TOF Software

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MICE CM 39

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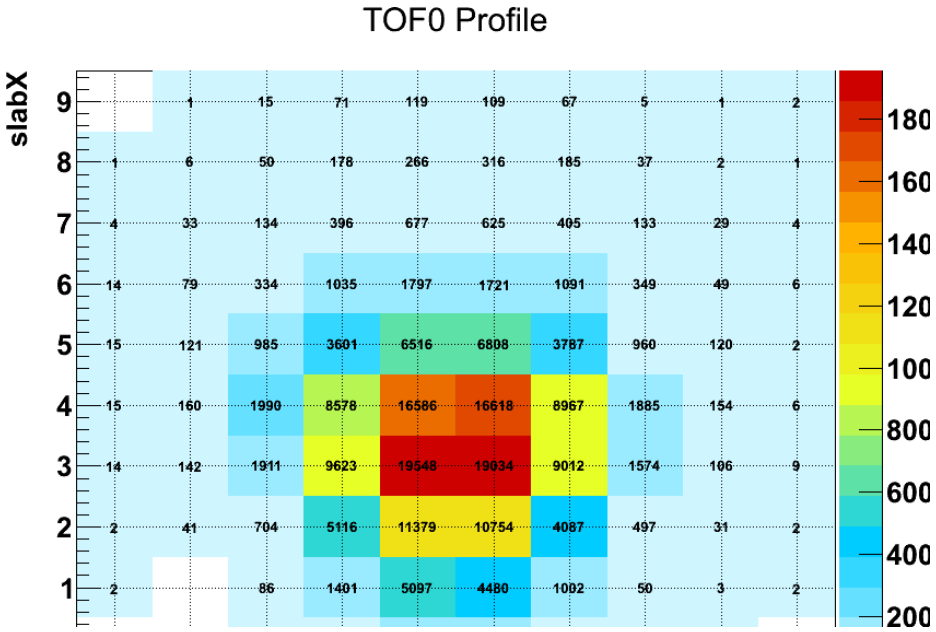
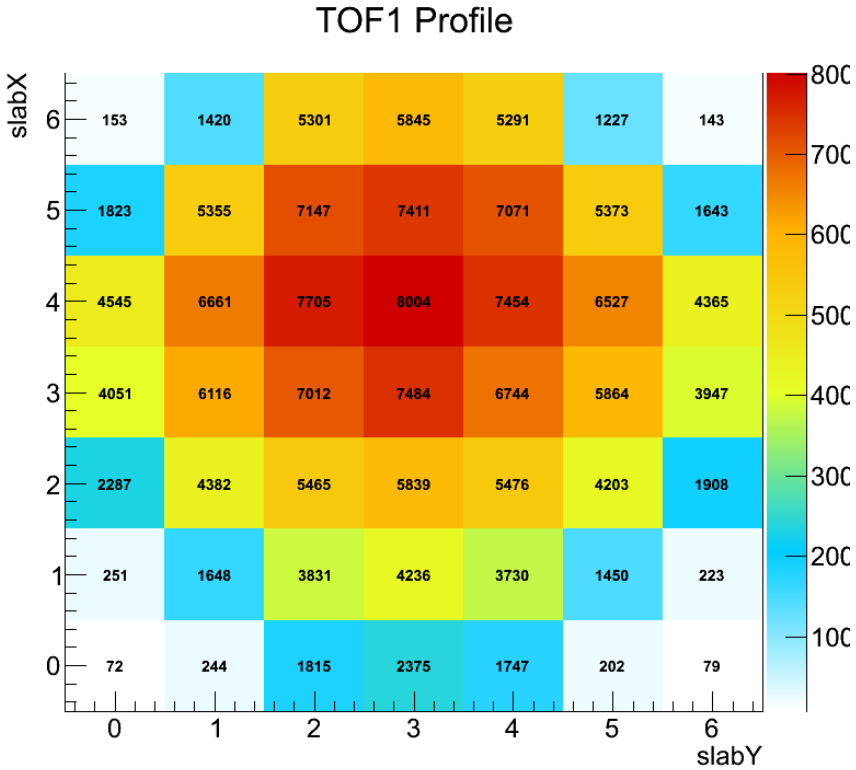
TOF Status

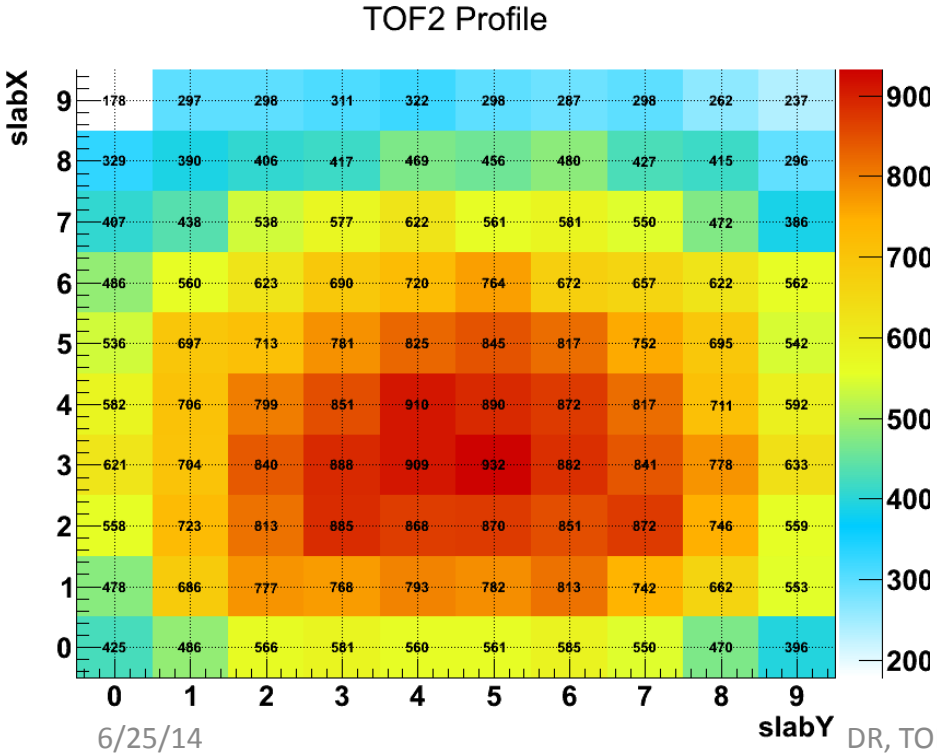
- TOF Reconstruction & MC have been stable for a while now
- But it's time to look into improving them. In this talk, I will cover outstanding issues and potential improvements to:
  - Calibration
  - MC
  - Reconstruction

Calibration

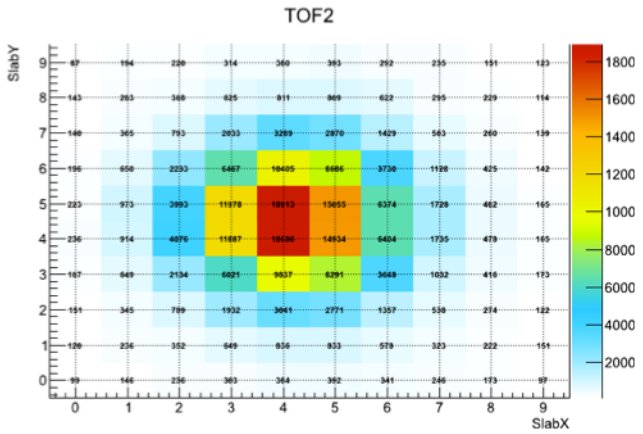
- Status: All TOFs calibrated and calibrations in DB
- A calibration reducer is now part of the online reconstruction
  - Outputs an ntuple of TOF slab hits
  - The calibrator itself is an offline stand-alone tool
    - *maintained on Launchpad: lp:mice-tofcalib*
  - the upload to DB is not automatic & probably will always require expert oversight to verify before DB upload
- Priority is to look into improving the calibration algorithm to get better calibrations for corner pixels with low statistics.
  - Uncalibrated pixels = reduced TOF acceptance
- Add position calibration
  - This has been on my list for long and got sidetracked, it's time to revive it and and get it done
- Monitor stability of calibrations



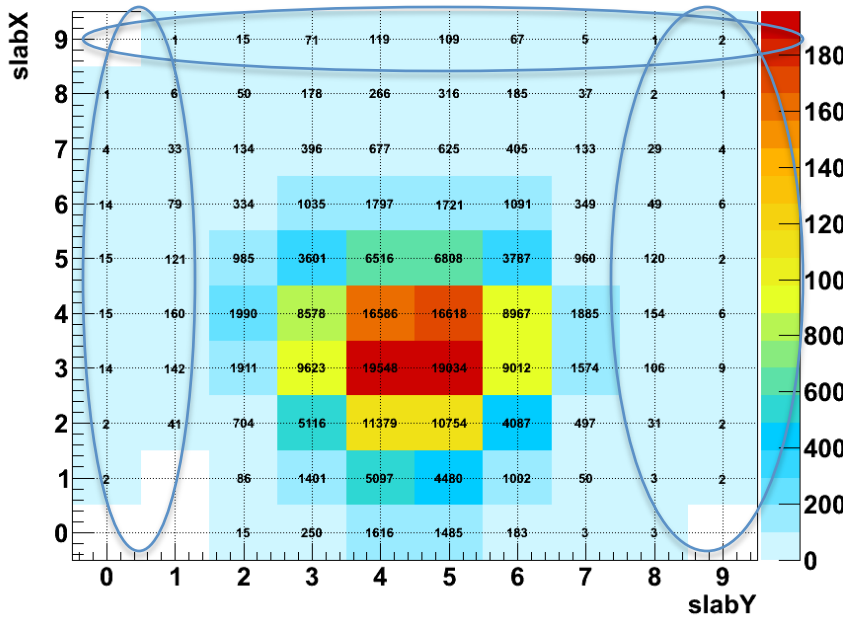




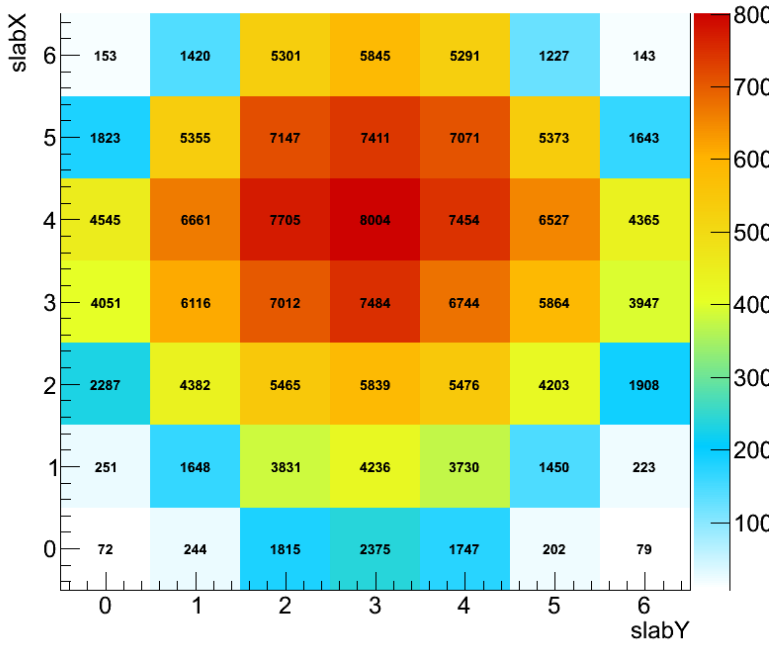
- Better coverage than in 2011, esply tof2



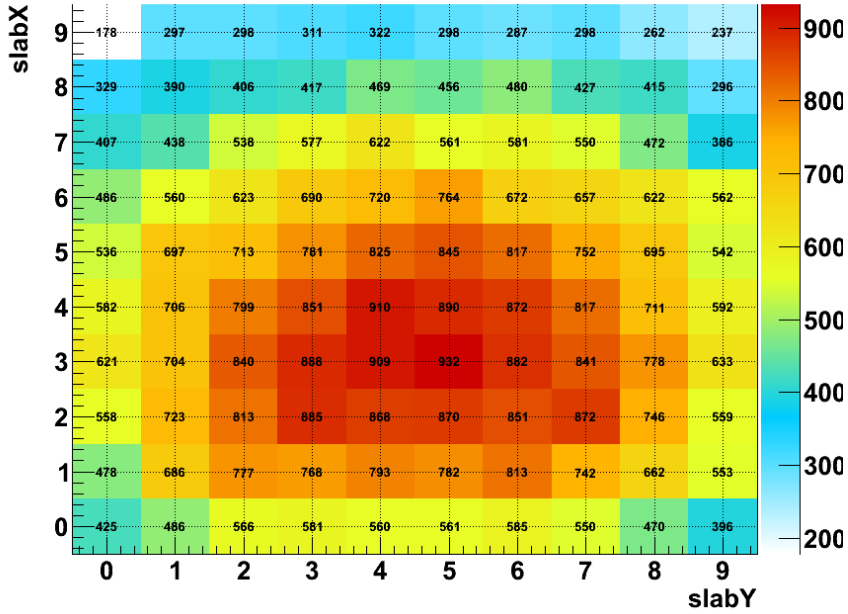
TOF0 Profile



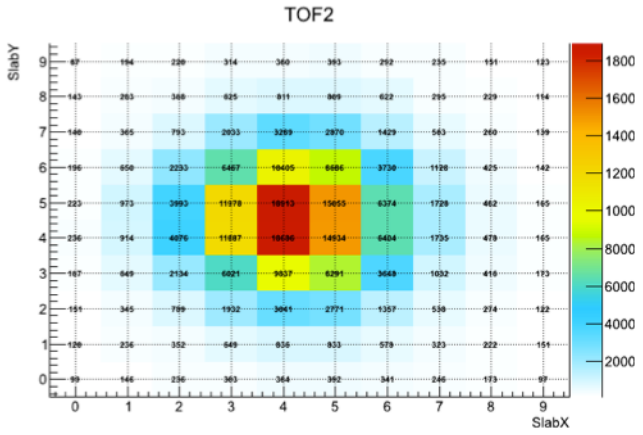
TOF1 Profile



TOF2 Profile



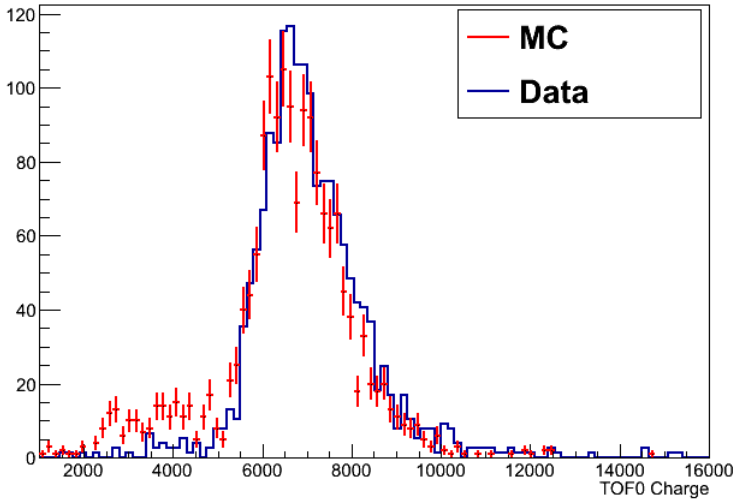
- Some slabs in TOF0 still uncalibrated

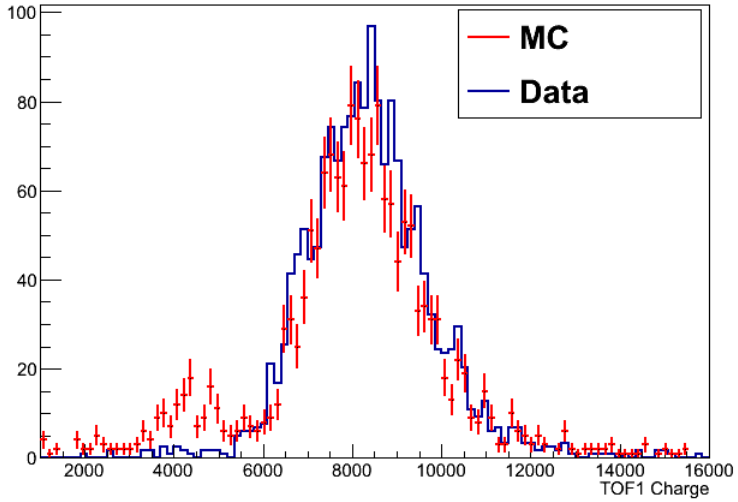


TOF MC

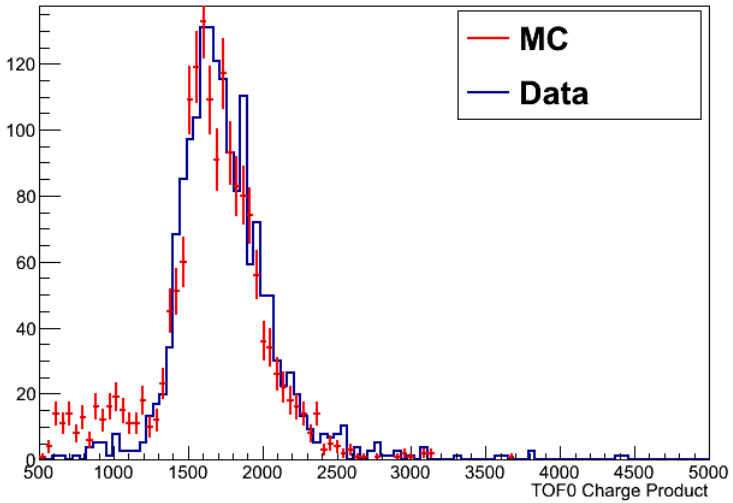
- Status: The digitization code is stable, works, and the MC is reconstructable.
- But….can it be improved?

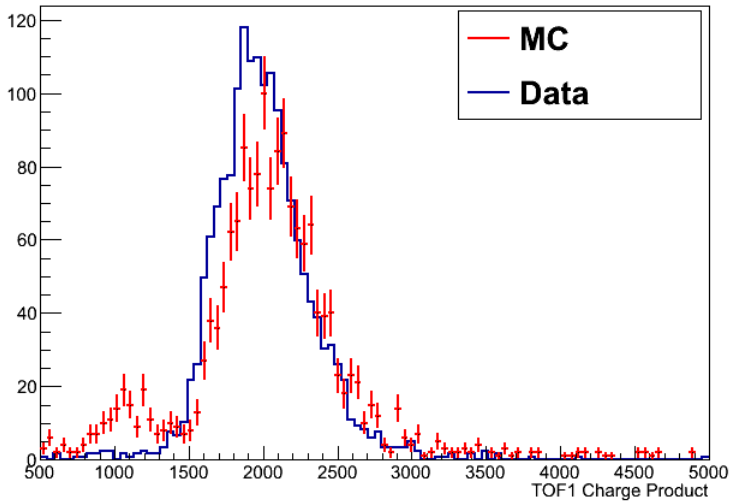
TOF MC/Data comparisons - Charge



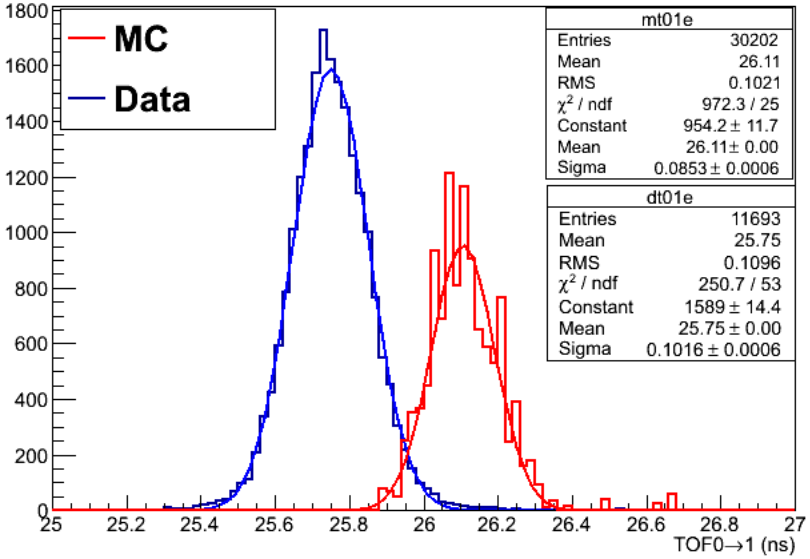


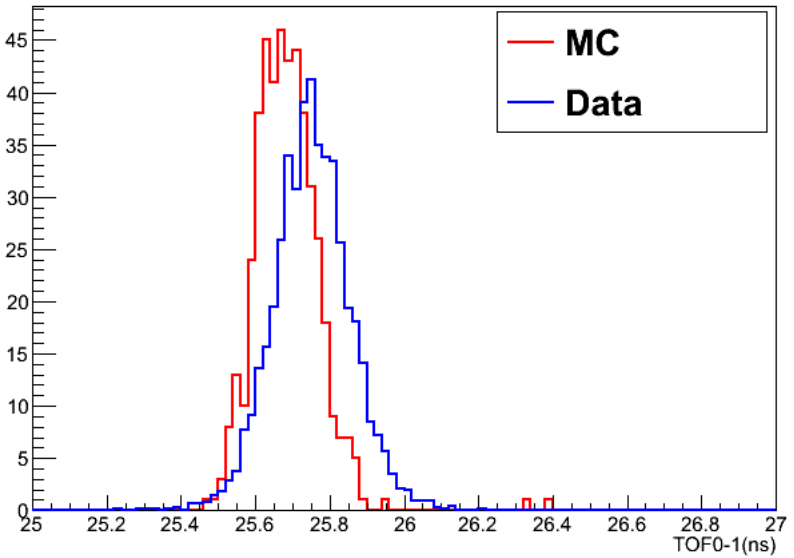
MC: beam 226 MeV/c, data 222 MeV/c





TOF MC/Data comparisons – Time





- MC electron peak is displaced from data (Run 3511)
  - Appears to be because of the positions in the geometry
  - Left, default legacy geometry – ~ 0.4 ns shift
  - Right, after adjusting TOF0-TOF1 distance to be closer to 2011 position - ~0.1 ns shift
  - Reiterates the "which geometry, which survey" issue

TOF MC

- The digitizer works and the MC is reconstructable, but can it be improved?
- Room for improvements:
  - Improve trigger pixel formation algorithm
  - Restructure digitizer to allow Trigger Digitization access to unsmeared time
  - The charge simulation can possibly be improved by having a tuneable "gain" for individual PMTs, and/or simulating the flash ADC pulse.
    - To me, this seems to be a lower priority unless analyses (e.g. PID paper) indicate otherwise
  - Add noise (?)

TOF Reconstruction

- The reconstruction code is stable. However...
- Only the earliest hit is used in formation of slab hits (if there is > 1 hit in a PMT)
  - Since the reconstructed output already has this requirement, it makes it impossible to find out what was rejected
  - Modify slab hit reconstruction to use all PMT hits
- Would like to add TOF0-TOF1 momentum reconstruction to MAUS
  - This has been "private" code and should be on a repository at the very least. Have the code from Victoria..
- Add efficiency plots to online reconstruction