TOF status report

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- November 2012 TOF/KL reinstallation
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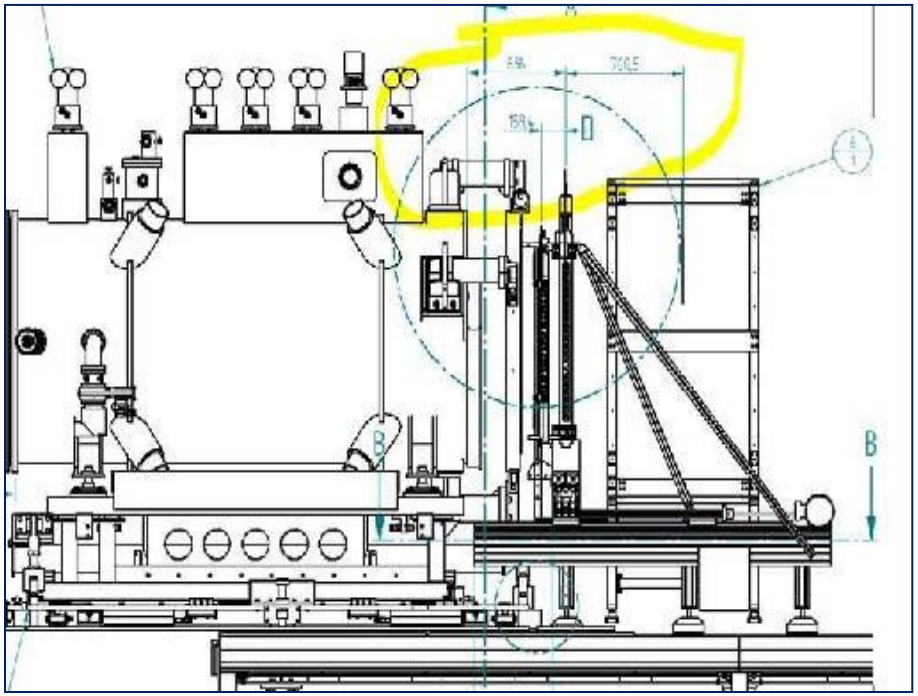
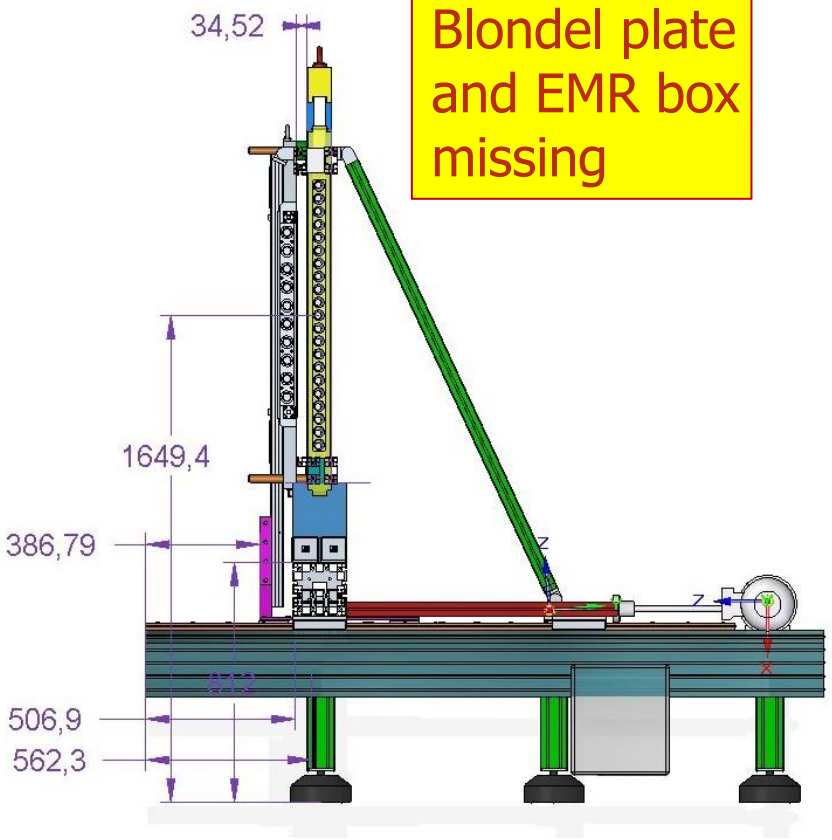
TOF2/KL reinstallation

- TOF2 and KL have been put in beam again on November 2012 by the INFN Roma Tre and Milano Bicocca/Pavia teams
- The support platform was modified to accommodate EMR and all detectors were recabled
- Unfortunately the MID December run didn’ t succeed to take data due to DAQ problems

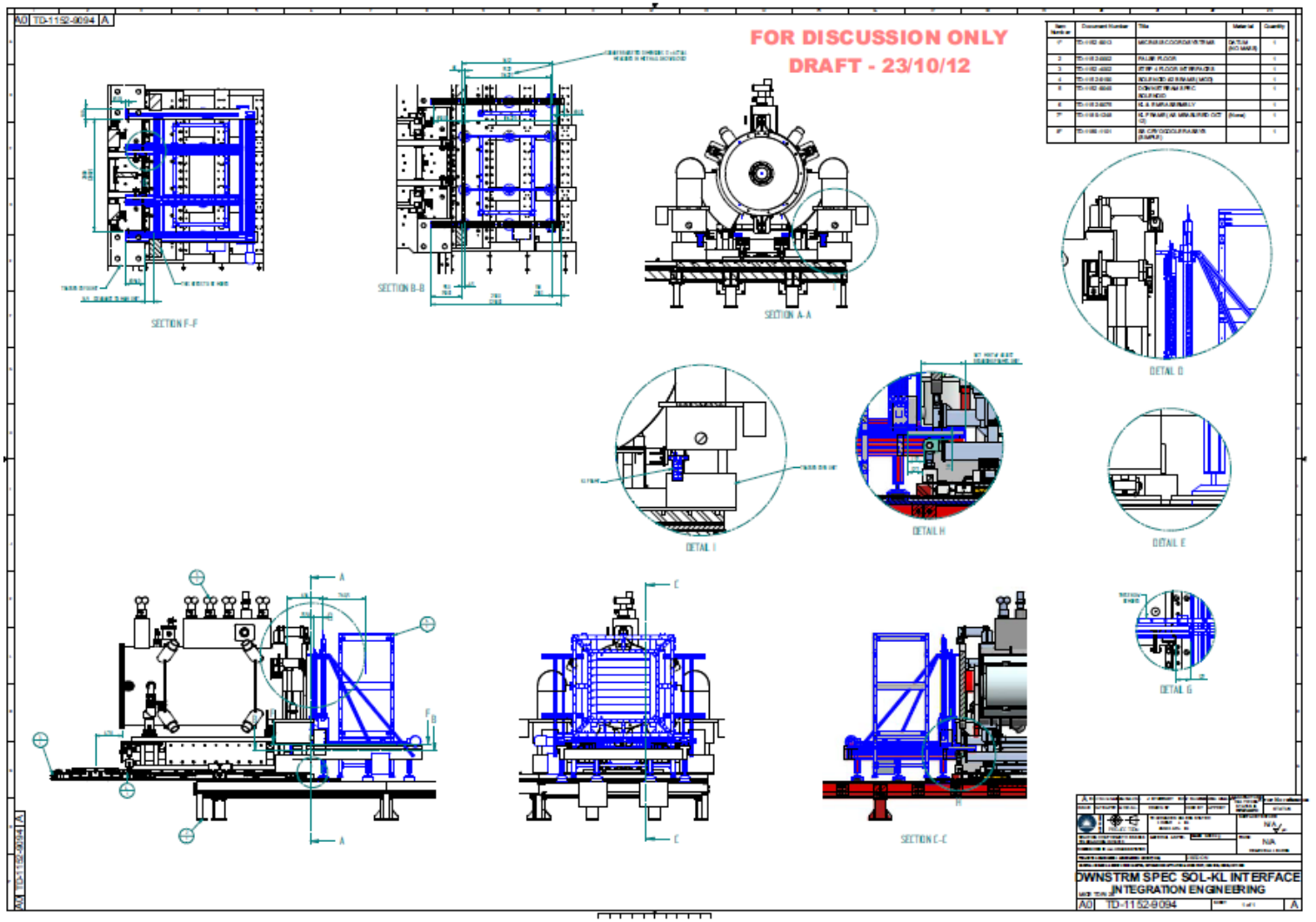
Current TOF2-KL trolley



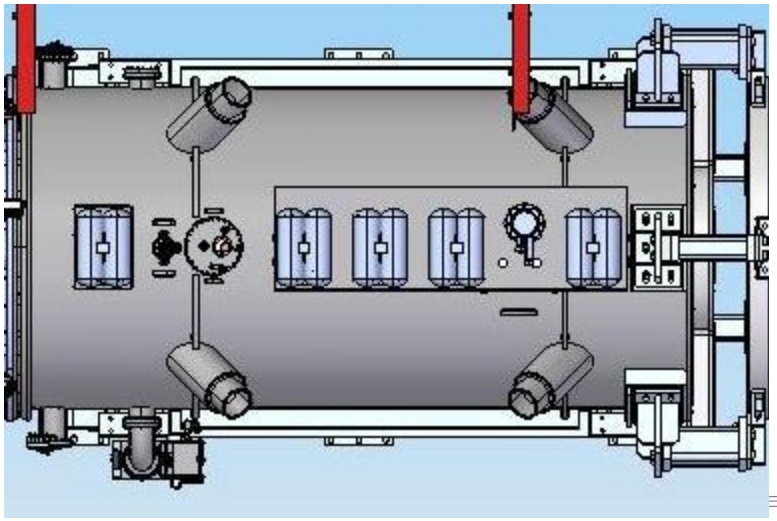


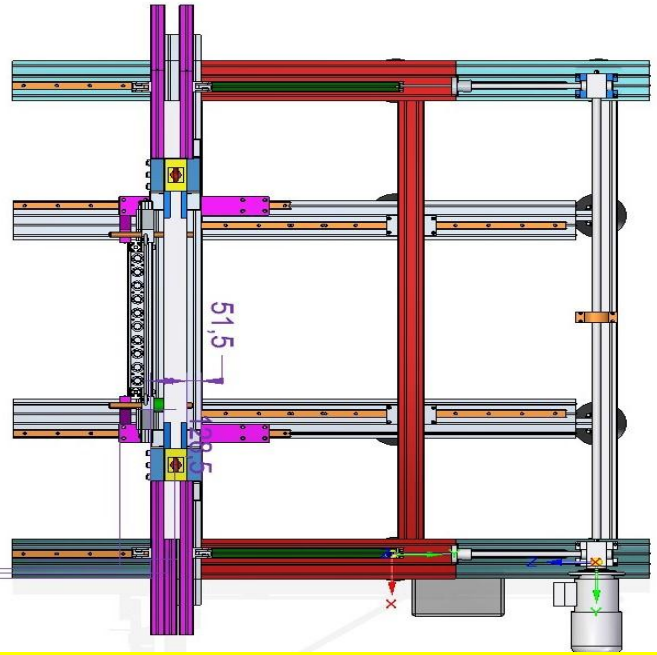
Blondel plate and EMR box missing

Discussion with Jason for integration in the Hall



TOF2-KL trolley – top view



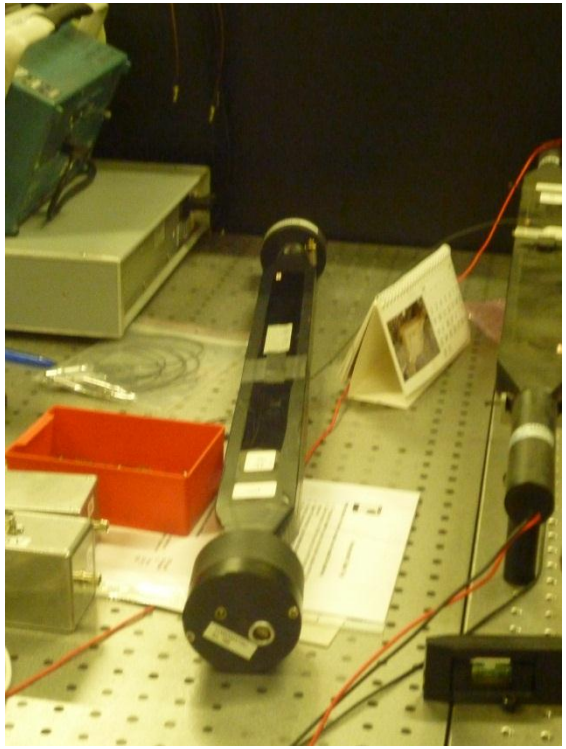


- During November 2012 re-installation, minor mods to avoid interferences with solenoid cryogenics required by Jason, all the rest (EMR …) considered fine

Warten auf Godot

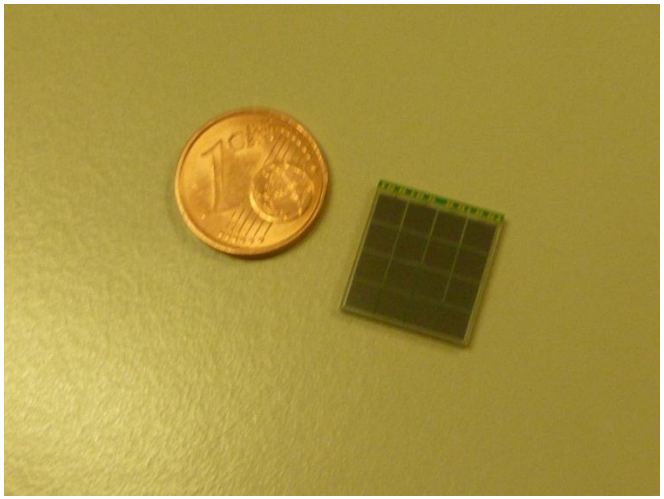
A backup solution for TOFes

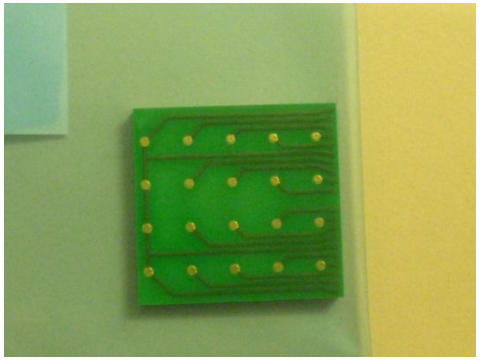
- We are seroiusly concerned with the level of stray magnetic fields in the MICE Hall: bigger than foreseen by GG/JC/… ??
- Straight backup solution for present TOF stations: with SiPMT arrays readout (not sensitive to **B** fields up to few Tesla) instead of conventional PMTs (R4998)
- **Idea**: just use 2 SiPMT arrays instead of 2 PMTs with the same TOF mechanics layout, lightguides …



SiPMT arrays used

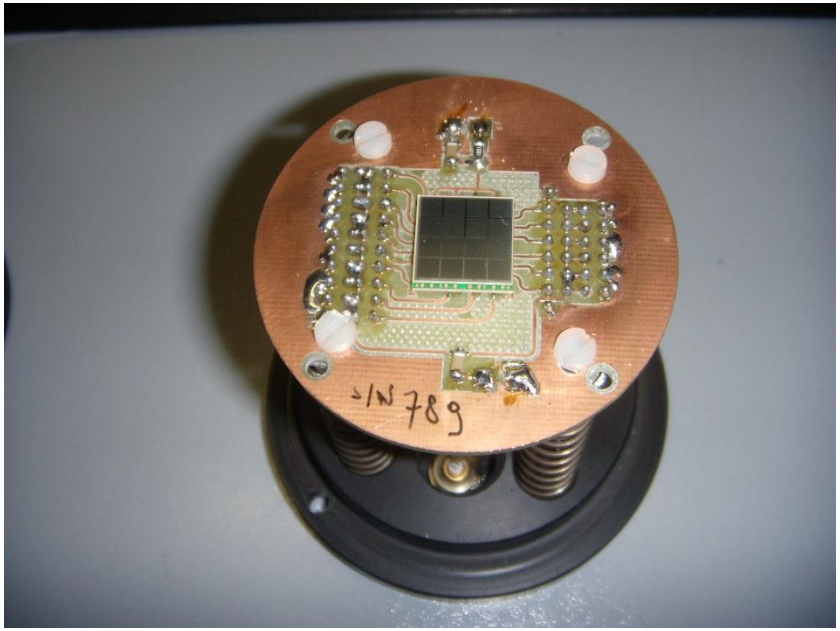
- Plan to use 4x4 arrays of SiPMT 3x3 mm2 (SenSL, Hamamatsu) or 4x4 mm2 (FBK/IRST) to study if it is possible to replace 1” PMTS
- Preliminary studies with our test laser setup and cosmics
- Effort MIB+PV (M.Bonesini, R. Bertoni, A. deBari, M. Prata, M. Rossella, R. Nardo’) just started



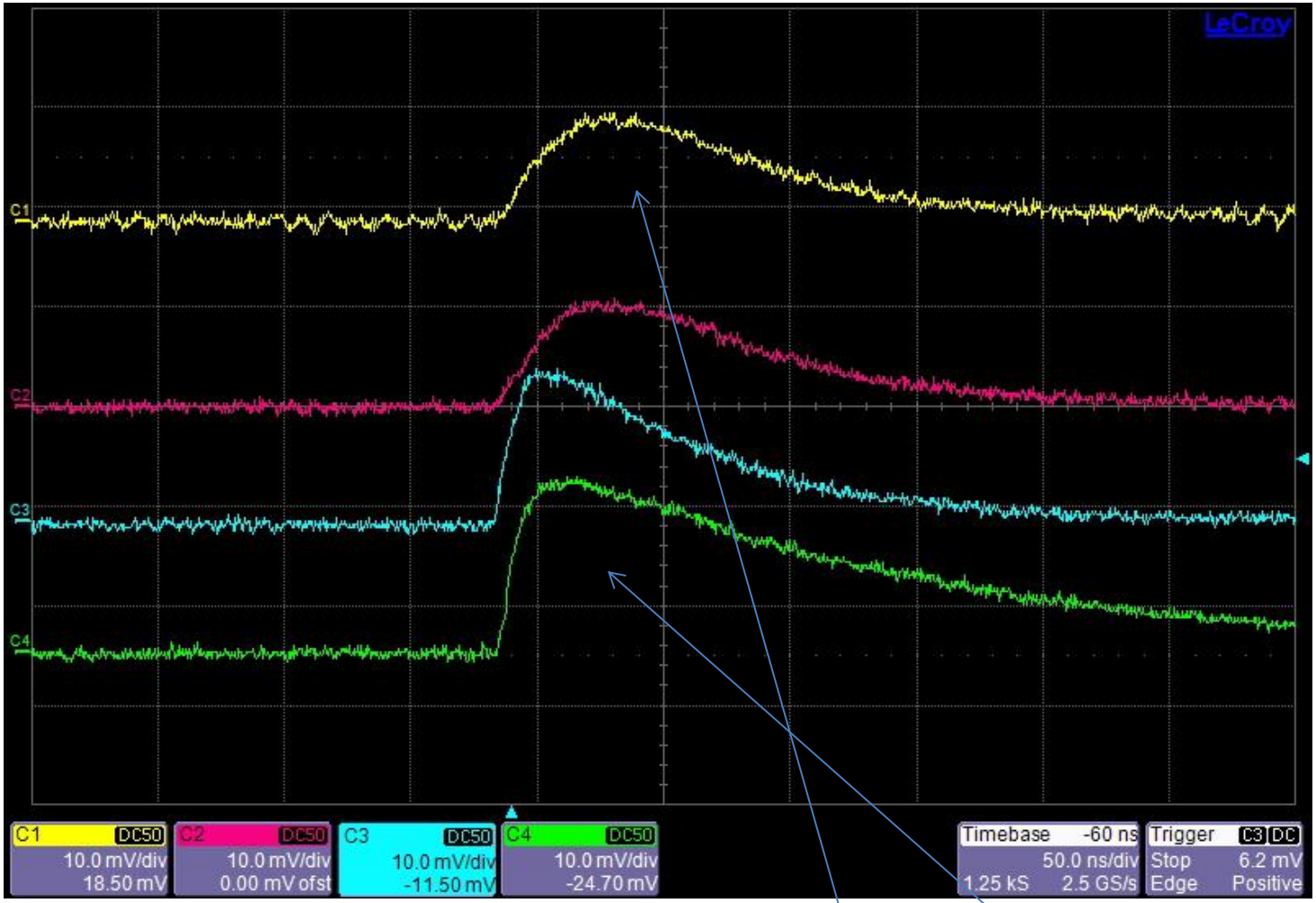


Some details

Housing of SiPMT arrays at TOF counter edge (not yet engineered)



SiPMT array mounted on a ``basette" (readout in parallel)



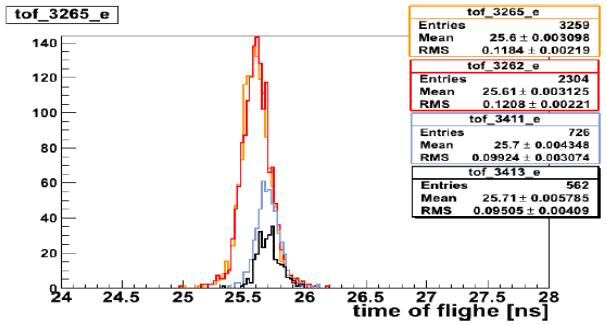
2 crossed bars equipped with SenSL or Hammamatsu SiPMT arrays, trigger on cosmics

Next steps

- Readout with inverting amplifier (x20) developed in PV
- Tests with laser setup (simulating MIP) and VME readout at MIB
- Comparison with different SiPMT arrays (SenSL, Hamamatsu, FBK, new Hamamatsu with vertical readout [expected TTS ~250 ps]) and conventional PMTs readout (baseline R4998)
- Investigating if there is the possibility to test in beam the equipped counters (BTF ?) together with PSI MEG experiment

Rate effects in TOF

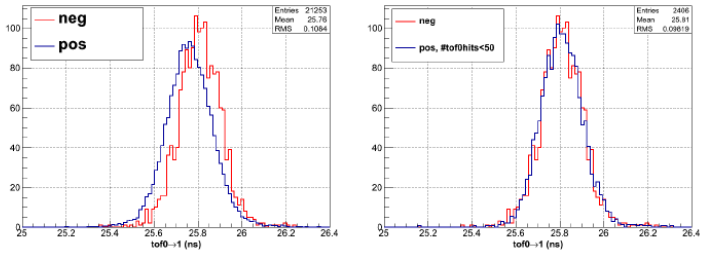
e^+e^- puzzle.



Some rate effects have been seen, but source is unclear: may be anything from PMTs to TDCs to splitters/shapers … beam …

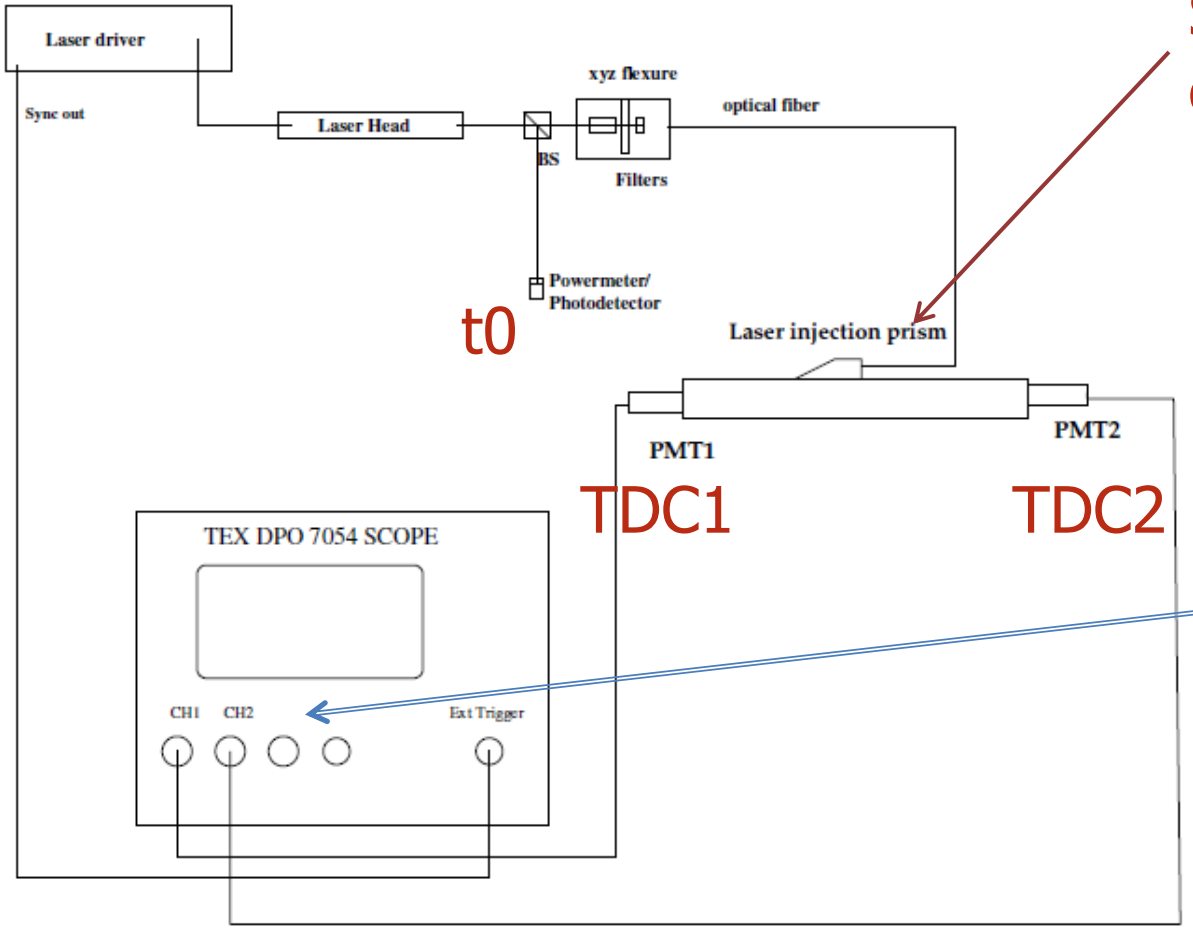
- The variation of the number of particle trigger per spill introduces difference in the measured time-of-flight ($\sim$ 100 *ps*) even when we use identical settings of the beamline channel.

- First looked at the time of flight for + and – data.
- Left: Obvious shift: e+ have lower tof than e-
- Right: No difference when only lower hit rate + data is selected



DR, A/M, 6/21/12 11

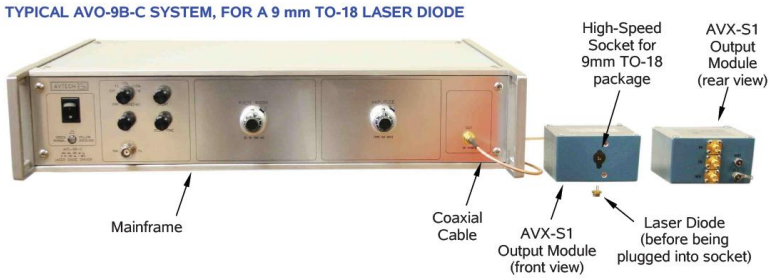
Test setup



Standard TOF2 counter

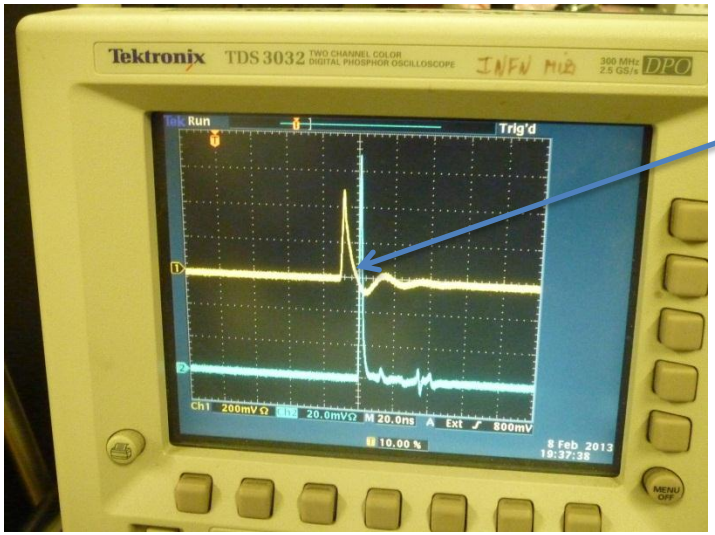
Replaced by a VME DAQ

Test setup: laser

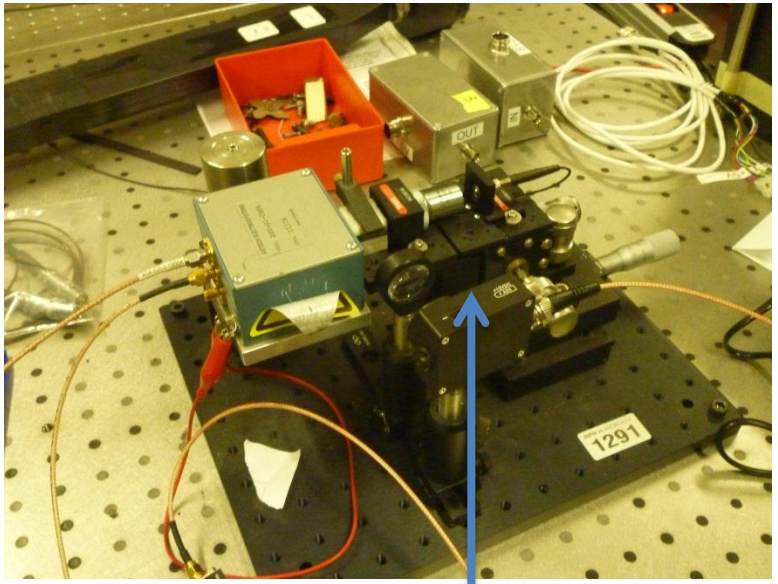


1. **Laser pulses width selectable between 120 ps and 3 ns length, with a ~200 ps risetime (simulate scintillator response)**
2. **Laser pulse height selectable to give scintillator response between a fraction of MIP and 10-50 MIPS**
3. **Laser repetition rate selectable between ~100 Hz and 1 MHz**
4. **The laser beam is splitted by a 50% beamsplitter to give a reference t0 on a fast photodiode (Thorlabs DET10A risetime ~1 ns) amplified via a 2 GHZ XA-X-20 FEMTO fast amplifier and inverted by a PLS pulse inverter**

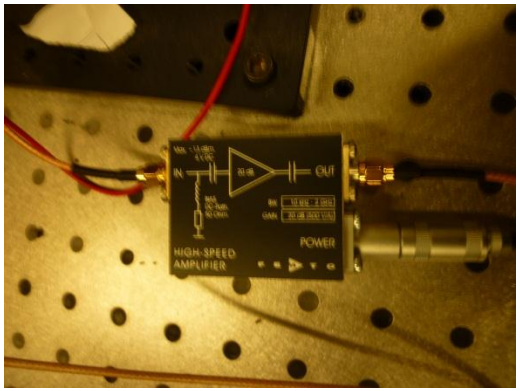
The laser system: some details



Photodiode signal



Fast 2GHz amplifier

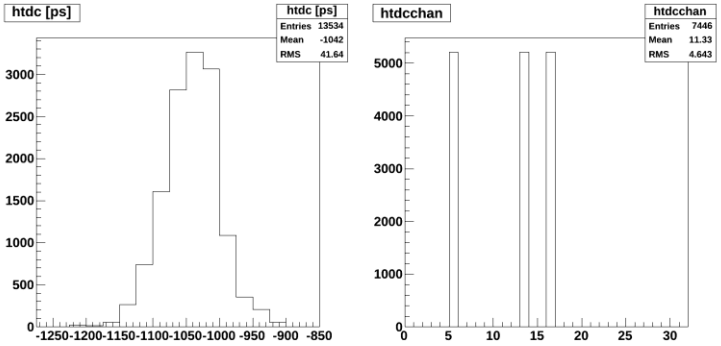


Laser injection system

Acquisition system

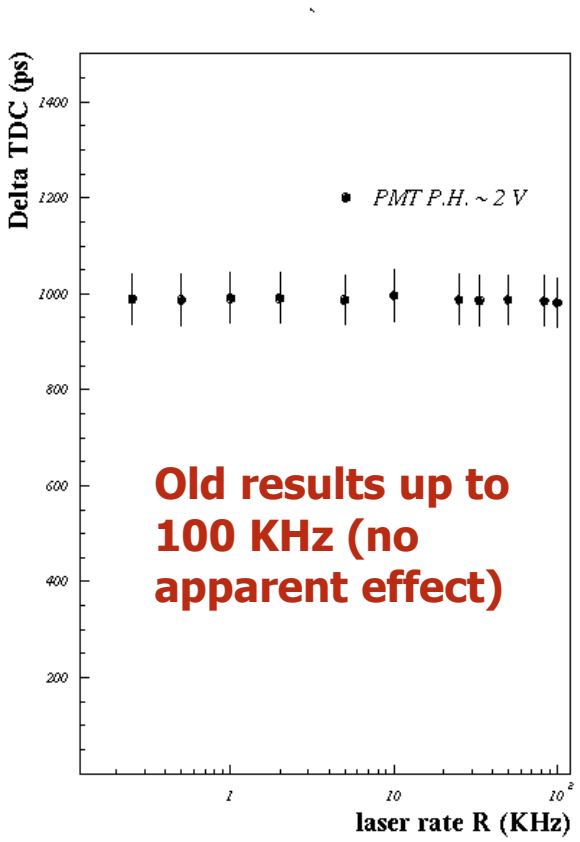
- VME based with CAEN V2718 VME-PCI interface
- VME CAEN TDC V1290A
- VME CAEN QADC V792 (to be replaced by a V1724)
- VME CAEN V895 L.E. discriminator
- Acquisition software home-written by Roberto (Bertoni) and heavily modified to go to 1 MHz rates
- Passive SUHNER 50%-50% splitter

Still preliminary results for TDC

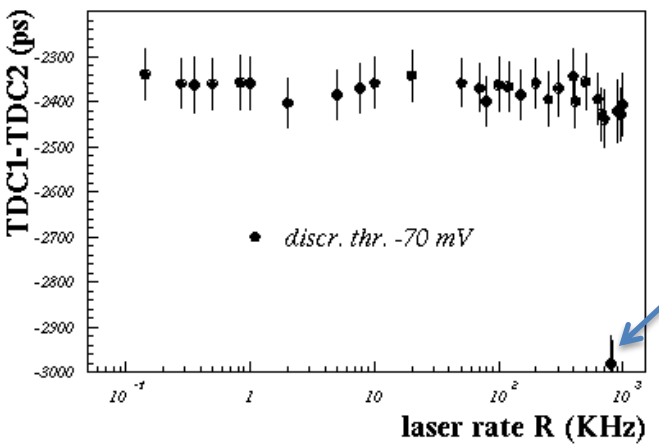


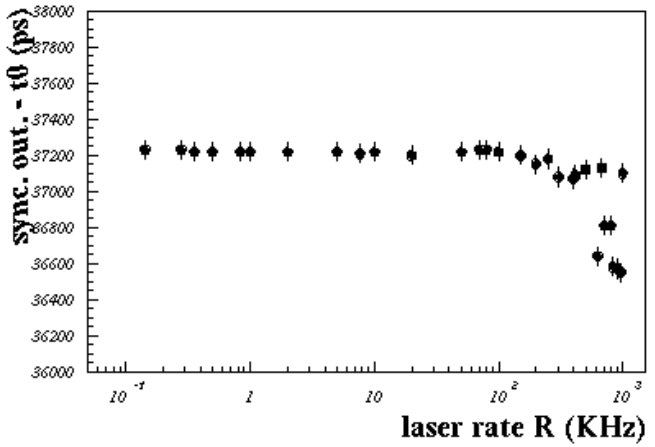
1. Signal from scintillation counter ~1-2 MIP
2. Now:

- Δt between CH #1,2 and single CH #1 or 2 with fast photodiode (t_0)
- QADC for CH # 1,2
- Rates up to 1 MHz



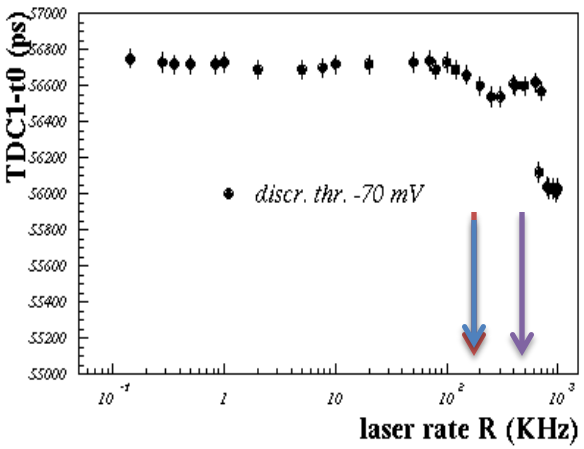
New results for TDC

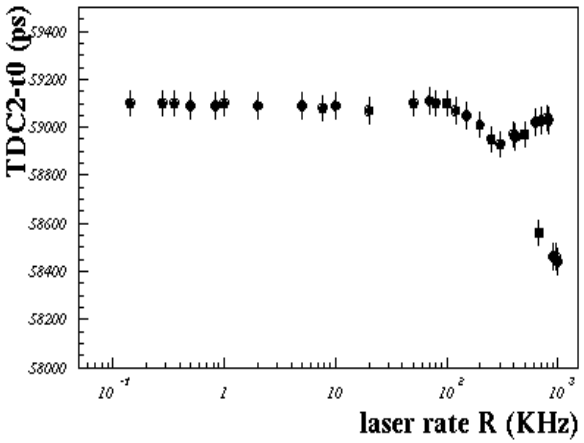




This glitch prompted our attention and the need for an external t0

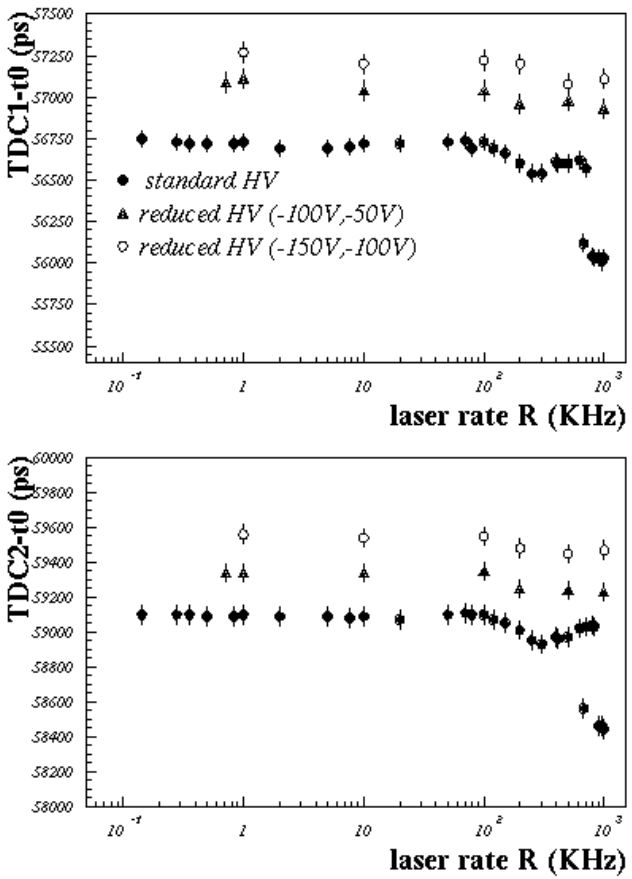
TDC vs t0





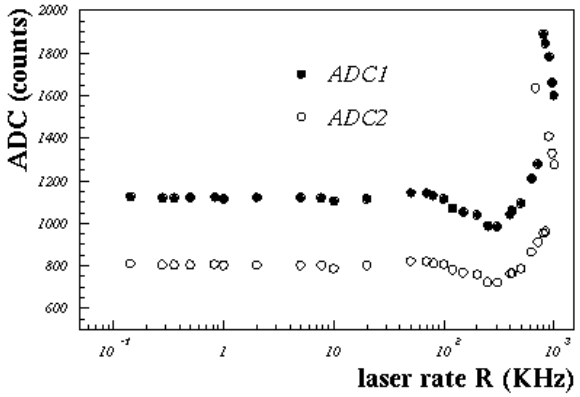
- Some clear effects appear at very high rates > 500 KHz for single PMTs with a -70 mV thr on V895 discri. (results move of about 600 ps) with some hints at lower values (rates > 150 KHz)
- May be PMTs, TDCs, VME discr used (CAEN v895), problems in t0 (stability of photodiode) …

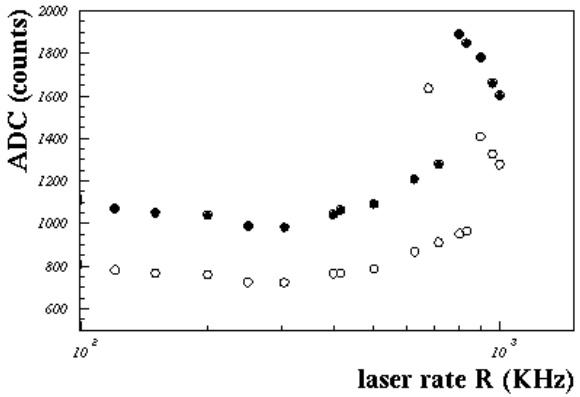
Effect of HV reduction



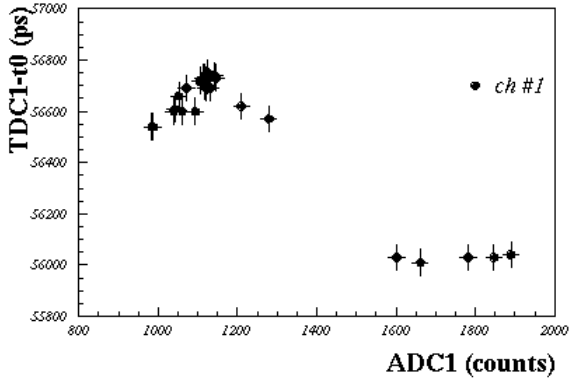
- A small HV reduction mitigates problems
- Less current driven by PMTs (this points to saturation effects in PMTs divider)
- Needs to investigate discr thr effect

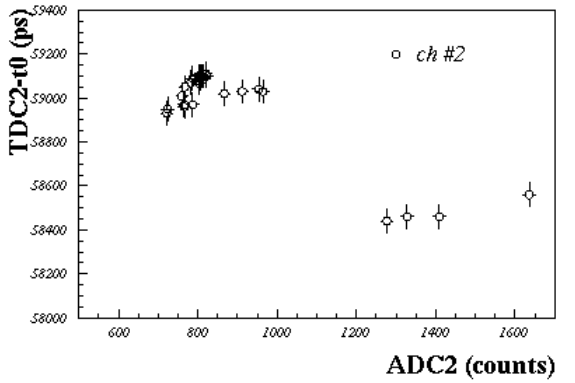
Effects on QADC (V792)



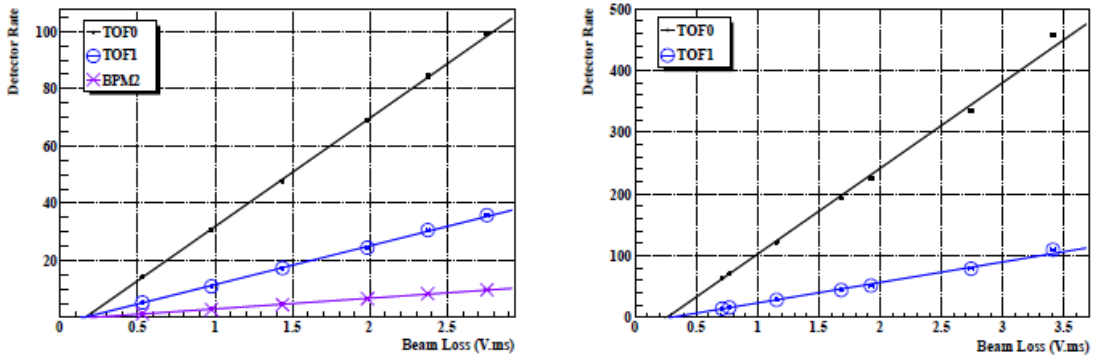


Quite expected: conv. Time of V792 QDC ~5.6 μs -> needs to go to V1724

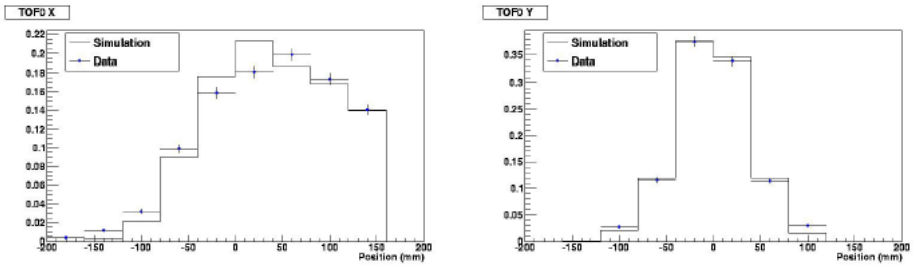




It is a problem ?



Particle rate vs target dip

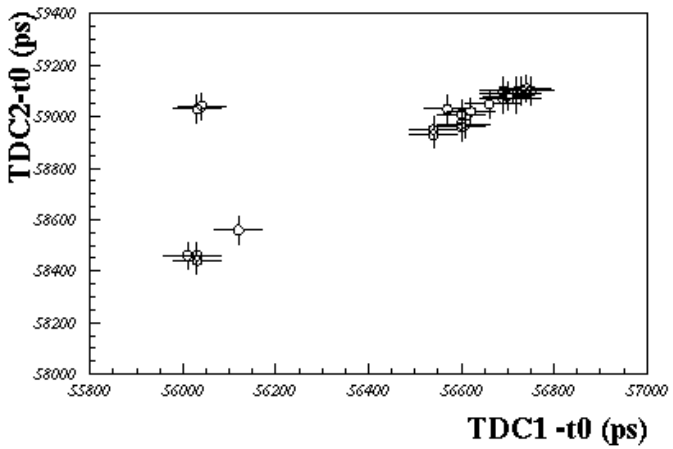


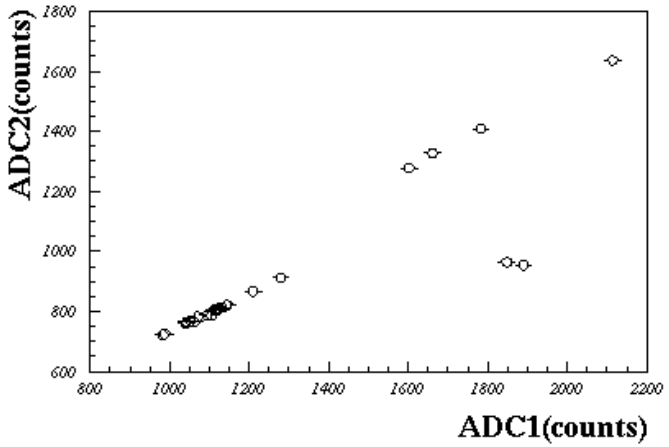
Beam profile at TOF0

From JINST paper

- Expected max rate at TOF0 for single slab for $\mu^+(\mu^-)$: **100 (30) part/spill* 0.68/4slabs~18 (6) KHz (1 V activation): with 4V activation we go to 75 KHz max**
- **A factor 5 less in TOF1**
- From previous results OK up to 150-200 KHz

TDCs vs ADCs scatter plot





Conclusions

My **wise cat** conclusions:

1. We need still more study (this time to eat the mouse)
2. But some effect seems to show up, albeit at higher rates than we experience