

TOF prospects for 2011 run

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TOF performances in 2010

- ◆ Smooth performances in 2010 run
- ◆ No major hardware problems
- ◆ Refurbishment of TOF0, TOF1 PMTs
- ◆ All described in the forthcoming MICE note – 367 (with KL)

MICE Collaboration

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Analysis of PID detectors (TOF and KL) performances in the MICE 2010 run

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The performances in the 2010 run of the main installed PID detectors of MICE: the time-of-flight system and the KL downstream calorimeter are reported in this paper. All detectors have shown a stable behaviour during all the run, with minor hardware problems, and performances compatible with the expectations.

¹ Now at Sofia University St. Kliment Ohridski

² Partially supported by INFN, sezione Milano Bicocca

TOF performances in 2010 run

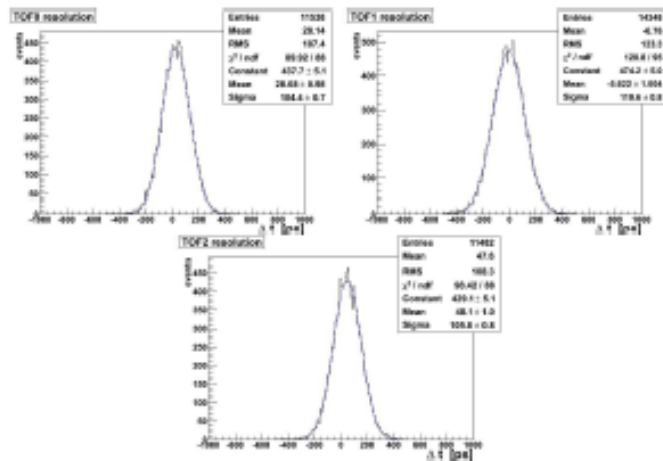


Fig. 9. Time difference Δt_{xy} between vertical and horizontal slabs in TOF0, TOF1 and TOF2. Trigger is on TOF1.

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



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

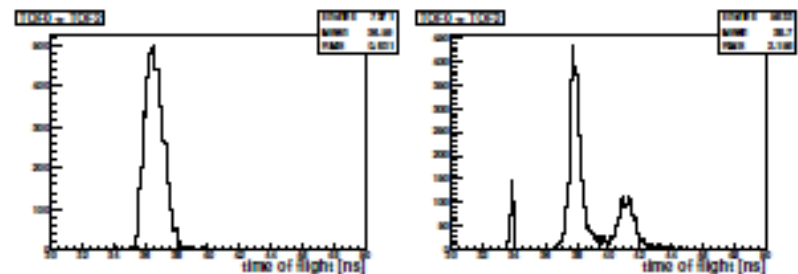


Fig. 11. Time of flight between TOF0 and TOF2 for muon (left) and electron (right) beam.

TOF stability during 2010 run

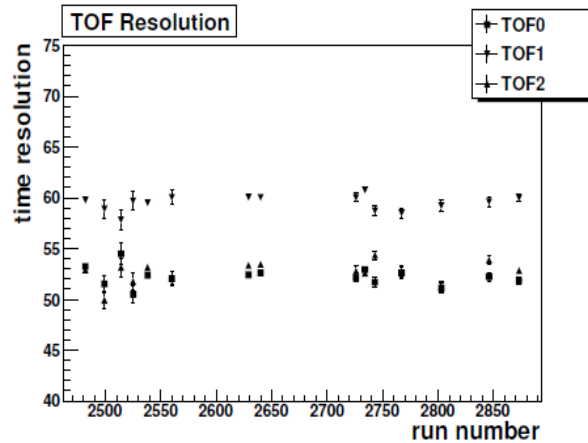


Fig. 12. Stability of the time resolution of the TOF stations versus running time. Nominal muon beam data with trigger from TOF1.

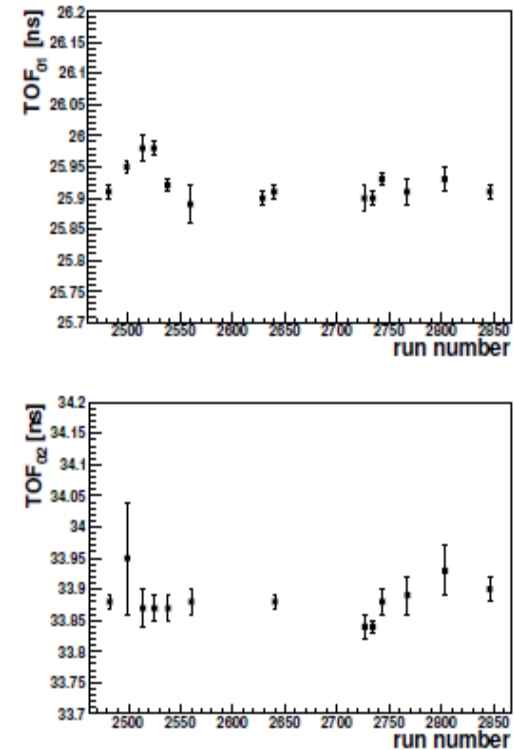


Fig. 13. Stability of the time-of-flight of electrons between TOF0 and TOF1 (top) and TOF0 and TOF2 (bottom) versus run number. Nominal muon beam data with trigger from TOF1.

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 and put back in DSA with newer PMTs (about 20 out of 40) , TOF1 is in Milano under refurbishing



TOF0/TOF1 maintenance operations at RAL



TOF0 refurbished



TOF1 refurbishing

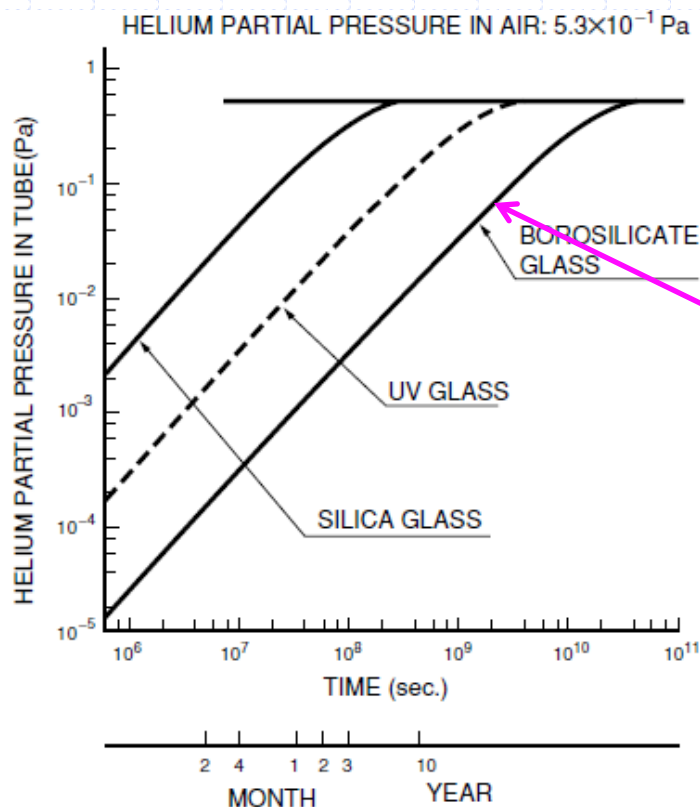
- TOF1 refurbishing involves the change of all PMTs (old ones 2006->2008 production) + a better mechanics for PMTs support (as the one of TOF2).
- Maybe this will solve the pending issue of the little worse resolution (60 ps) as compared to TOF0/TOF2 (~50 ps)
- We still miss some PMTs that are at Hamamatsu for refurbishing (this delays our schedule), but we are confident to have it ready by April/May

He poisoning of R4998 PMTs



- We need some input for the possible releases of He in the Hall
- Up to now some preliminary discussions with M. Courthall, Andy, ...
- The idea is to test a R4998 PMT with a mixture of 3%He+97%N₂ to see at what level problems begin to show up (measure t)

From Hamamatsu PMTs Handbook: no data specific to R4998

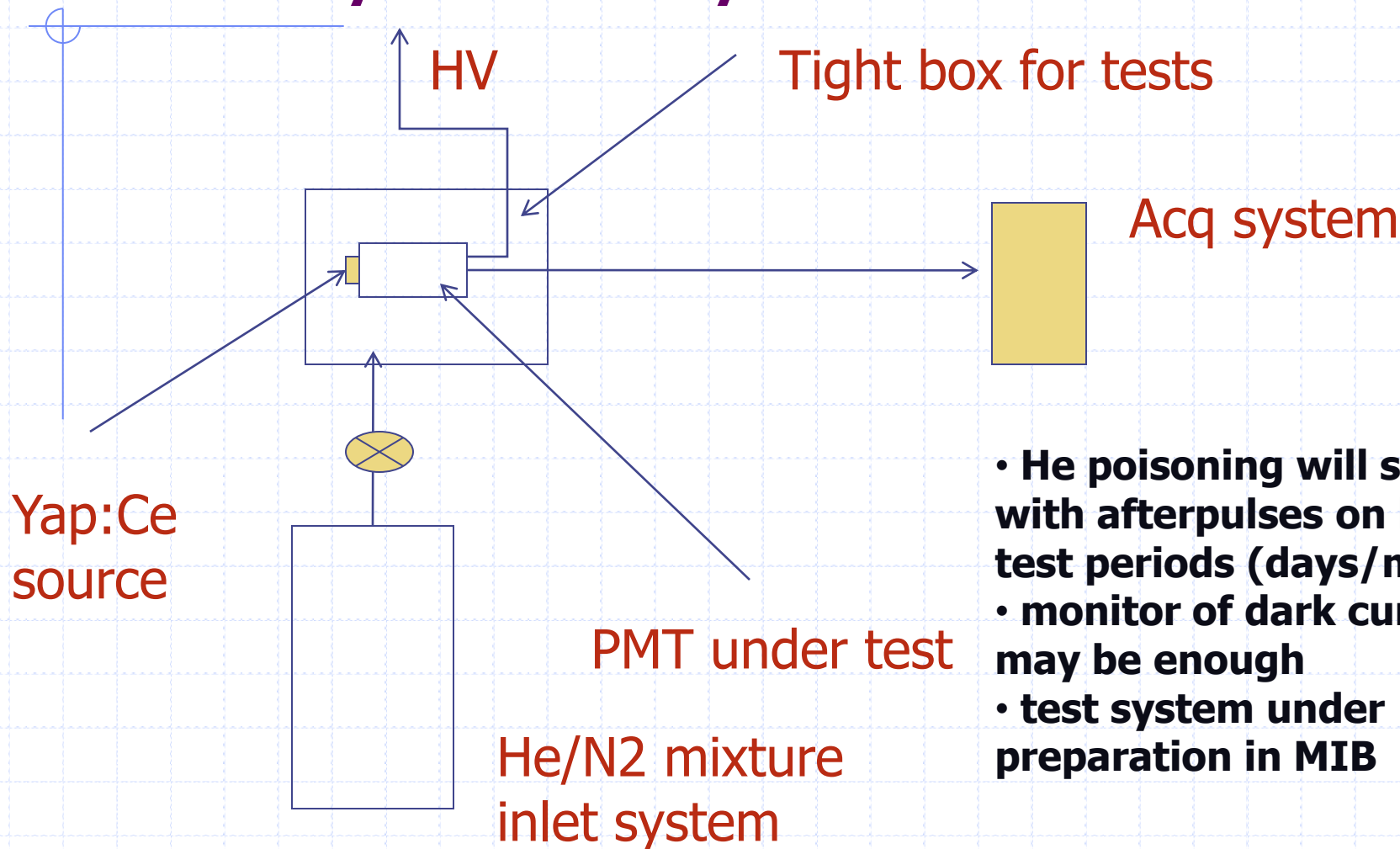


R4998 window

3-14: Bulb materials and variations in helium partial-pressure inside a tube

Helium gas exists on the earth at a partial pressure of about 0.5 Pa. As stated above, the permeability of helium through silica glass is extremely high, as much as 10^{-19} cm²/s (at a pressure difference of 1.013×10^5 Pa) at room temperatures. Because of this, the helium pressure inside the photomultiplier tube gradually increases and finally reaches a level close to the helium partial-pressure in the atmosphere. The time needed to reach that level depends on the surface area and thickness of the silica glass. For instance, if a 1-1/8 inch (28 mm) diameter side-on photomultiplier tube with a silica bulb is left in the atmosphere, the helium partial-pressure inside the tube will increase to 9×10^{-2} Pa after one year. (Refer to Figure 13-14.)

Test system layout



- He poisoning will show up with afterpulses on long test periods (days/months)
- monitor of dark currents may be enough
- test system under preparation in MIB