Commissioning the MICE Trackers

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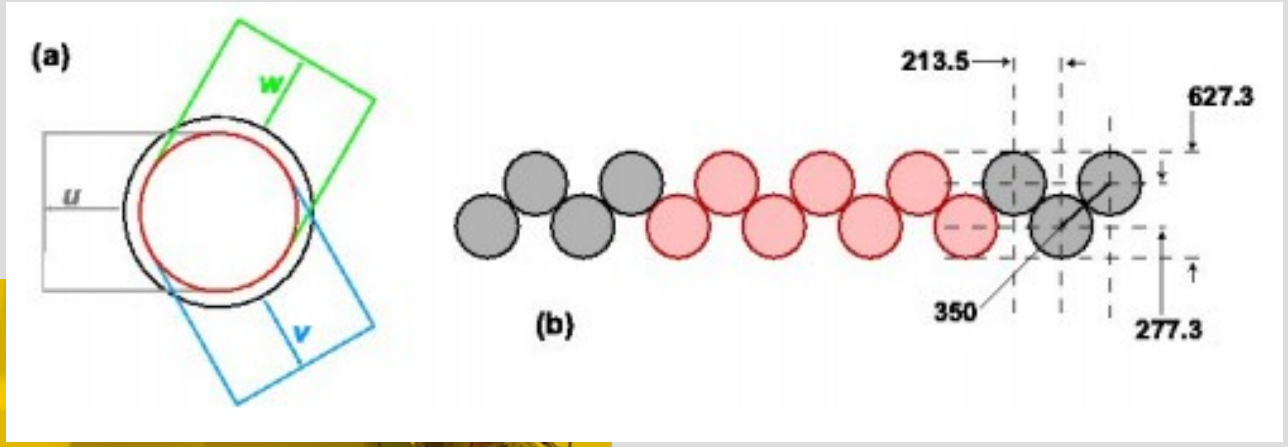
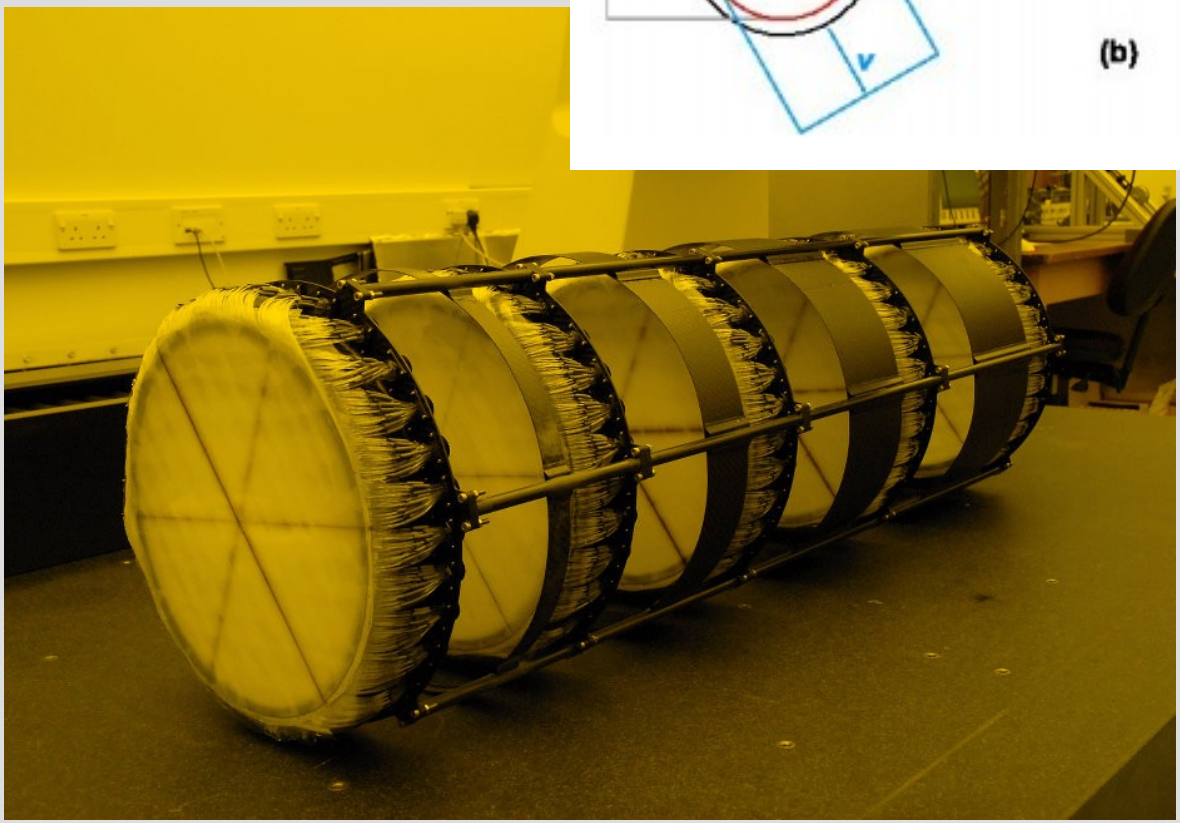
The MICE Trackers





5 Stations

3 Planes / Station

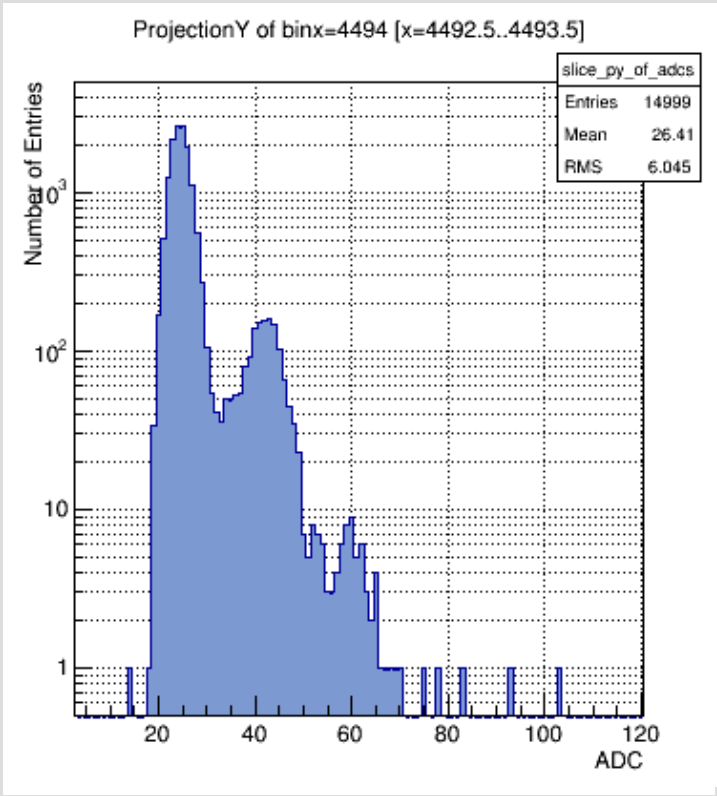
Timeline

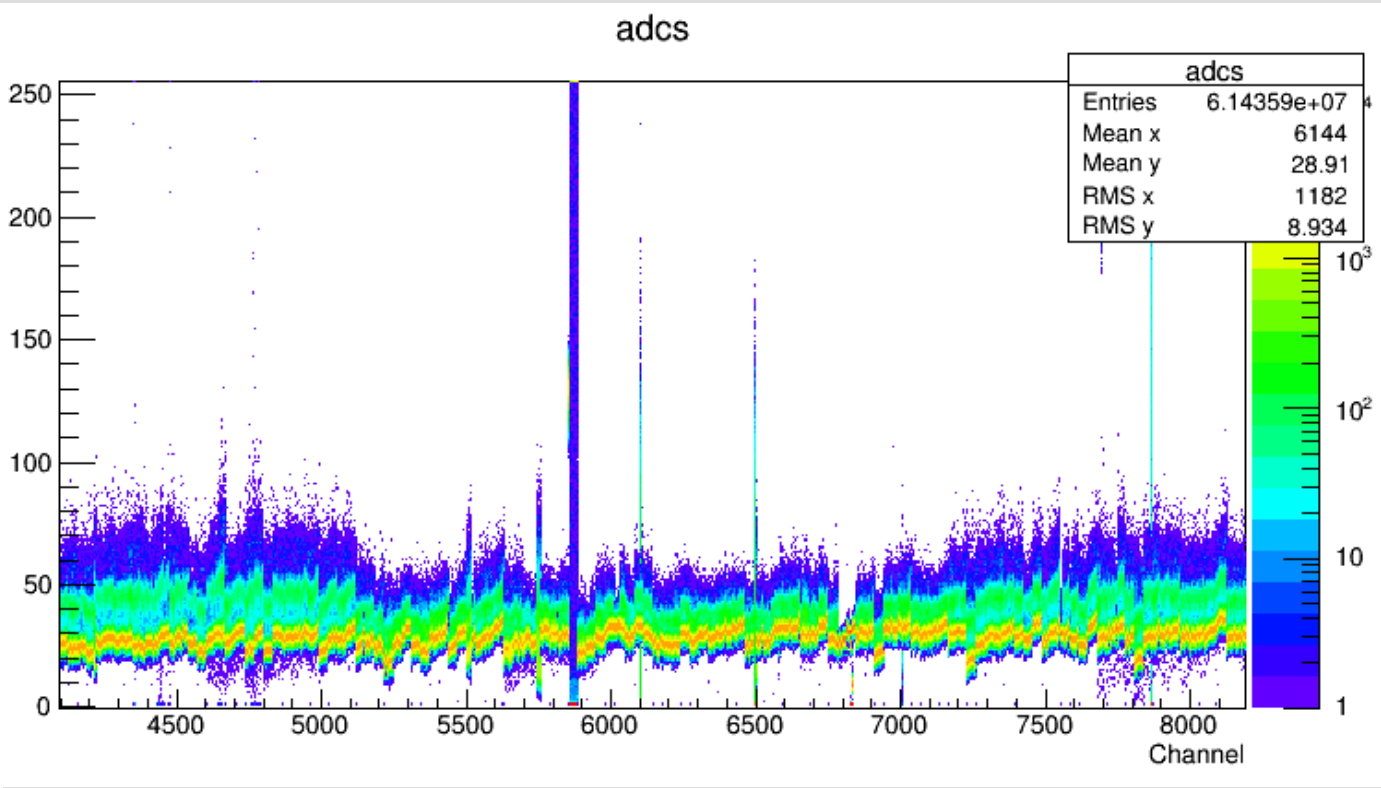
- October 14: Moved trackers cryostat into MICE Hall.
- November 14: Achieved 9.0K temperature regulation on VLPCs.
- January 15: Integrated Upstream detector in DAQ.
- April 15: System ready for calibration
- June 15: Started taking beam data in the detectors

Bias Calibrations

- 8192 front end channels.
- Bias applied in groups of 64.
- Optimum bias is selected on noise, similar to d zero. (2.3% > 1 p.e. peak)
- Used external LED pulser to inject similar ammount of light into each VLPC.
  - Performed before light guide attachment.
- Automated script scans through biases with and without LED.
- Fits and calibration results checked visually.
- Data collected with and without external LED at optimum bias to check the calibration
- Attached light guides
  - PRY face plates could then be attached.

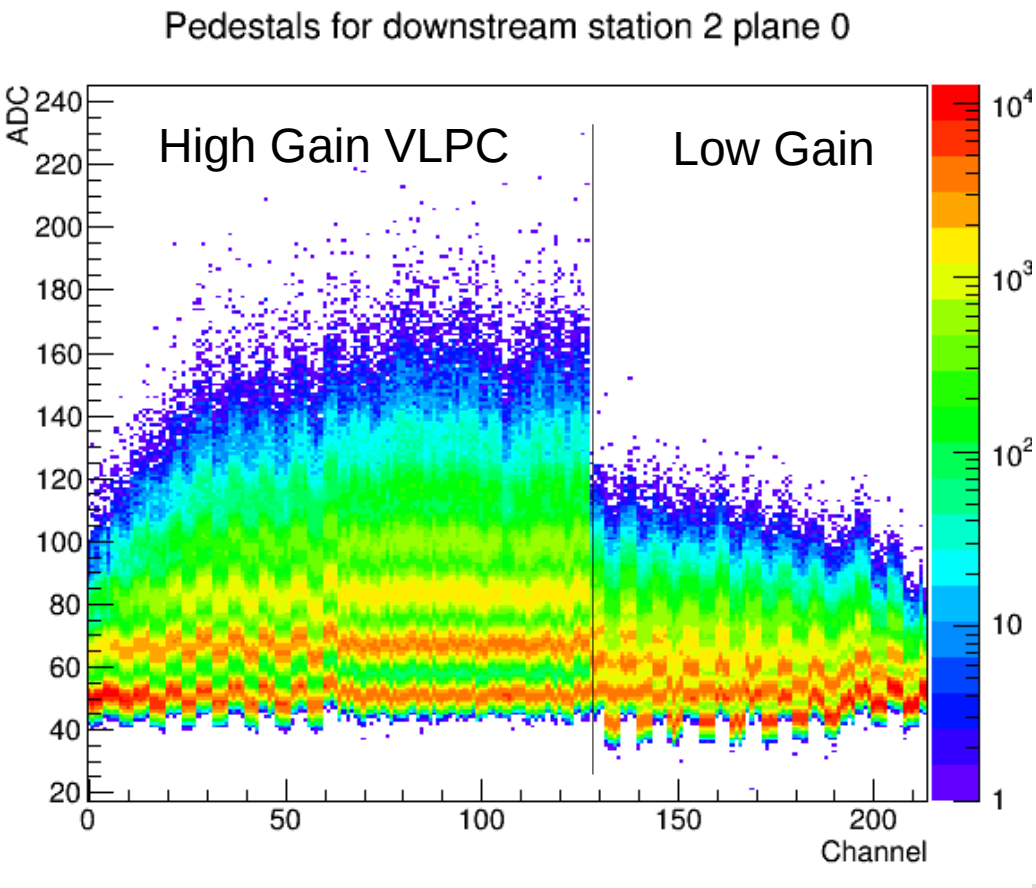
Optimum Bias

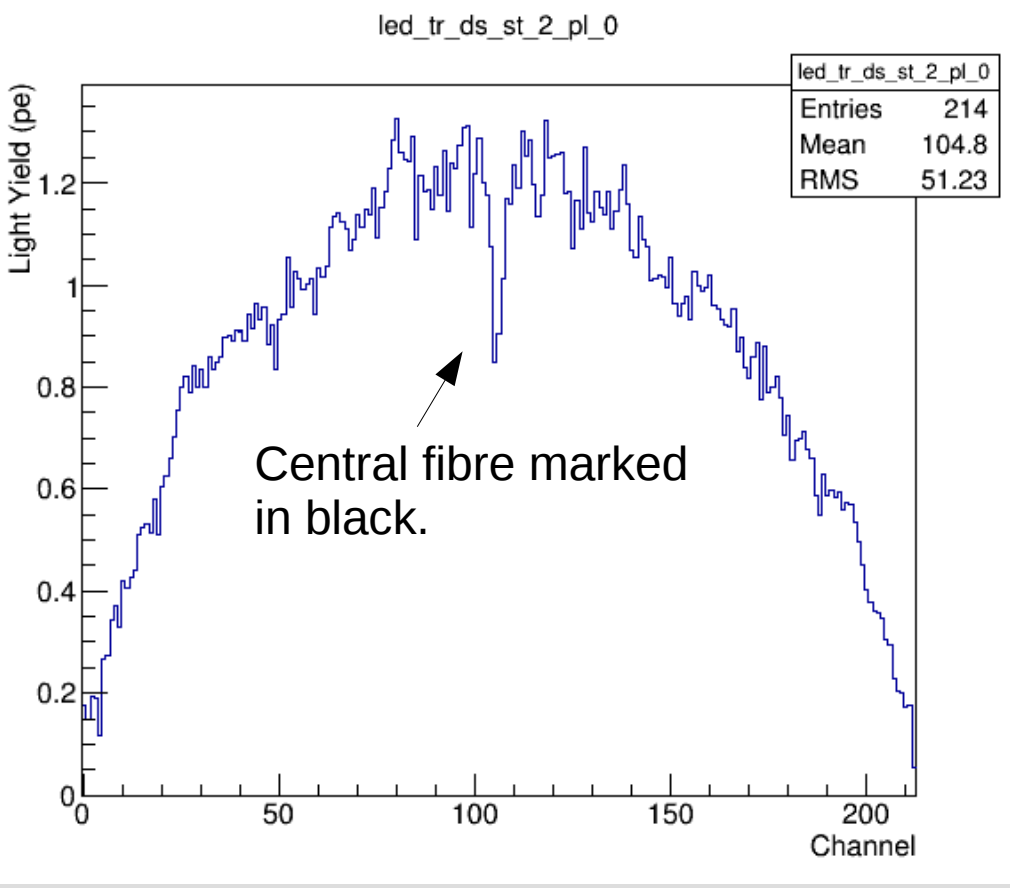




- Optimum bias for the downstream detector.

Internal LED

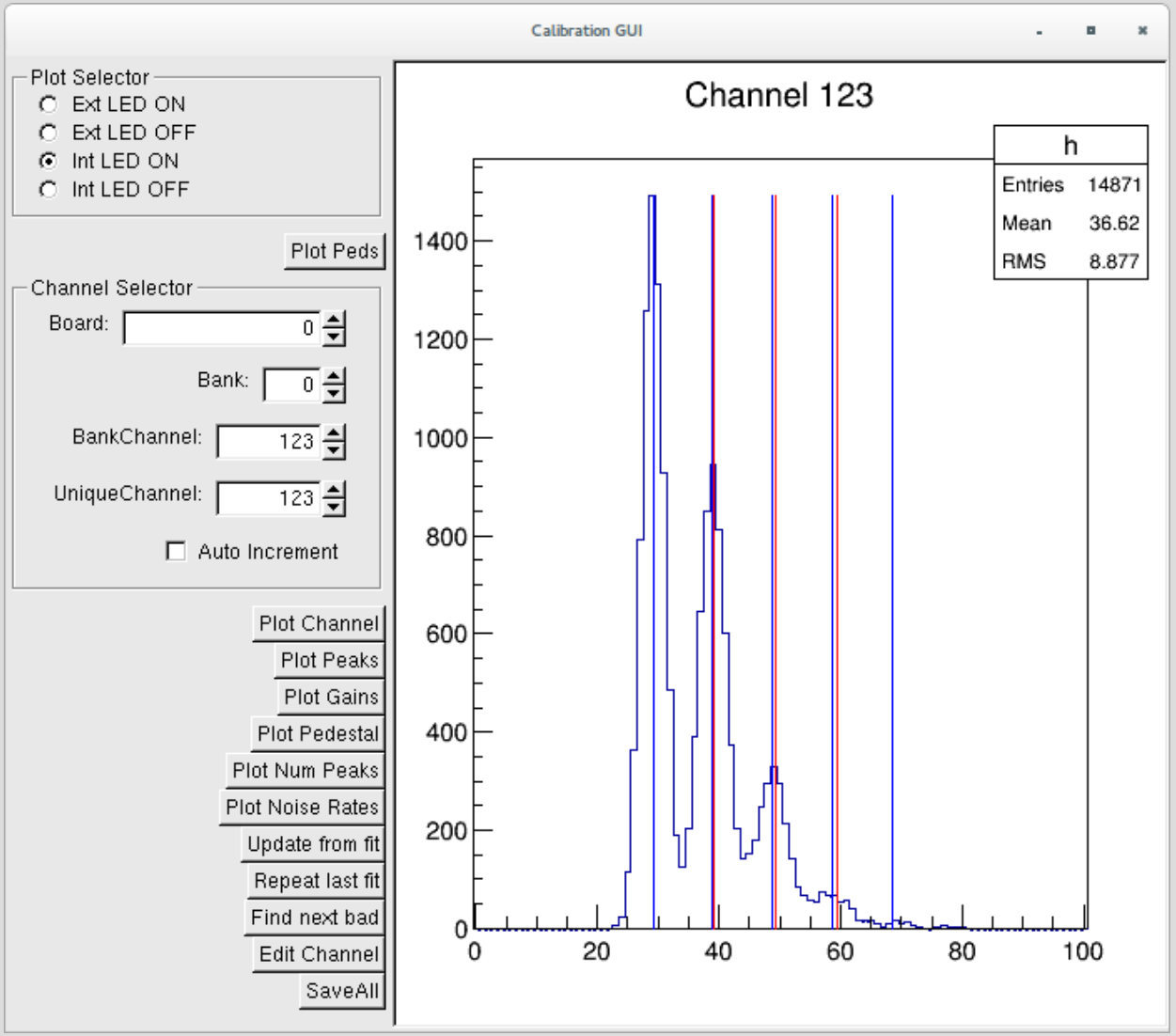




- Ran internal LED system once all light guides attached.
  - Helped check channel mapping

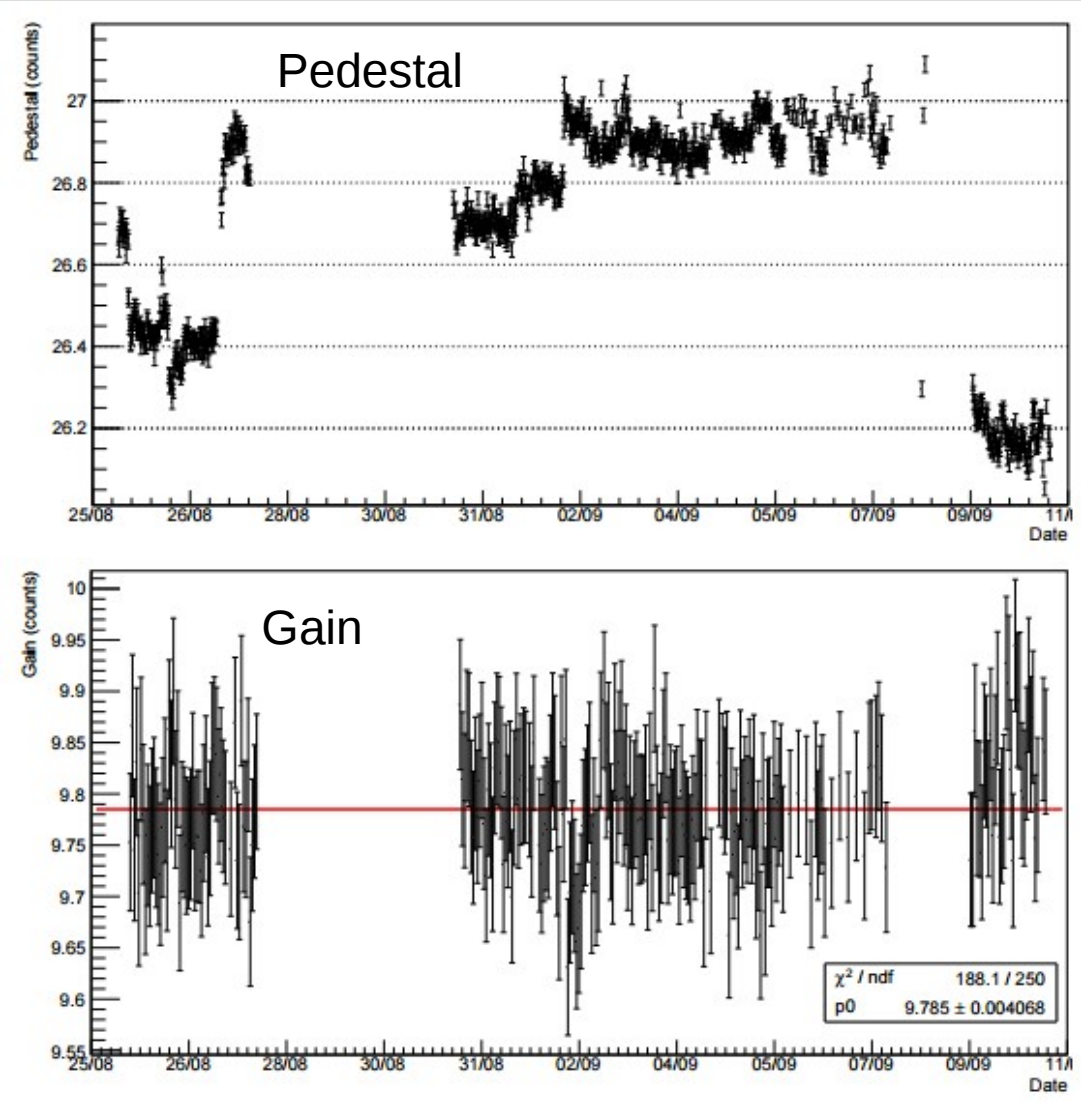
ADC Calibrations

- Calibration of the ADCs is performed by fitting the photo electron peaks.
- A first pass, where the data is automatically fitted is performed.
- Next the calibration is verified/fixed using a custom GUI tool.
- Provides output for data reconstruction and online monitoring checks.



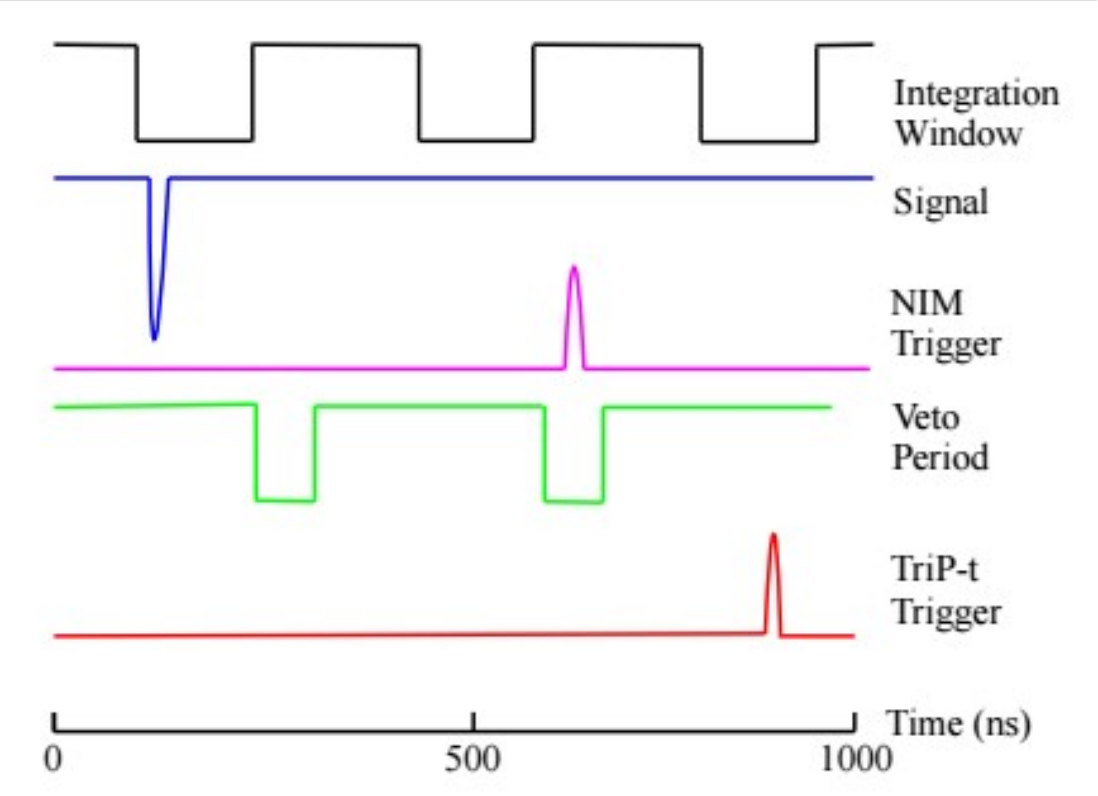
Soak Test

- "Soak tested" for two weeks of "continuous" readout.
  - Gaps are causes by manually pausing the readout and software errors.
- Checked data for corruption and errors from the electronics
  - Found none
- Monitored pedestals & gain of each channel →
- Gain is very stable
- Pedestal drifts considerably.

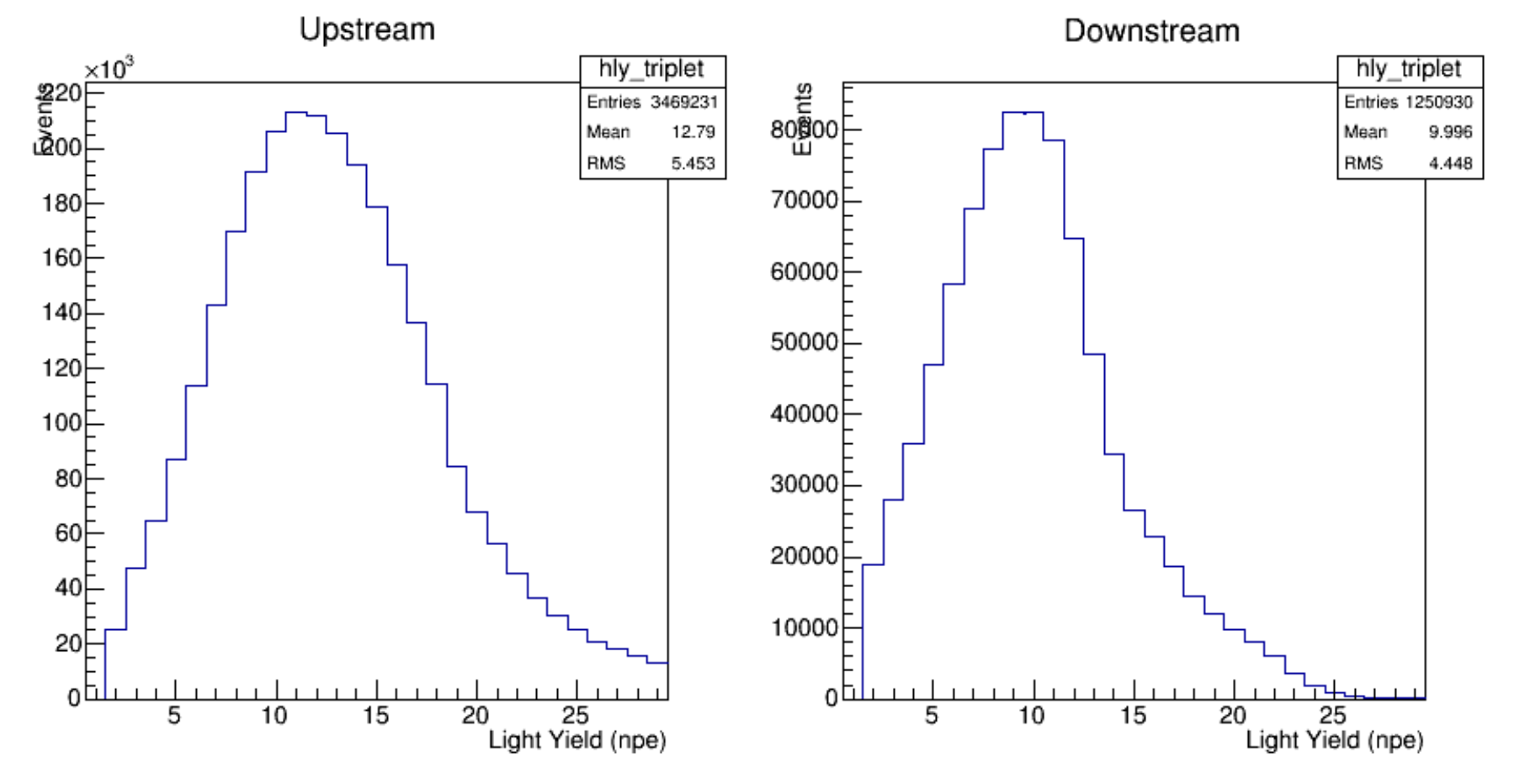


Beam timing

- Efficient readout requires that we synchronise the integration window of the TriP-t to the beam.
- We use the ISIS-1RF reference, which is ~2.9-3.1MHz and phase locked to the ISIS ~100ns long bunches.
- From this signal we gate triggers to a 120ns window, which is optimised by maximising the number of triggers within the gate
- Finally we synchronously delay the integration window and trip-t trigger to maximise detector hits



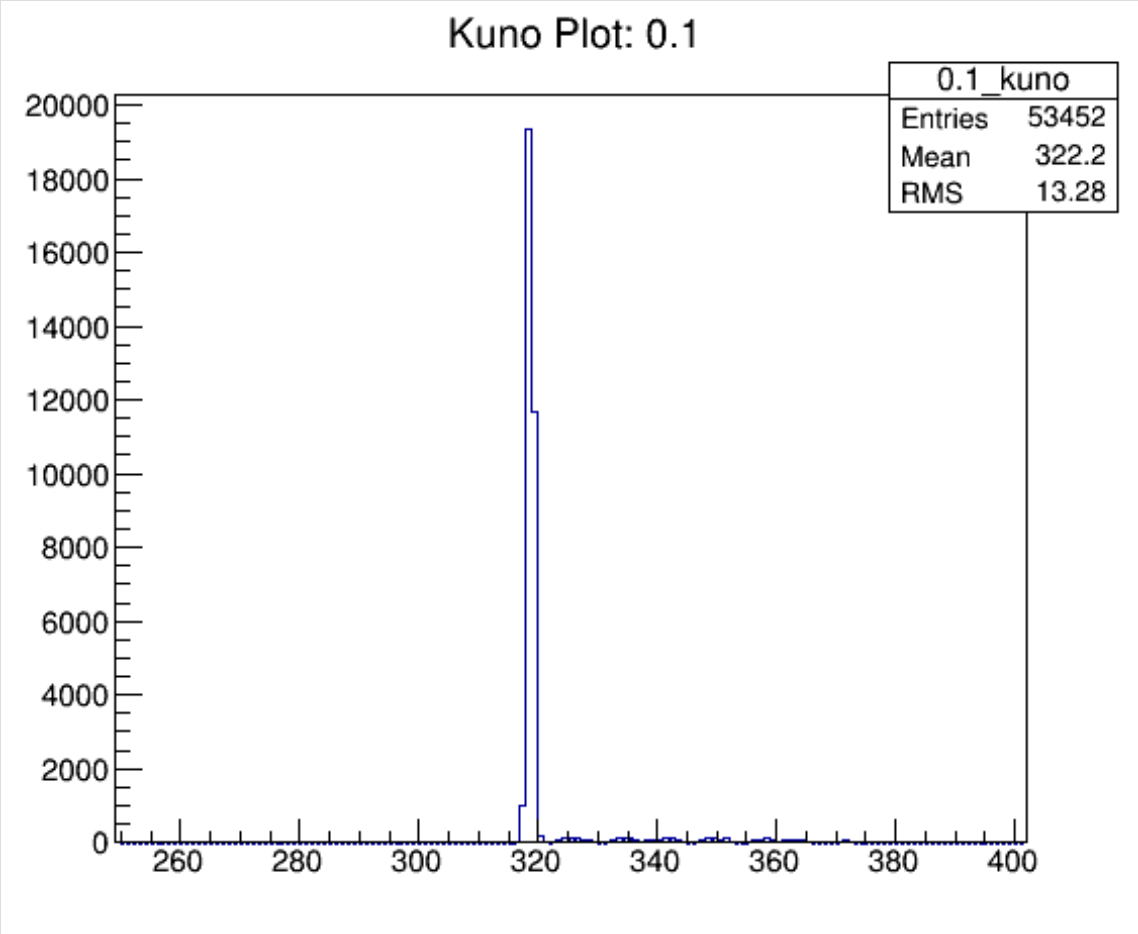
Light Yield



- Beam light yield from triplet spacepoints

Mapping - Kuno Plot

- Detector channels should sum to 319 for a three fold coincidence
- The large spike at 319 helps verify the mapping.



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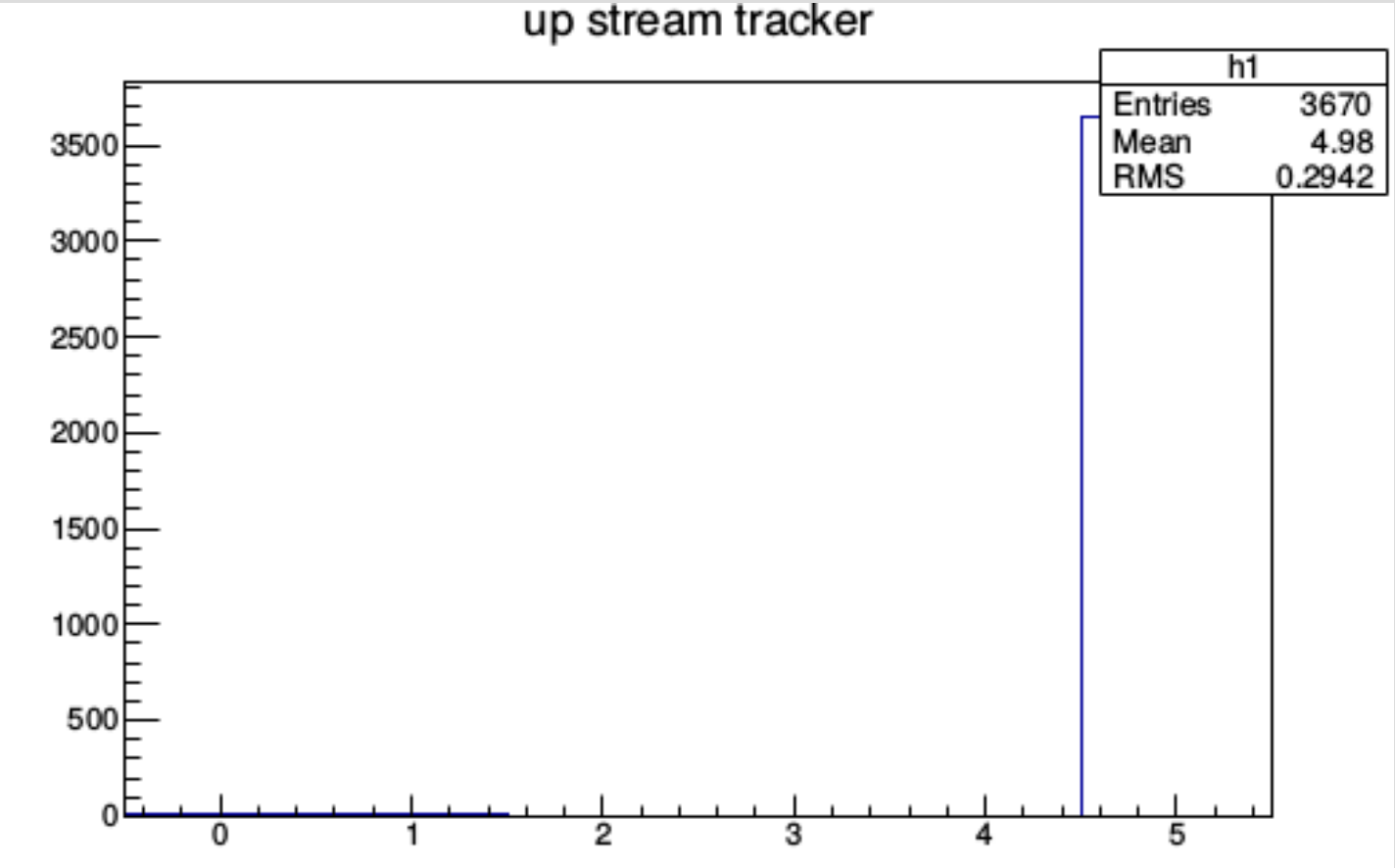
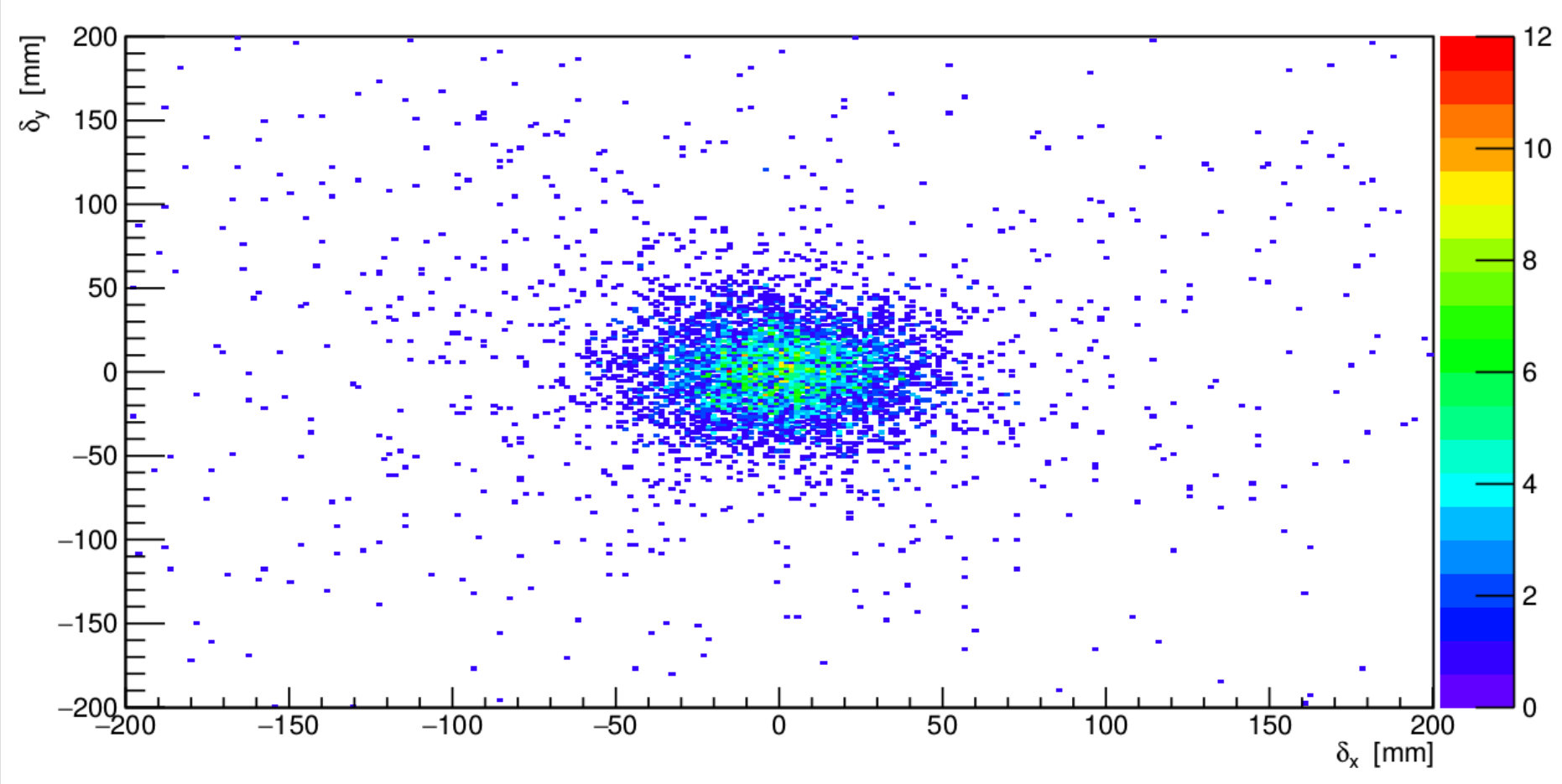
Hit Multiplicity



- Upstream Efficiency: 99.5 %
- Downstream Efficiency 99 %

P. Kyberd

Tracker Alignment



- Field off, Straight tracks used for alignment of upstream/downstream detectors. Figure above contains residuals.

C.Hunt

Conclusions

- Bulk of the commissioning work is complete.
- Detectors are now being readout as part of the normal operation of the experiment.
- Tracker calibration data is collected each MICE shift
- Routine checks are performed each data taking shift to validate data quality.
- Analysis under way to verify detector performance.
  - Current data sets indicate thinks are looking good.