

# **Rates effects with TOF**

**M. Bonesini, R. Bertoni**  
**Sezione INFN Milano Bicocca**

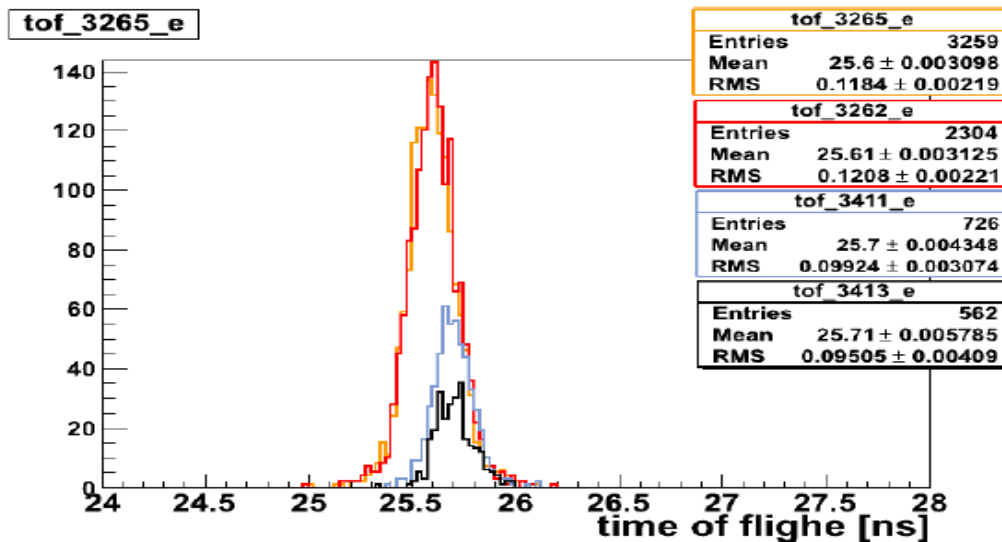
# Starting point

- Some rate effects have been seen by Yordan and Durga, but source is unclear: may be anything from PMTs to TDCs to splitters/shapers ... beam ...
- Some plots just to remind it **and shed some light on this phantom**



# From Yordan

$e^+e^-$  puzzle.

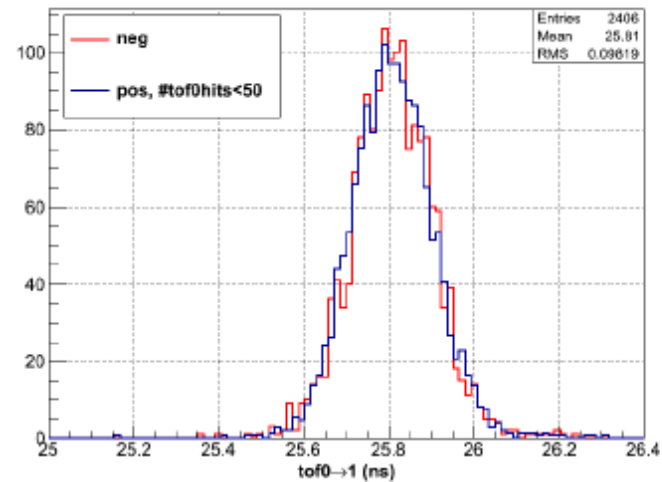
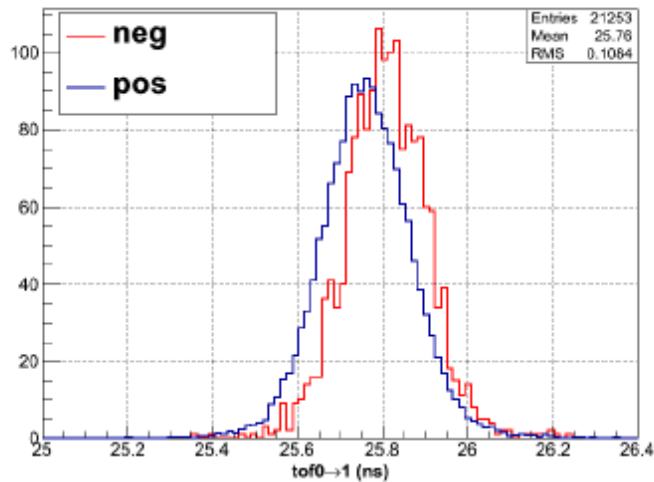


- The variation of the number of particle trigger per spill introduces difference in the measured time-of-flight ( $\sim 100$  ps) even when we use identical settings of the beamline channel.

Navigation icons: back, forward, search, etc.

# From Durga

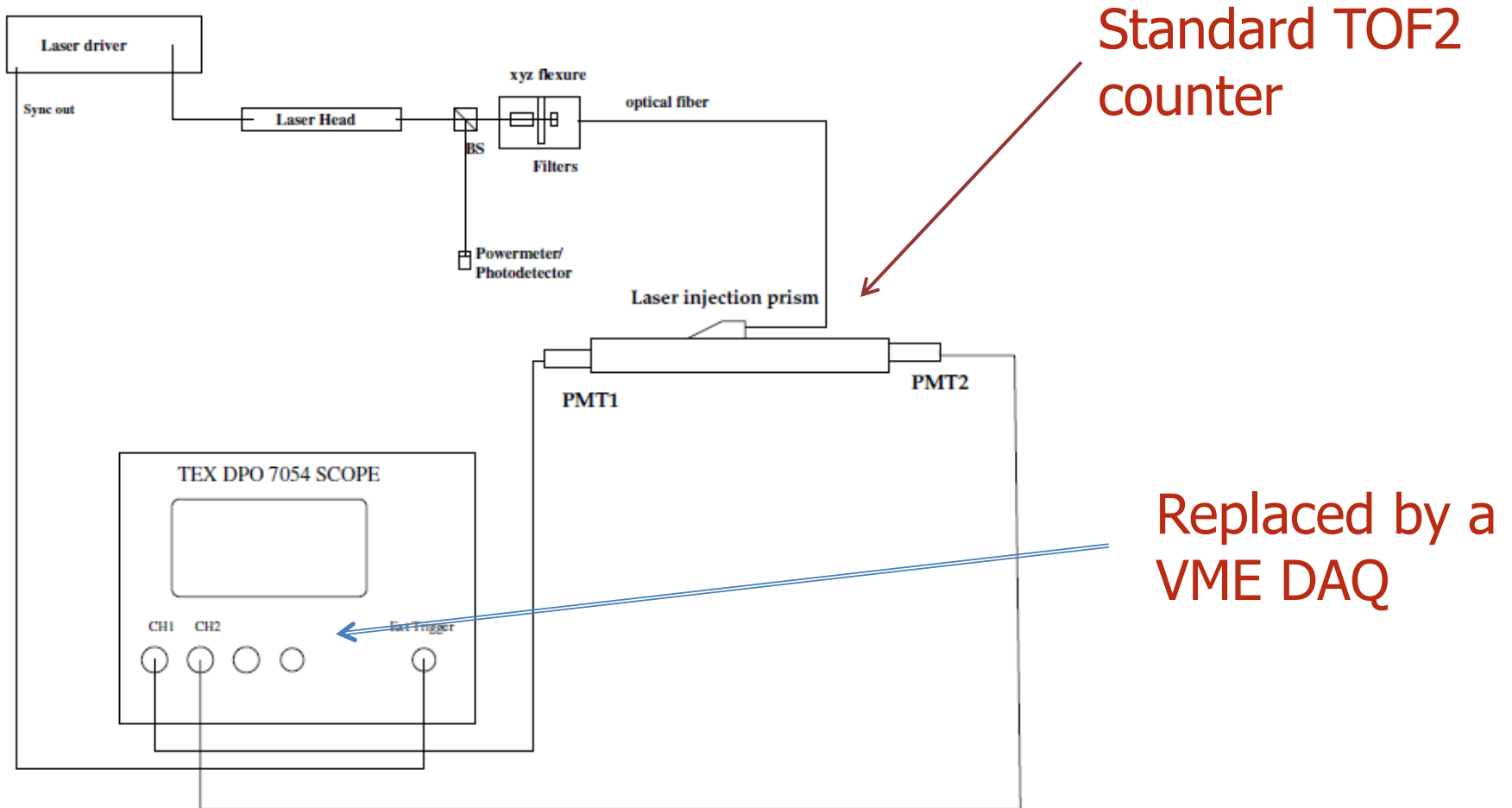
- First looked at the time of flight for + and – data.
- Left: Obvious shift: e+ have lower tof than e-
- Right: No difference when only lower hit rate + data is selected



DR, A/M, 6/21/12

11

# Test setup

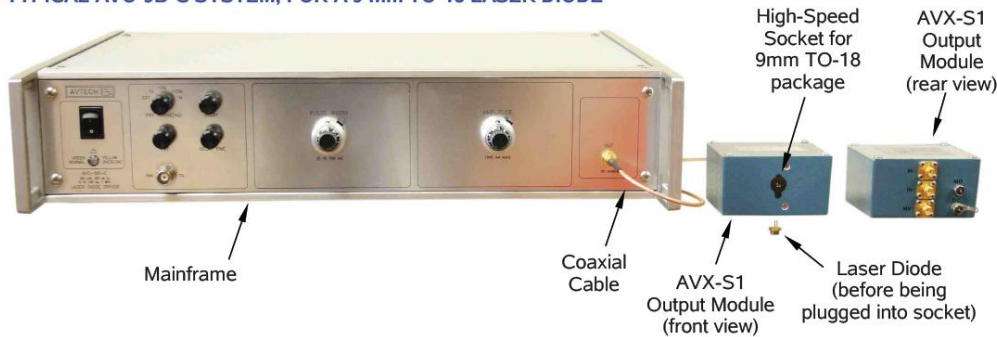


# Test setup: laser

- Use an home-made laser diode at  $\sim 400$  nm based on a fast Avtech AVO-9A-C pulser and a NICHIA 50 mW violet diode laser
  1. Laser pulses width selectable between 120 ps and 3 ns length, with a  $\sim 200$  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  $\sim 100$  Hz and 1 MHz

# The laser system

TYPICAL AVO-9B-C SYSTEM, FOR A 9 mm TO-18 LASER DIODE



**GPIC**      **SPECIFICATIONS**      **AVO-9 SERIES**

**Model # 1 Amp, with PRP 5 T.O MW**

Model	AVO-9A-BP	AVO-9B-BP	AVO-9B1-BP	AVO-9B2-BP	AVO-9A3-BP	AVO-9A4-BP	AVO-9A5-BP
Amplitude <sup>1</sup>	0 - 200 mA	0 - 200 mA	0 - 200 mA	0 - 400 mA	0 - 800 mA	0 - 800 mA	0 - 1 A
Max. output rate (max. 500 ns pulse width)	13V	13V	22V	40V	40V	40V	52V
R <sub>s</sub> + R <sub>load</sub>	50Ω						
Transformer ratio, N:1	1						
Allowed load voltage range:	0 to 2V. (Contact Avtech if your diode has a higher forward voltage drop)						
Pulse width (FWHM)	0.4 - 4 ns	0 - 100 ns	0.5 - 1000 ns	0.6 - 1000 ns	0.4 - 216 ns (0.4 - 4 ns opt)	1 - 10 ns	1 - 10 ns
Minimum duty cycle:	5%	5%	5%	5%	5%	5%	5%
Maximum PRP <sup>2</sup>	1 MHz	1 MHz	100 kHz	1 MHz	100 kHz	1 MHz	1 MHz
Rise times (10% - 90%)	≤ 200 ps	≤ 200 ps	≤ 200 ps	≤ 200 ps	≤ 200 ps	≤ 200 ps	≤ 200 ps
Fall times (90% - 10%)	≤ 200 ps	≤ 200 ps	≤ 200 ps	≤ 200 ps	≤ 200 ps	≤ 200 ps	≤ 200 ps
Related I/O series:	AVP-9A-1	AVMP-2	AVPP-1A	AVPP-2A	AVP-9A-1	AVP-9A-1	AVP-9A-1
Included output module:	AVO-9B						
Polarity:	Positive or negative (specify)						
(SP) and (R) I/O count <sup>3</sup>	Standard on 8 units.						
Laser diodes:	Check <a href="http://www.avtech.com/links">http://www.avtech.com/links</a> for availability and downloads.						
Notes / Misc. comment <sup>4</sup>	Optional. See <a href="http://www.avtech.com/links">http://www.avtech.com/links</a> for details.						
Double pulse separation (opt <sup>5</sup> )	0 to +50% of the period	Not available	0 to +50% of the period	NA	0 to +50% of the period	NA	NA
Propagation delay:	≤ 100 ns (0 to 10 ns to pulse out)						
jitter:	± 25 ps ± 0.01% of cycle delay (0 to 10 ns to pulse out)						
DC offset or bias insertion:	Apply required DC bias current in the range of 0-100 mA to solder terminal on output module.						
Logic delay:	Variable 0 to 200 ns (1 second for 8 units), sync out to pulse out						
Logic output (to I/O):	+3V, 500 ns						
Logic input:	Synchronous or asynchronous, active high or low, Schmitt. Suppresses triggering when active.						
Trigger required:	External mode: +5 V (TTL), ≥ 50 ns						
Monitor output option <sup>6</sup> :	Provides connection to input of photo diode detector.						
Connectors:	Out: 0-8 pin	User-specified socket. Sockets can be provided for 8 pin, 9 pin, butterfly, and other packages. Typ. 9-pin, 0-8 pin-BNC, Monitor SMA.					
Recommended accessory kit:	Add the suffix "-ACT" to the model number to include the recommended accessories: Cables of three SMA, 10 SMA, 2 SMA connectors (10, 20 & 30 dB) for use on the output, and one 10 SMA, 1 SMA, 1 SMA lead through terminator (10W SMA, 0-8 pin-BNC) for use on external trigger inputs.						
Power requirements:	100 - 240 VAC, 30 - 80 W						
Dimensions, Mainframe (9-in-W):	100 x 400 x 270 mm (3.9" x 15.7" x 10.6"). Anodized aluminum, with blue plastic trim.						
Dimensions, Output Module:	41 x 66 x 76 mm (1.6" x 2.6" x 3.0"). cast aluminum, blue enamel						
Temperature range:	+15°C to +45°C						

1. All multi-wavelength (MEL, MEL-C, MEL-D) and (MEL-E) models of amplifiers and frequency. See <http://www.avtech.com/links> for details.  
 2. For system at maximum pulse rate, 20% of maximum pulse rate should be allowed by setting the negative rate limiter and output terminal protection on the output. Between the maximum and minimum pulse rates, the maximum pulse rate is 100 ns. The maximum pulse rate is 100 ns.  
 3. Includes double pulse to multi-pulse conversion. P = 1 A.  
 4. Add the suffix "-ACT" to the model number to specify the "ACT" kit.  
 5. Standard output option.  
 6. For the double pulse option, add the suffix "-DP". This option requires the maximum amplitude to be limited by 50%.  
 7. For photo diode output module, refer to AVP-9A-1.  
 8. For 1 A in 40 pulse mode, multi-pulse mode with 100 ns pulse period, the maximum pulse rate is 100 ns for each pulse.  
 9. The maximum PRP of the external mode is 100 ns for 1 A in 40 pulse mode. The maximum PRP of the internal mode is 100 ns.

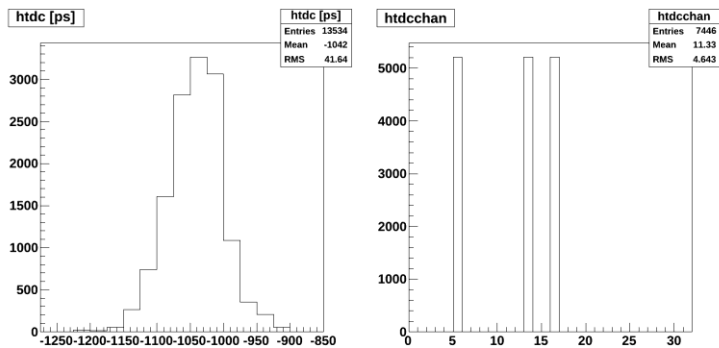
# Acquisition system

- VME based with CAEN V2718 VME-PCI interface
- VME CAEN TDC V1290A
- VME CAEN QADC V792 (to be replaced soon by V1724)
- VME CAEN V895 L.E. discriminator
- Acquisition software home-written by Roberto (Bertoni)
- Passive SUHNER 50%-50% splitter (to be replaced soon by BG splitter/shaper)

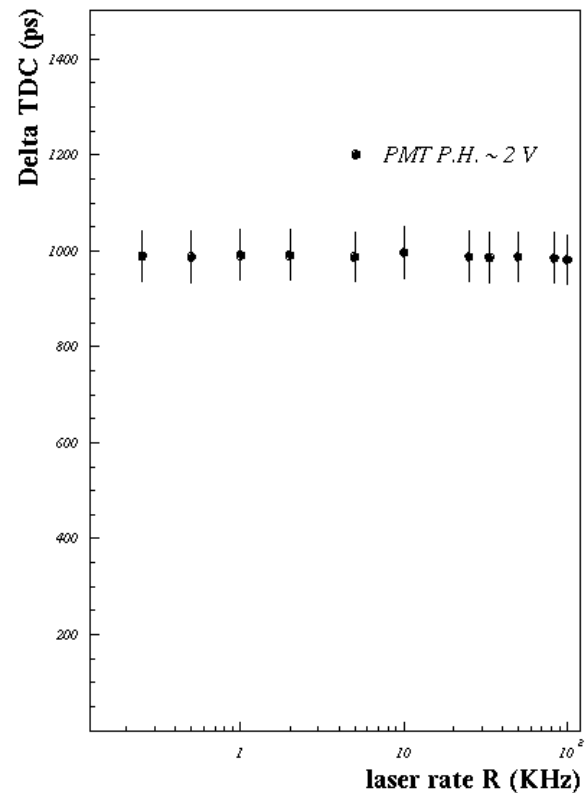




# Preliminary results for TDC

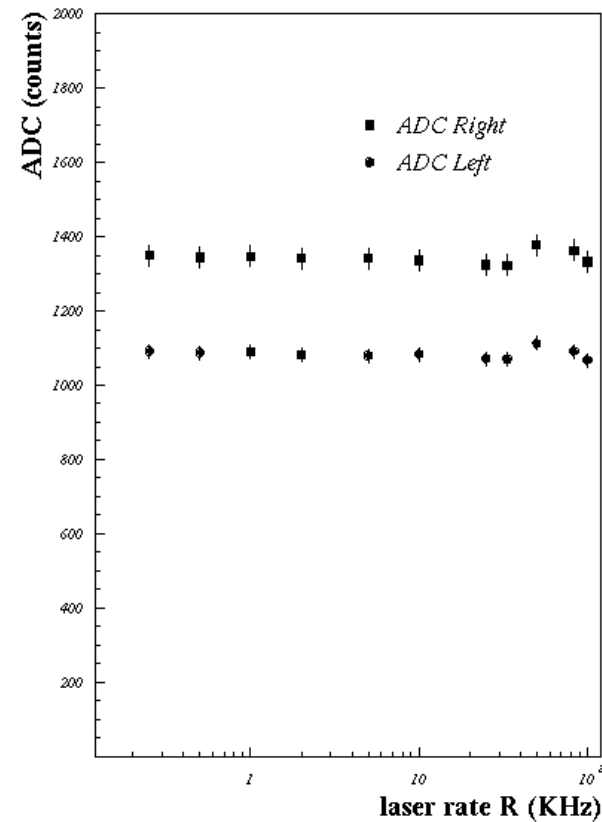


1. Signal from scintillation counter  $\sim 1-2$  MIP
2.  $\Delta t$  between two PMTs
3. Apparently no effect for PMTs+TDCs, but need a reference  $t_0$  to be cply sure



# Preliminary results for ADCs

- No clear effect for ADCs (remind V792 not V1724 now)



# Conclusions



1. Mouse has been caged BUT the reason may be another one (as regards PMTs/TDCs/...)
2. Needs more study
3. Work in progress

