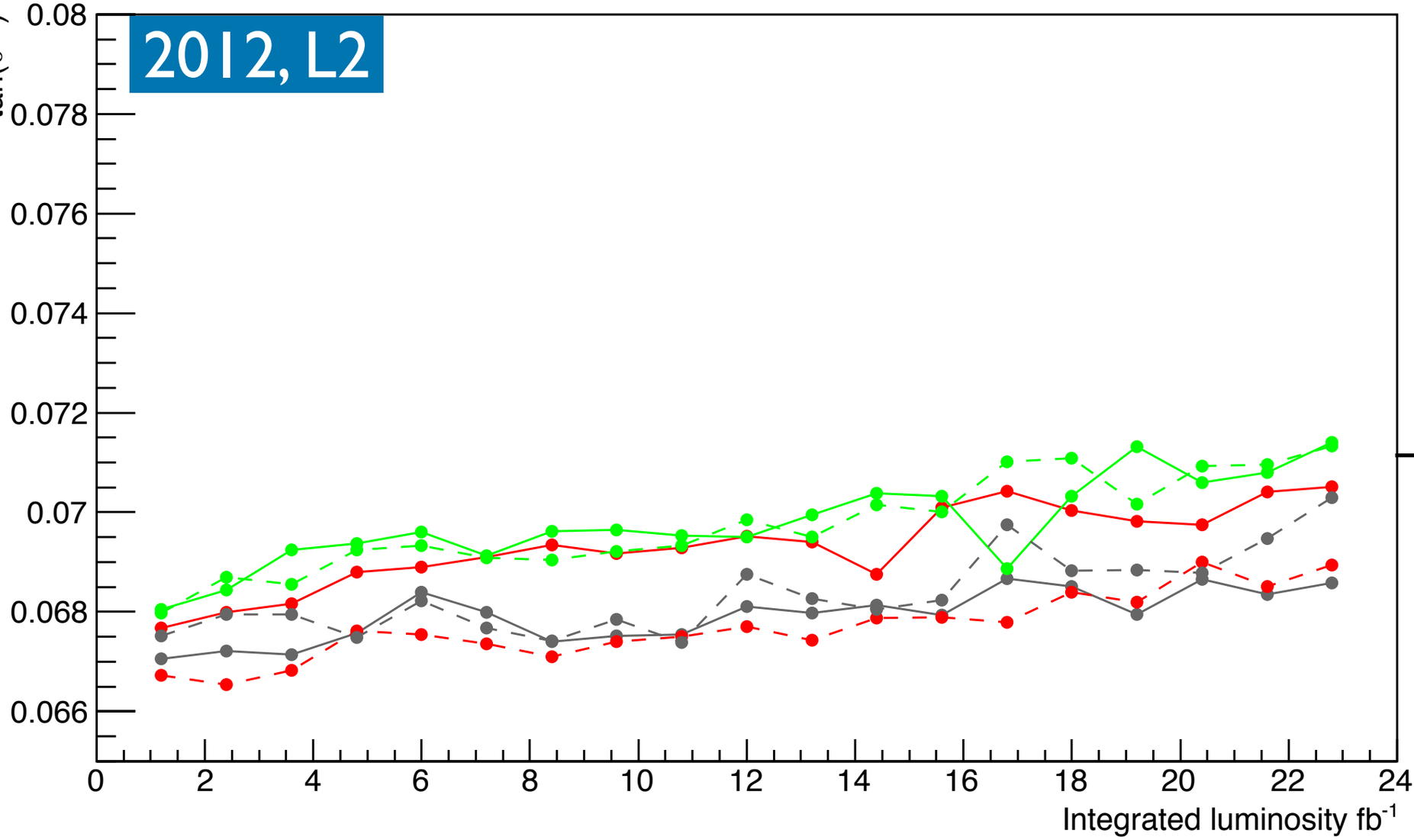


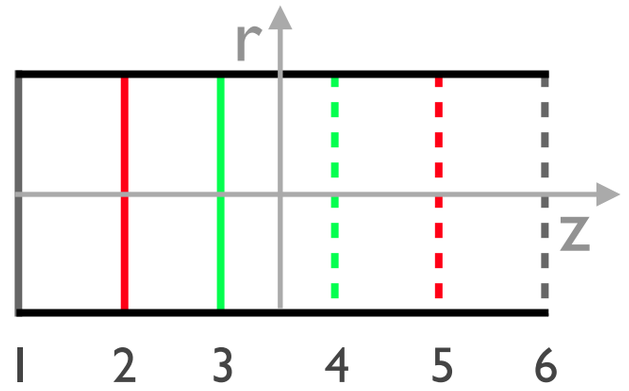


RINGS

mp1295
Pixel+Strip

Lorentz angle evolution: TIB (Layer 2)

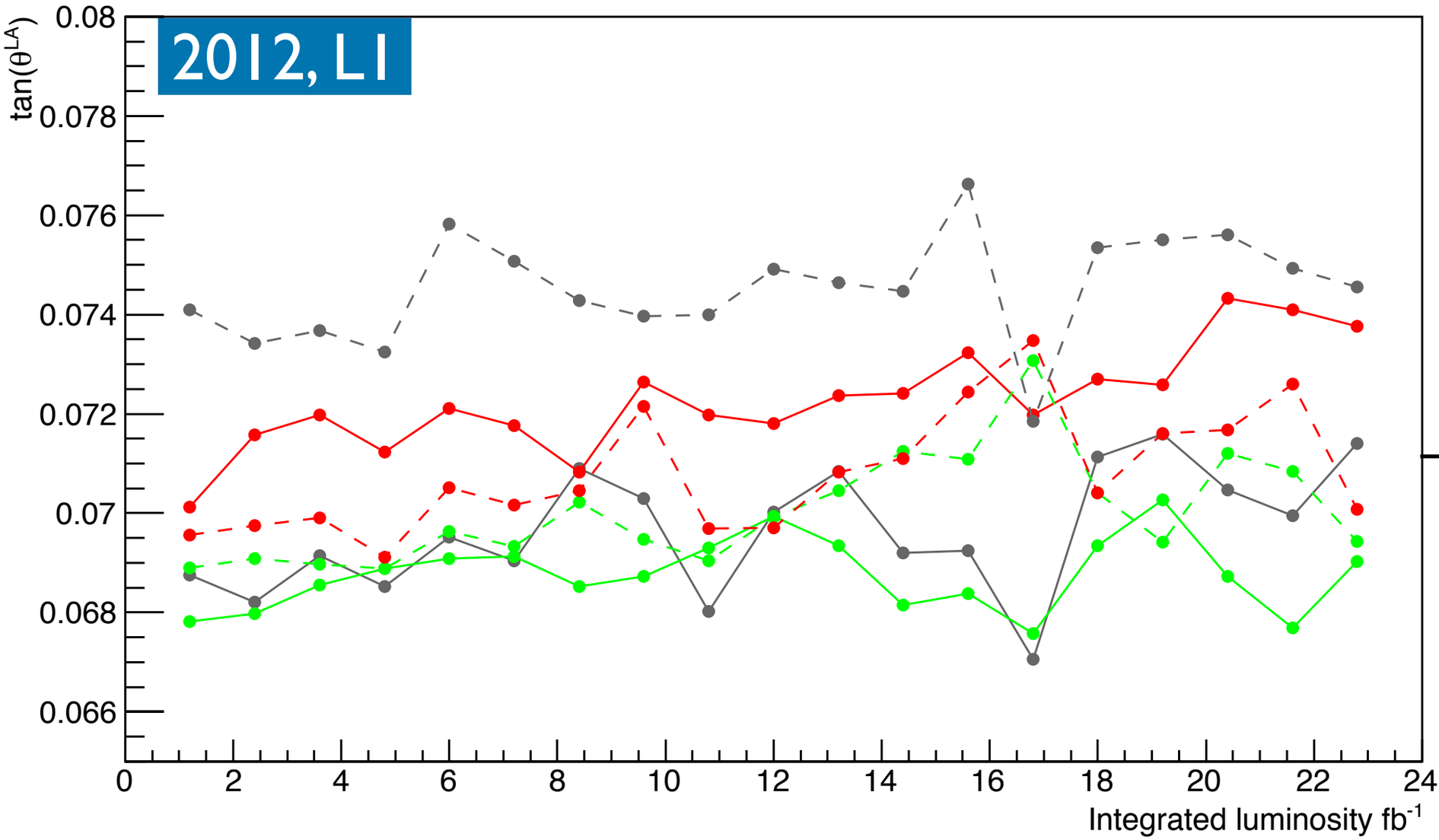


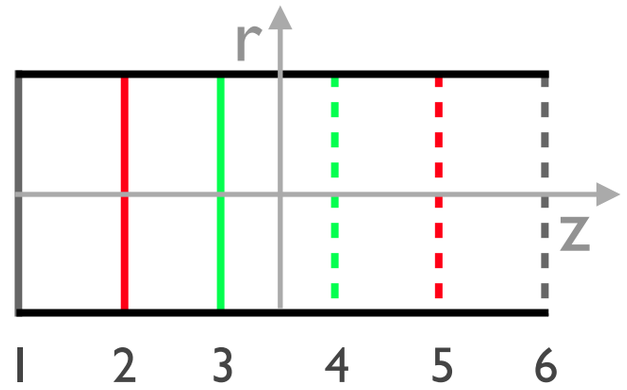


RINGS

mp1295
Pixel+Strip

Lorentz angle evolution: TIB (Layer 3)

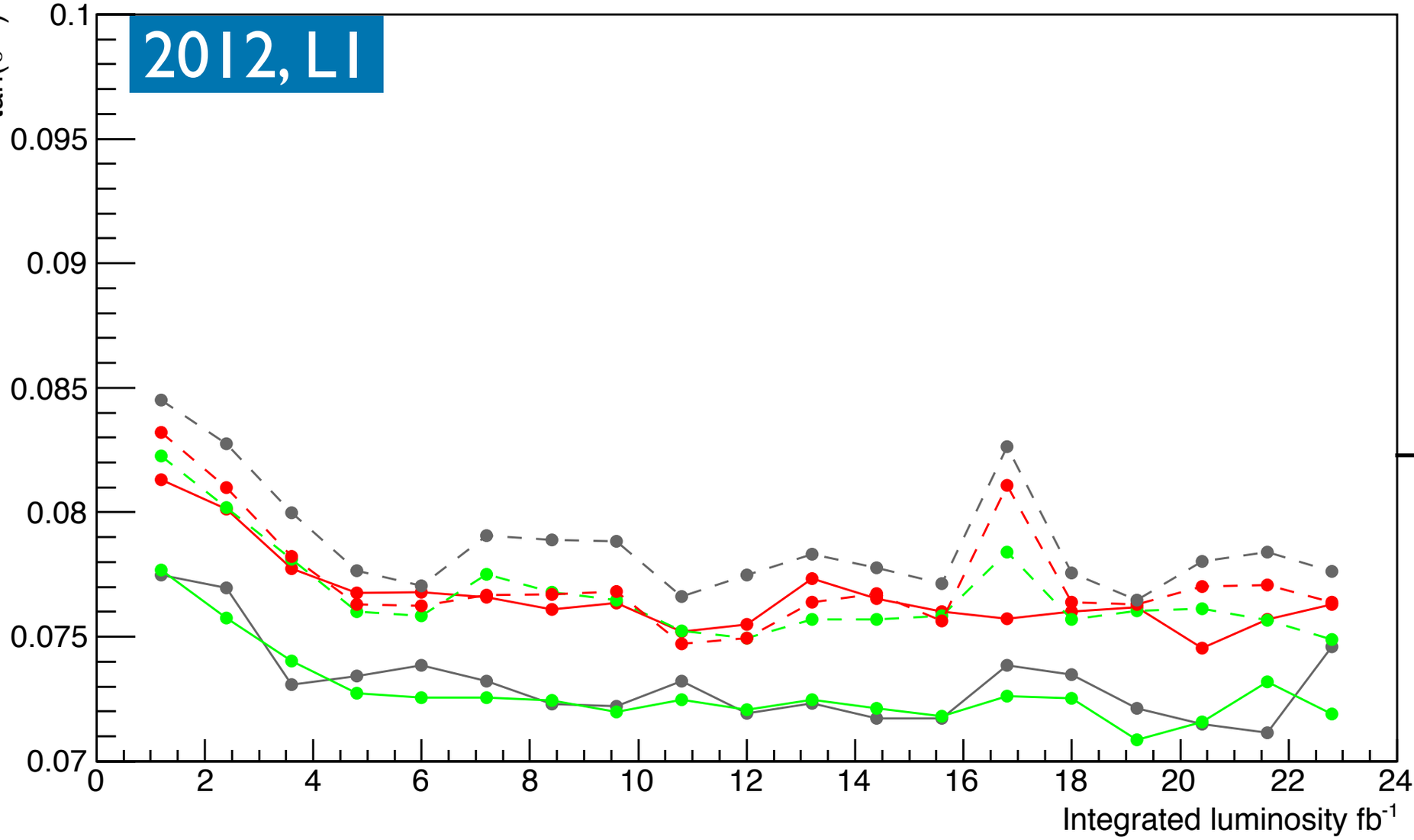


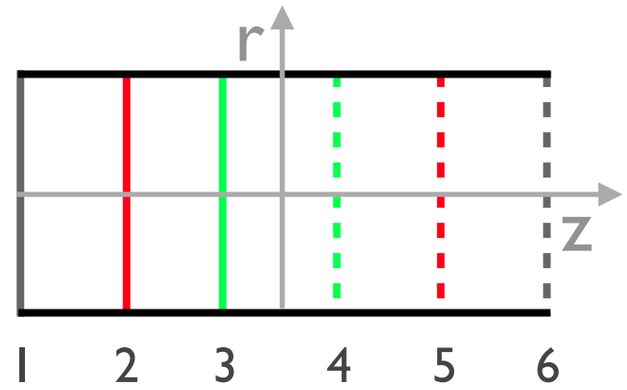


RINGS

mp1295
Pixel+Strip

Lorentz angle evolution: TOB (Layer 1)

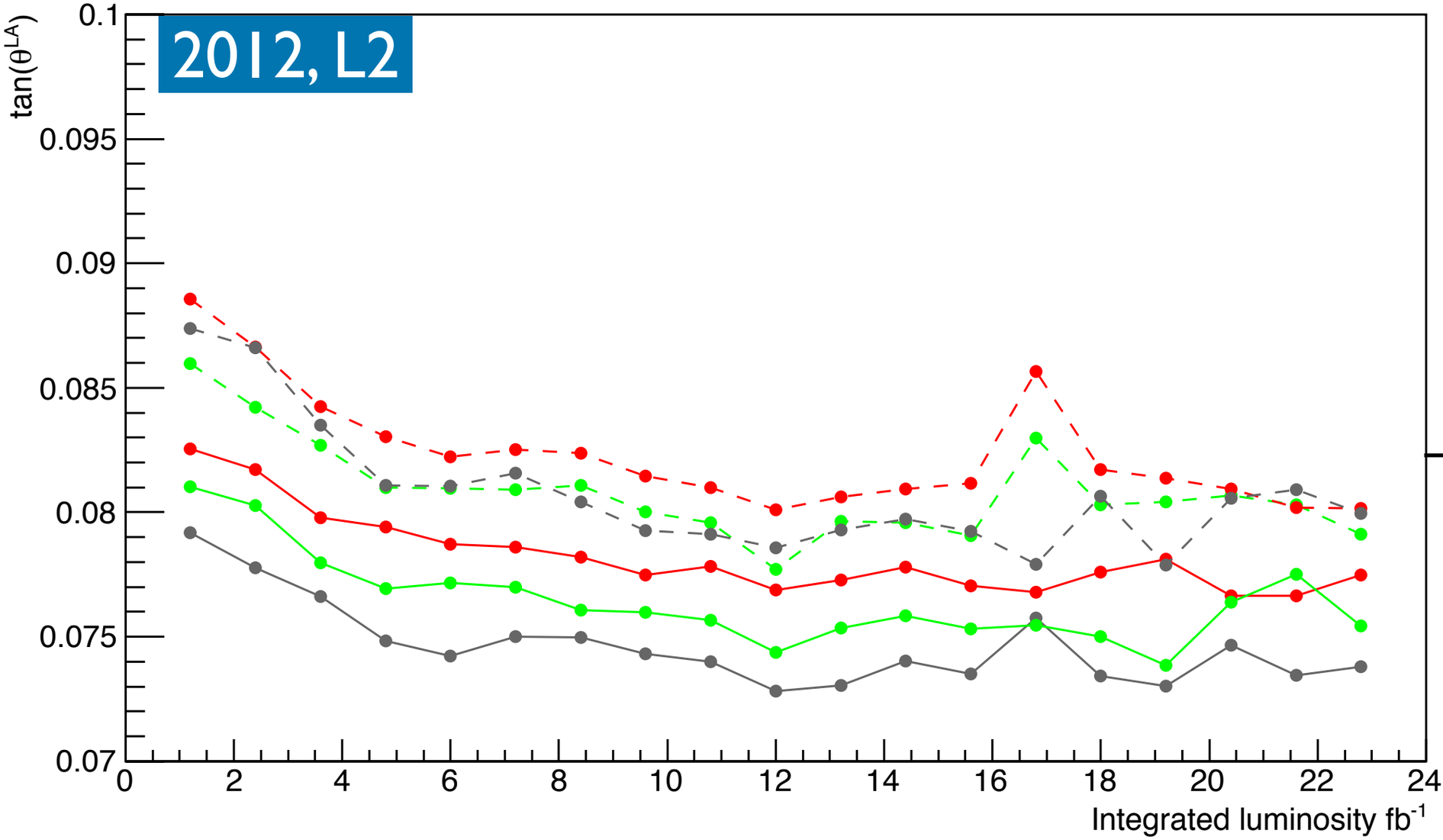


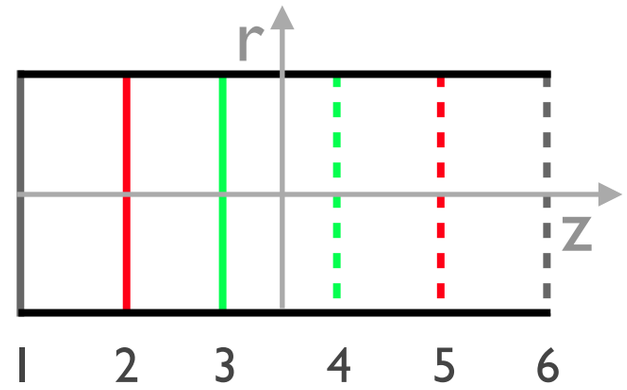


RINGS

mp1295
Pixel+Strip

Lorentz angle evolution: TOB (Layer 2)

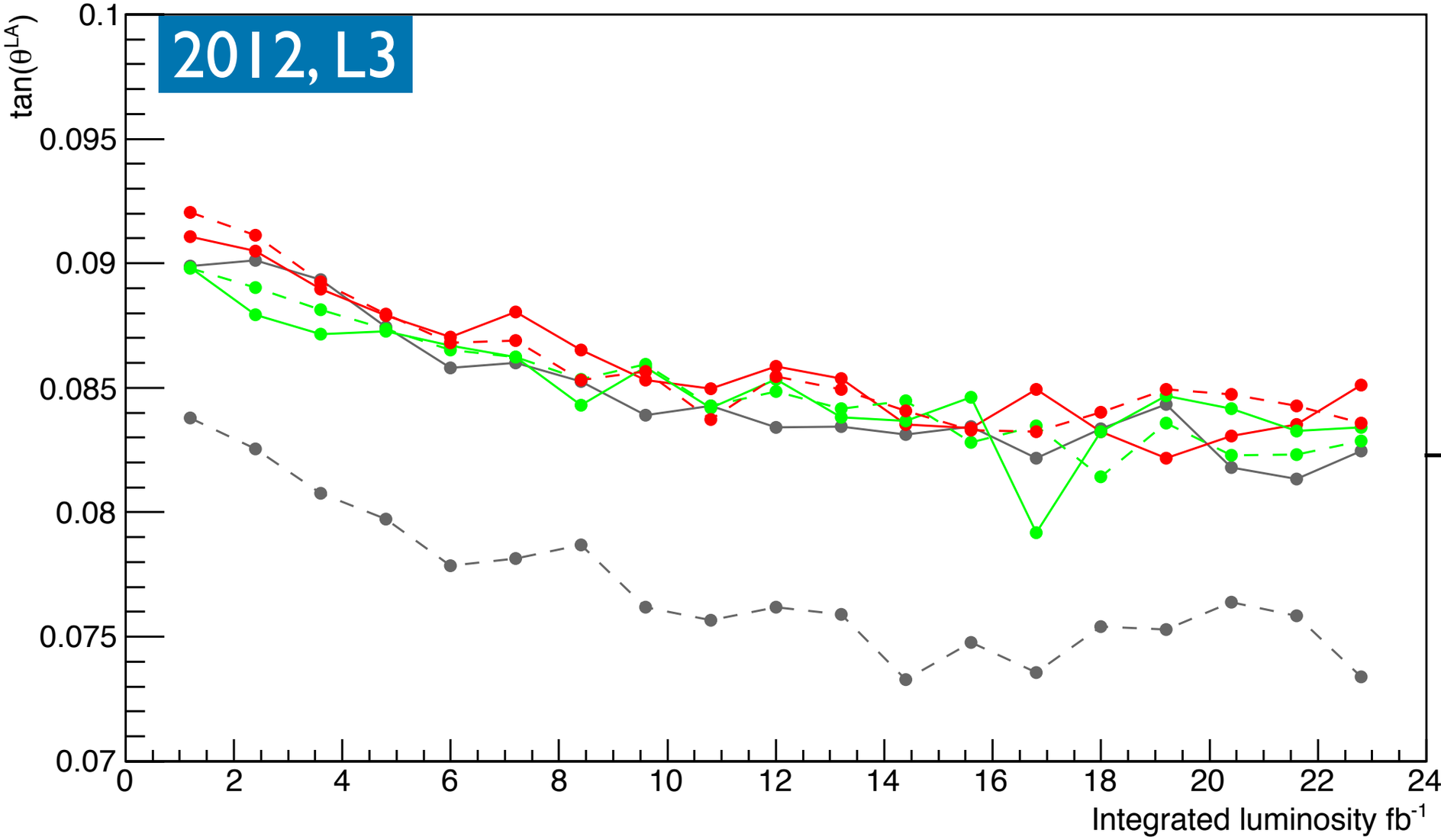


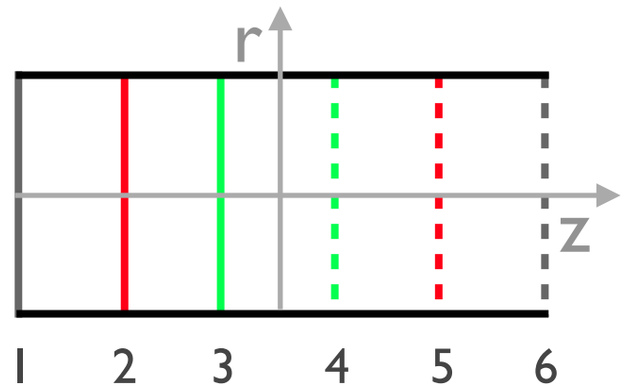


RINGS

mp1295
Pixel+Strip

Lorentz angle evolution: TOB (Layer 3)

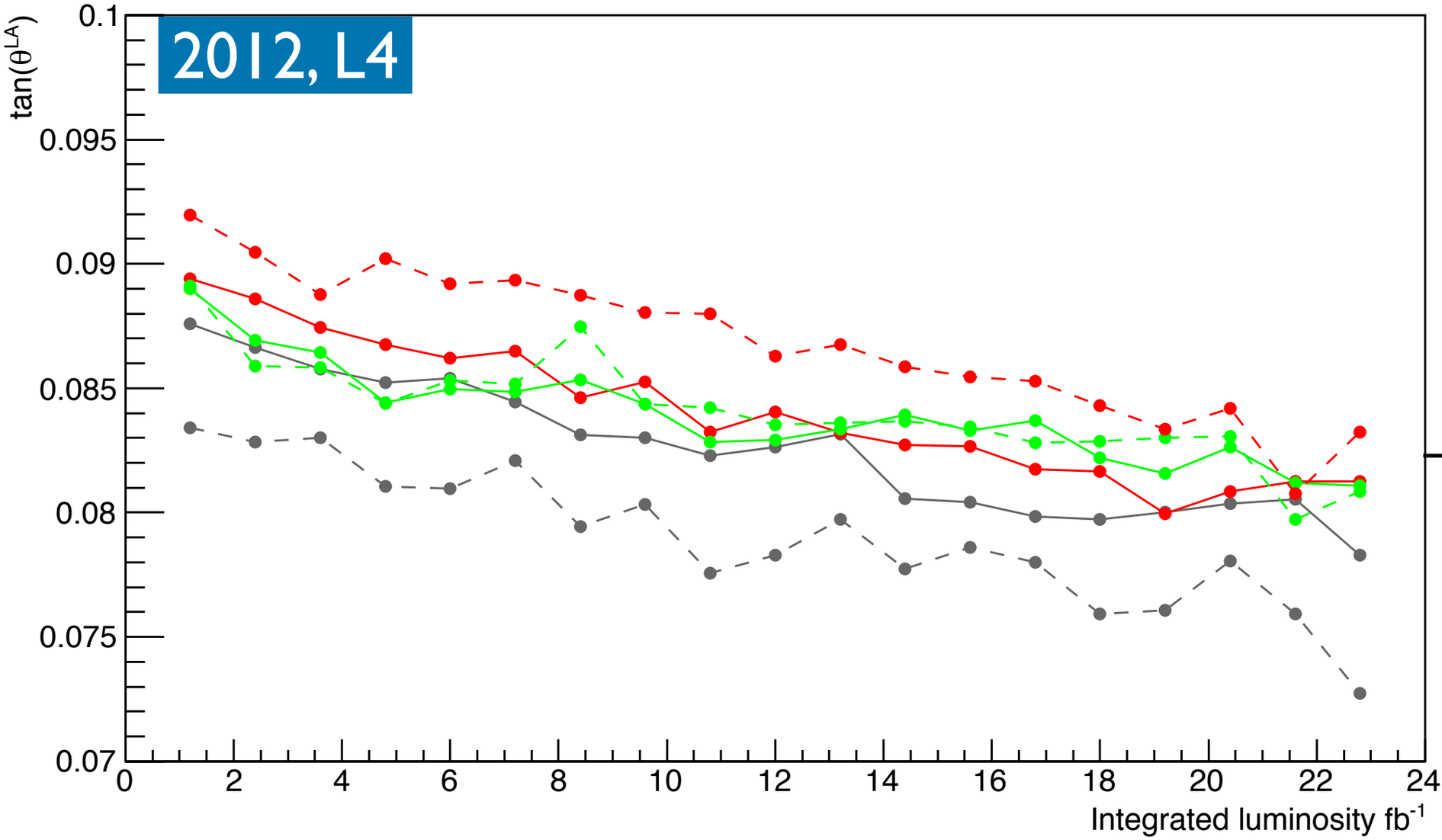


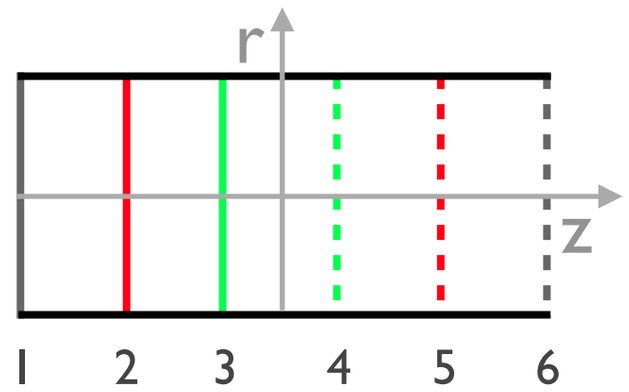


RINGS

mp1295
Pixel+Strip

Lorentz angle evolution: TOB (Layer 4)





RINGS

mp1295
Pixel+Strip