SLR Portable Calibration Standard
Mission Review

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Czech Technical University, Prague, Czech Republic

Goals

- ground ranging machine diagnostics
- identification of error sources due to :
  - epoch and time interval timing
  - epoch and frequency reference
  - data acquisition, filtering and processing
  - calibration scheme and ground survey
  - operational procedures
  - radio frequency interference
  - other sources (?)

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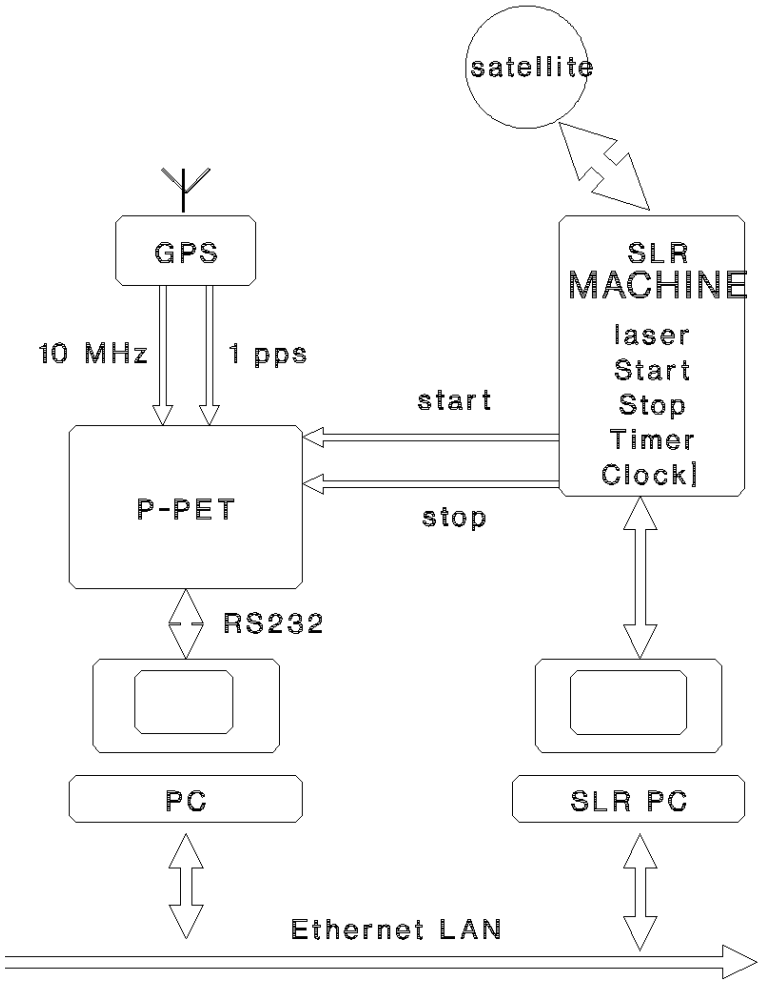
PCS BLOCK SCHEME



minicoll

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

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P-PET Main Parameters

• timing resolution	1.2 ps
• timing jitter / channel	2.5 ps
• non-linearity	< 2.5 ps
• drift, stability	< 0.7 ps/K, 0.5ps/hour
• **adjustment**	**NO**
• input signals	Start,Stop,1pps,10MHz
• max. repetition rate	> 100 readings / sec > 2 MHz laser rate
• interface	RS232 (3 wires)
• mass (transport config.)	32 kg

Portable Calibration Standard Missions

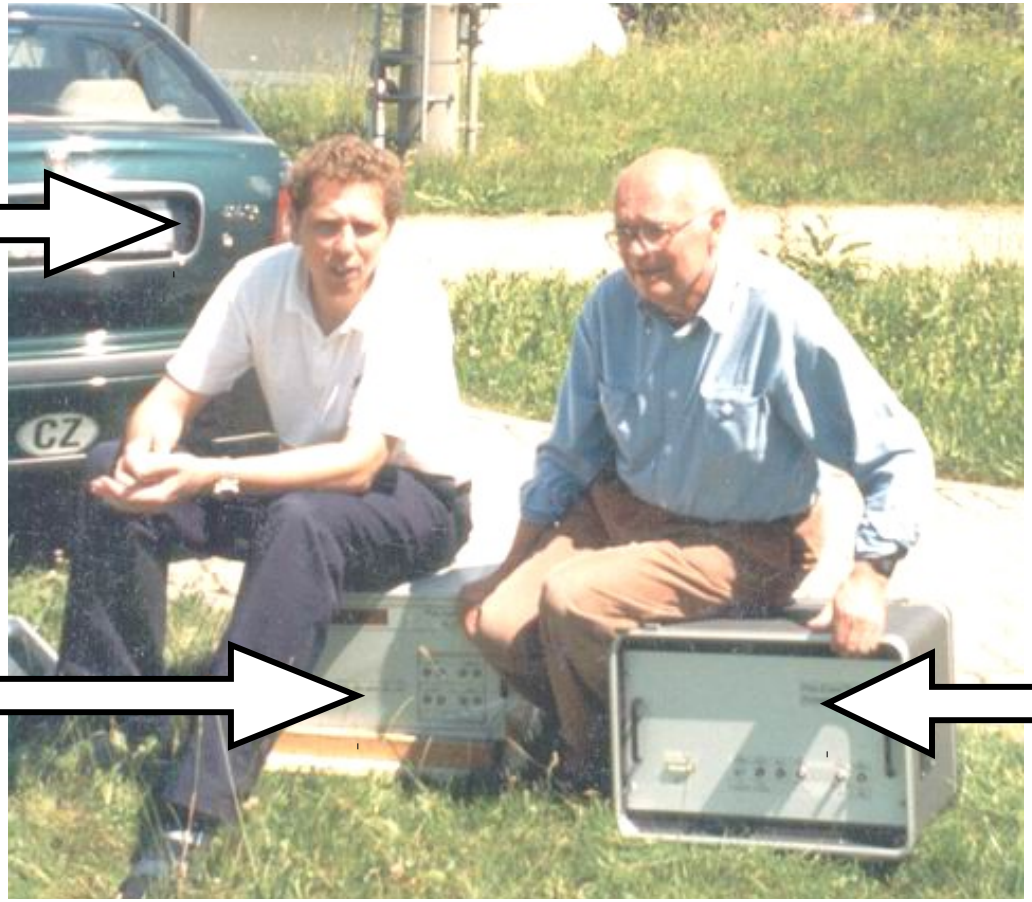
Graz	**97/98/99**	**high precision SLR, stability comparison to counter cluster**
WLRS Wettzell	**97/99**	**t/r biases, low jitter, stability**
TIGO Wettzell	**1998**	**TW, t/r biases, low jitter, stability**
Zimmerwald	**1998**	**TW, t/r biases, low jitter, stability**
Herstmonceux	**1998**	**counters linearity**
Shanghai	**2001**	**t/r biases, low jitter, survey,operation procedures HP5370B counter linearity**
Potsdam	**2001**	**low jitter, SR620 counters linearity**

P-PET Mission, WLRS & TIGO, Wettzell 1998

" worldwide maximum PET density / m^2 "

PET4TIGO

Chile



PET4WLRS

Wettzell

P-PET

Demo

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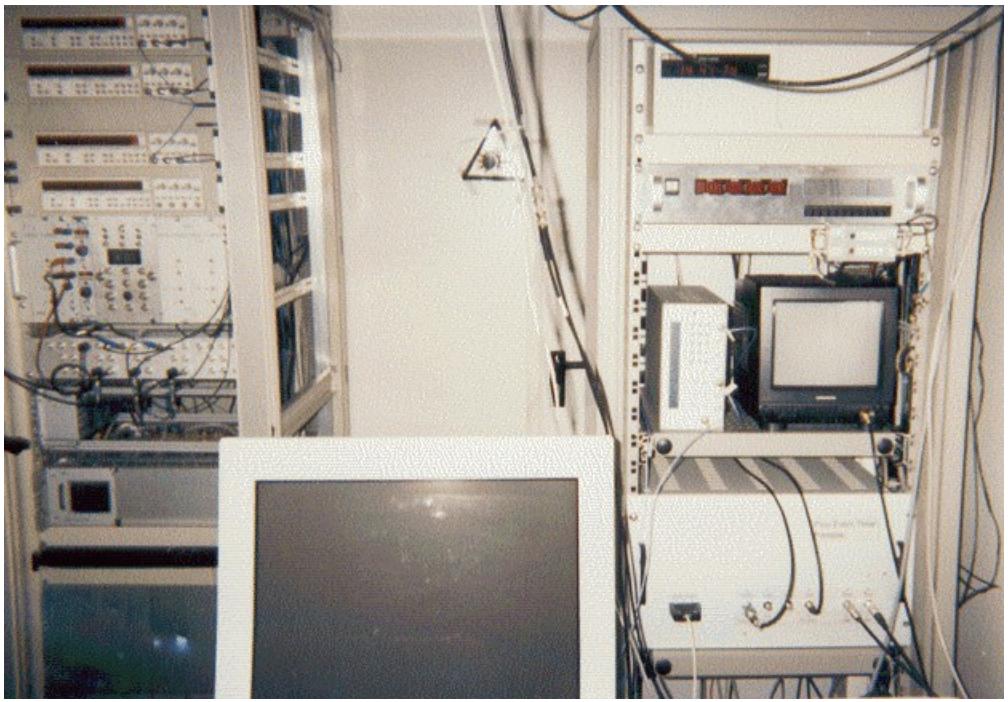
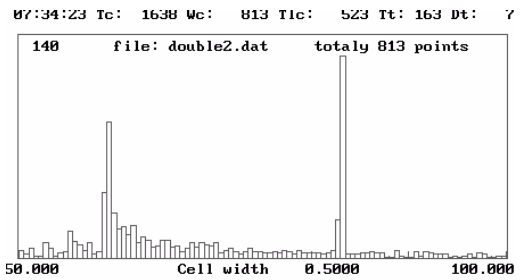
P-PET Mission, TIGO, 1998, TW SLR

4 x SR620



P-PET



Infrared, 75 ps
1 phot

Blue, 45 ps
1 phot

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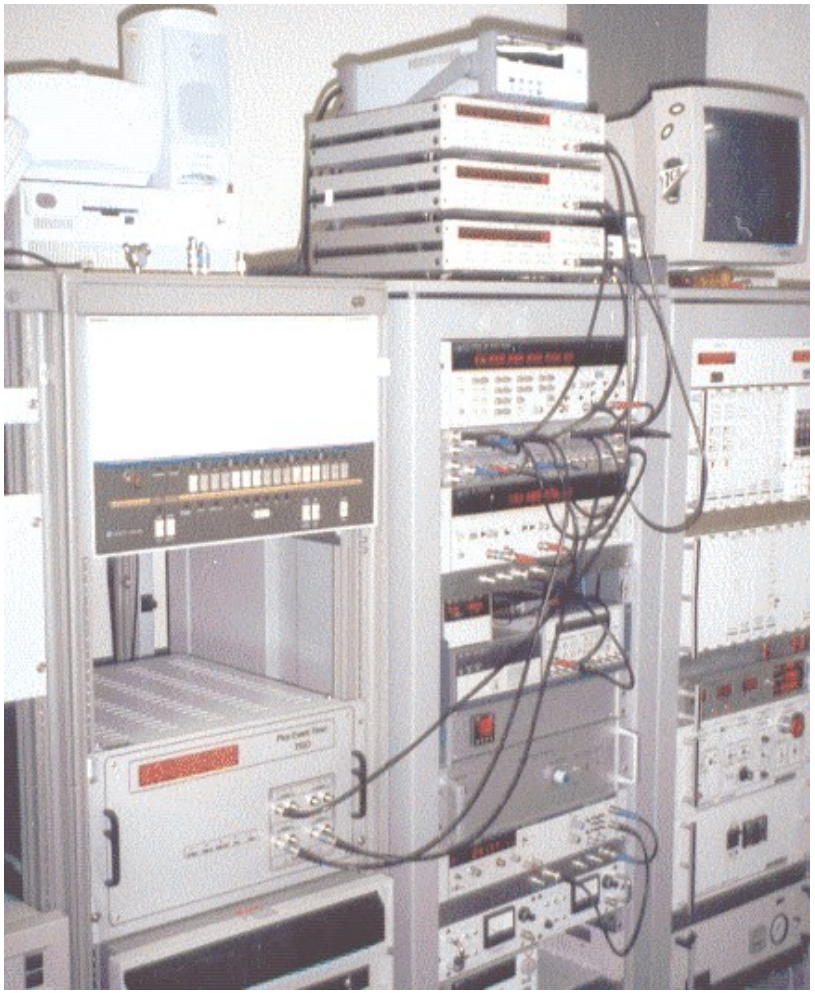
PET Mission, Graz, 1999
Comparison to Graz Counter Cluster



3 x SR620

2 x HP5370

PET4TIGO

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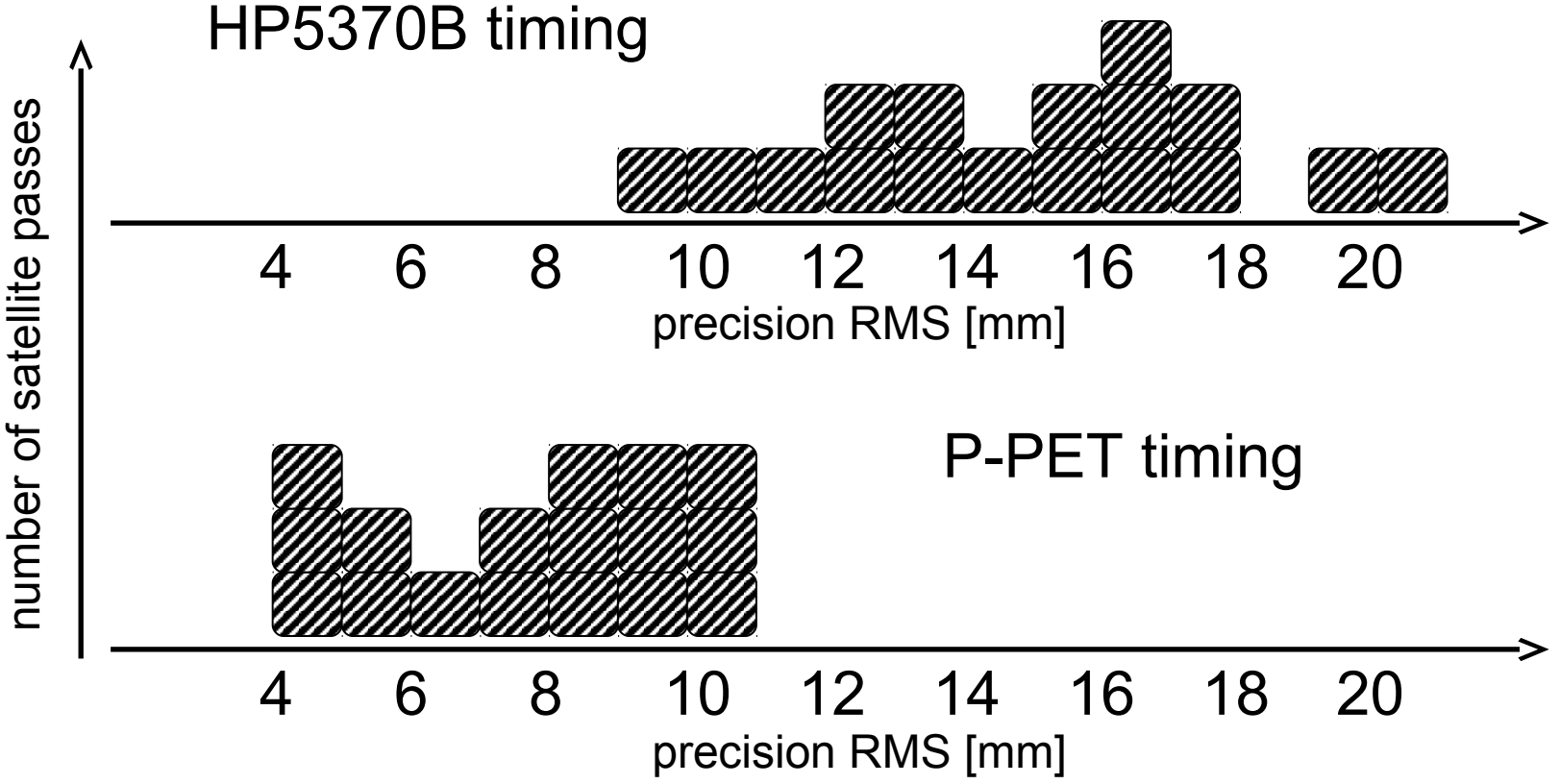
SLR single shot precision Shanghai 2001



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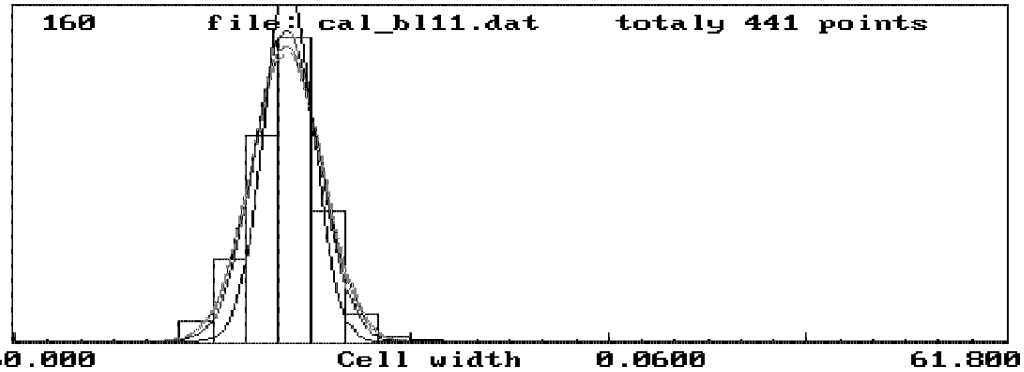
Zimmerwald, 24hour Mission,May 27-28,1998
Two wavelength ranging

Original station setup 150 psec

After system re-cabling and detectors tuning

SLR system	120 psec
P-PET timing	76 psec @ red
	58 psec @ blue



Criter.	MEAN	SIGMA	PT #
0.000 / 61.800	60.493893	0.064484	409
3.0 * SIGMA	60.492798	0.062723	407
2.5 * SIGMA	60.493141	0.058284	398
2.0 * SIGMA	60.496422	0.044916	350

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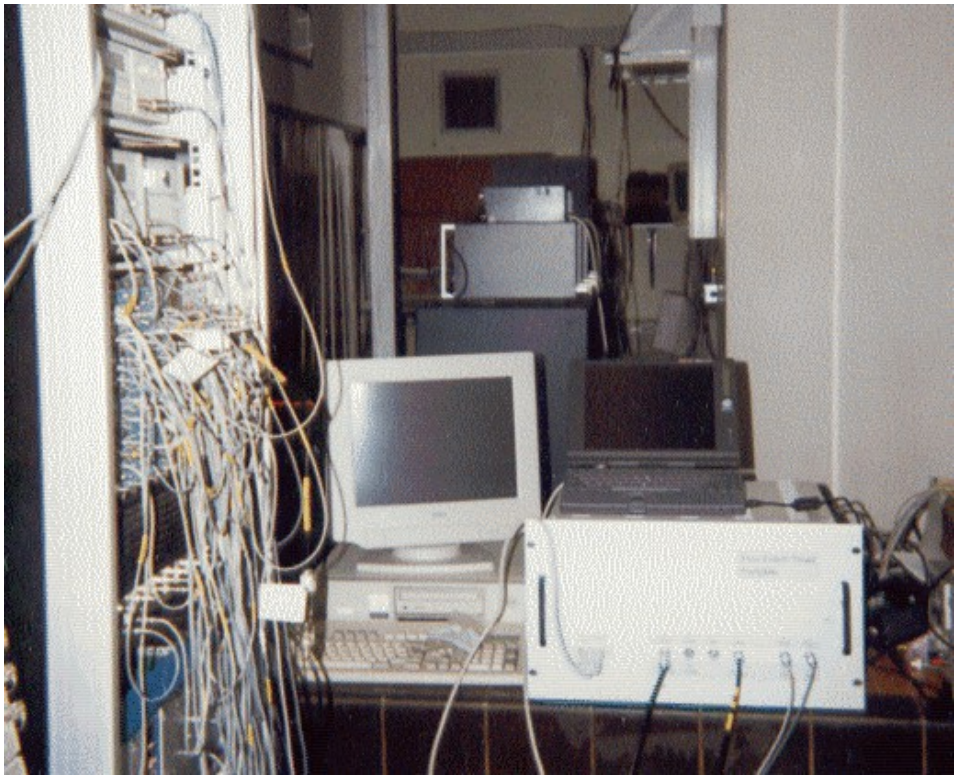
P-PET Mission, Herstmonceux, 1998
Counters linearity tests

Counters



notebook

P-PET

=> Eurolas Workshop, Herstmonceux, March 2002

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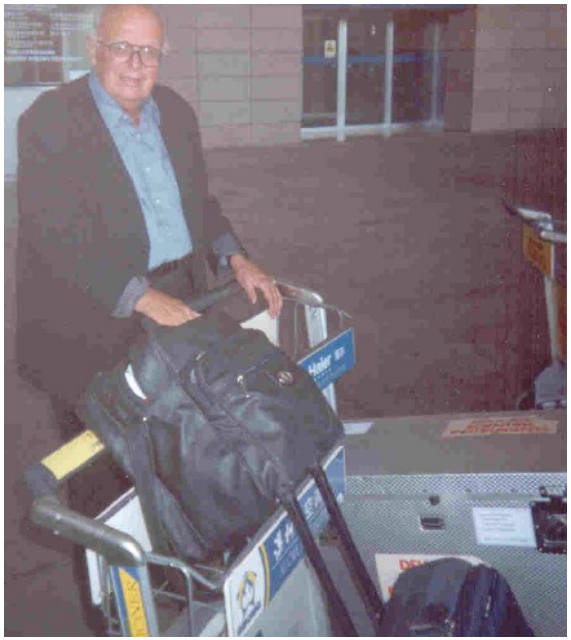
P-PET Mission, Shanghai, August 2001
Personal Luggage Transportation

Shanghai Observatory SLR



Lufthansa Check-in

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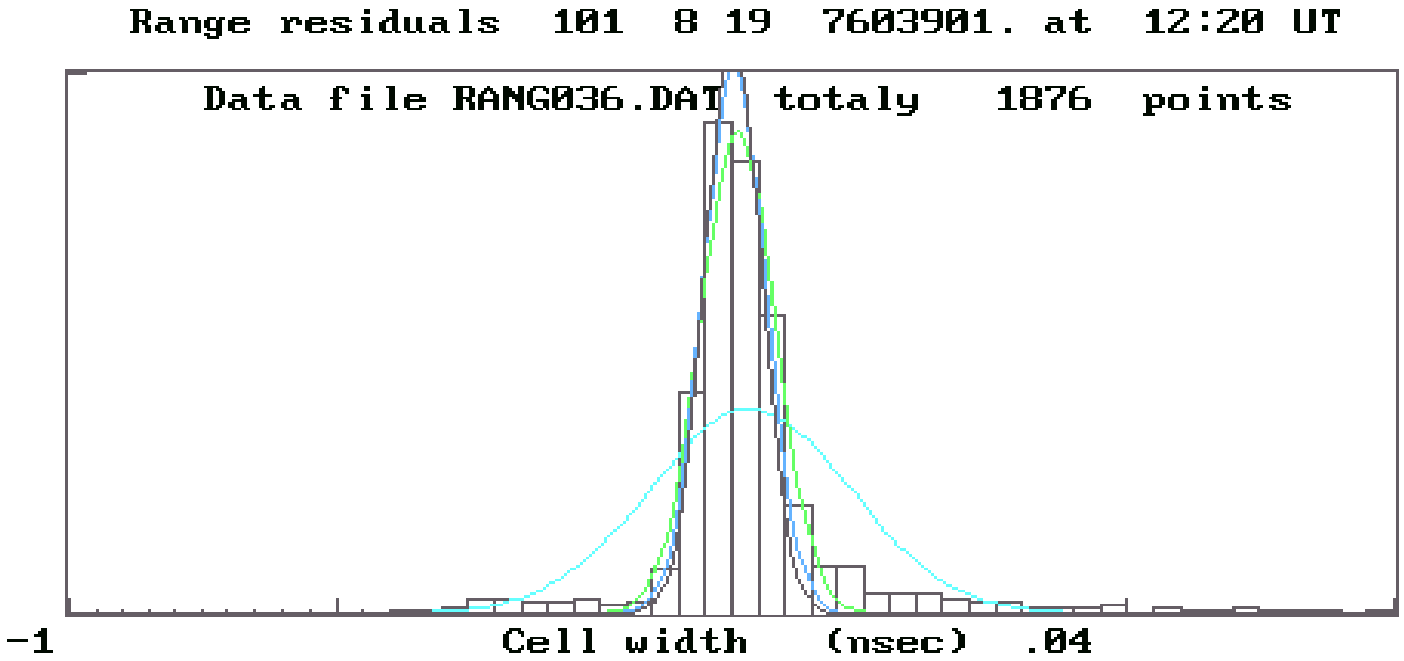
Shanghai SLR, P-PET timing
Lageos, Aug. 19,2001 7.0 mm rms



	Criter.		MEAN	SIGMA	PT #
Limits	-1.000 /	1.000	0.027430	0.151741	1315
	3 * SIGMA		0.007832	0.056696	1153
	2.5*SIGMA		0.002507	0.047051	1093
	2.2*SIGMA		0.000586	0.042044	1041

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Conclusion

- Portable Calibration Standard based on a Pico Event Timer is a powerful tool to identify error sources in the SLR “ranging machine”

- the entire system is compact,
  easy to transport,
  fast to install and
  user friendly

- the calibration mission can be accomplished within one week time slot,