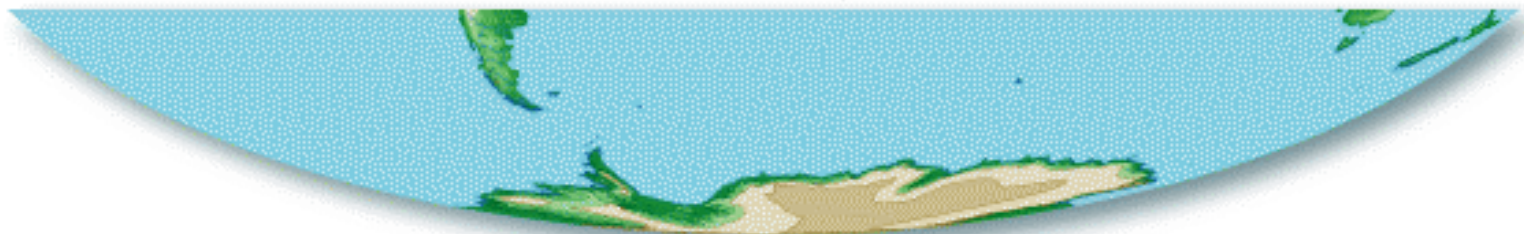# Portable - Pico Event Timer Upgrade

Karel Hamal , Ivan Prochazka

presented at
the 13the Workshop on Laser Ranging
Washington DC, October 7-11, 2002

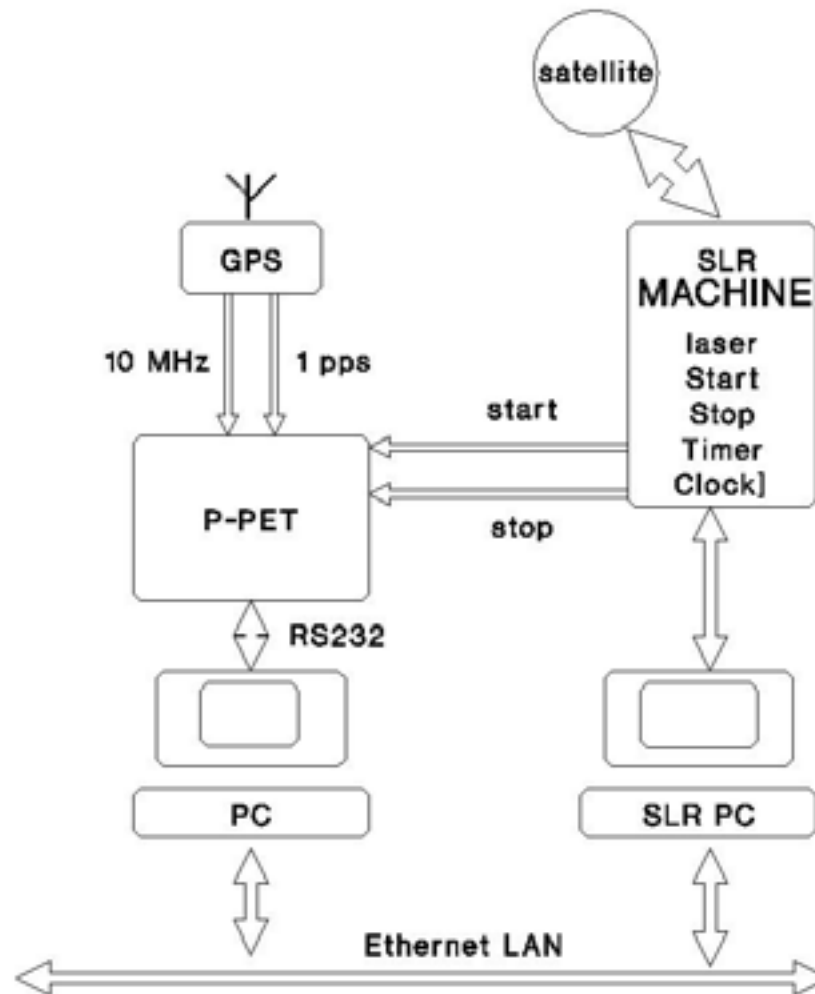**Czech Technical University, Prague, Czech Republic**

Portable Pico Event Timer Upgrade

Goals

- timing <u>resolution</u> increase to 2.5 psec/channel
  - new Dassault ETM modules

- measurement <u>repetition rate</u> increase
  - higher communication speeds

- increased timing <u>stability</u>
  - new input circuits

- timing <u>linearity self-test</u> built in
  - new HW and SW package

- capability to co-operate with <u>multi kHz</u> systems
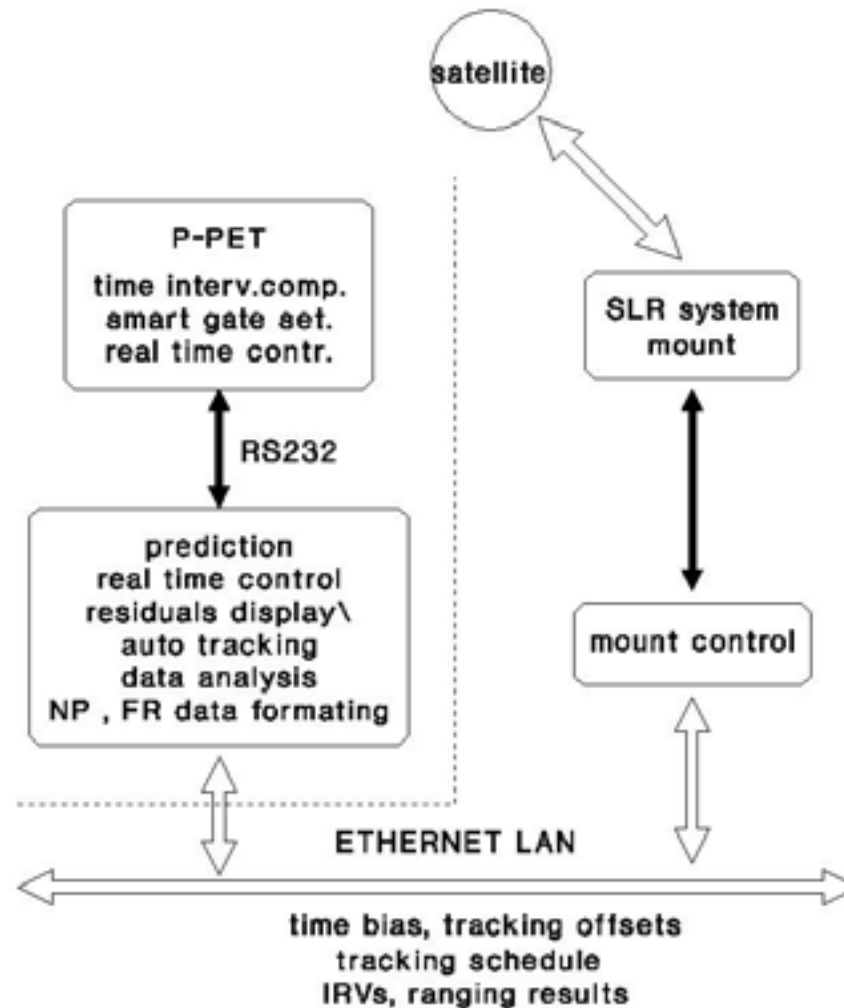 - advanced input arming logic

K. Hamal, I. Prochazka, Prague,
September 2002

Portable Pico Event Timer Upgrade
SLR INTEGRATION

K.Hamal,I.Prochazka, EurOpto, London 1997

K. Hamal, I. Prochazka, Prague,
September 2002

Portable Pico Event Timer Upgrade
SLR SOFTWARE INTEGRATION

K.Hamal,I.Prochazka, EurOpto, London 1997

K. Hamal, I. Prochazka, Prague,
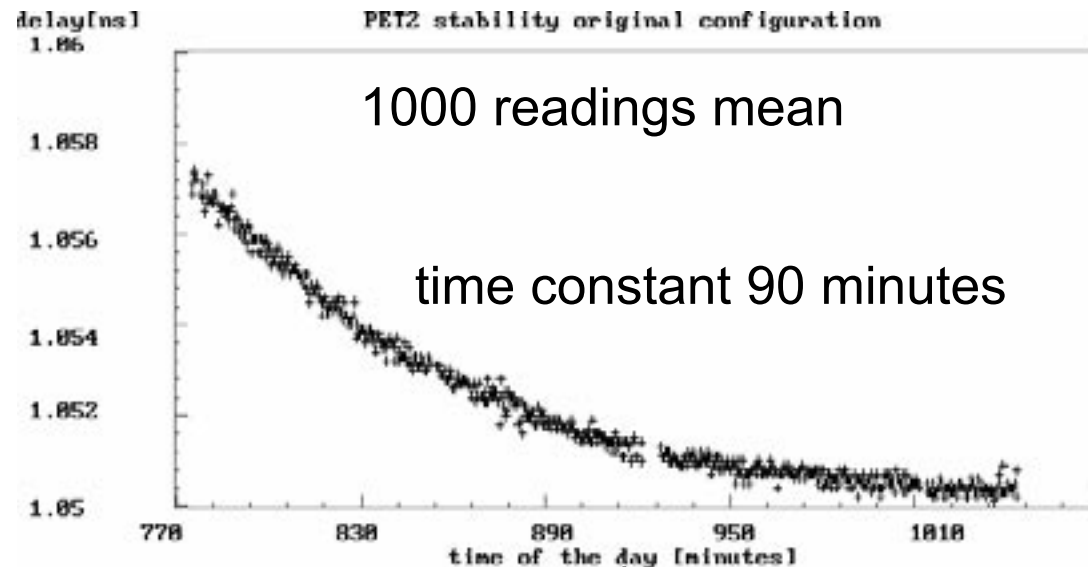September 2002

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P-PET temporal stability test

Cable delay test, 1 hour series
25 +/- 1 deg. C, no airconditioning

2 ps/screen

PET2 temporal stability +/- 0.45 ps 1 hour
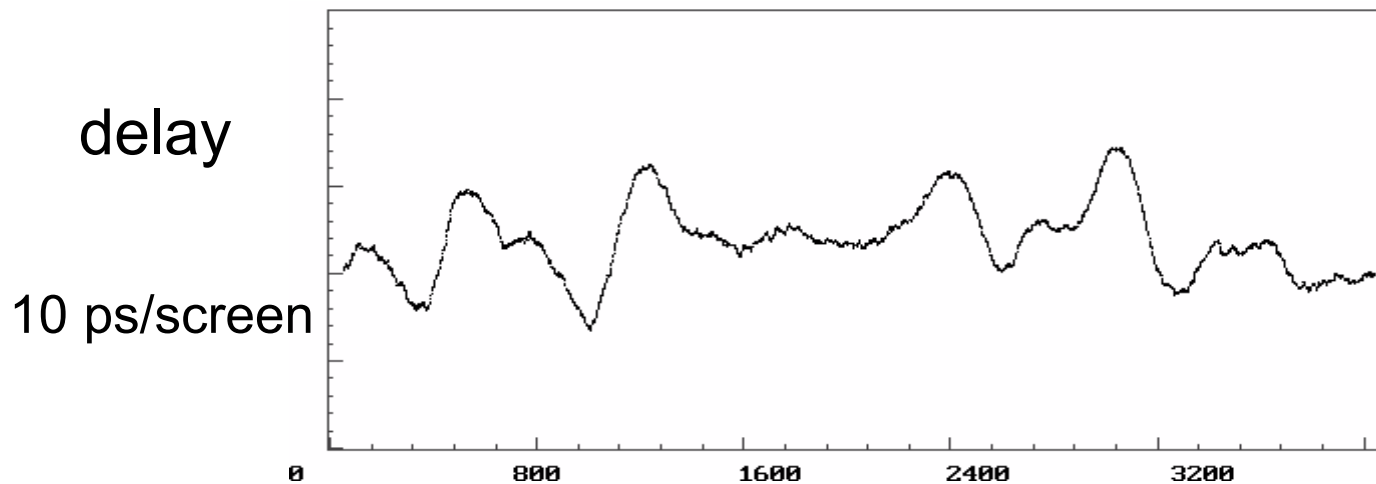
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Portable Pico Event Timer Upgrade

P-PET timing linearity test

Internal self test

delay

10 ps/screen

TDC channel No,

Cable delay timing test,
measured time interval Start=>Stop versus Start TDC channel No
moving average, 100/10 k readings

P-PET2 linearity error < +/- 2.8 ps

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P-PET Parameters Upgrade

-                            London 97 =>   **Wash 2002**

- timing resolution   1.2 ps
- timing jitter / channel   5 ps   **2.5 ps**
- non-linearity / channel   < 5 ps (spec)   **< 2.5 ps (meas)**
- temperature drift   < 0.7 ps/K   **< 0.53 ps/K**
- temperature time const.   **90 minutes**
- temporal stability   +/- 1.0 ps/hr   **+/- 0.45 ps/hr**
- max. repetition rate   30 Hz   **100 Hz, 2MHz sampl**
- No. of channels   2(4)
- interface   RS232
- mass transport   32 kg

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September 2002

Ground Ranging Machine Error Budget

Contribution		random		systematic	
		1 pe	100 pe		
Laser	pulse	14 ps	1 ps		
Start	jitter	3 ps	3 ps	walk	2 ps
Stop	jitter	25 ps	5 ps	walk	3 ps
Timing	jitter	3 ps	3 ps	stability	1 ps
				linearity	3 ps
Mount				eccentr.	
Calibration				survey	
Total	rss	30 ps	7 ps	rss	6 ps
Ground calibration		30 ps	7 ps		

Laser 35 ps, C-SPAD, PET