Quadrupole/TOF alignment study update

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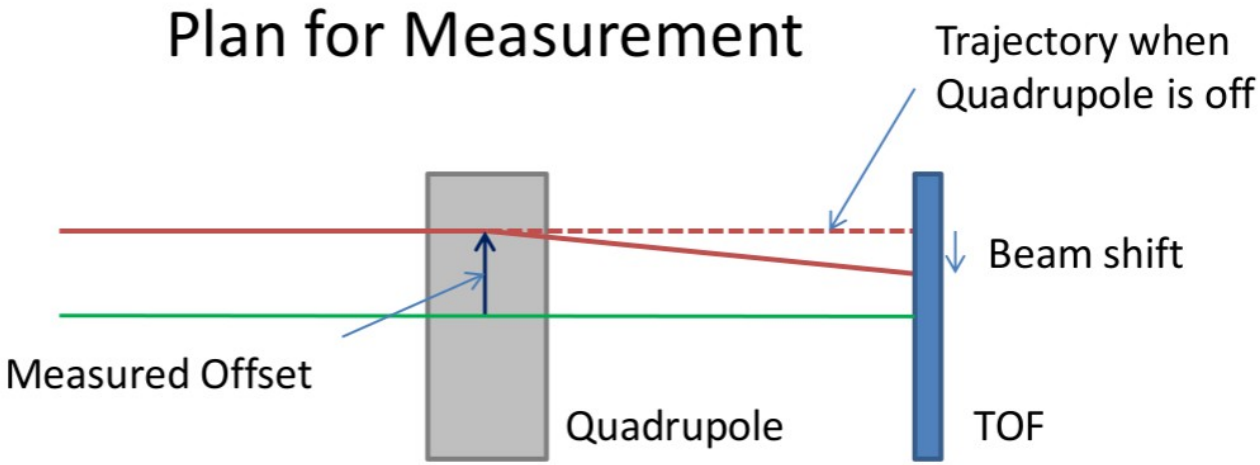
Reminder – Quad Alignment Study



If the beam is not aligned to the quadrupole, then on average it will receive a transverse kick proportional to the quadrupole current.

By varying the quadrupole current and monitoring how the beam position changes in a TOF then the size of the kick can be calculated. This will enable the position of the quadrupole to be calculated relative to the beam position.

Based on the beam size, distance to quadrupole and current scan size, it should be possible to measure the offset to a few mm. Note: Not as good as survey!

This procedure will need to be done for each quadrupole needing to be measured.

Last Time

G4Beamline working with ole's deck. Needed to check quadrupole current conversions:

- Conversions I am using are consistent with Johns, Marks thesis and the 'Magic Spreadsheet' (except a mistake I made when converting D2 field)

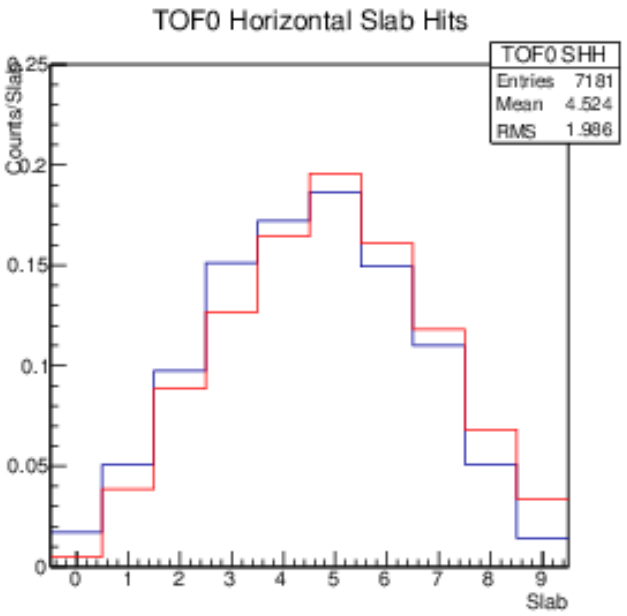
MAUS was reading old data files and producing slab hits in the TOF, however no space points were being generated:

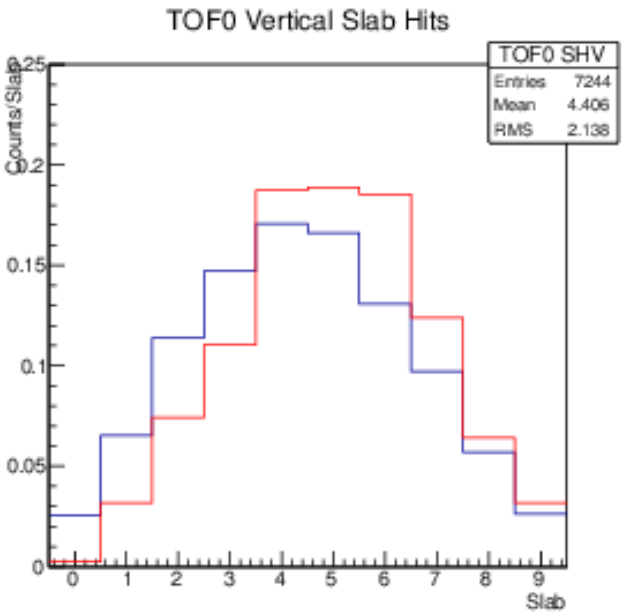
- Durga found this was due to no valid calibration existing in the CDB. He has now uploaded a calibration, which makes space points.

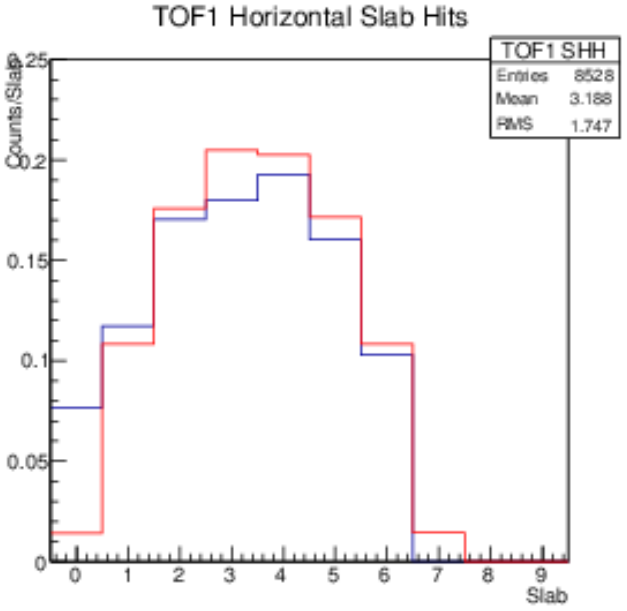
Worries over unconstrained system:

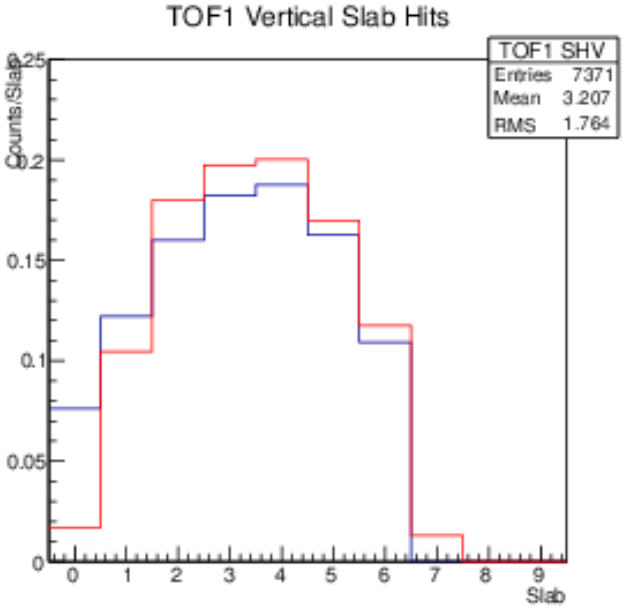
- Each quadrupole was individually swept from 0A to full current in a number of steps, using TOF1 to look for deflection from the beam axis.
- The deflection seen at TOF1 is a combination of an offset and angular misalignment of the magnet, which cannot be separated without a second measurement
- TOF2 was running, so it is plausible this could be used to separate the two sources of misalignment.

Comparison between G4BL and MAUS TOF Slab Hits:







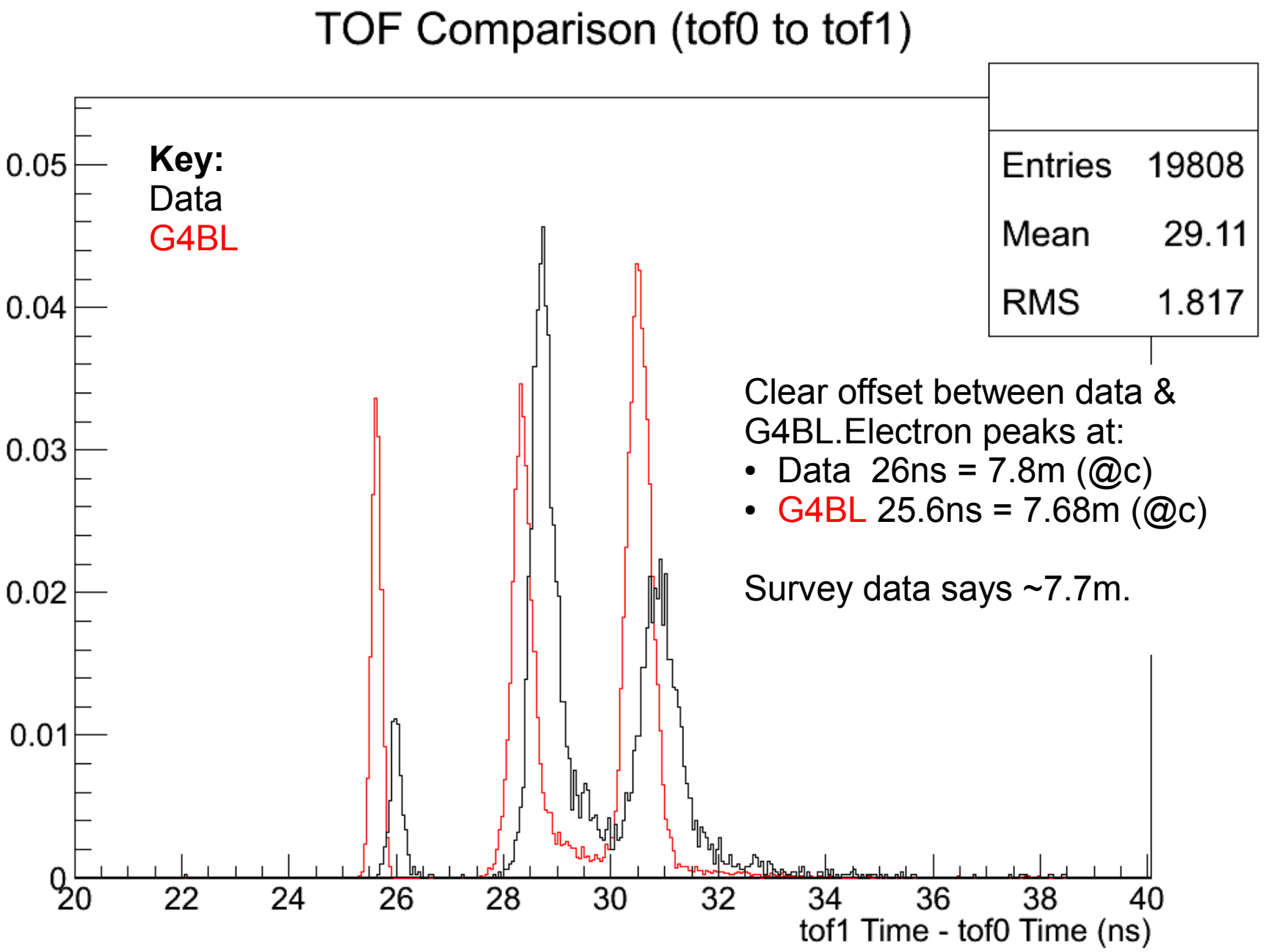


Key:
Data
G4BL

Plots not perfect:

- uncalibrated TOF
- G4BL D2 field was ~5% incorrect

Comparison between G4BL and MAUS TOF:



Clear offset between data & G4BL.Electron peaks at:

- Data 26ns = 7.8m (@c)
- G4BL 25.6ns = 7.68m (@c)

Survey data says ~7.7m.

Enhancing TOF position resolution

It is possible to apply the same technique mark used in G4MICE, to the data output from MAUS. Once a Space point is found, the individual calibrated PMT times (after Time walk, cable length) are applied to the PMTs in the Slab Hits section: