Lorentz angle correction updates

(Cosmics 2010)

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Tracker alignment meeting
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Alignment setup:

Three different geometries have been produced:

1. combLA - aligned on combined 3.8T(1M events) and 0T(500K events) 2010 peak Cosmics data, with LA correction for TIB and TOB applied.
2. combNoLA - aligned on combined 3.8T(1M events) and 0T(500K events) 2010 peak Cosmics data, without LA correction applied.
3. mp1081 - aligned on 3.8 T (2.3M events) 2010 peak Cosmics data, without LA correction.

Data used for alignment is from ReReco dataset:
/Cosmics/Commissioning10-TkAlCosmics0T-Jun01ReReco-v1/ALCARECO

LA correction is implemented as a shift of signal in cm by 2 additional alignment parameters: 1 for TIB and 1 for TOB, which have simplified derivates:
±1•[angle between B-field and module];

Summer2011 was used as starting geometry for all three compared geometries.

	Alignables:	Parameter values:
TrackerTPBLayer,111111 TrackerTPEHalfDisk,111111 TrackerTIBHalfBarrel,111111 TrackerTOBHalfBarrel,111111 TrackerTIDEndcap,111111 TrackerTECEndcap,111111	TrackerTIBModuleUnit,101111 TrackerTOBModuleUnit,101001 TrackerTIDModuleUnit,101001 TrackerTECModuleUnit,101001	TIB: 0.3 μm TOB: 1.2 μm

Validation setup:

Release: CMSSW_4_2_4_patch1

GlobalTag: GR_P_V20;

Kinks&Bows Correction from 2011;

Data: 2010 0T Cosmics peak mode

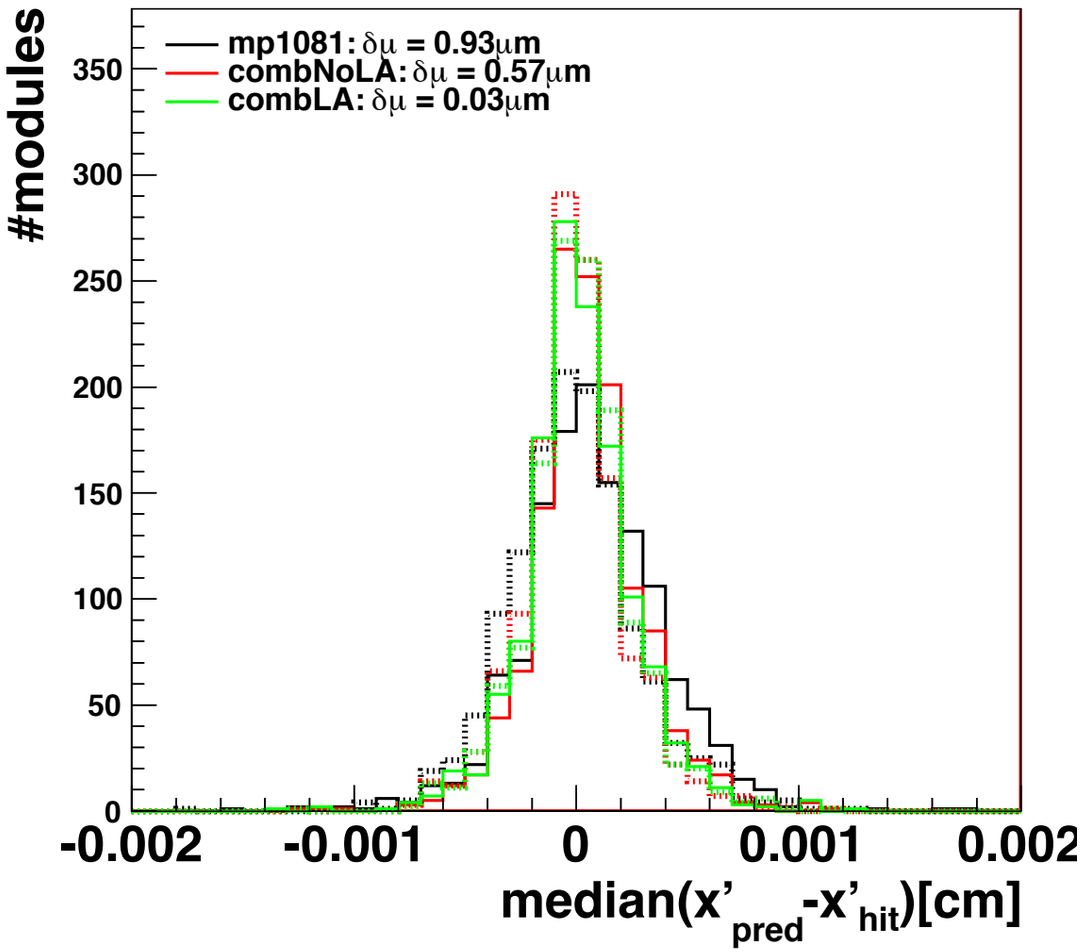
/Cosmics/Commissioning10-TkAlCosmics0T-Jun01ReReco-v1/ALCARECO

Statistics: 500K events;

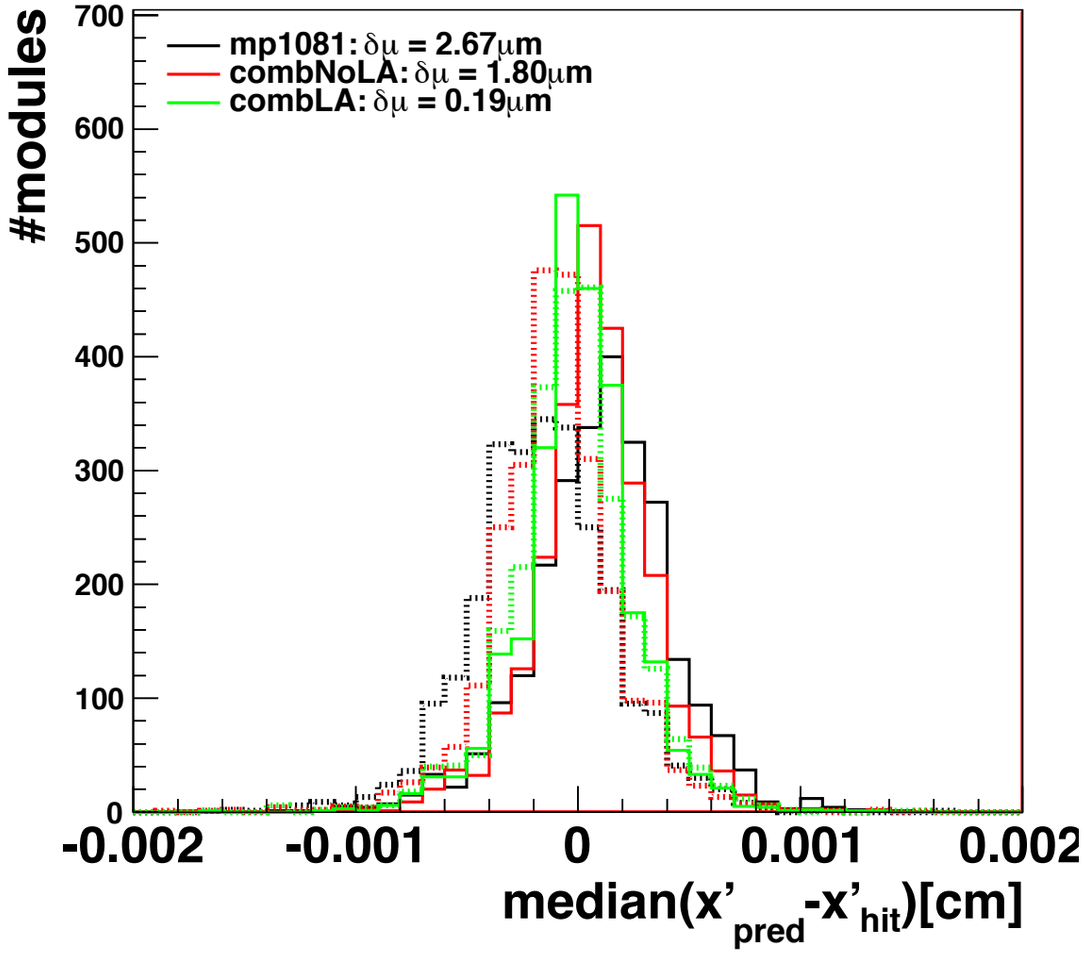
The validation on 3.8T data can't be done, since the derived corrections can not be applied yet.

DMR Validation - 0T Cosmics

Distribution of the median of the residuals in TIB



Distribution of the median of the residuals in TOB



Aligned on **3.8T** data

Aligned on **3.8T+0T** data

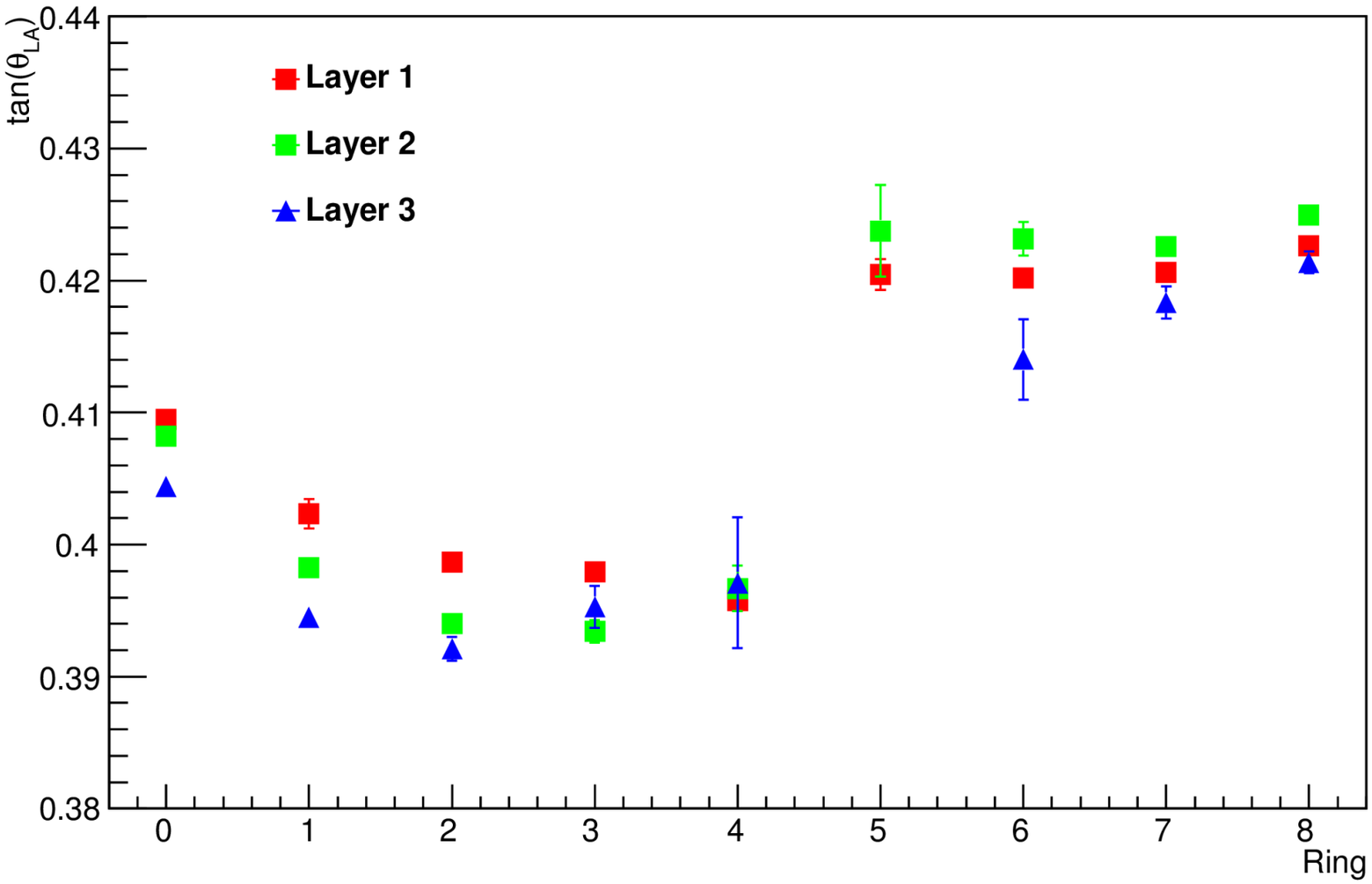
Aligned on **3.8T+0T** data **with LA corr**

——— Positive rDirection

- - - - - - Negative rDirection

Adding 0T data to alignment gives small improvement, but adding LA correction cures the split of DMR.

Lorentz Angle Z asymmetry in 3.8T



From Jelena Luetić on 26.07.12

2012 collision data; Ring 0 – average value;

In field on data tan(Θ_{LA}) has opposite deviations from average value in forward and backward halfbarrels. This should be seen in 0T data and be compensated by LA correction in alignment.

Alignment setup:

1. mp1132 - aligned on combined 3.8T(500K events) and 0T(500K events) 2010 peak Cosmics data, with 1 LA correction for TIB, TOB and PXB applied.
2. mp1135 - same as mp1132 but with 2 corrections for PXB: 1 for rings 1-4, and 1 for rings 5-8.

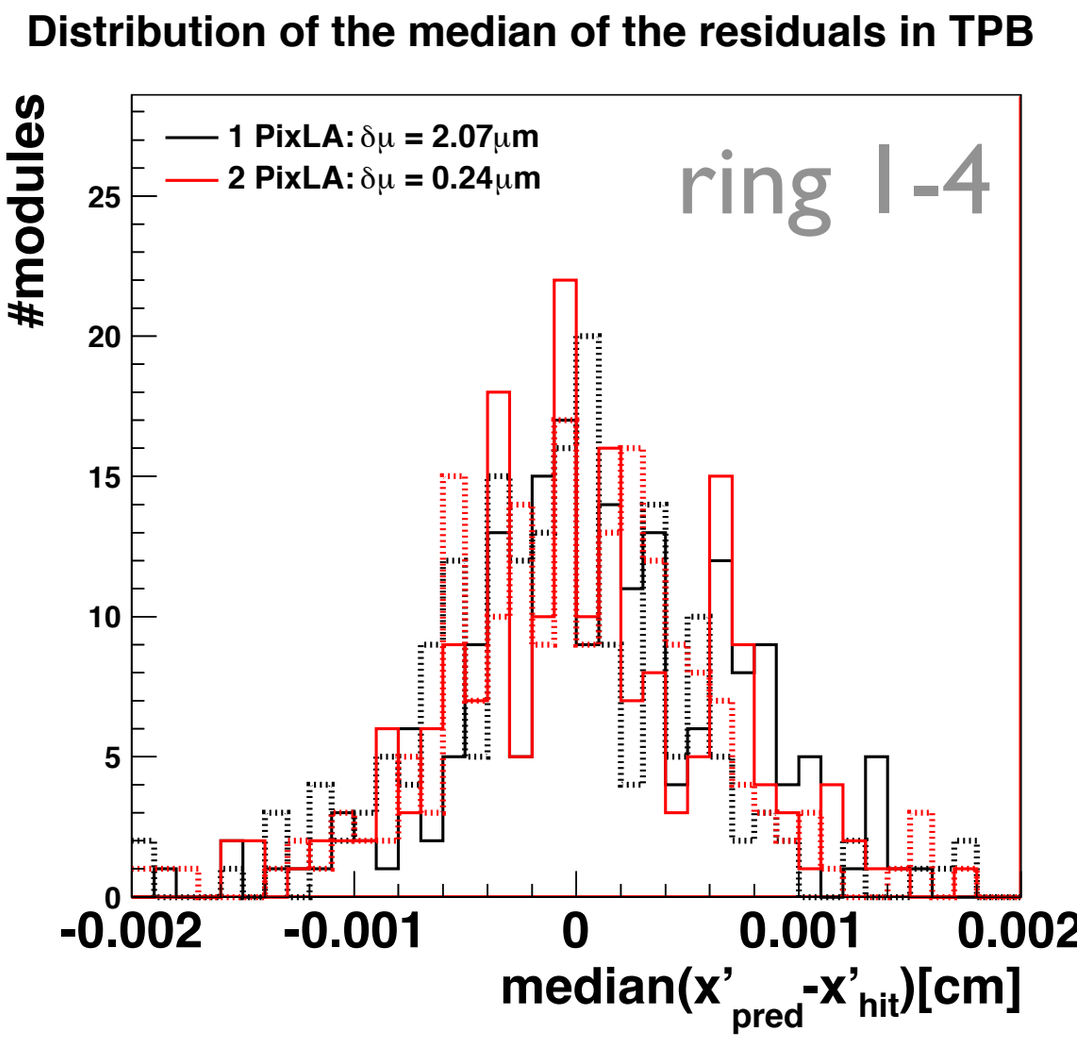
Determined is the correction of the value of mobility: $\tan(\Theta_{LA})$ per Tesla – the value used by Local Reconstruction group for determination of LA correction.

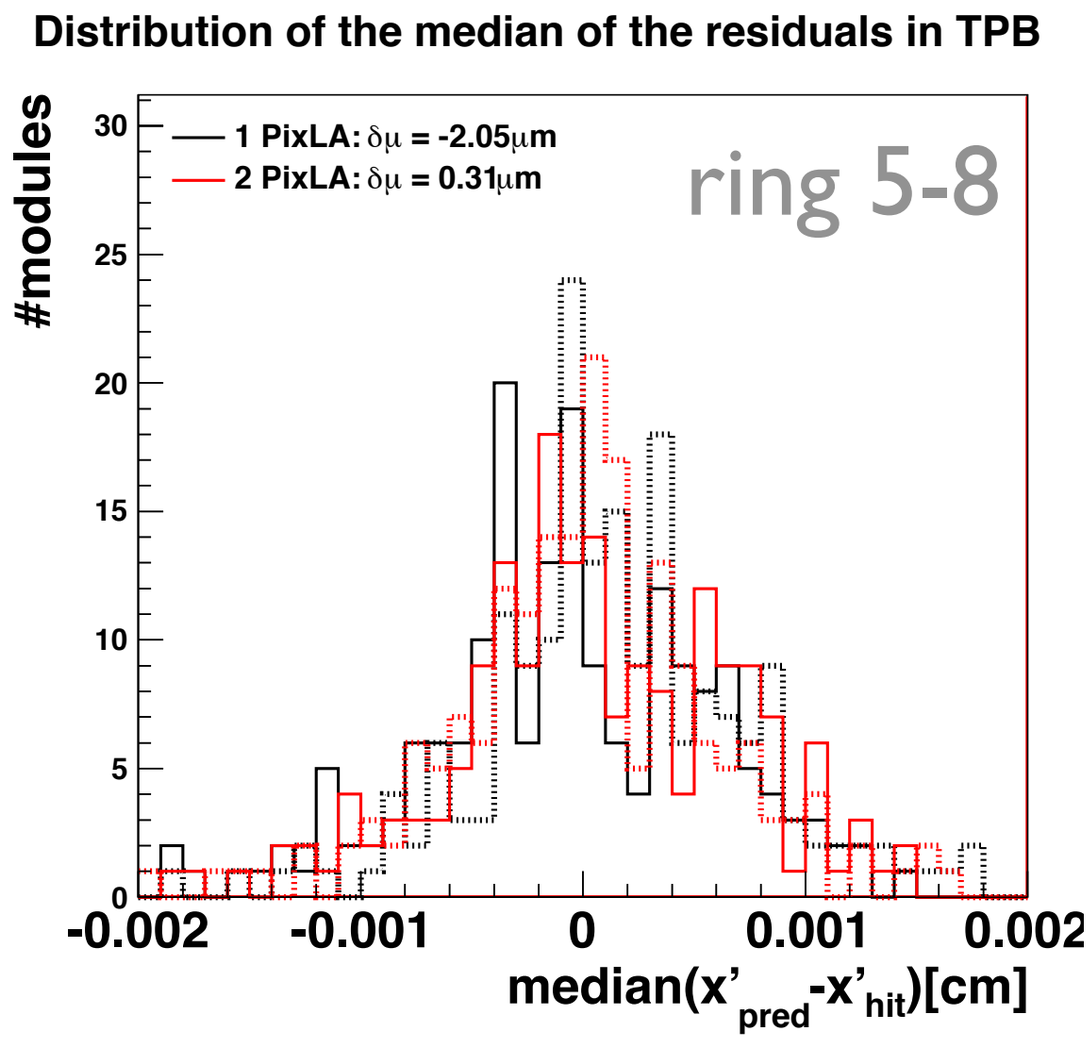
	Alignables:
TrackerTPBLayer,111111	TrackerTPBModule,111001
TrackerTPEHalfDisk,111111	TrackerTIBModuleUnit,101111
TrackerTIBHalfBarrel,111111	TrackerTOBModuleUnit,101001
TrackerTOBHalfBarrel,111111	TrackerTIDModuleUnit,101001
TrackerTIDEndcap,111111	TrackerTECModuleUnit,101001
TrackerTECEndcap,111111	

The same dataset and starting geometry have been used.

The same validation setup has been used.

DMR Validation - 0T Cosmics





1 correction for whole PXB

2 corrections for PXB (rings 1-4, 5-8)

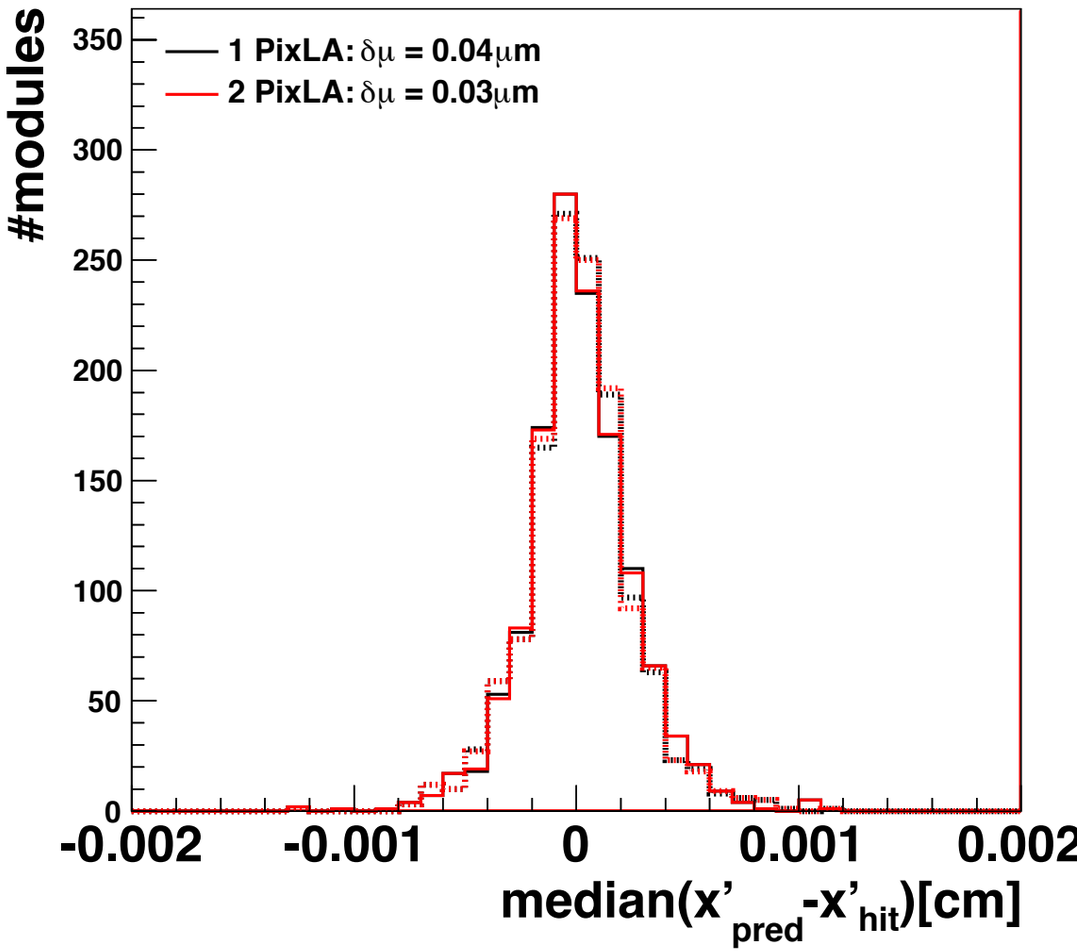
——— Positive rDirection

- - - - - - Negative rDirection

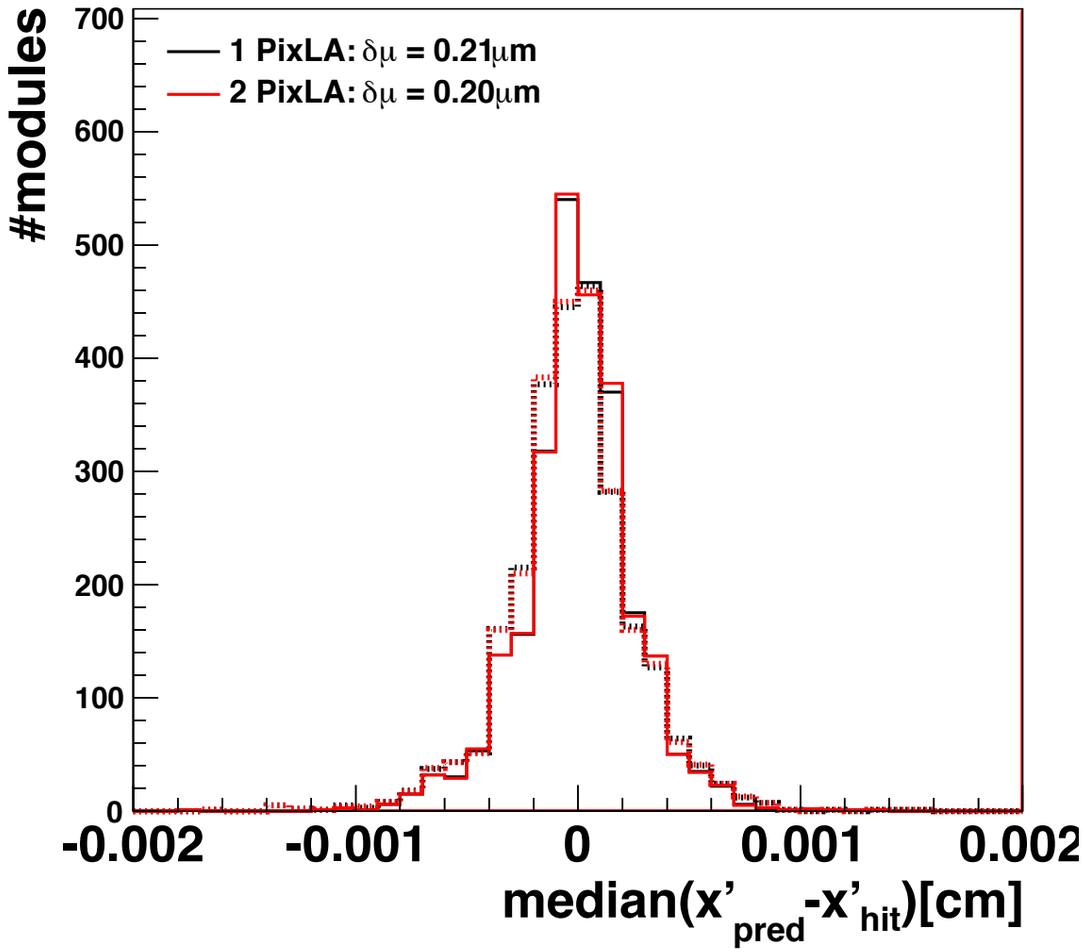
We see the opposite LA shift in 2 halfbarrels and no shift after adding separate correction for each halfbarrel.

DMR Validation - 0T Cosmics

Distribution of the median of the residuals in TIB



Distribution of the median of the residuals in TOB



1 correction for whole PXB

2 corrections for PXB (rings 1-4, 5-8)

——— Positive rDirection

- - - - - - Negative rDirection

In TIB and TOB 2 alignments don't differ and are consistent with the combLA geometry (slide 4).

Conclusion

- LA corrections have been added for Pixel Barrel.

- Effect from different Lorentz Angle values in forward and backward halfbarrels has been seen in validation on 0T data.

- Aligning 2 separate parameters for rings 1-4 and 5-8 in PXB compensated the difference of LA in PXB halfbarrels.

- It confirms that the LA correction in alignment procedure works properly but still validation at 3.8T is needed.