

TOF status report

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TOF0+TOF1 refurbishing



- many PMTs of TOF0 are very old (bought in 2006 by Alain and others in 2007) and have an old design of the active divider and the valve insulation from mu metal, giving a lot of problems (spikes ...)
- Hamamatsu Japan kindly agreed to refurbish them (kapton insulation/new active divider) if back to firm before 31/12/2010: after it they say it would be OUR problem
- So in early September we dismantled the first PMTs to be sent back to Japan (MB,GC,RB) and the operation was redone in December (MB,AB,RB) during the Heathrow blockade. In total ~ 50 PMTs were sent back: clearly the operation was not done in a single shot.
- TOF0 has been refurbished in September 2010 and put back in DSA with newer PMTs (about 20 out of 40) , TOF1 was refurbished in Milano in spring 2011 and put back in DSA in June 2011



TOF0/TOF1 maintenance operations at RAL



TOF1 refurbishing

- TOF1 refurbishing involves the change of all PMTs (old ones 2006->2008 production, before any Hamamatsu “upgrade” to cure spikes, breakdown ...) + a better mechanics for PMTs support (as the one of TOF2).
- So we decided to ship it back to MIB for complete refurbishing and upgrades in mechanics
- all remounted PMTs were tested, but a delay in PMTs delivery by Hamamatsu (the last 12 arrived 20/6/2011) implies that we will still have to change a few in September (5 out of 28)
- Maybe this will solve the pending issue of little worse resolution (60 ps) as compared to TOF0/TOF2 (~50 ps)
- TOF1 was re-installed at RAL in mid June

TOF1 refurbishing



- a MICE note will give details about TOF0/TOF1 refurbishing including lab tests
- each PMT was fully tested for about 1-2 weeks
- TOF1 mechanics improved

MICE Collaboration

MICE-NOTE-DET-XXX

6 July 2011

The Refurbishing of MICE TOF0 and TOF1 detectors

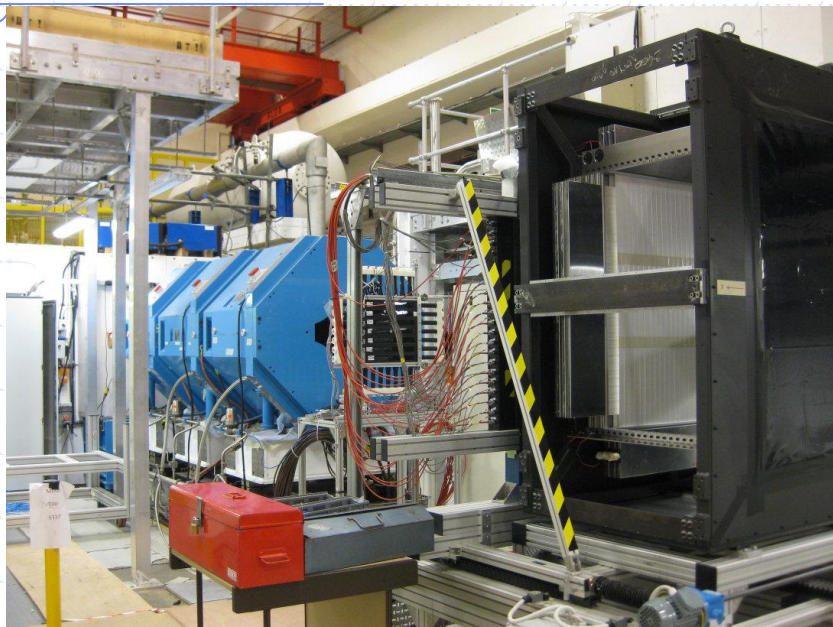
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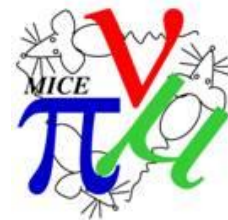
The TOF0 and TOF1 detectors have been refurbished in late 2010 and beginning 2011. Nearly half of the older PMTs have been sent to Hamamatsu, Japan, for refurbishing and changed with newer ones. TOF1 have been completely rebuilt at INFN Milano Bicocca, with improvements to the detector's mechanics. Before mounting, PMTs have been subject to extensive tests to assess their reliability.

Refurbishing of downstream platform to accommodate EMR



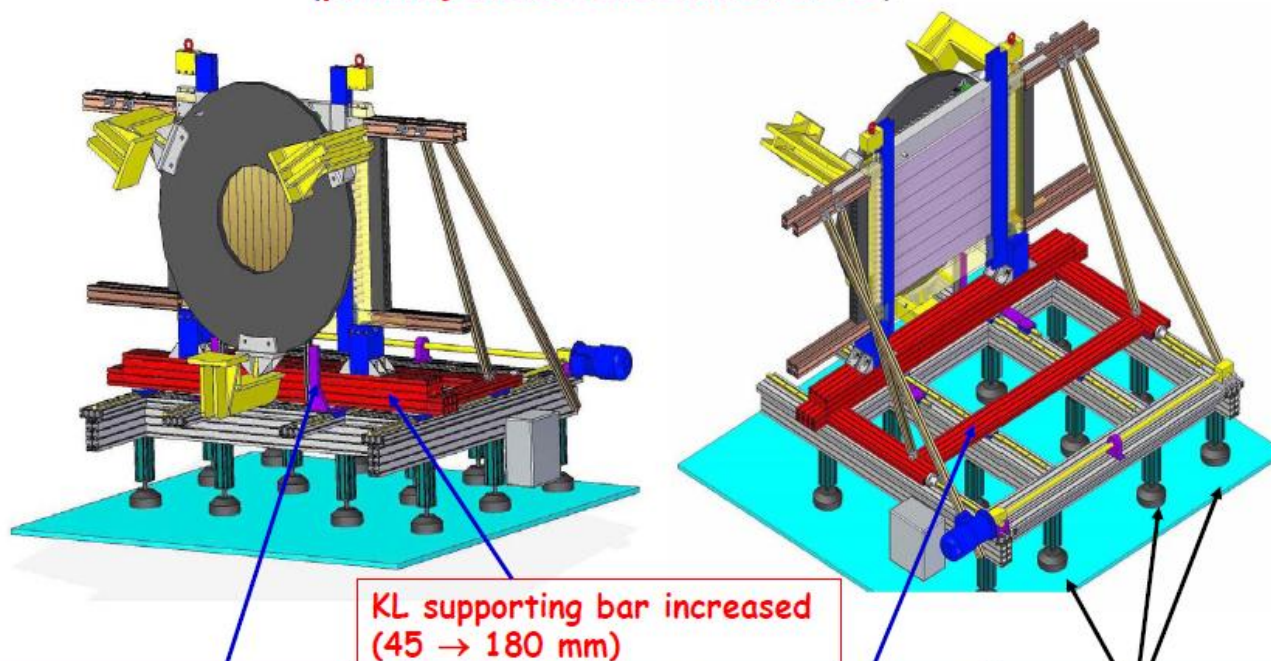
1. Two interventions (all details/CAD drawings agreed since March 2011 with GVA people: meeting with F.Cadoux et al at UniGE) to modify the downstream RM3 platform to accommodate EMR
2. Work done in April/May by INFN Rm3 +MIB

Update at CM29 on downstream support



Downstream PID trolley - Update

(partially done in november 2010)



KL supporting bar increased
(45 → 180 mm)

TOF2 sliding system repositioned

EMR sliding system removed

feet shortened

Ludovico Tortora
INFN - ROMA TRE

MICE CM29 RAL 15-18 Feb 2011

7

TOF performances in 2010 run

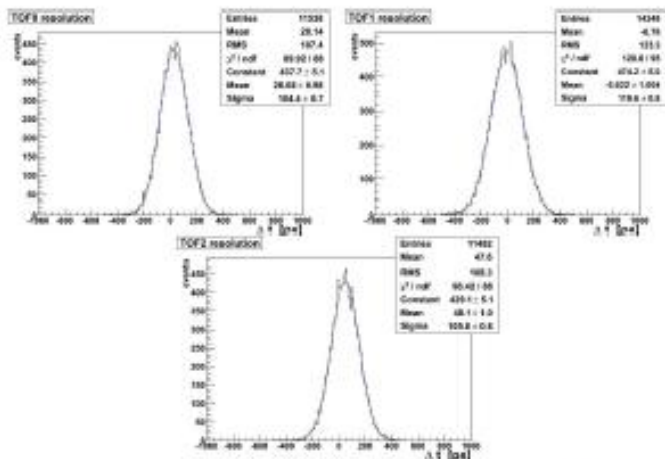


Fig. 9. Time difference Δt_{xy} between vertical and horizontal slabs in TOF0, TOF1 and TOF2. Trigger is on TOF1.

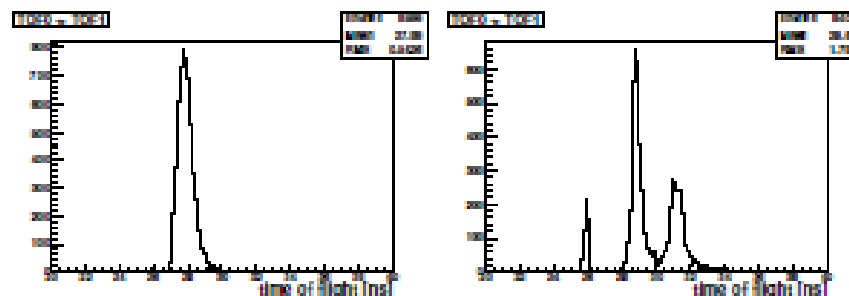


Fig. 10. Time of flight between TOF0 and TOF2 for muon (left) and electron (right) beam.

- Time resolution after calibration:
- TOF0 - 51ps;
- TOF1 - 58ps;
- TOF2 - 52ps.

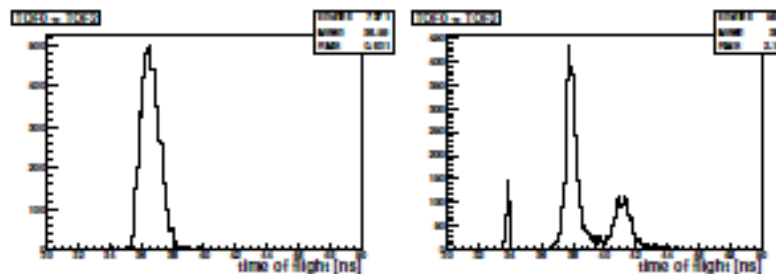


Fig. 11. Time of flight between TOF0 and TOF2 for muon (left) and electron (right) beam.

TOF stability during 2010 run

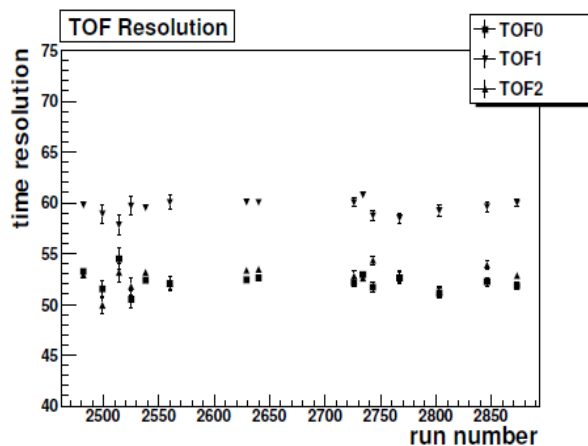


Fig. 12. Stability of the time resolution of the TOF stations versus running time. Nominal muon beam data with trigger from TOF1.

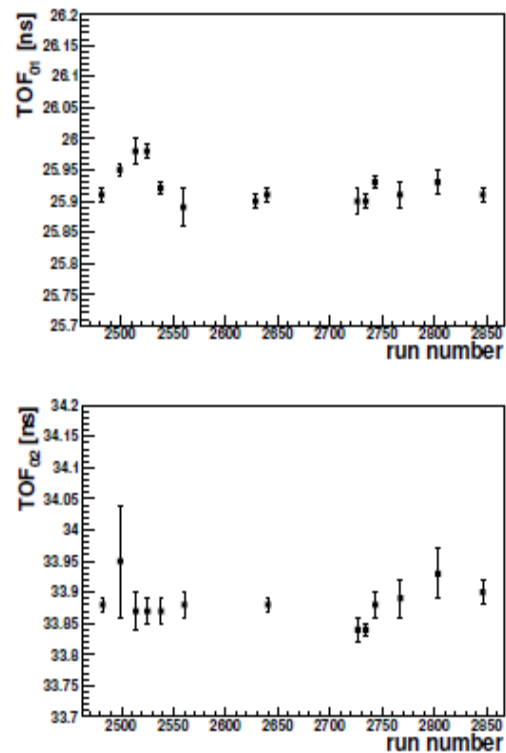


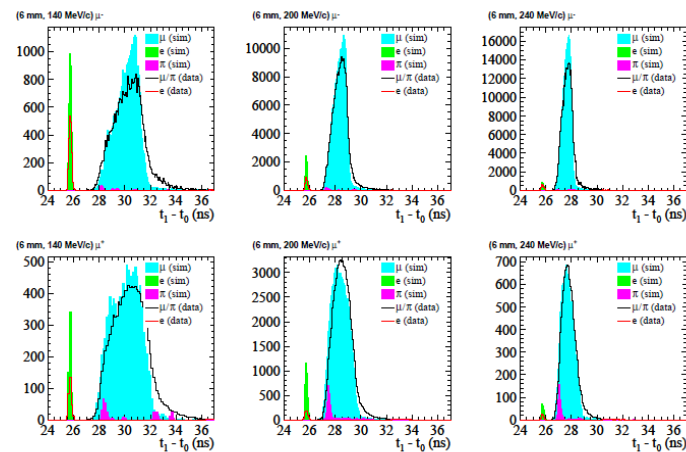
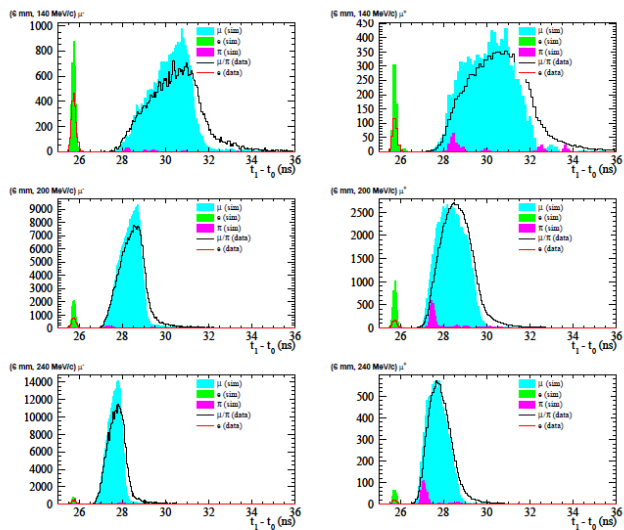
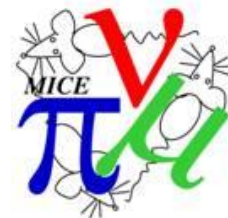
Fig. 13. Stability of the time-of-flight of electrons between TOF0 and TOF1 (top) and TOF0 and TOF2 (bottom) versus run number. Nominal muon beam data with trigger from TOF1.

TOF conversion factor



- Disagreement data/mc with nominal 25 ps/count factor
- After discussion with CAEN engineer we discovered conversion factor is $25 * 1000 / 1024$ (bits!!) with ± 10 ppm precision
- Implementing this inside G4MICE improves data/MC comparison (see Thursday Mark's talk)

Situation now



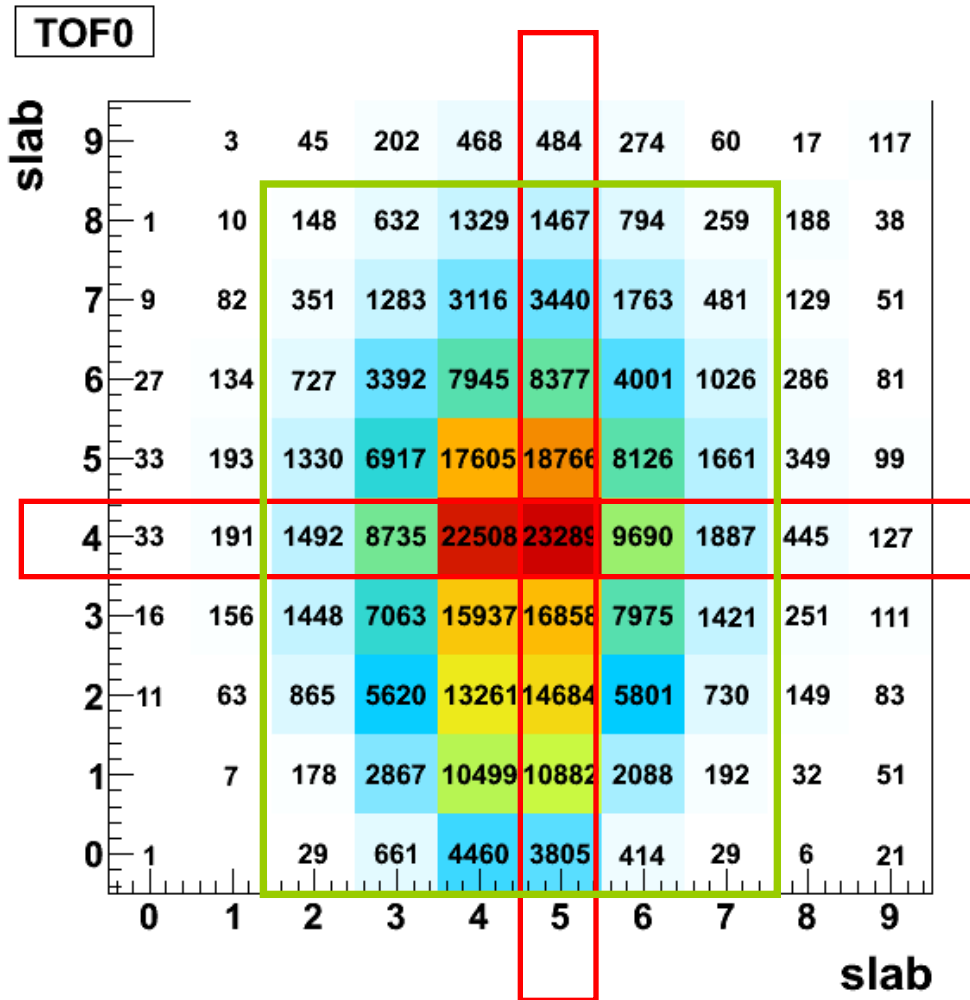
TOF Calibrations Needs



1. TOF0, TOF1 have been refurbished in MIB and put back in DSA with new PMTs.
2. => We will need **New calibration!**



Requirements for Time Walk calibration (from Yordan presentation at CM29)



All you need is particles.
Any kind of beam settings are OK.

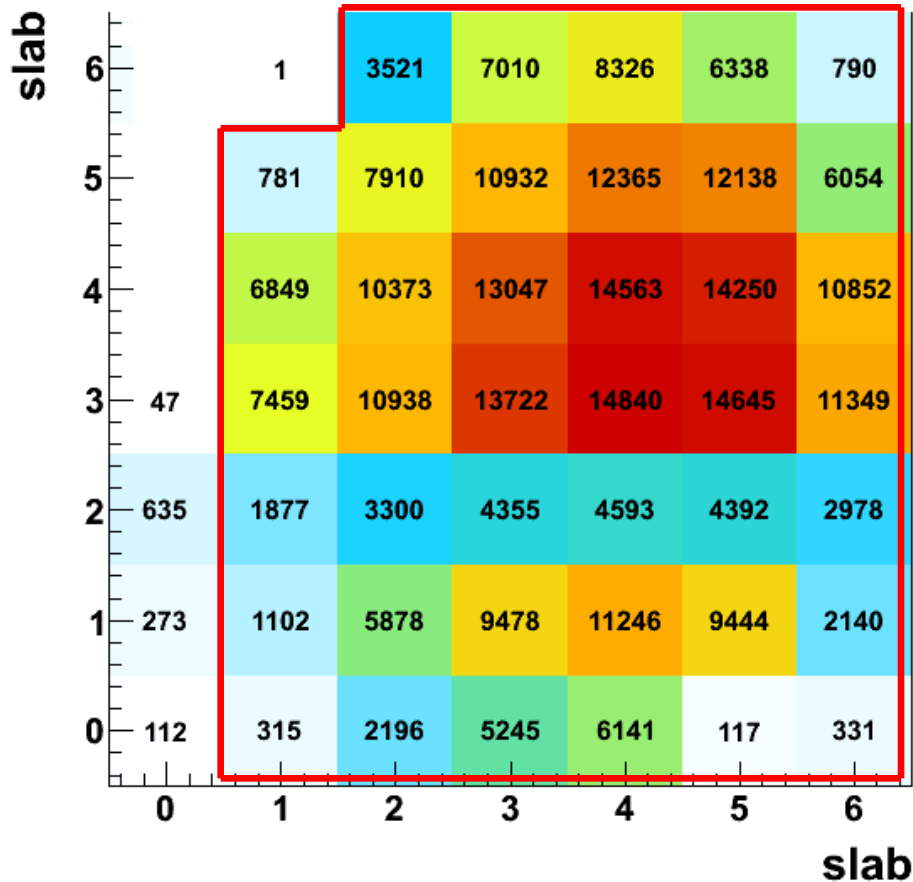
The important point is the number of hits in the central pixel of each slab. We need **>1K events** in these pixels.

For this particular example we will be able to have a TW calibration only in the green area.

Requirements for calibration of the trigger station



TOF0

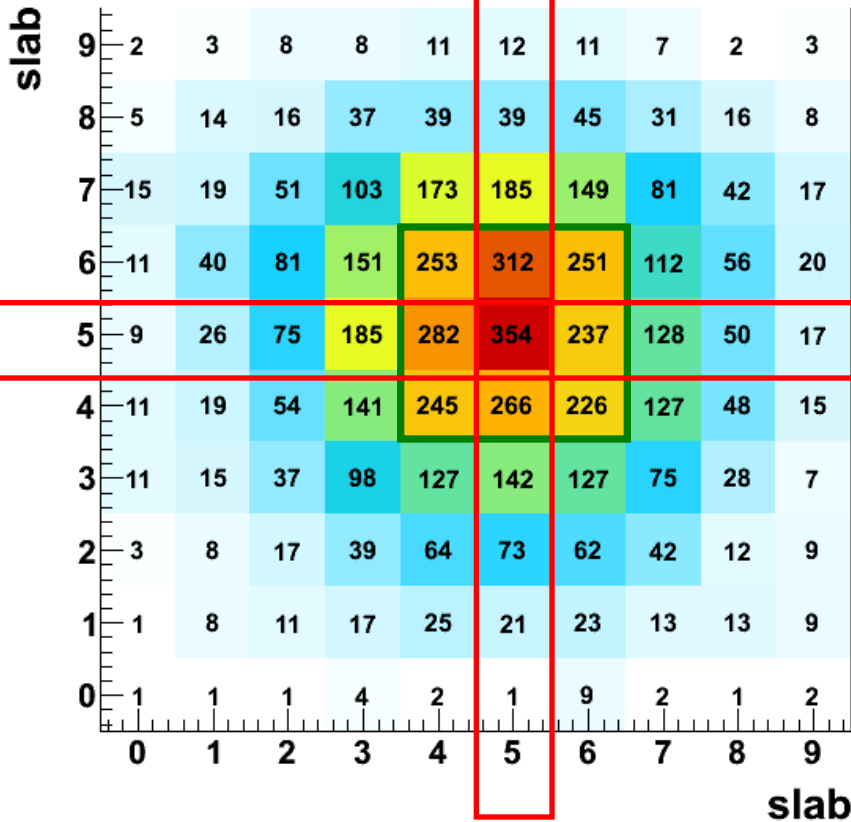


- Any kind of beam settings are OK.
- We need **>100 events** in each pixel.
- For this particular example we will be able to calculate the relative trigger delays only in the pixels inside the red area.

Requirements for calibration of the other stations



TOF2 profile



- We need electrons. => We need electron beam.
- The important is the number of hits in the central pixel of each slab. We need **>200-300 events** in these pixels.
- For the example here we will be able to have a calibration only in the green area in the centre.

Conclusions



- TOF0/TOF1 refurbished with new PMTs (about 50 changed out of 68) + a better mechanics for TOF1 PMTs support (as the one of TOF2).
- Maybe this will solve the pending issue of the little worse resolution (60 ps) as compared to TOF0/TOF2 (~50 ps)
- TOF performances were good