ATLAS Tile Calorimeter

TileCal Calib, DQ, DP, Performance and Processing meeting

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Introduction

Laser Data : We use the laser calibration data produced by **Giulia di Gregorio** for 1/3 of the laser runs since 2015 untill the end of 2017. She used the combined method to calculate the corrections (the same method used for this years corrections).

Thanks, Giulia!

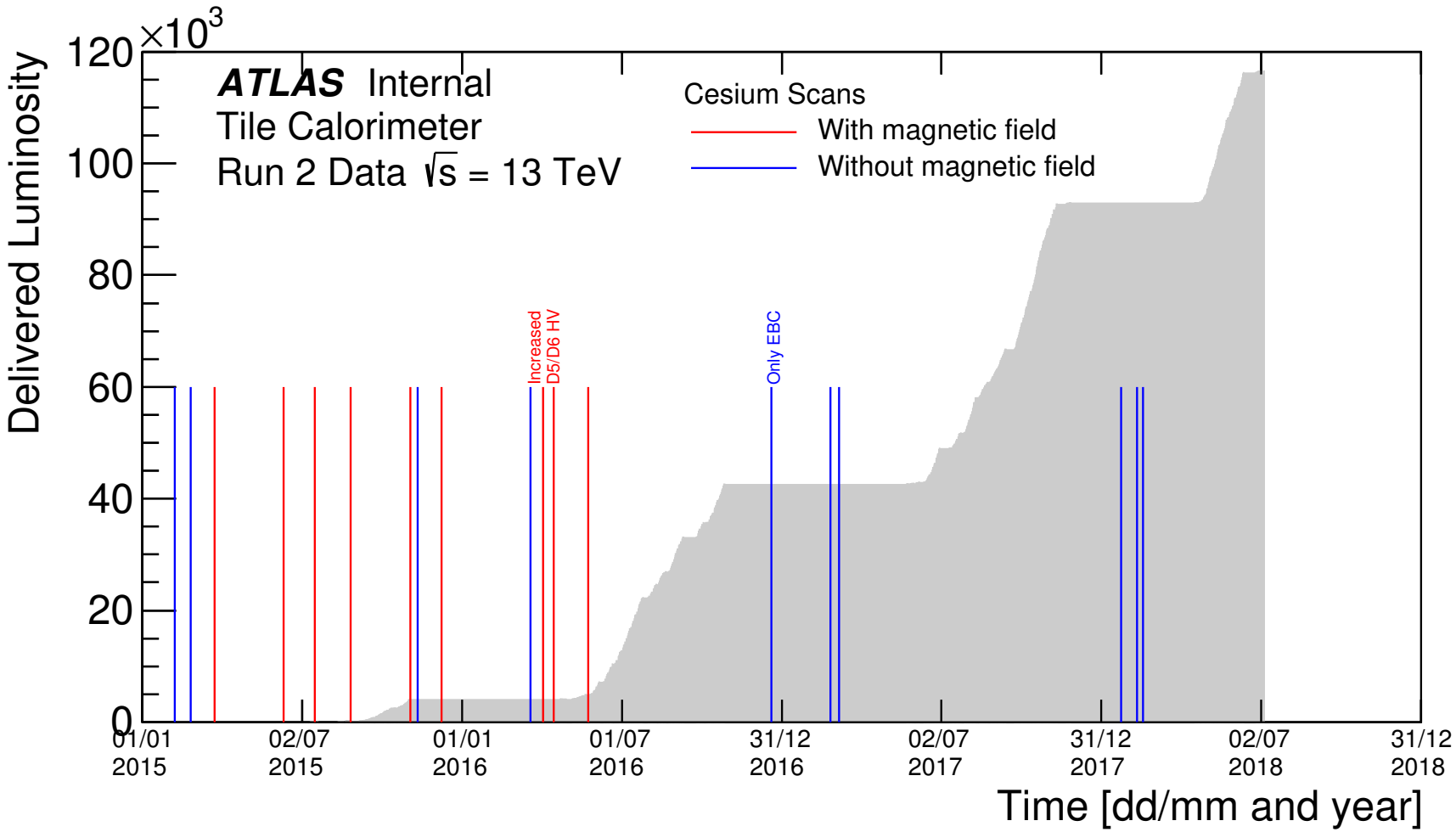
Goals :

- study the average drift of the different cell types
- study the RMS of the variations in the channels (as done with Cesium)
- study on the difference between the measurements of the two PMTs connected to a given cell.

NB: The version used by Giulia is outdated (new developments by Henric not yet included). We will update this to the latest version of the calculation.

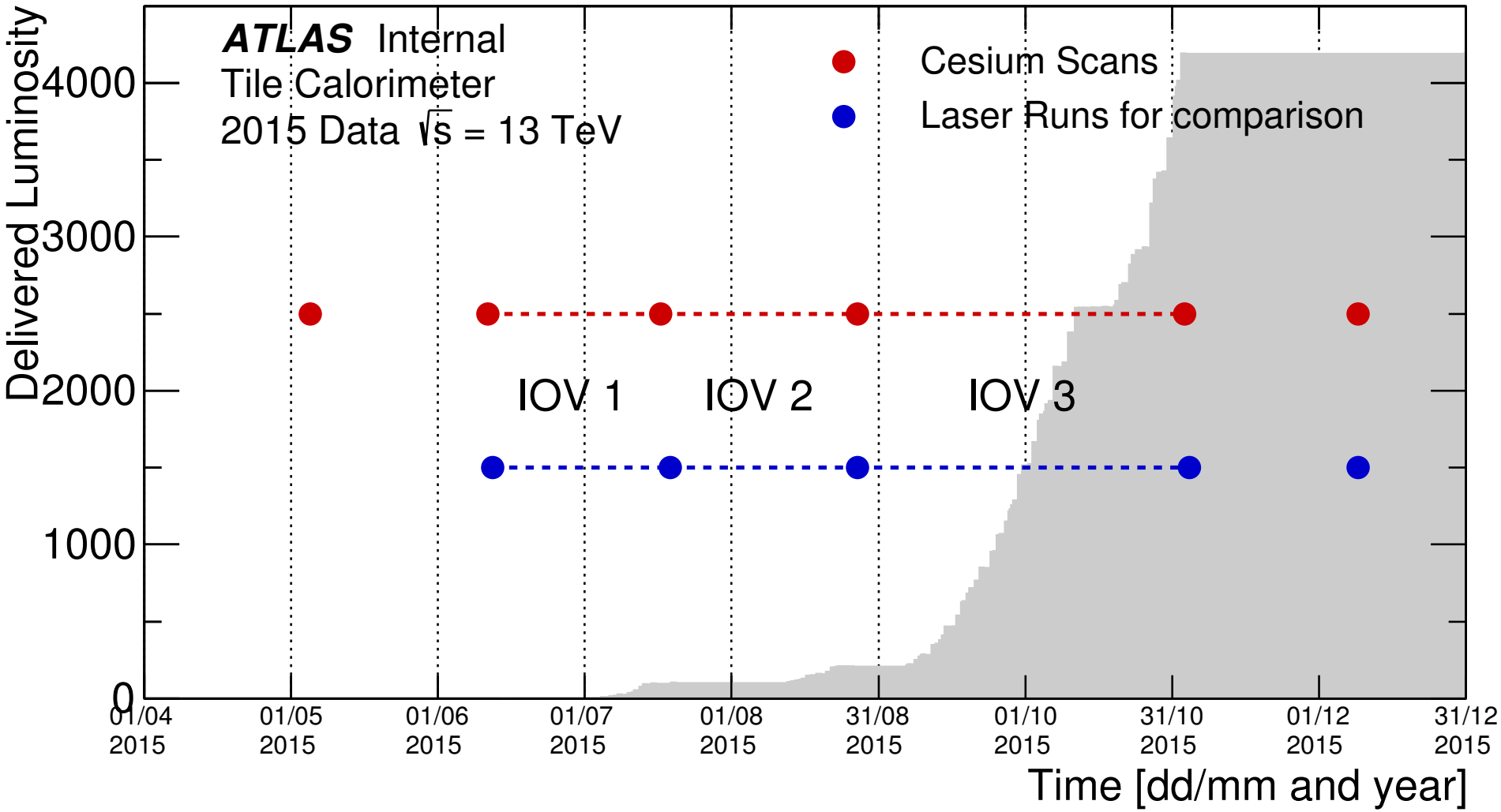
Masked channels : We exclude all channels that are masked in the HG (combined method uses HG). We also exclude those channels flagged as affected for the laser system. Non-instrumented channels are also not used.

Cesium Scans in Run 2



Plan: Compare the drifts measured by Cesium and laser system during several time periods (IOV), according to Cesium scan availability.

Cesium Vs Laser



Cesium Vs Laser

- We start doing a comparison in 2015, where more scans were performed.
- We defined 3 IOVs covering different data taking periods. Laser runs selected within 1 day of the Cesium scan **(avoided runs right after the scan)**.
- Cesium data: **Extracted Cesium constants from COOL DB**.
- Laser data: Combined method using **latest version of the code (new smoothing)**.
- CESIUM (from DB, all with magnetic field)
  IOV1: 263962 (11/june) $\leftrightarrow$ 270000 (17/july)
  IOV2: 270000 (17/july) $\leftrightarrow$ 277321 (27/aug)
  IOV3: 277321 (27/aug) $\leftrightarrow$ 284600 (3/nov)
- LASER (new combined method, reference from Giulia)
  IOV1: 267534 (12/june) $\leftrightarrow$ 272493 (19/july)
  IOV2: 272493 (19/july) $\leftrightarrow$ 277320 (17/aug before Cs)
  IOV3: 277320 (27/aug) $\leftrightarrow$ 284682 (4/nov)

Laser Study

Laser runs in 2015

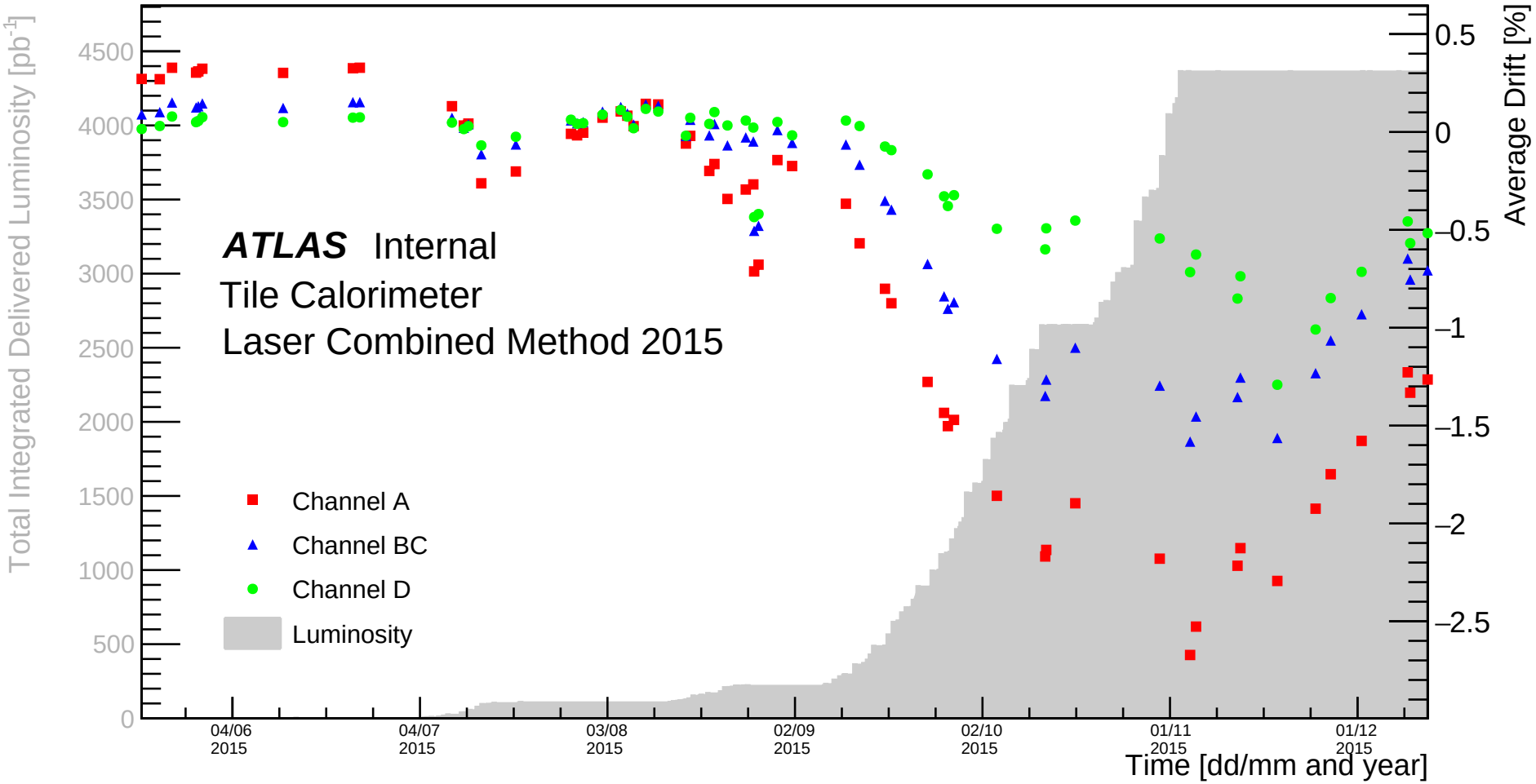


Figure: Average Drift vs Time

Laser runs in 2015

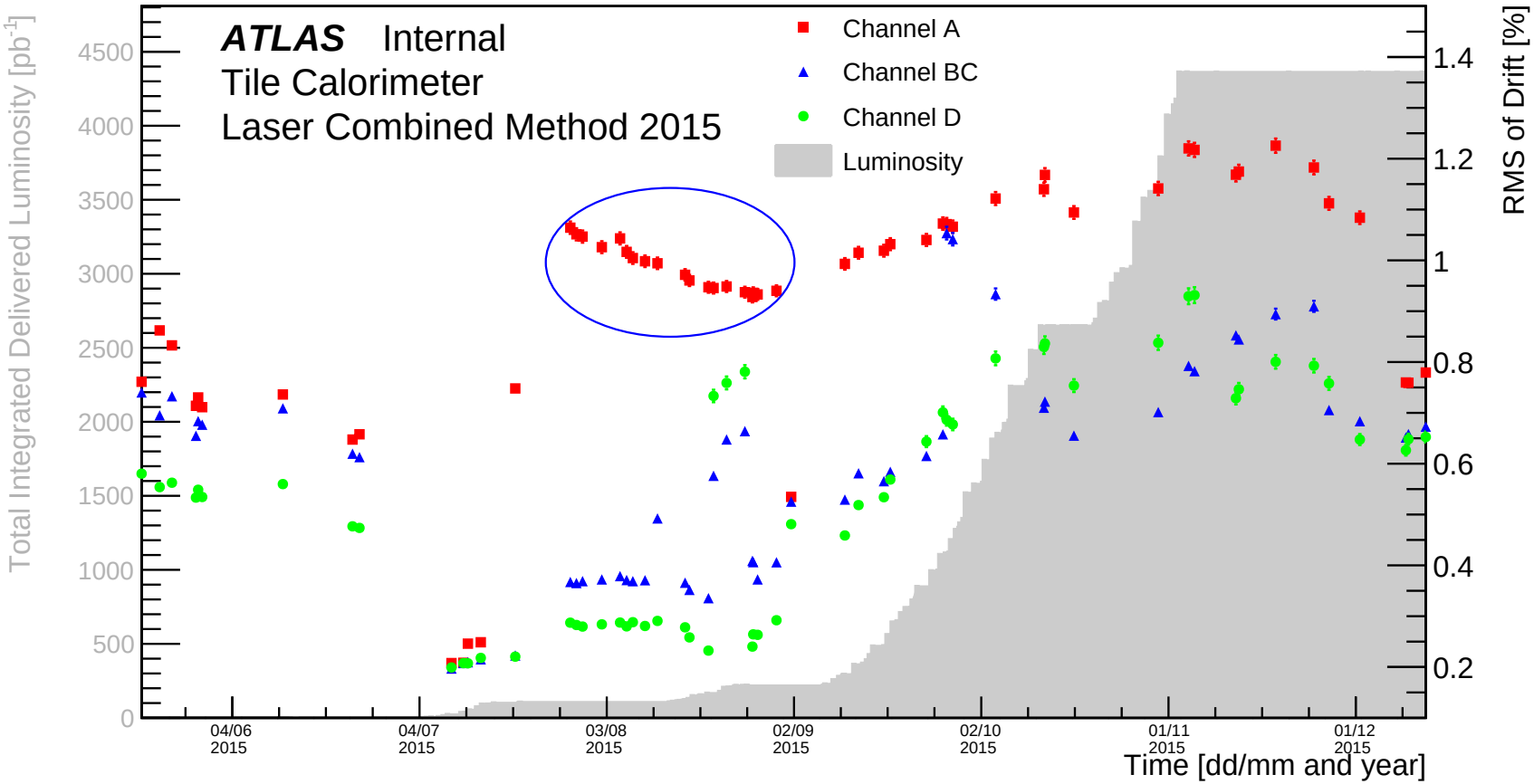
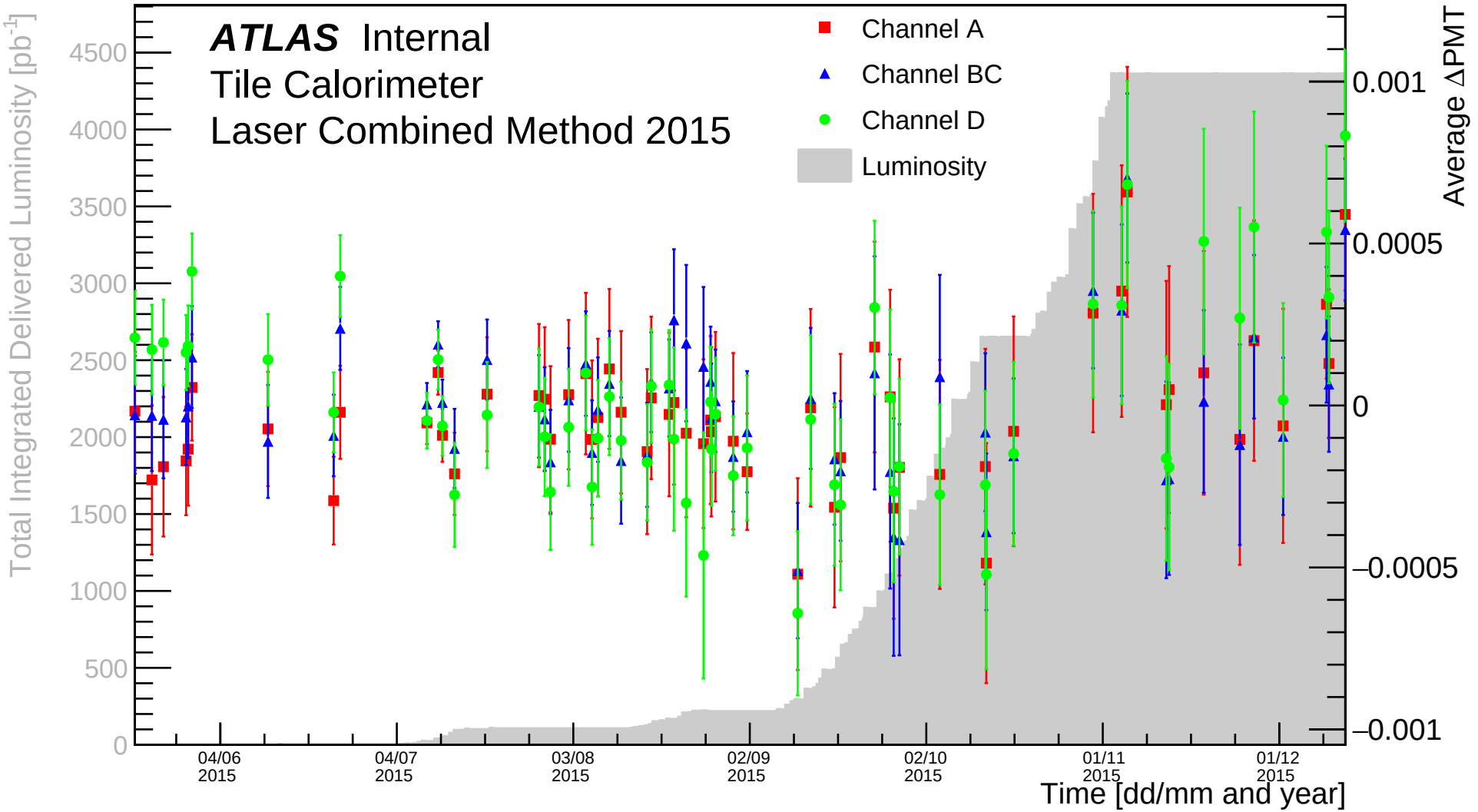


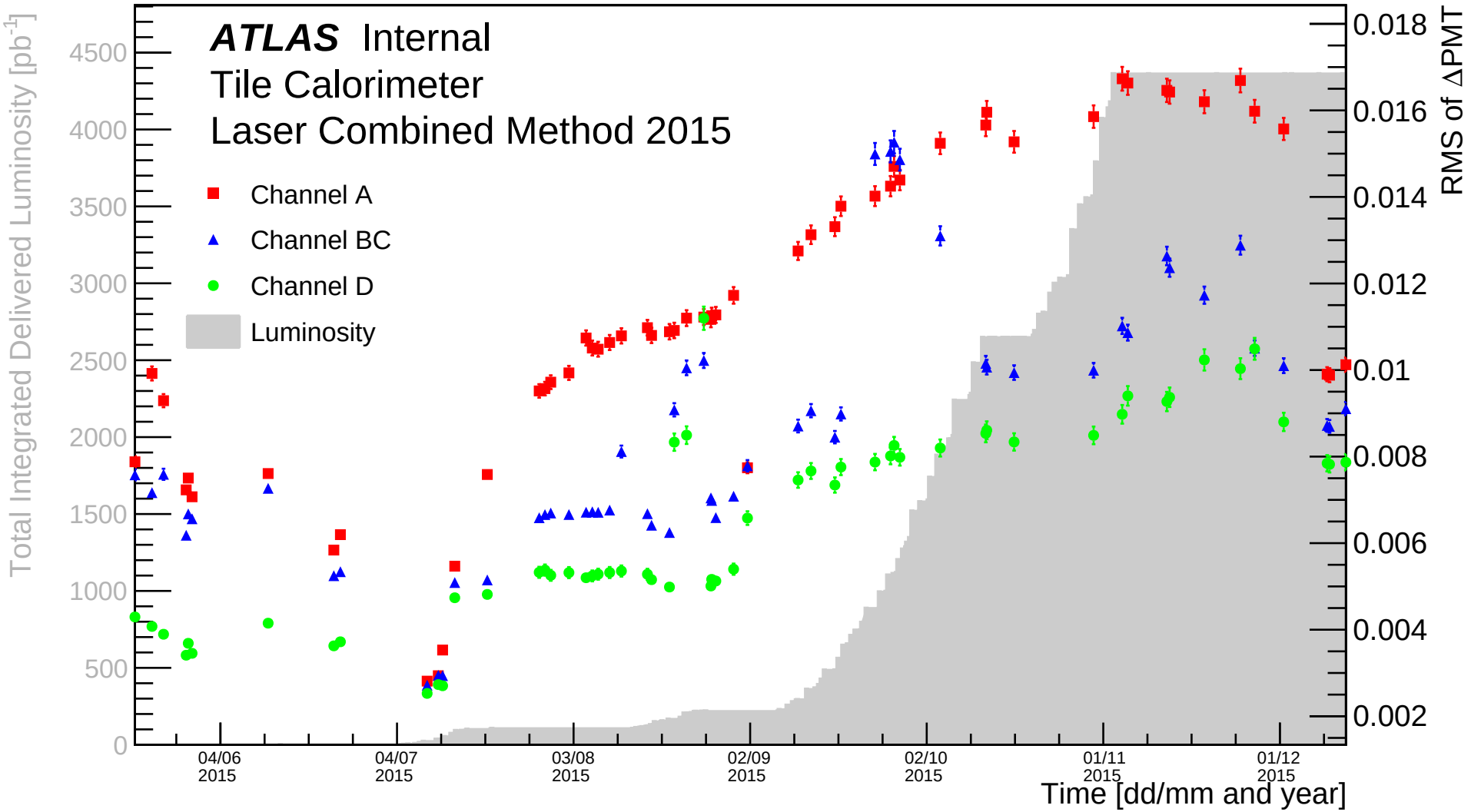
Figure: RMS of the Drift vs Time

NOTE : We will try to understand the jumps encircled above.

Laser runs in 2015



Laser runs in 2015



Laser runs in 2015

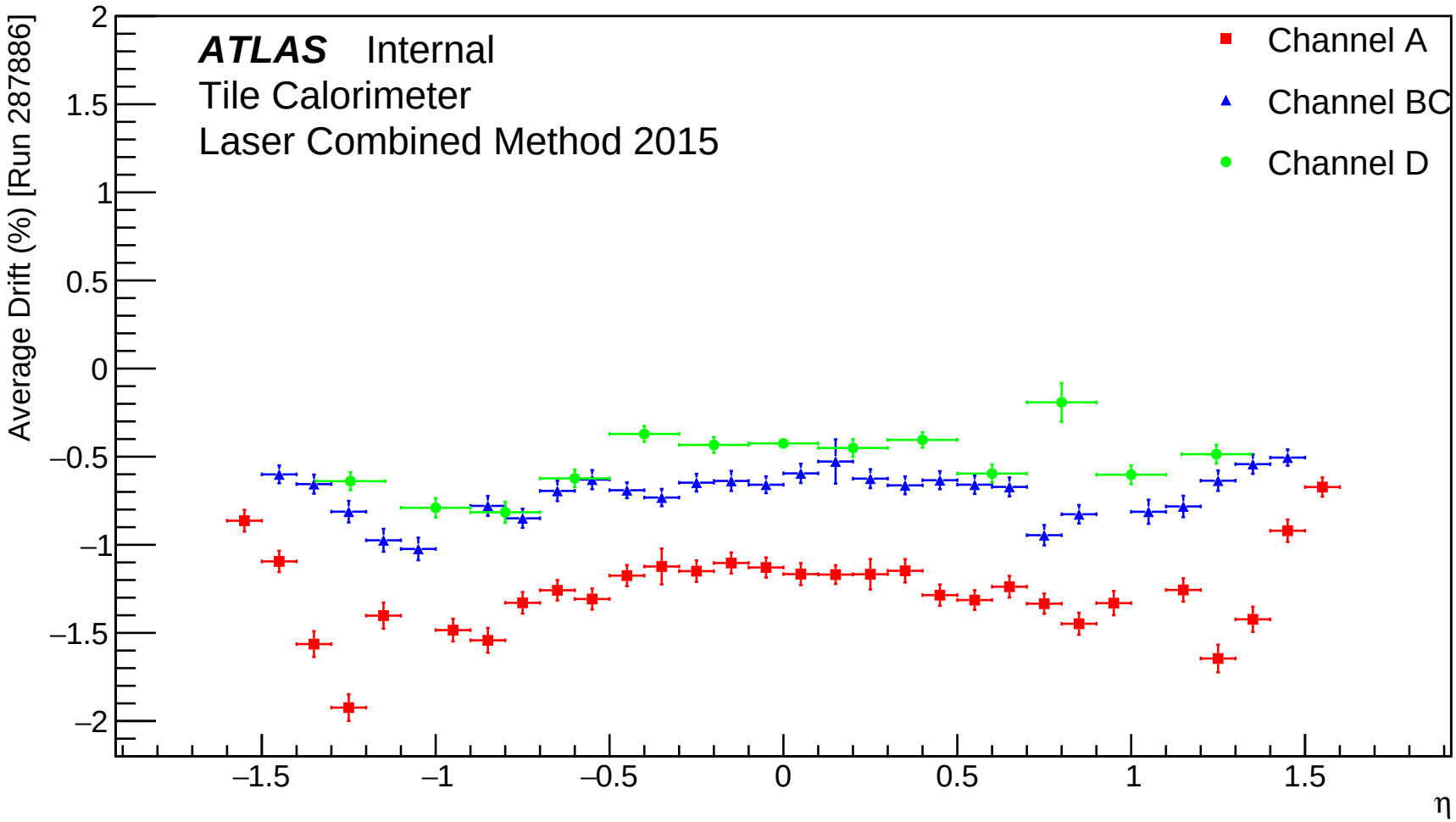


Figure: Average Drift vs η (Dec 12, 2015)

Laser runs in 2015

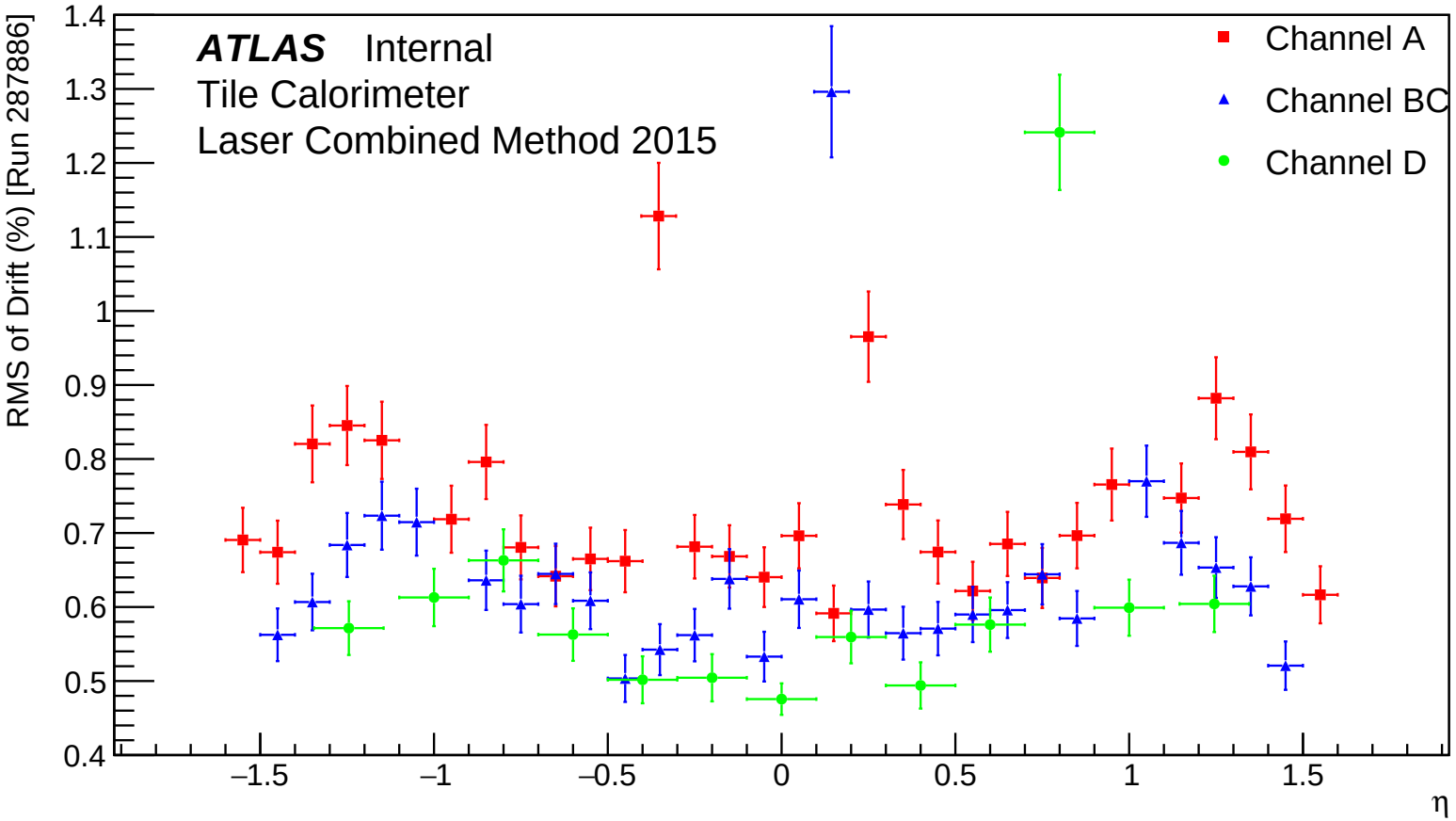
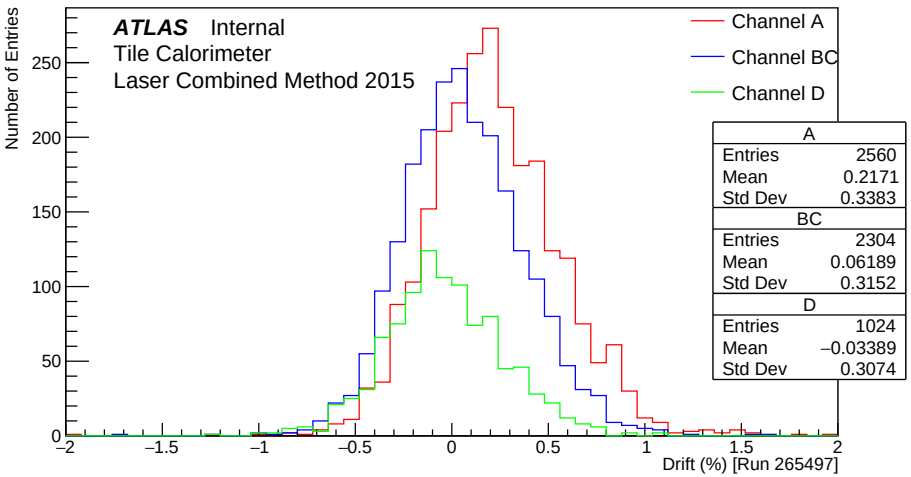


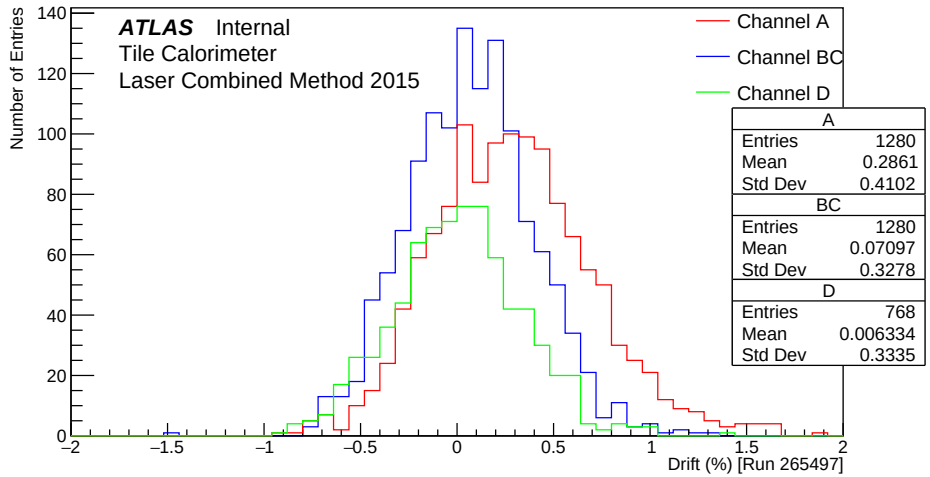
Figure: RMS of Drift vs η (Dec 12, 2015)

NOTE : We will check the cells with large fluctuations.

1-D Distributions for Laser runs in 2015



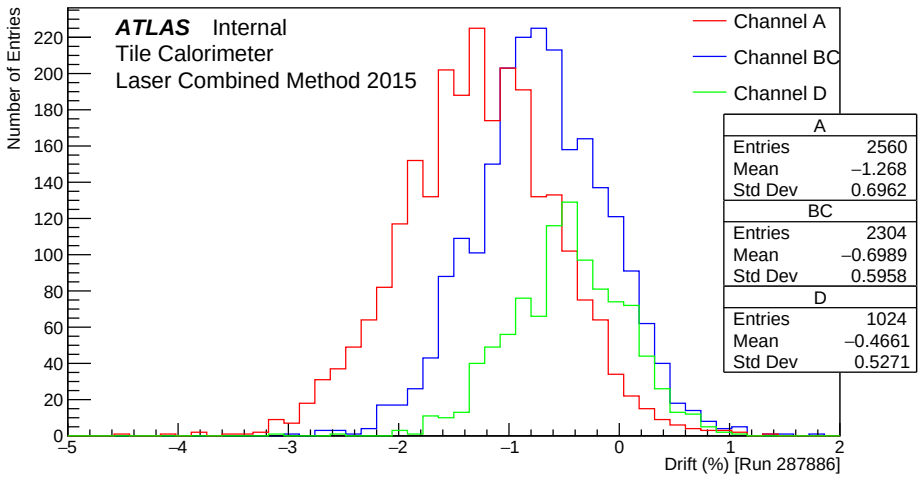
(a) Long Barrel



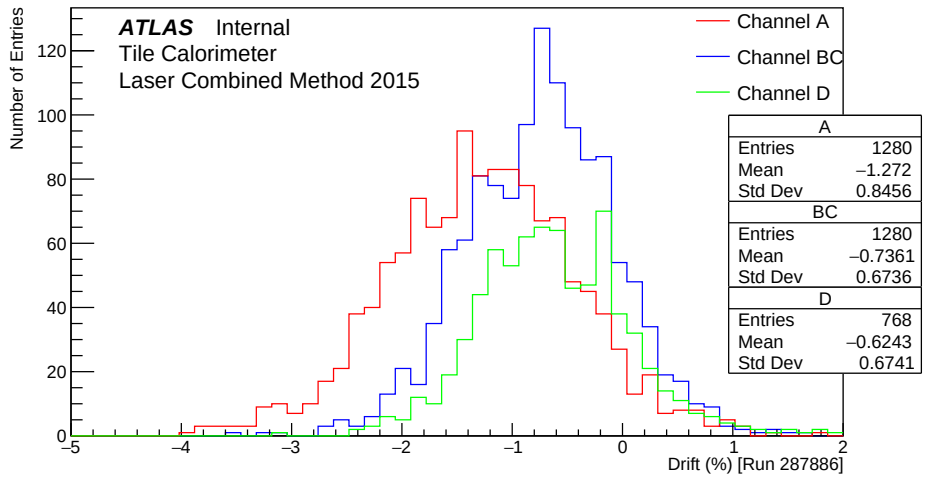
(b) Extended Barrel

Figure: Distribution of Drift (May 20, 2015)

1-D Distributions for Laser runs in 2015



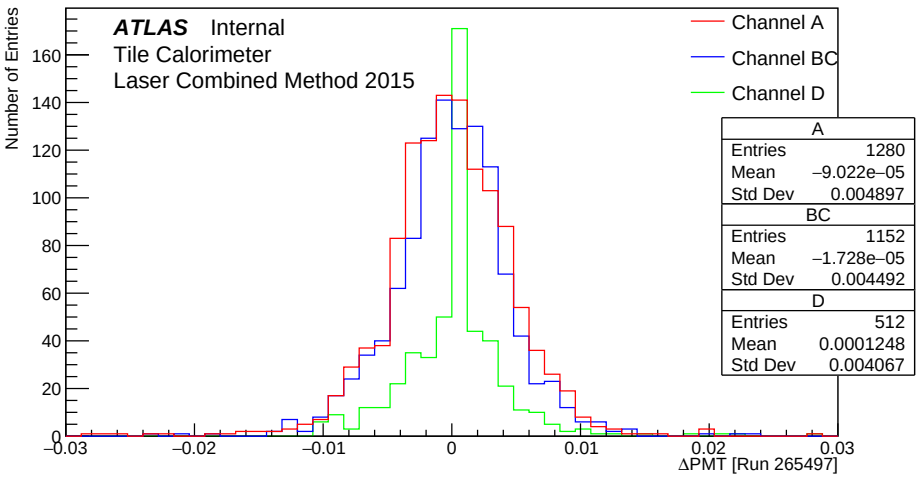
(a) Long Barrel



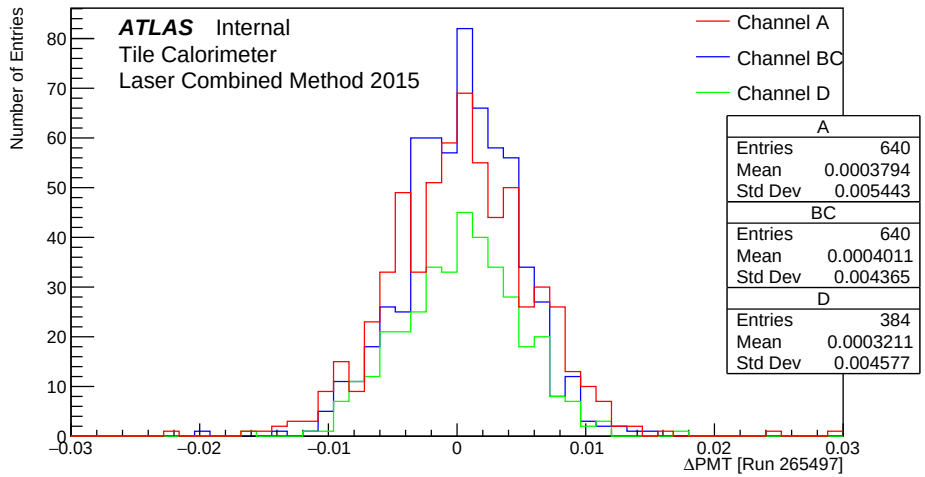
(b) Extended Barrel

Figure: Distribution of Drift (Dec 12, 2015)

1-D Distributions for Laser runs in 2015



(a) Long Barrel

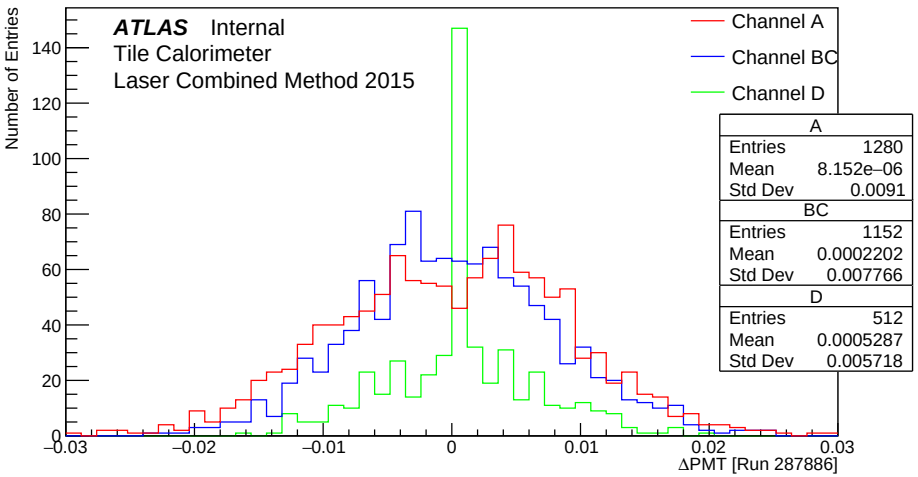


(b) Extended Barrel

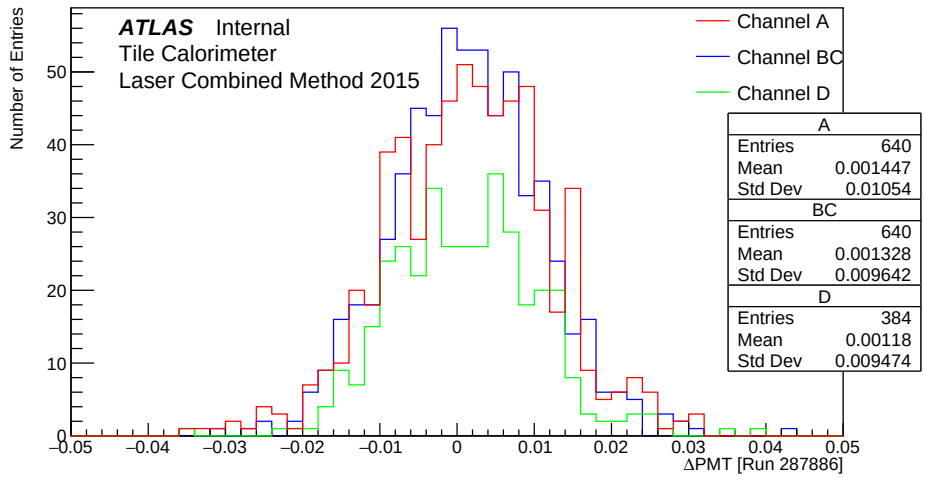
Figure: Distribution of ΔPMT (May 20, 2015)

NOTE : We will try to understand the peak at zero in D-cells in Long barrel.

1-D Distributions for Laser runs in 2015



(a) Long Barrel



(b) Extended Barrel

Figure: Distribution of ΔPMT (Dec 12, 2015)

Laser runs in 2016

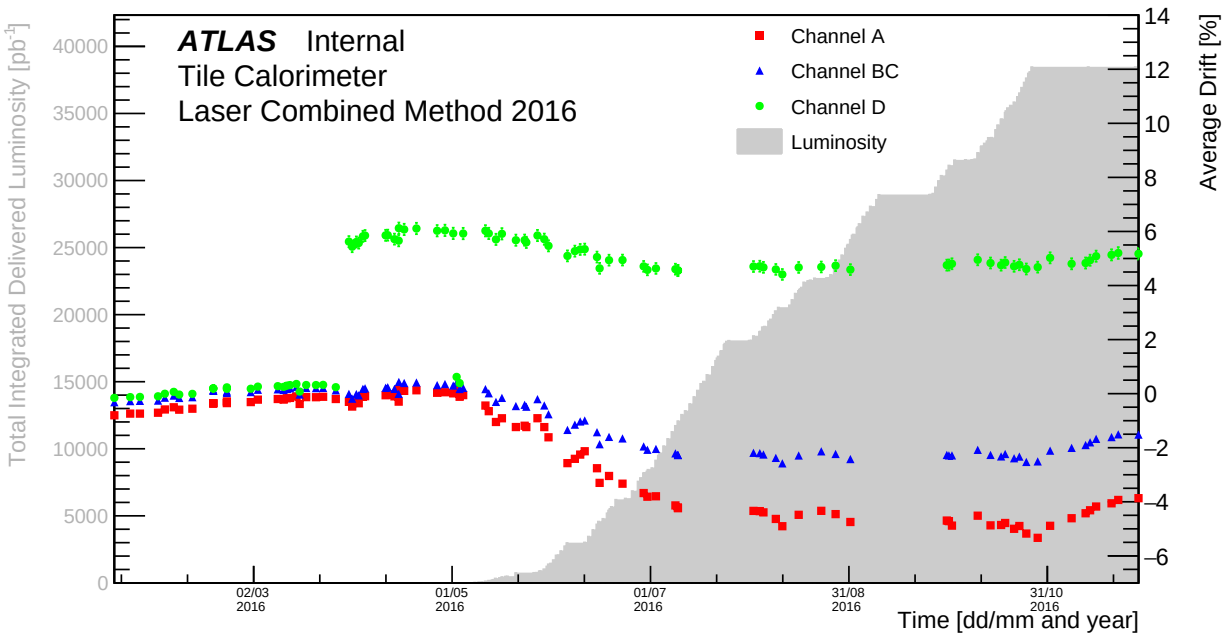


Figure: Average Drift vs Time

- We see jump of the D-cells since the HV was increased for D5 and D6 here.
- Giulia used a single reference (in 2015) for these points too. We'll update to a new reference each year.

Laser runs in 2016

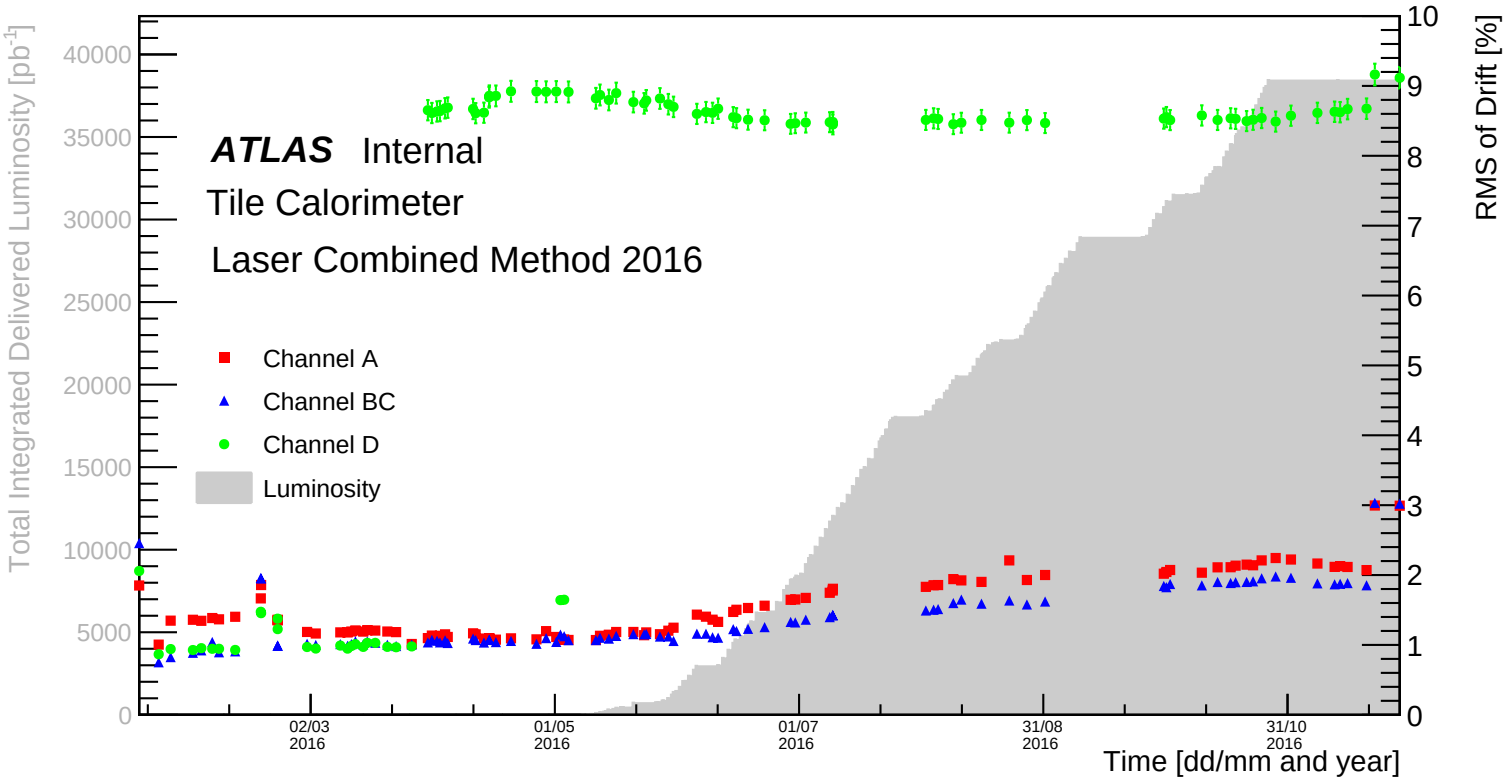
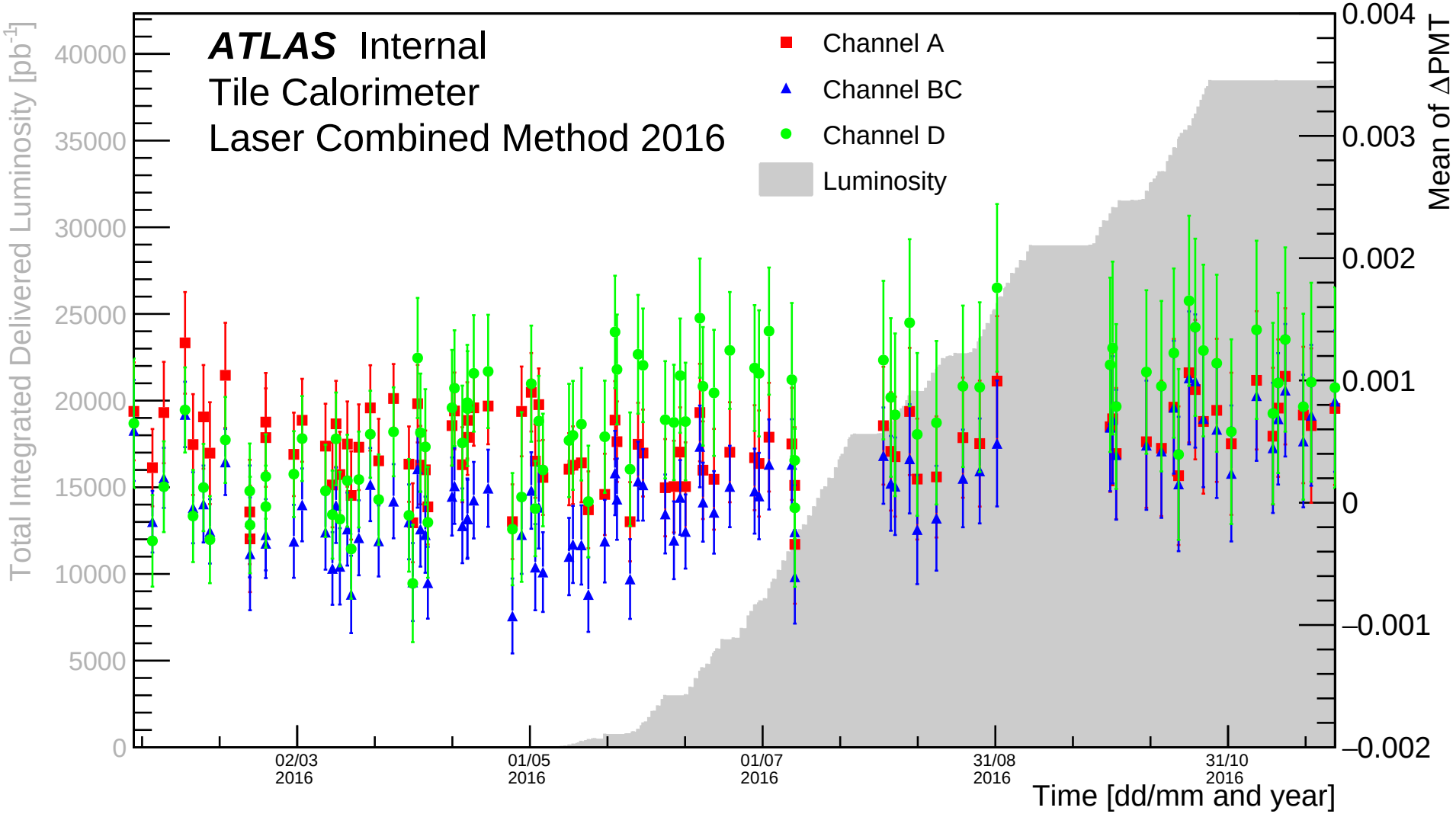


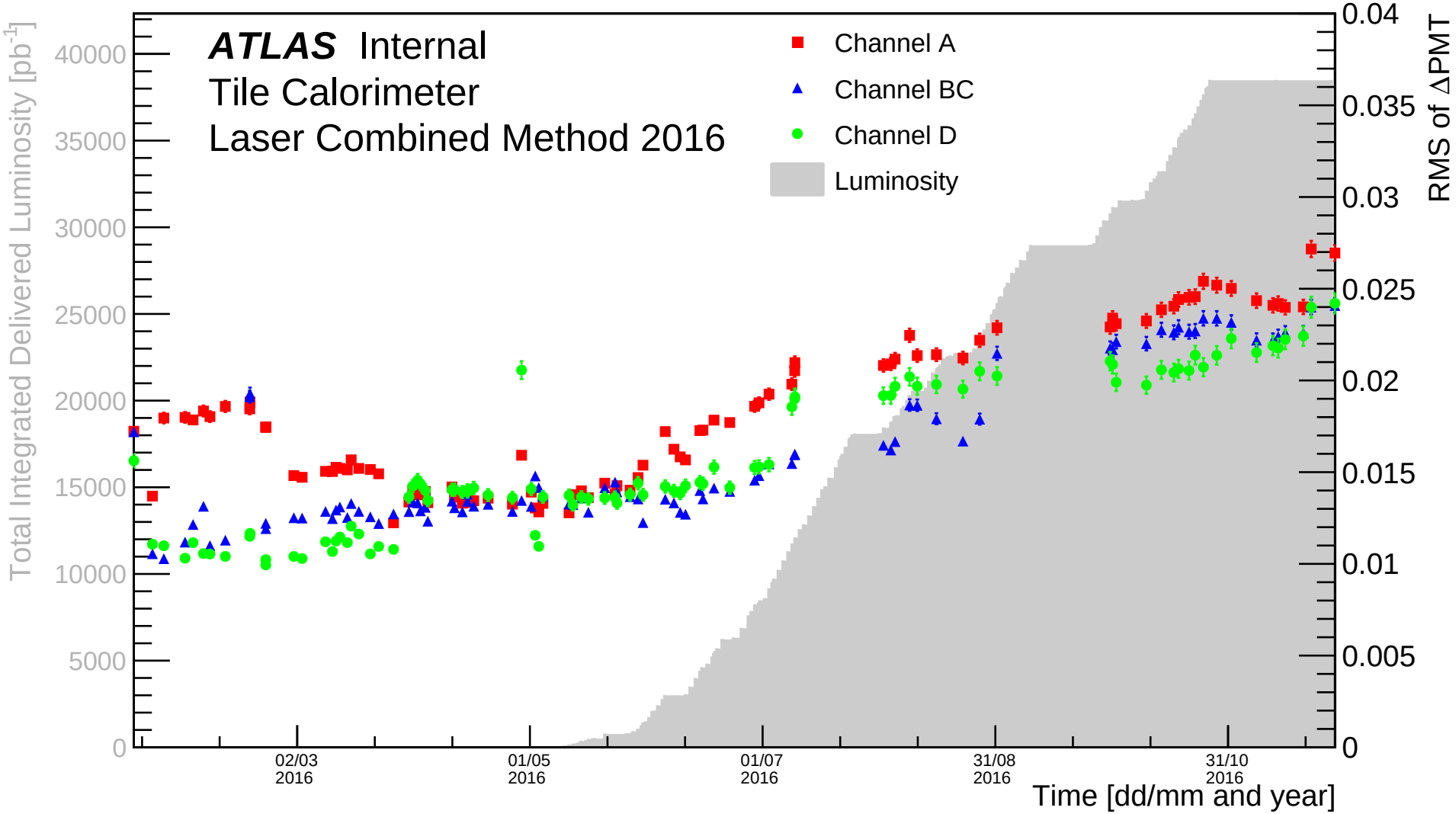
Figure: RMS of the Drift vs Time

NOTE : We see jump of the D-cells since the HV was increased for D5 and D6 here.

Laser runs in 2016



Laser runs in 2016



Laser runs in 2017

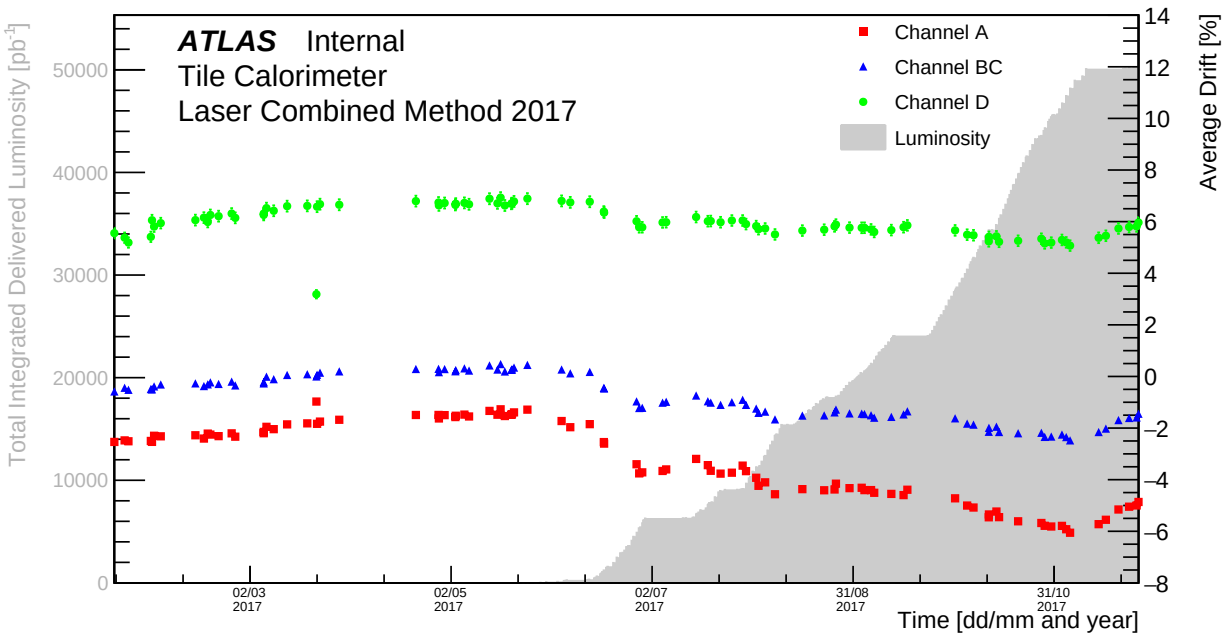


Figure: Average Drift vs Time

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Laser runs in 2017

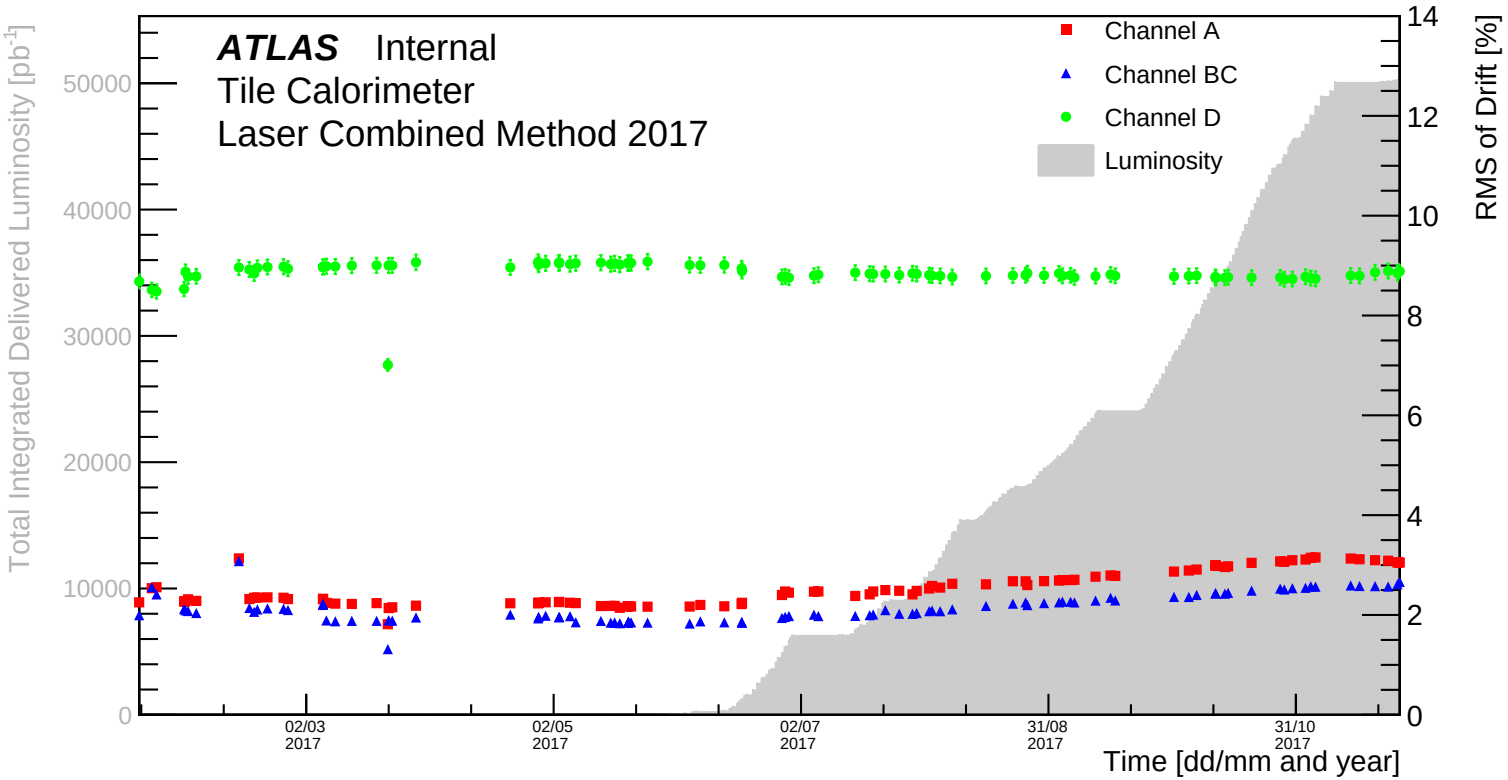
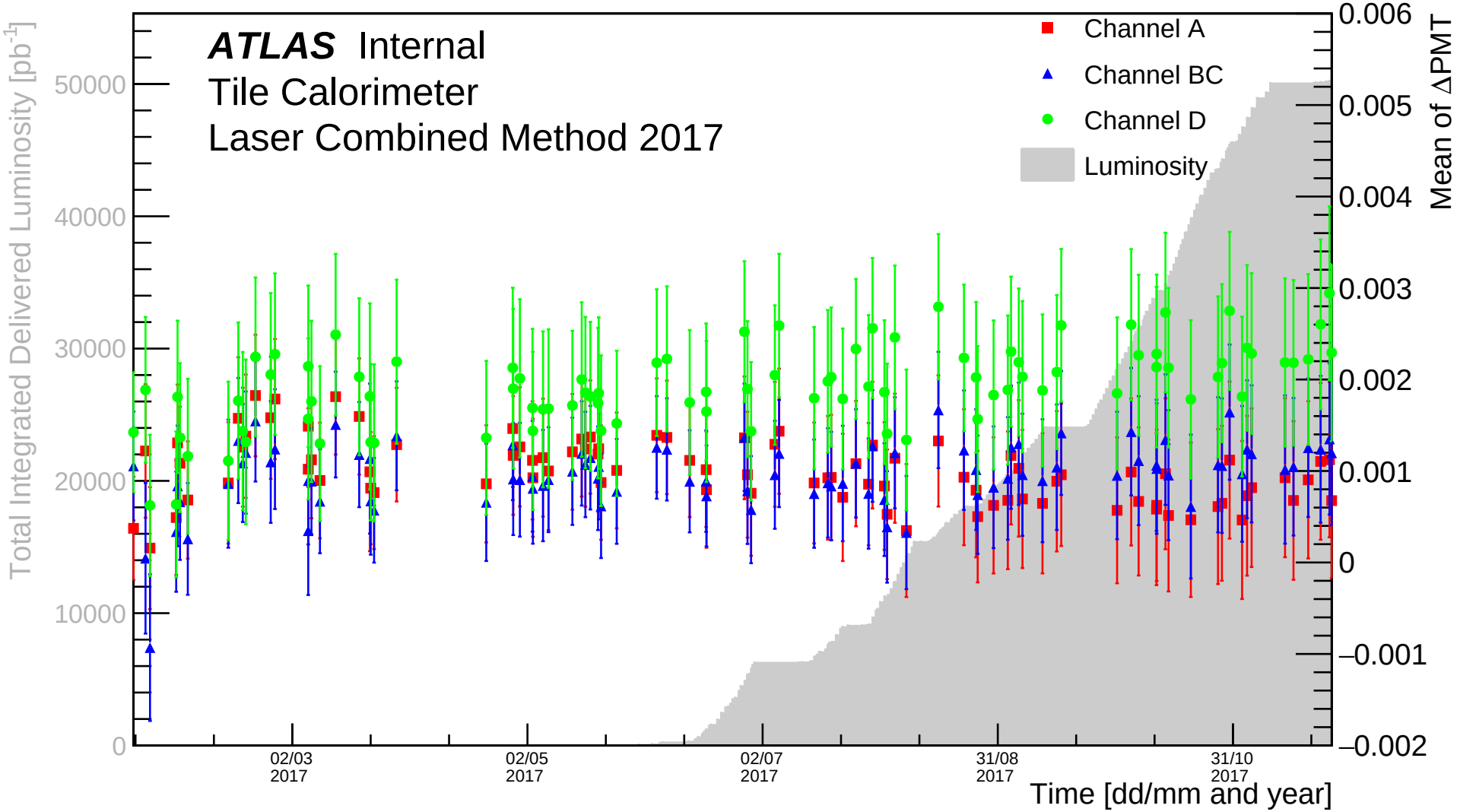


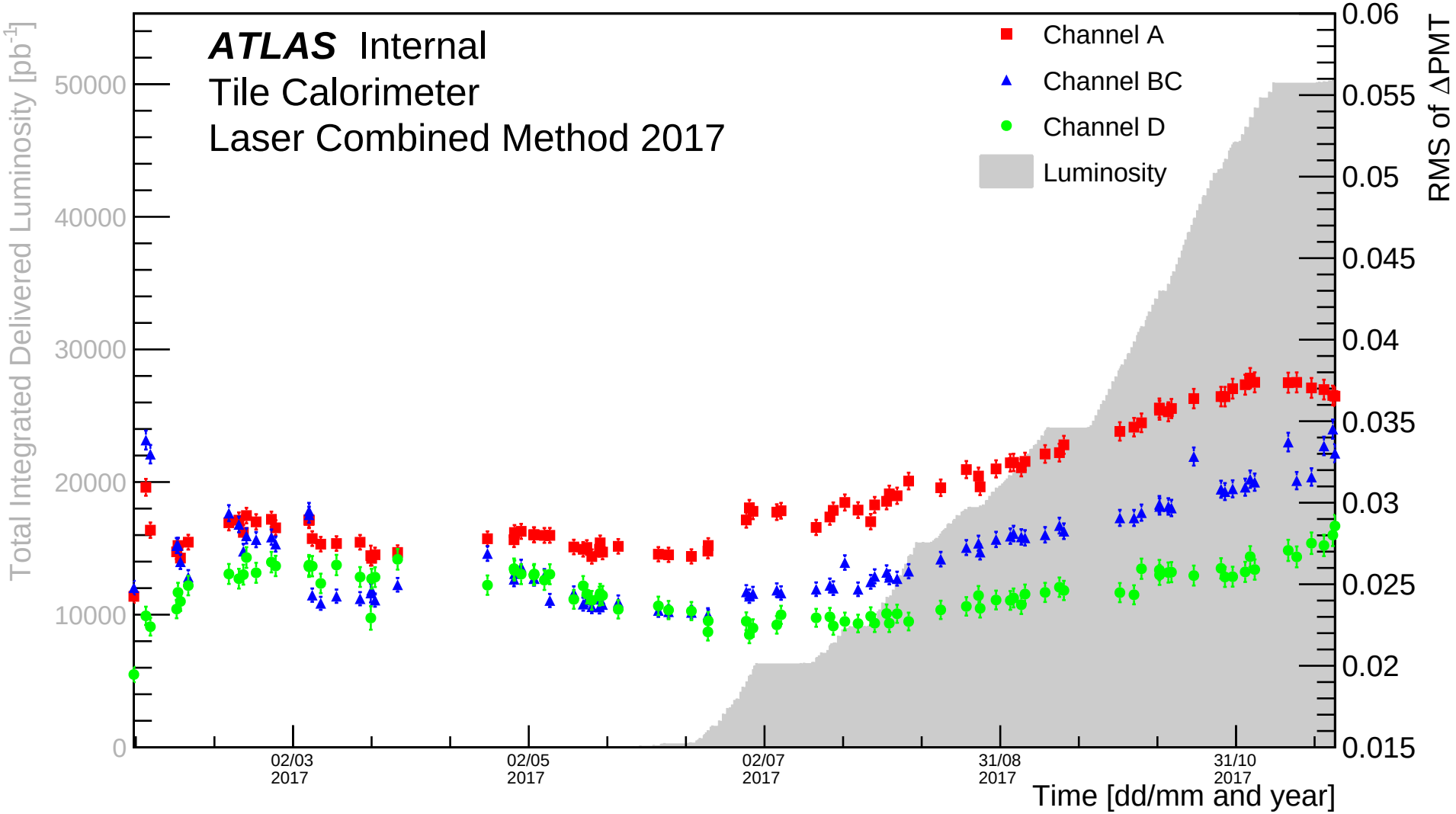
Figure: RMS of the Drift vs Time

NOTE : We see jump of the D-cells since the HV was increased for D5 and D6 here.

Laser runs in 2017

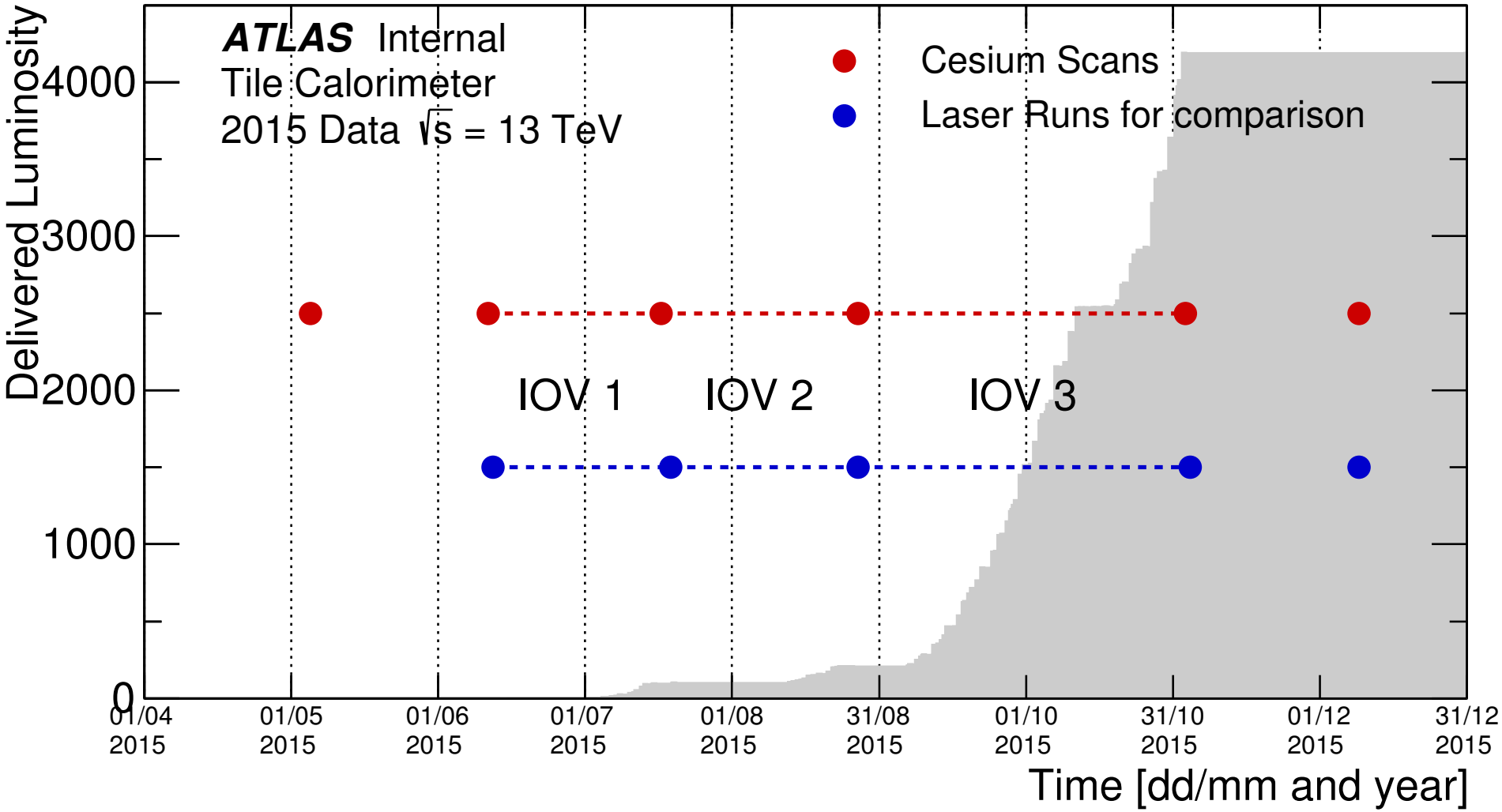


Laser runs in 2017

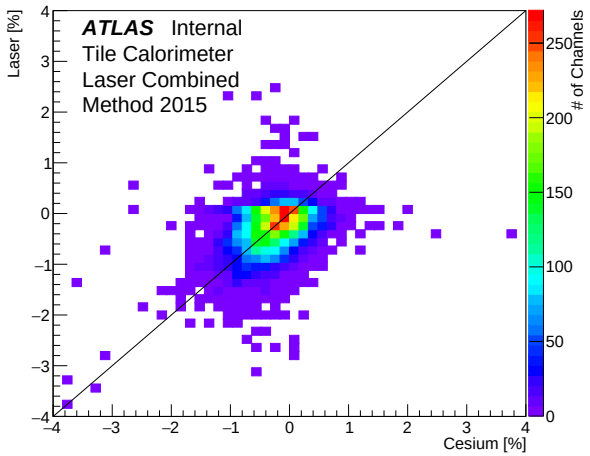


Comparison against Cesium

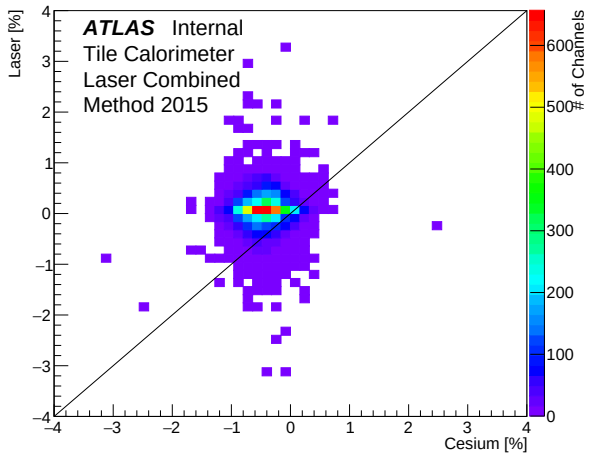
Reminding about the IOV's



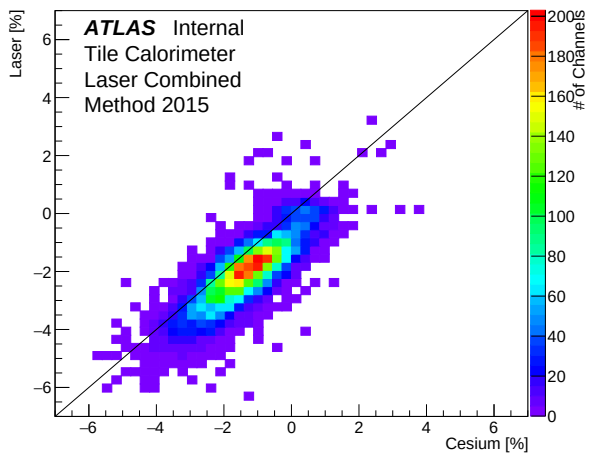
Laser vs Cesium Scans in 2015



(a) IOV 1



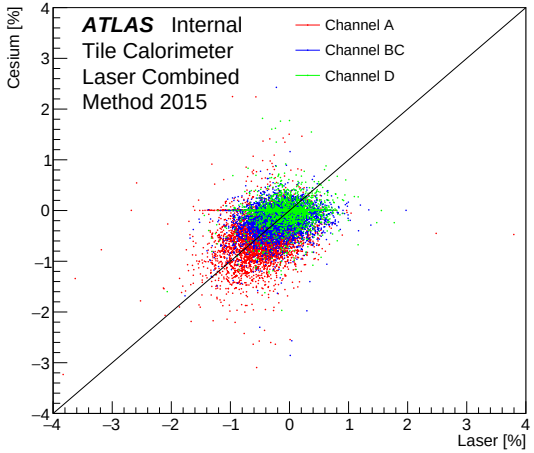
(b) IOV 2



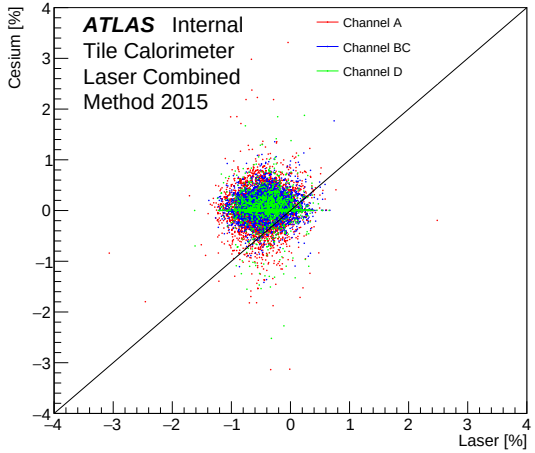
(c) IOV 3

Figure: Laser vs Cesium drift for all instrumented channels

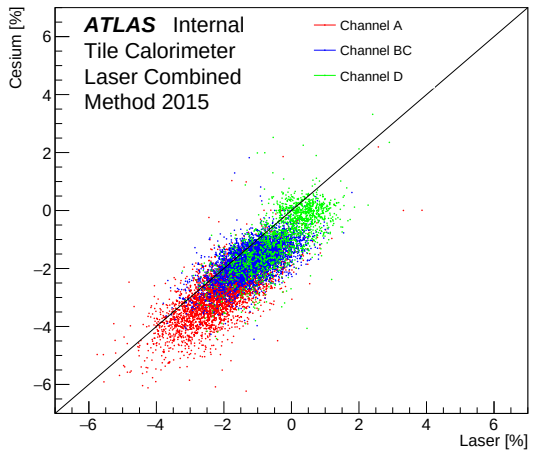
Laser vs Cesium Scans in 2015



(a) IOV 1



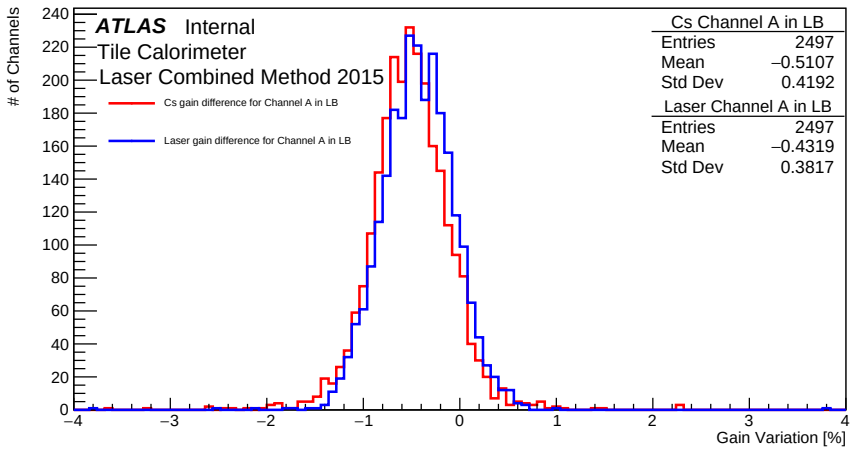
(b) IOV 2



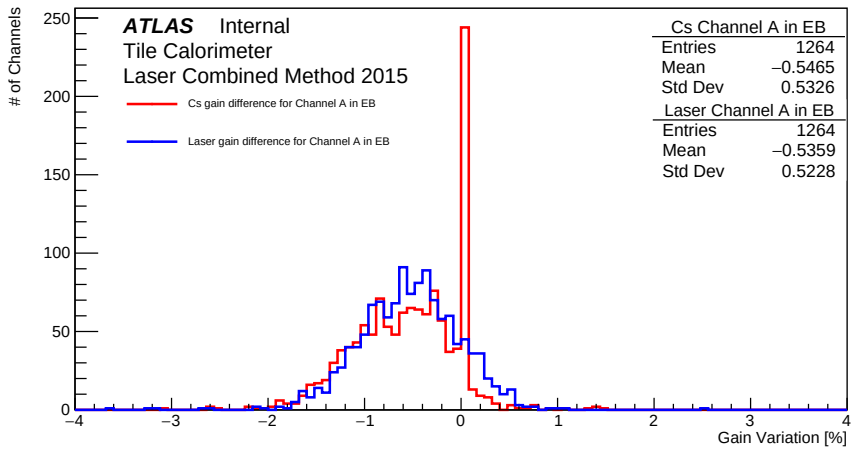
(c) IOV 3

Figure: Laser vs Cesium drift for different types of channels

Laser vs Cesium Scans in 2015



(a) Long Barrel

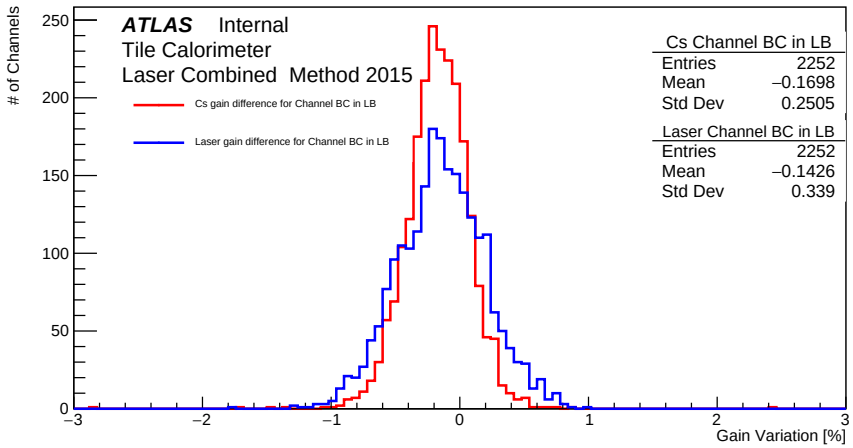


(b) Extended Barrel

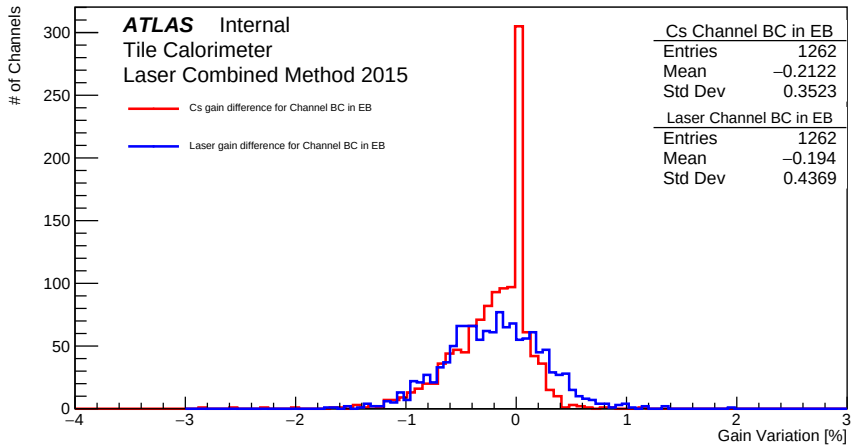
Figure: Laser and Cesium gain variation for A channels IOV 1

NOTE : We are investigating which channels return a zero variation in the cesium drift for these IOV's.

Laser vs Cesium Scans in 2015



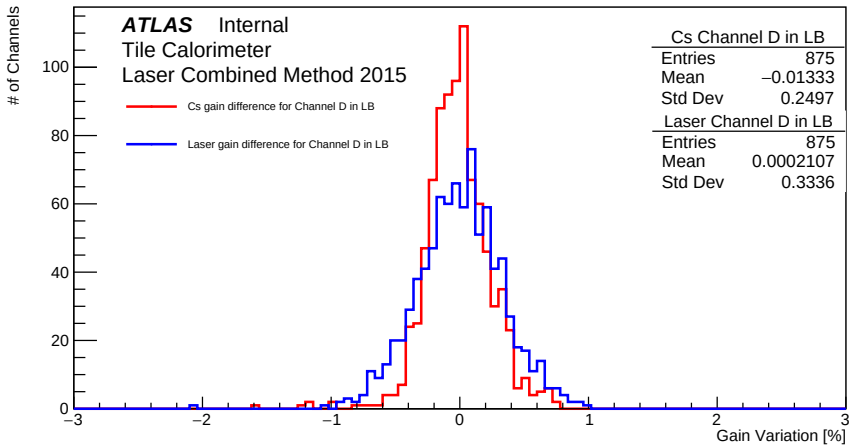
(a) Long Barrel



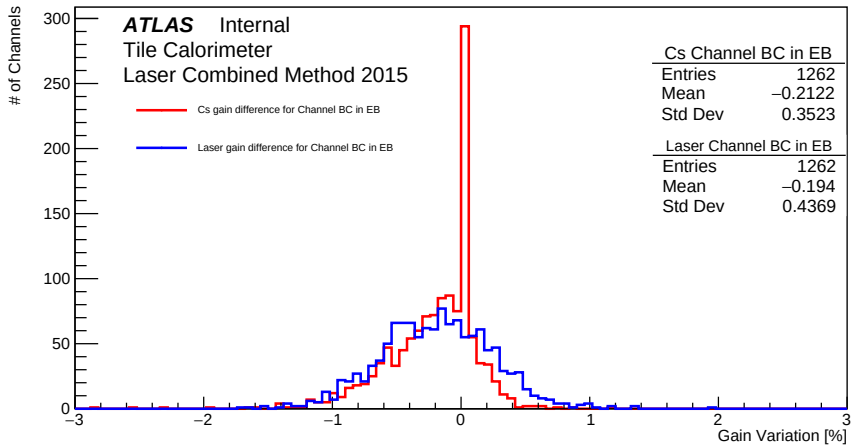
(b) Extended Barrel

Figure: Laser and Cesium gain variation for BC channels IOV 1

Laser vs Cesium Scans in 2015



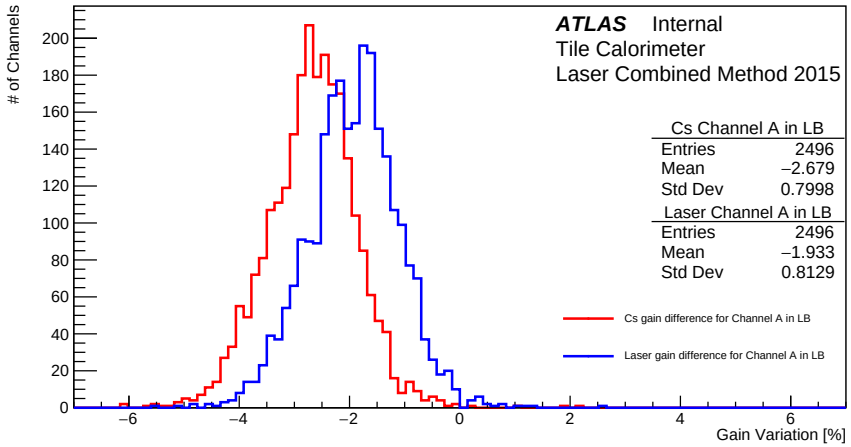
(a) Long Barrel



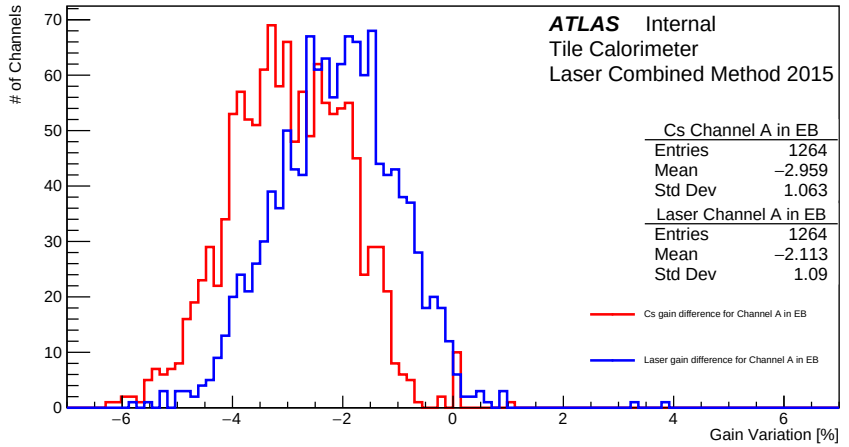
(b) Extended Barrel

Figure: Laser and Cesium gain variation for D channels IOV 1

Laser vs Cesium Scans in 2015



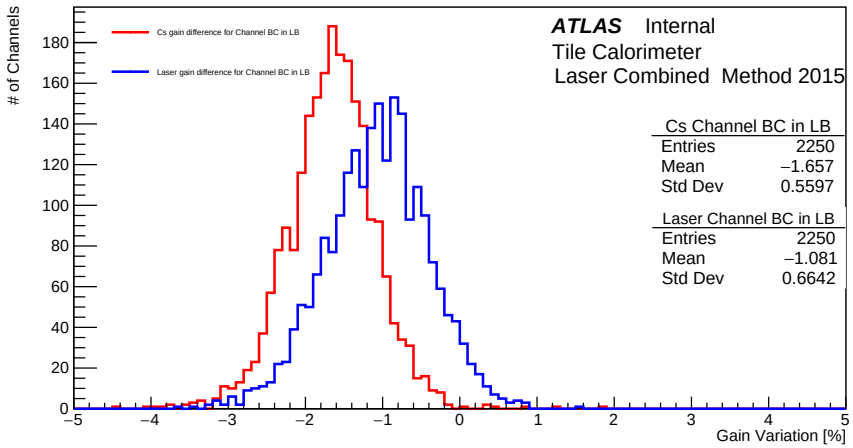
(a) Long Barrel



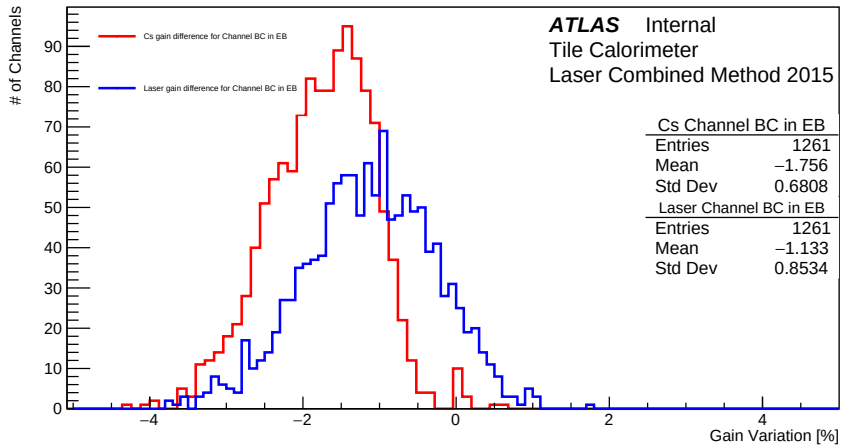
(b) Extended Barrel

Figure: Laser and Cesium gain variation for A channels IOV 3

Laser vs Cesium Scans in 2015



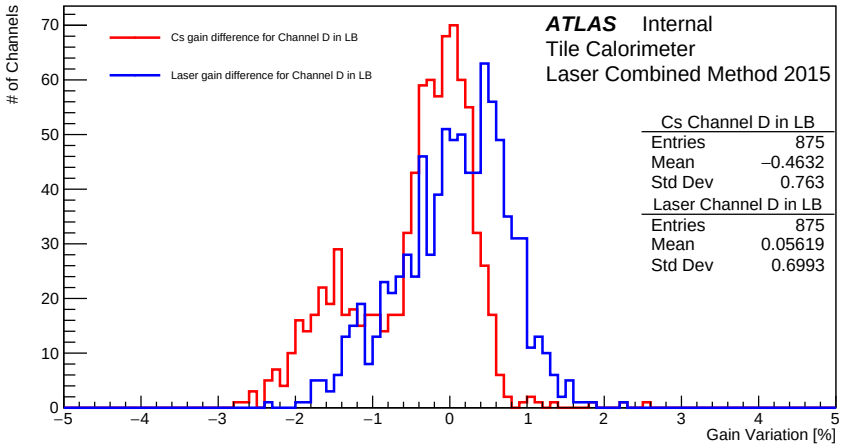
(a) Long Barrel



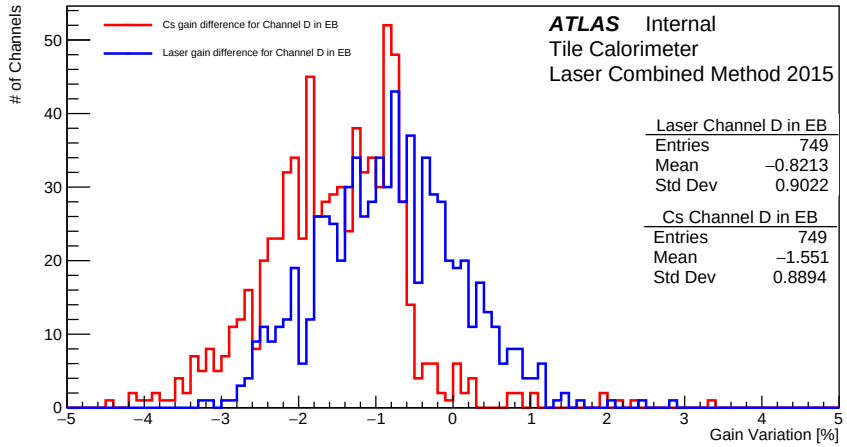
(b) Extended Barrel

Figure: Laser and Cesium gain variation for BC channels IOV 3

Laser vs Cesium Scans in 2015



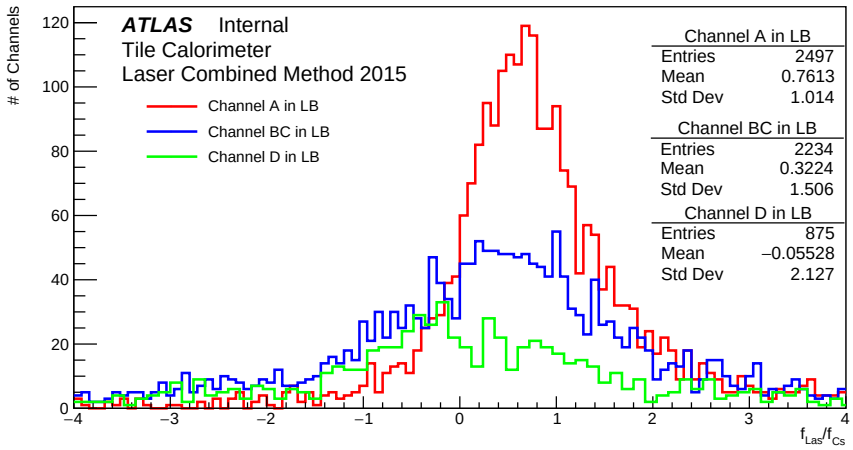
(a) Long Barrel



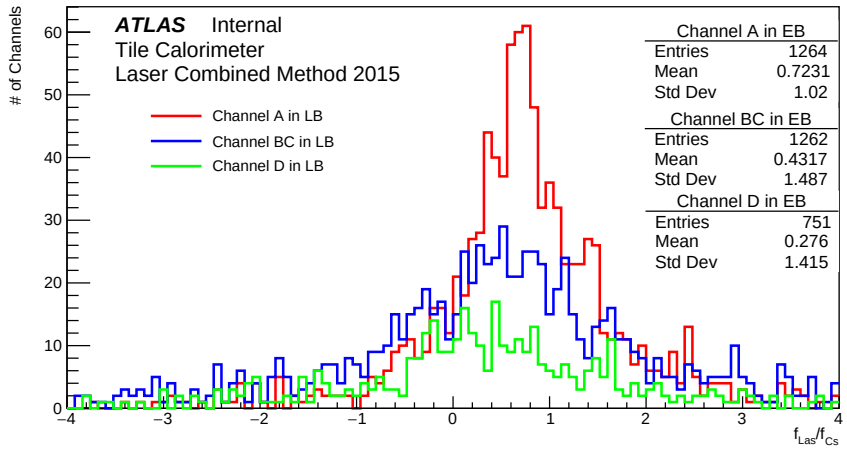
(b) Extended Barrel

Figure: Laser and Cesium gain variation for D channels IOV 3

Laser vs Cesium Scans in 2015



(a) Long Barrel

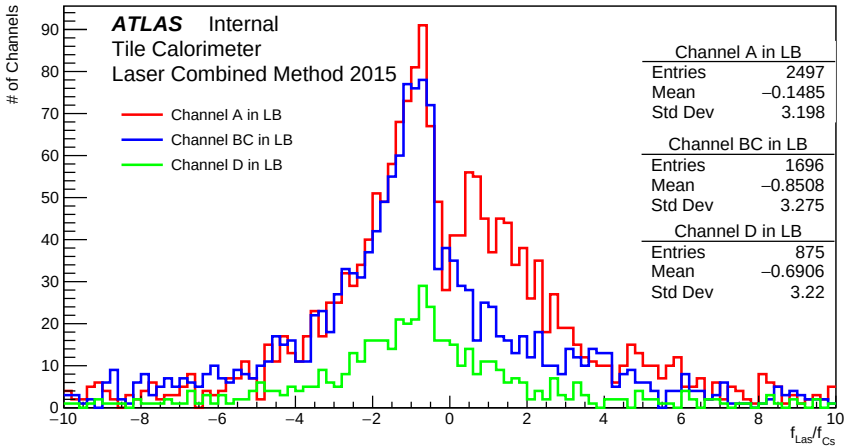


(b) Extended Barrel

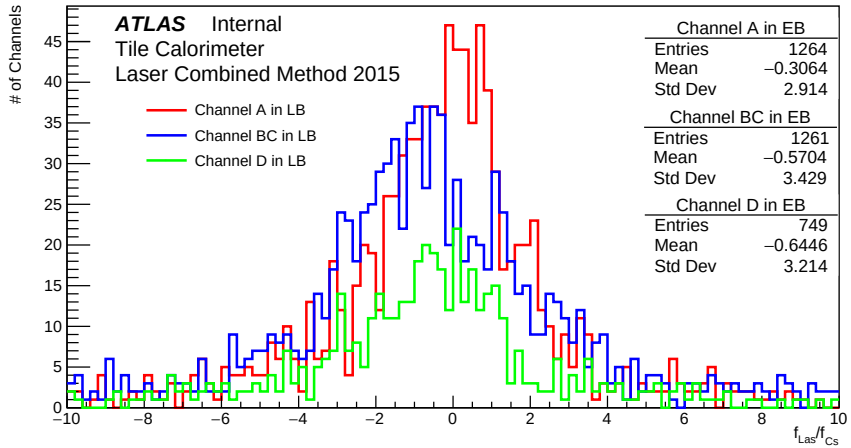
Figure: Fraction of Laser and Cesium gain variation IOV 1

- The goal is to do a similar study as done for run 1 laser data by Djamel, Dominique and Emmanuelle.
- For reference see the following document.

Laser vs Cesium Scans in 2015



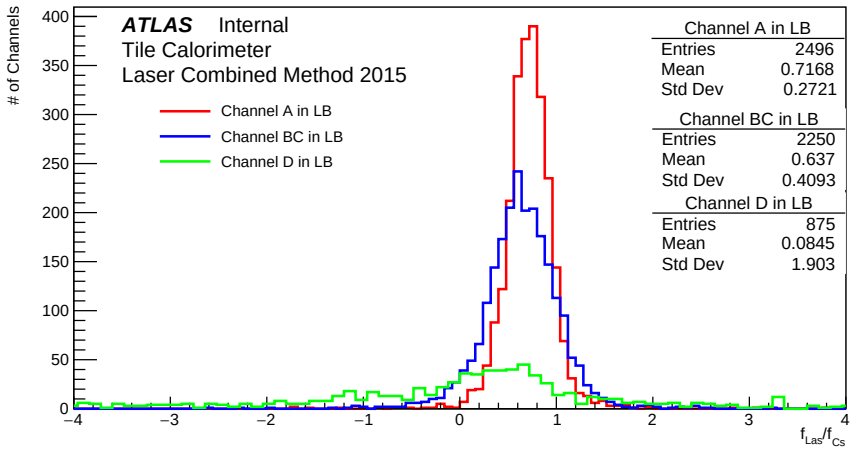
(a) Long Barrel



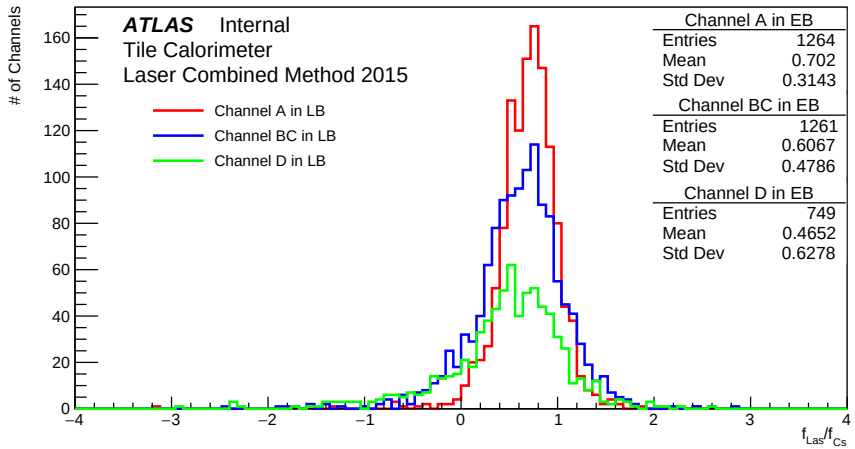
(b) Extended Barrel

Figure: Fraction of Laser and Cesium gain variation IOV 2

Laser vs Cesium Scans in 2015



(a) Long Barrel



(b) Extended Barrel

Figure: Fraction of Laser and Cesium gain variation IOV 3

Outlook

We will continue this study.

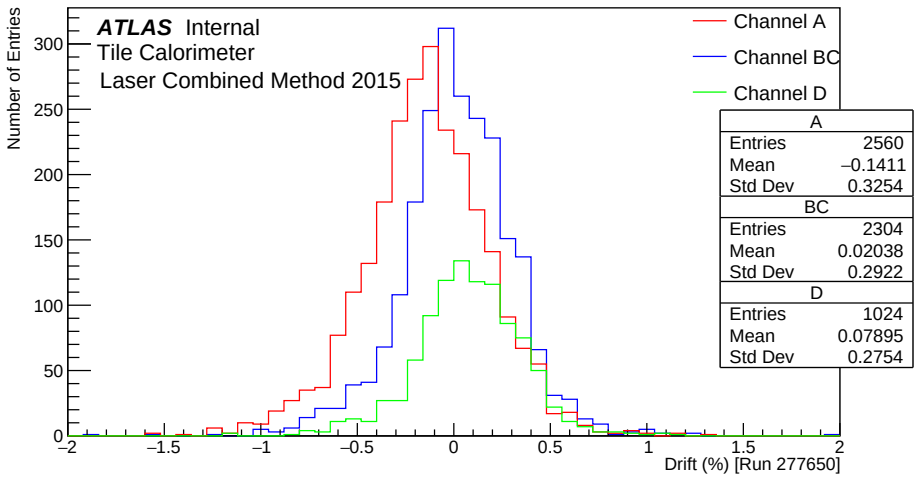
- Update the laser calibration files with the latest and greatest version of the code (including latest developments by Henric)
- Include a comparison Cesium-Laser for 2016 and 2017 (covering the full year)
- Doing similar checks for the direct method (CF). Djamel/Nazlim will kindly provide the data for this (so it includes the latest developments).
- The ultimate goal of this is to extract conclusions from the comparison with Cesium measurements and approve plots for public use.

Comments or Questions ?

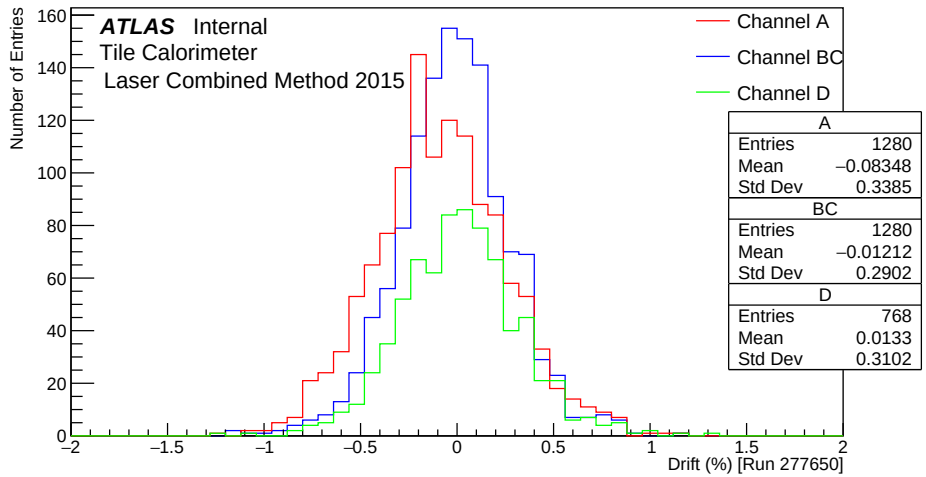
Thank you for your attention!

Backup Slides

1-D Distributions for Laser runs in 2015



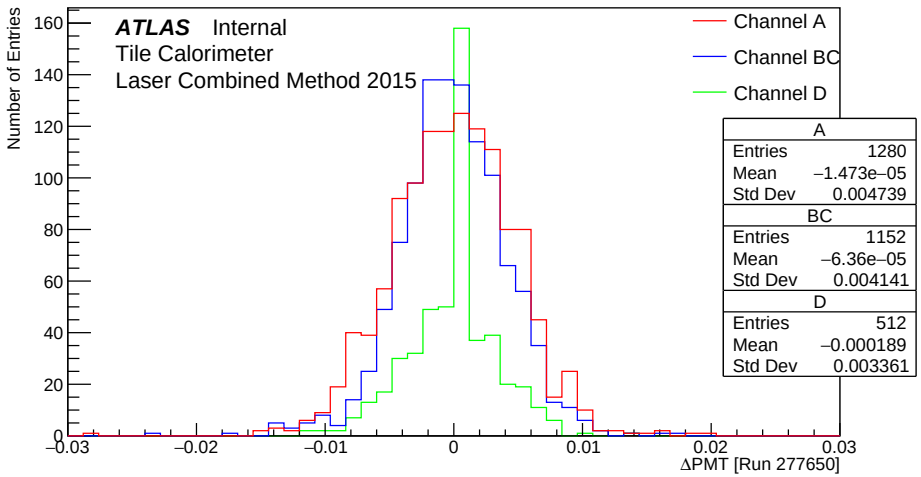
(a) Long Barrel



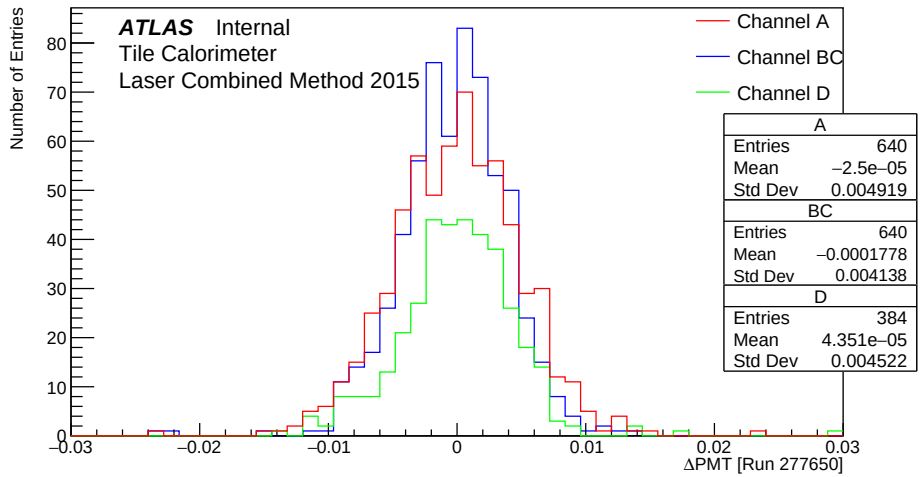
(b) Extended Barrel

Figure: Distribution of Drift (Aug 30, 2015)

1-D Distributions for Laser runs in 2015



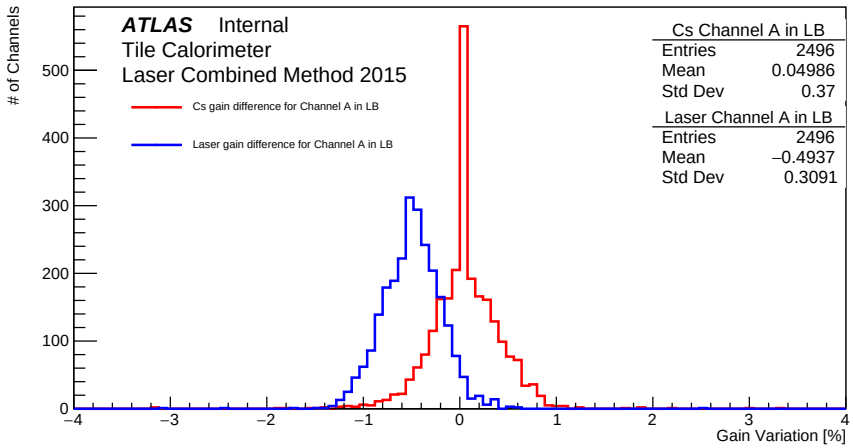
(a) Long Barrel



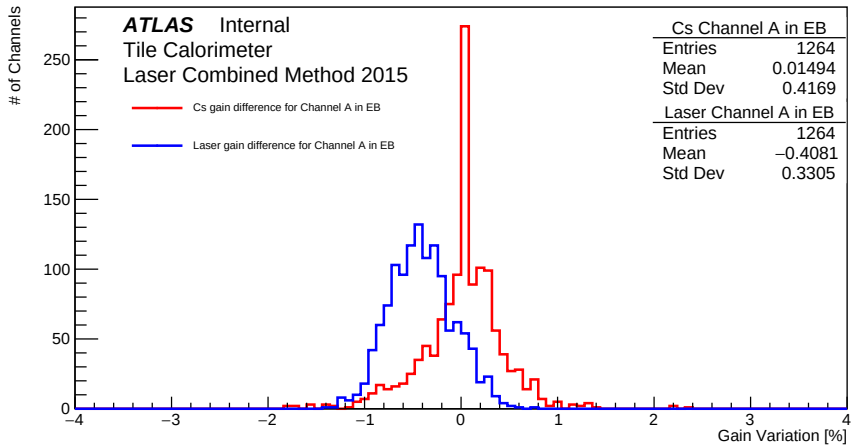
(b) Extended Barrel

Figure: Distribution of ΔPMT (Aug 30, 2015)

Laser vs Cesium Scans in 2015



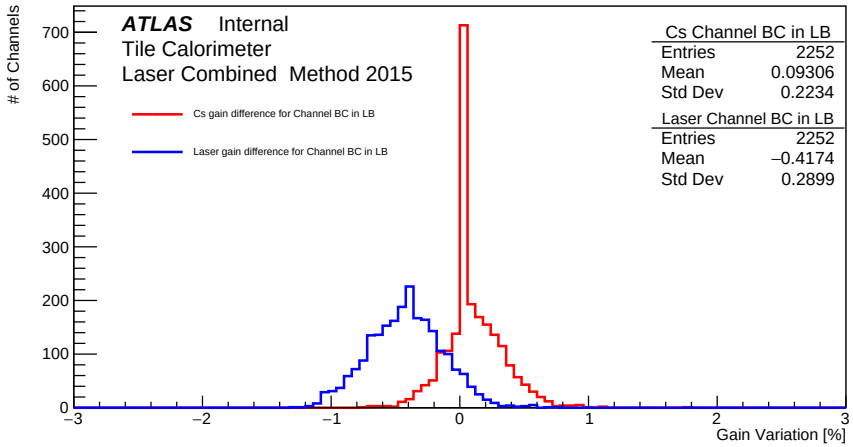
(a) Long Barrel



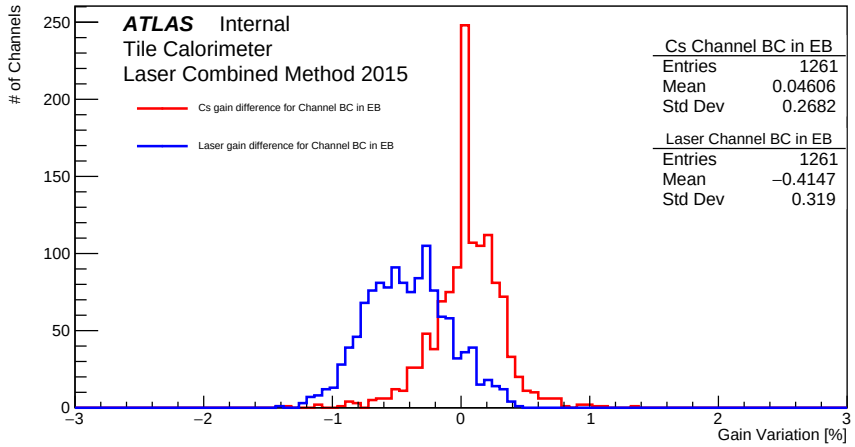
(b) Extended Barrel

Figure: Laser and Cesium gain variation for A channels IOV 2

Laser vs Cesium Scans in 2015



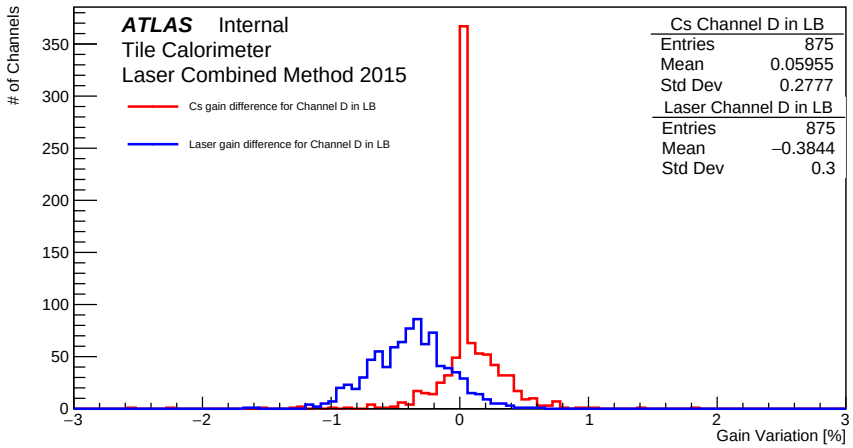
(a) Long Barrel



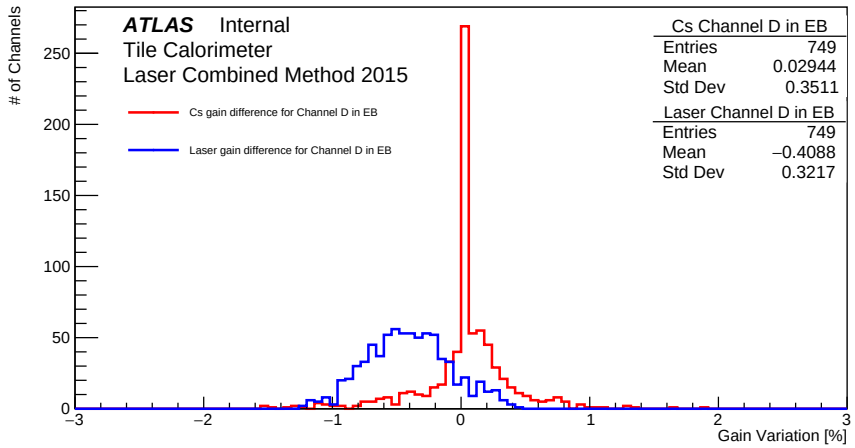
(b) Extended Barrel

Figure: Laser and Cesium gain variation for BC channels IOV 2

Laser vs Cesium Scans in 2015



(a) Long Barrel



(b) Extended Barrel

Figure: Laser and Cesium gain variation for D channels IOV 2

Reference plots

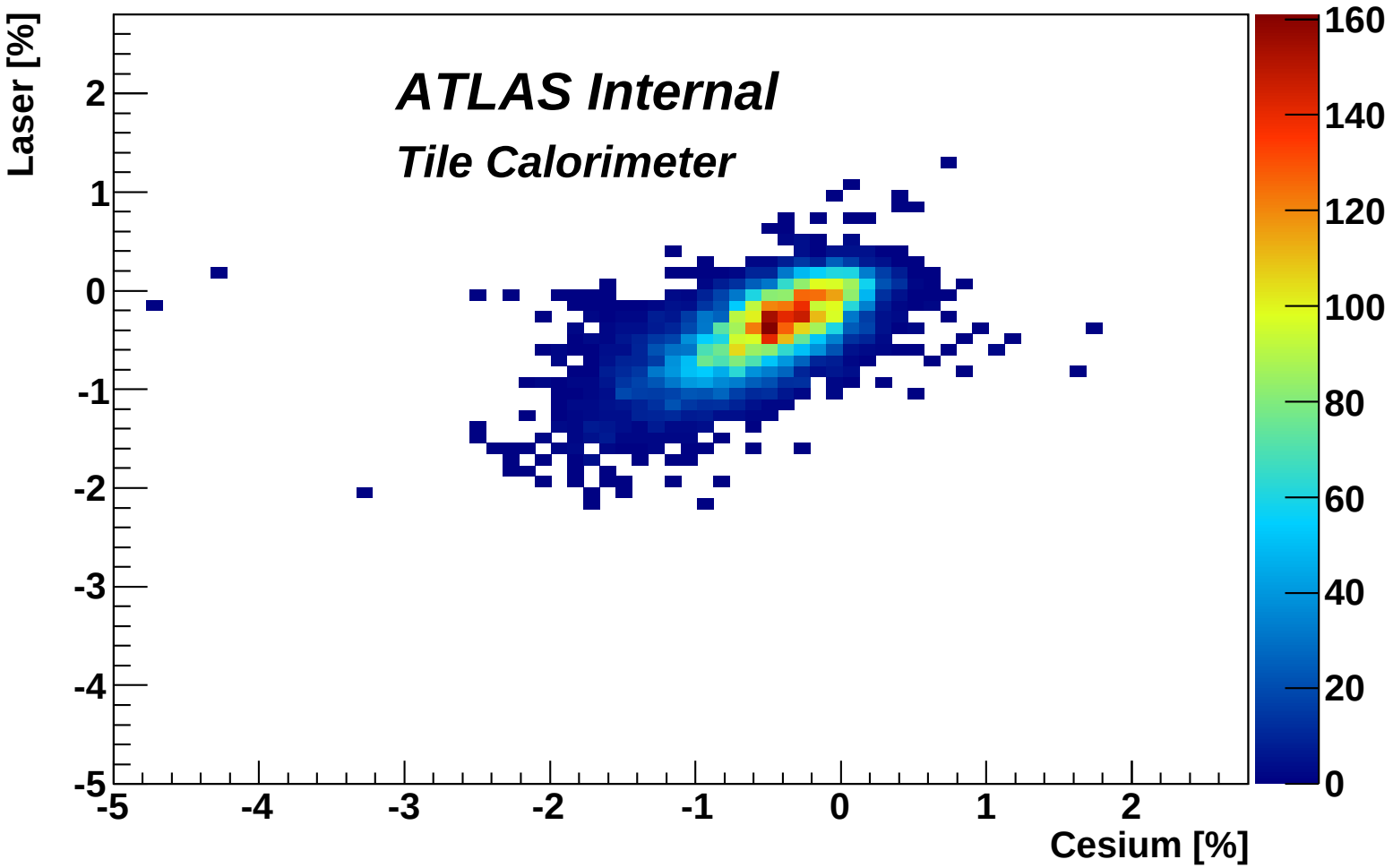
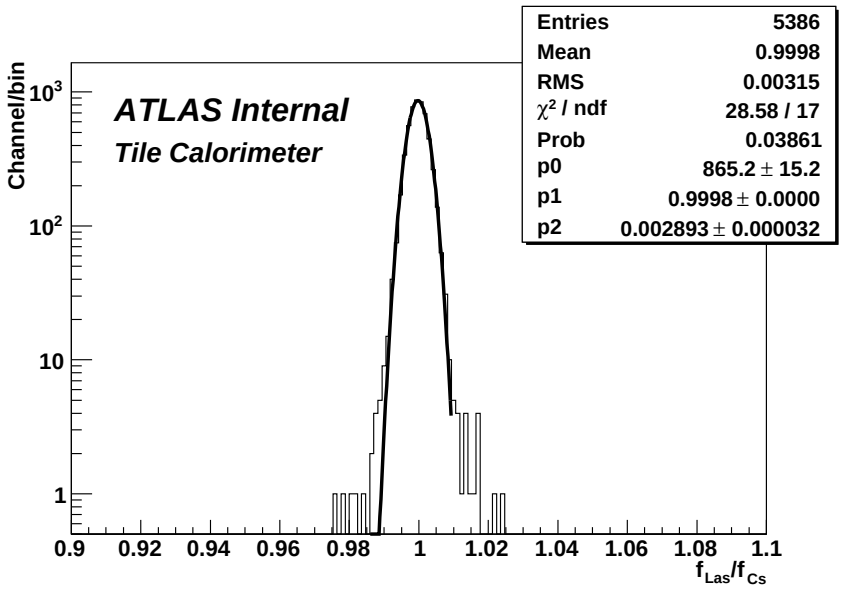


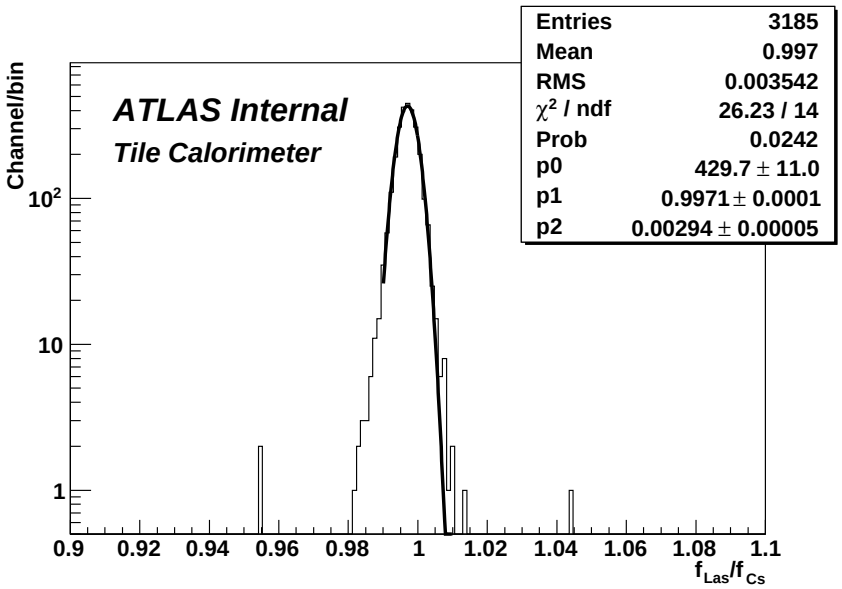
Figure: Gain variation in Cesium vs Gain variation in Laser

This plot is taken from the document referred in slide 35.

Reference plots



(a) for long barrels



(b) for extended barrels

Figure: Distribution of the ratio f_{Las}/f_{Cs}

This plot is taken from the document referred in slide 35.