

TOF & CKOV Reconstruction

CM 35, Software Session

February 15 2013

- TOF software status
 - MC digitization
 - Comparisons with Data
- Ckov software status

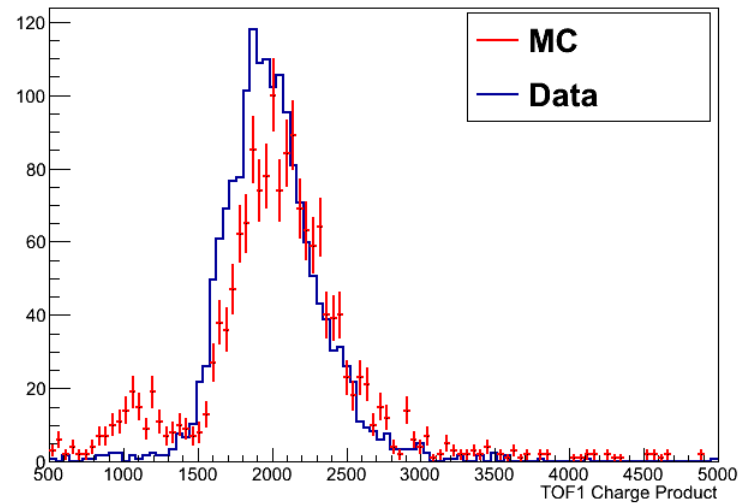
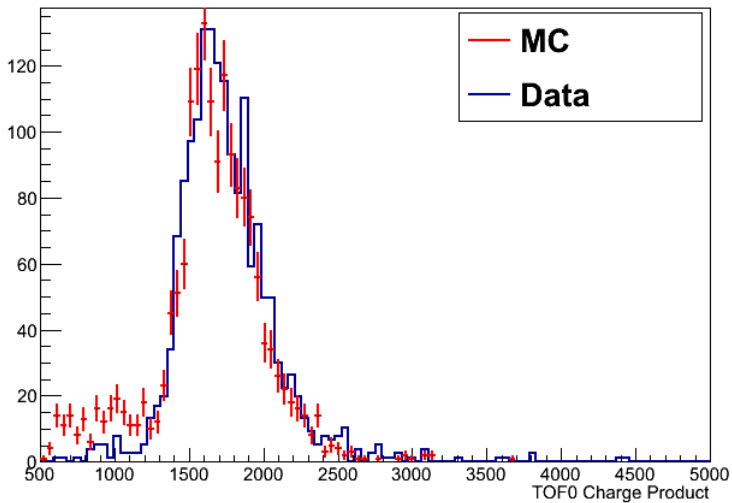
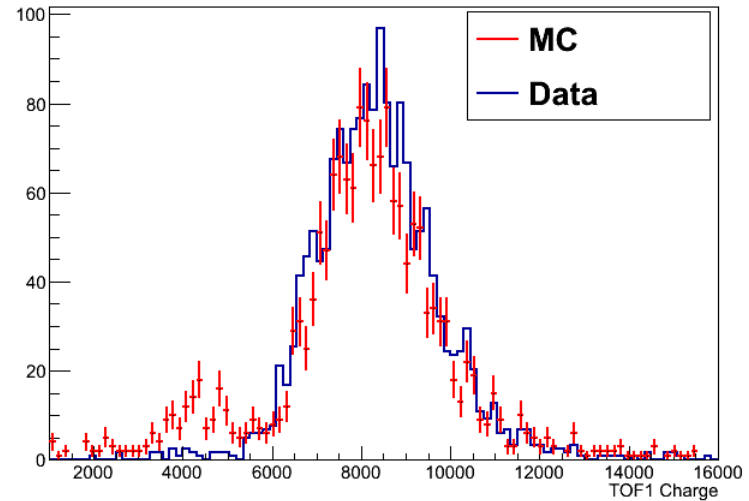
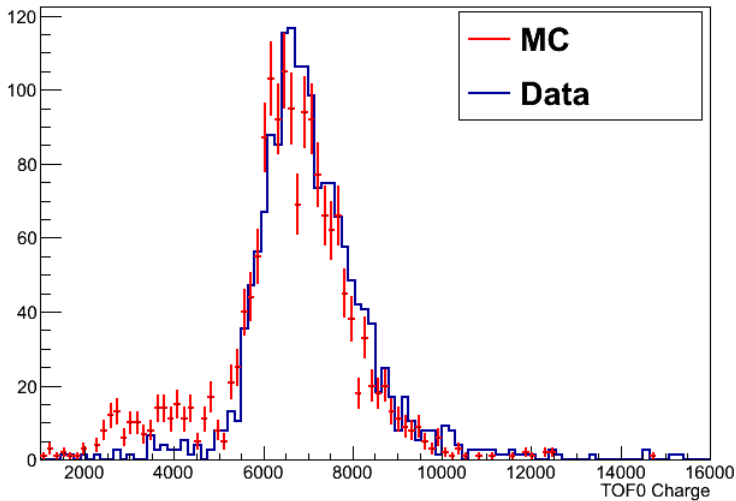
TOF charge digitization

- Since last CM – the TOF ADC digitization has been fixed and tuned.
- 2. Get energy deposited by a GEANT hit in a TOF slab
- 3. convert Edep to # photoelectrons (n_{pe})
- 4. n_{pe} are Poisson-smearred & attenuated depending on the distance from the hit to either PMT
- 5. an efficiency is applied to the attenuated n_{pe} reaching the PMTs
- 6. Poisson-smear the n_{pe} at the PMT
- 7. convert n_{pe} to ADC & add a Landau-smear
- Photoelectrons from multiple hits in a slab are added up. This could be improved – e.g. find the fastest hit and only add hits which are within the time resolution

TOF time digitization

- Since the last CM: detector resolutions in MC were off. These have been tuned to better match the actual resolutions.
 1. Get time of GEANT hit at a TOF slab
 2. Propagate the time from the hit-position to either PMT
 3. Smear the time by the detector resolution
 4. Uncalibrate
 - a) Since the TOF calibration corrections are based on a “trigger pixel”, I ‘fake’ a trigger pixel and add the corrections based on this pixel
 - b) The trigger-pixel-finding could be improved
 - c) The other option is to not uncalibrate the MC and correspondingly have the reco not calibrate it
 5. Convert time to TDC

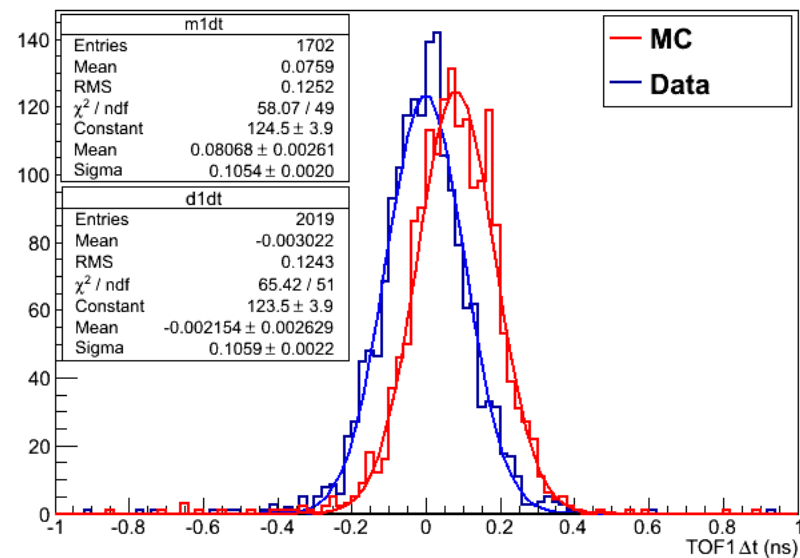
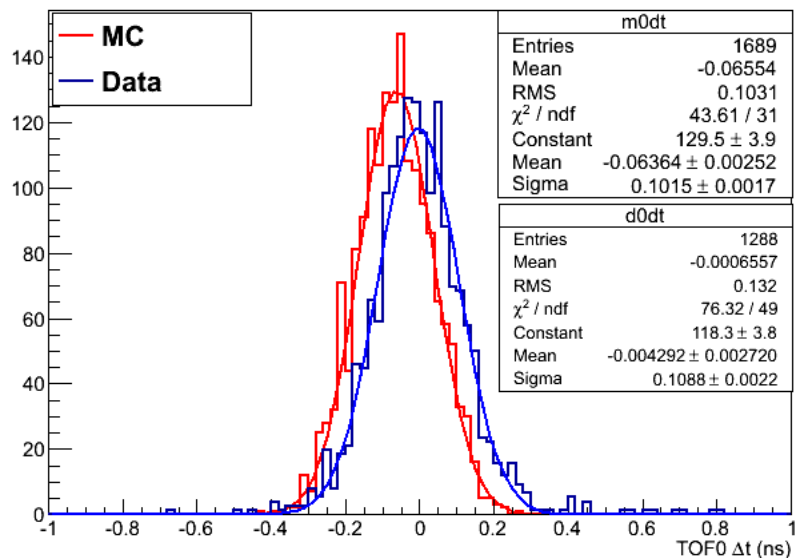
TOF MC/Data comparisons - Charge



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

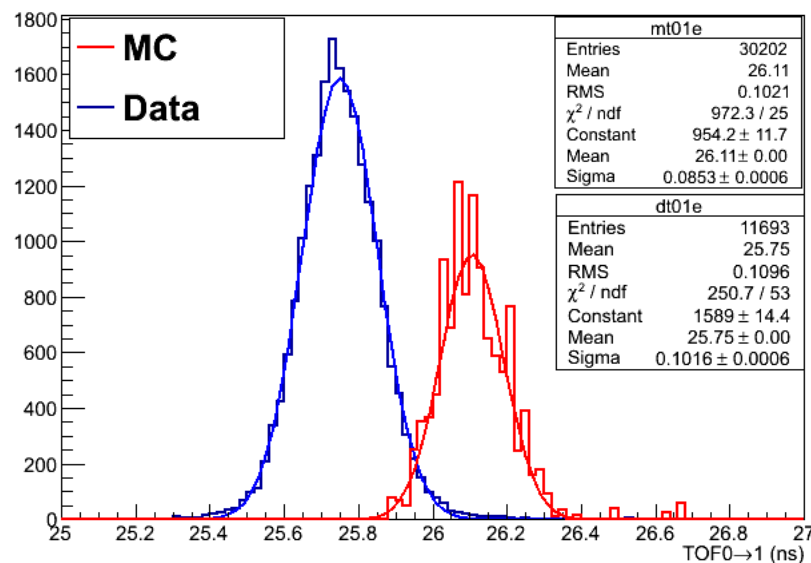
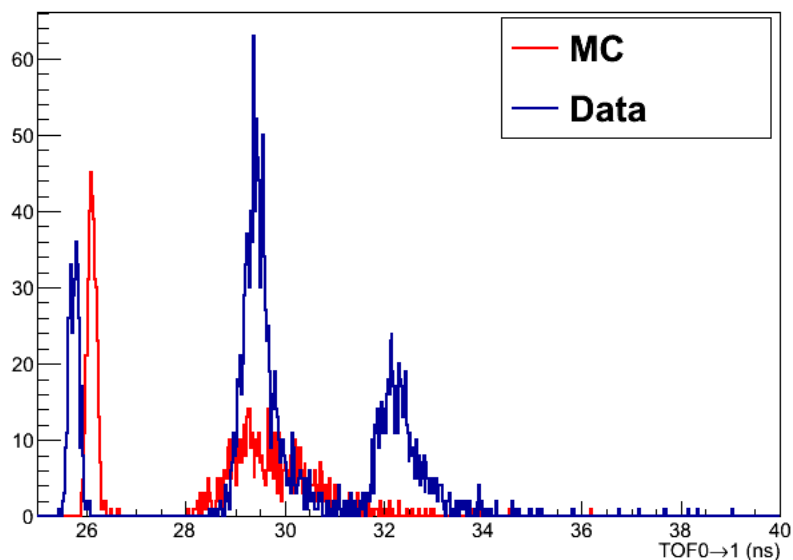
cm35, 2/15/13

TOF MC/Data comparisons - Time



- Resolutions are comparable
 - TOF0 \approx 51 ps (mc) / 55 ps (data)
 - TOF1 \approx 52 ps (mc) / 53 ps (data)
- Means are off from data (should be = 0 for perfect calibration) most likely due to improper trigger pixel simulation

TOF MC/Data comparisons – Time



- MC electron peak is displaced from data
 - MC geometry, TOF0/TOF1 positions from legacy./ Beamline.dat , distance = 7824.1 mm
 - Data uses 7693.4 mm
 - Corresponds to ≈ 0.4 ns difference

TOF MC & Reco misc.

- After the digitizer the reconstruction chain and code is same as for real data, except for:
 - SpacePoint reco tries to find the pixel that triggered the event and has a tolerance window in the search for the trigger pixel. Bloated this up slightly for MC.
- The TDC -> time conversion that was being used (25 ps/TDC) was not accurate (thanks to Maurizio for pointing it out). Should be 25 ns/1024 TDC channels. Fixed.
 - If we have done any serious batch processing, it should be redone

TOF Calibration & Geometry

- Calibration constants were read from local ascii files
- They are now in the CDB
- Timestamps associated with each set of calibrations in the CDB
- Default configuration is “current”
 - old ascii files are still in the repository, but they should be removed at some point
- Geometry continues to be from legacy MICE Modules.
- Matt & Ryan are working on TOF GDML schema

To Do

- As usual....documentation & tests
 - Especially integration tests for the simulation
- Add Efficiency histograms to Online Monitoring
- Incorporate Mark Rayner's calibration with the current time calibration
 - Mark's calibration has two parameters 1) speed of light and 2) a Δ
 - The Δ needs to be re-done for each data-set
 - Working on it, preliminary version needs to be validated

CKOV (from Gene Kafka)

- Ckov plots should now be working online
- Ckov window materials have been redefined in the legacy geometry
- Simulation physics list has been updated to get optical photons generated
- Working on getting the updated PhysicsList -- that handles optical photons -- into the trunk, with it defaulted to disabled
 - There seems to be an issue with the Ckov not letting anything get downstream of it
- Ckov hits were not being written out – the sensitive detector code has been fixed and updated. Working now.
- Updating the reco – MapPyCkov -- but changes have not been committed.

