

Altimetry and Transponder Ground Simulation Experiment

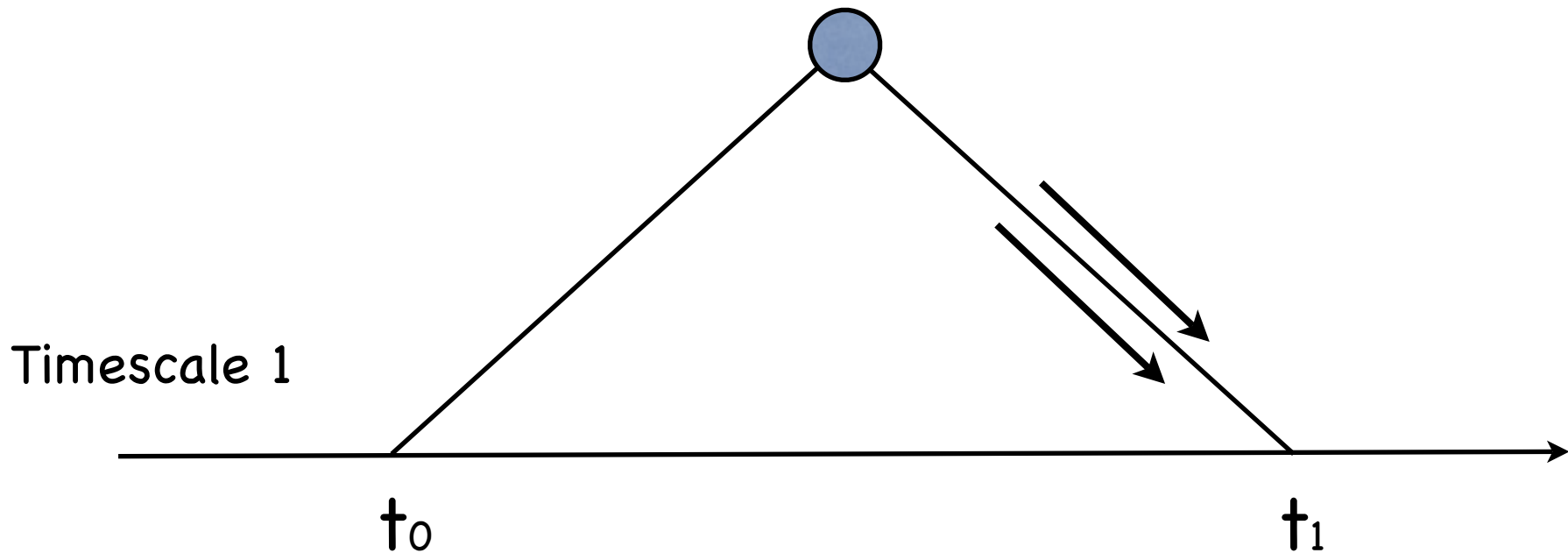
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P. Lauber¹, N. Brandl³, K.H. Haufe³, H. Michaelis²

¹FESG - TUM

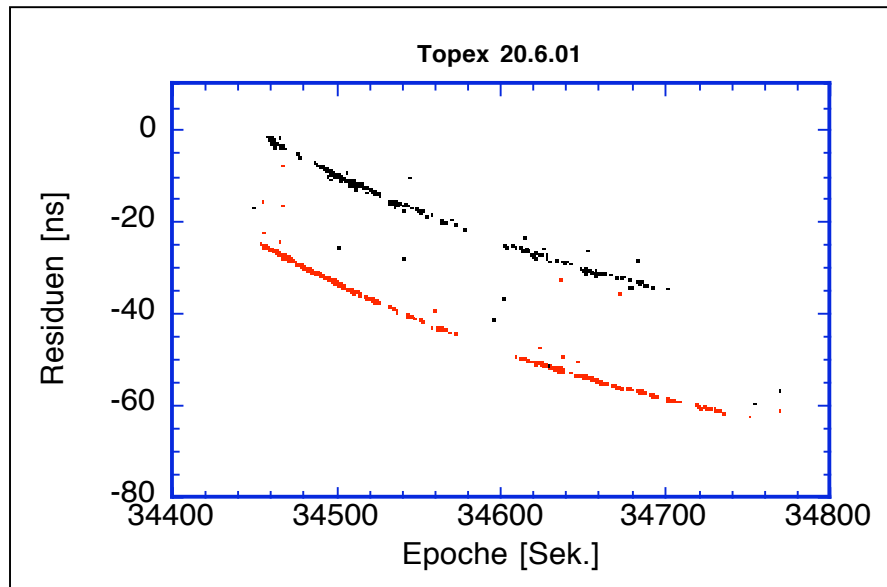
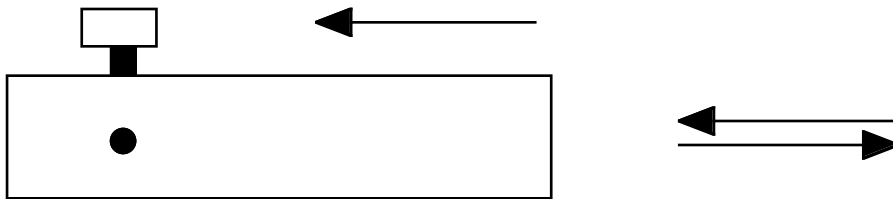
²DLR - Institut für Planetenerkundung

³Bundesamt für Kartographie und Geodäsie

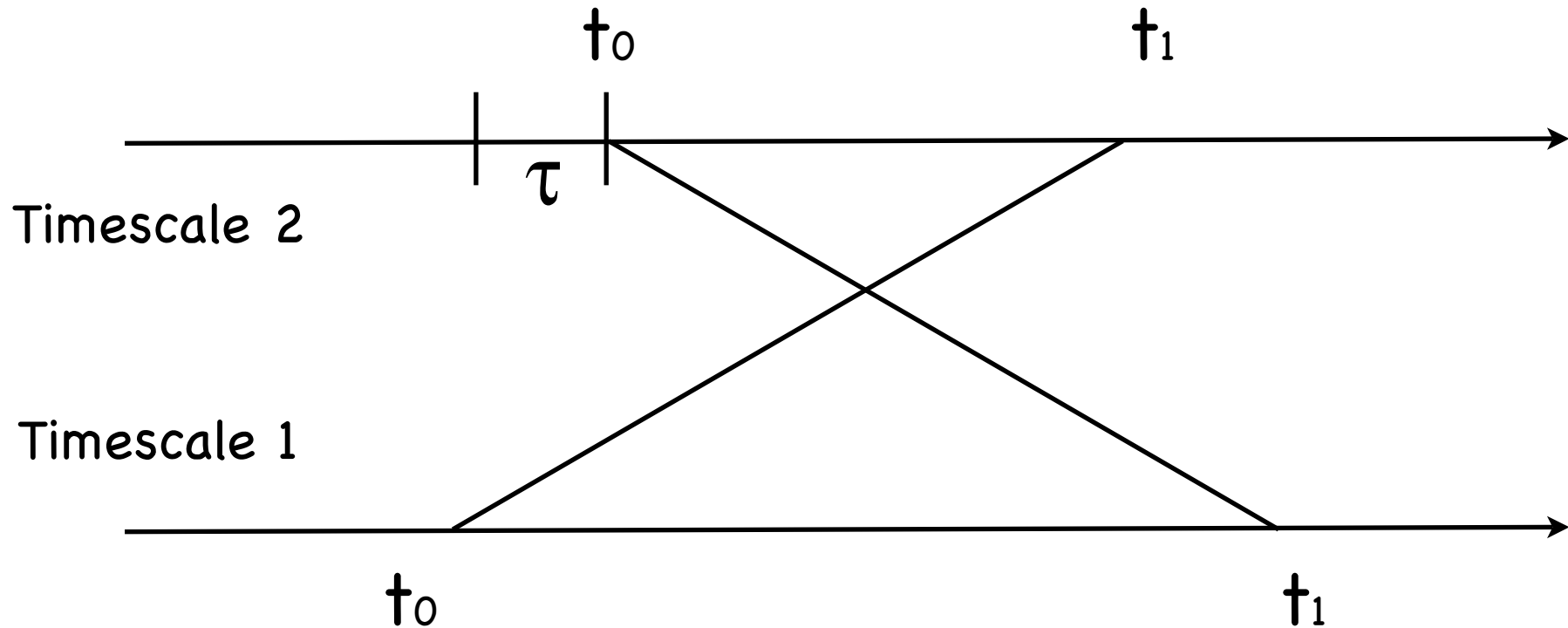
SLR: "Transponder Simulation"



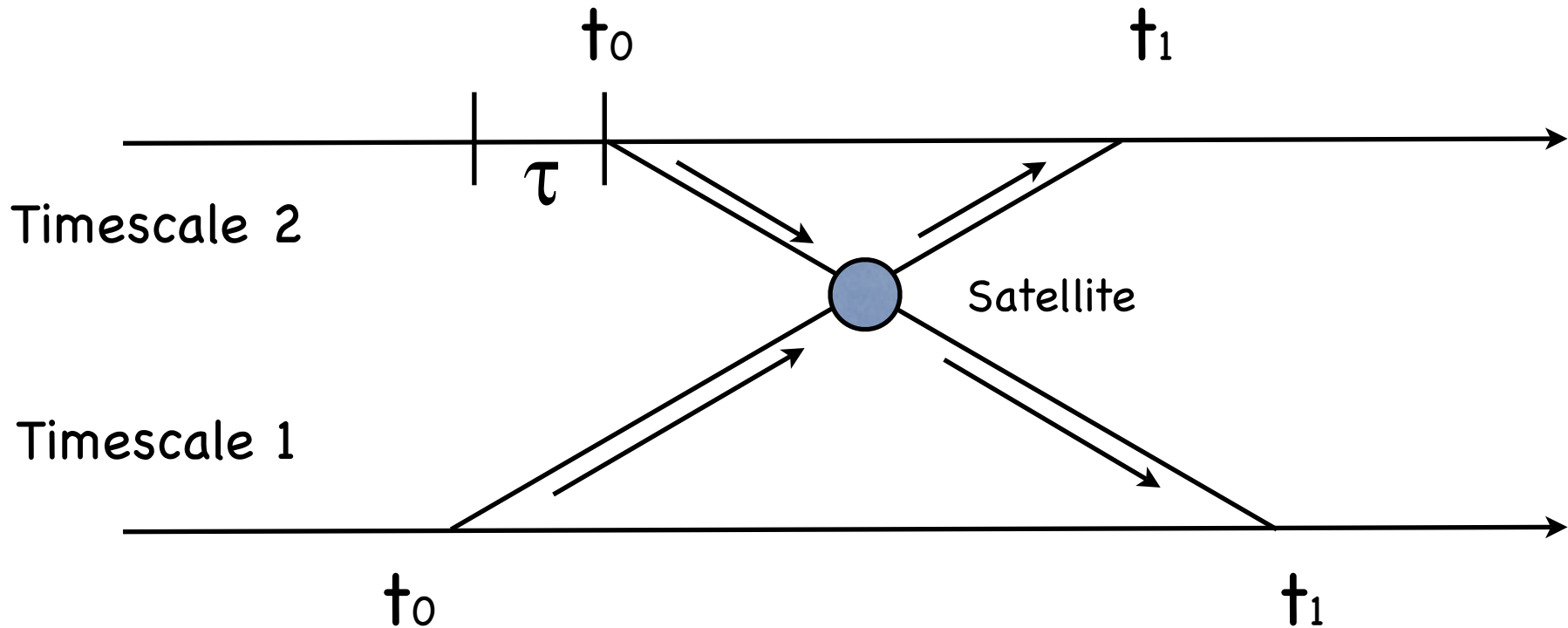
Early Receiver Tests



Asynchronous Transponder

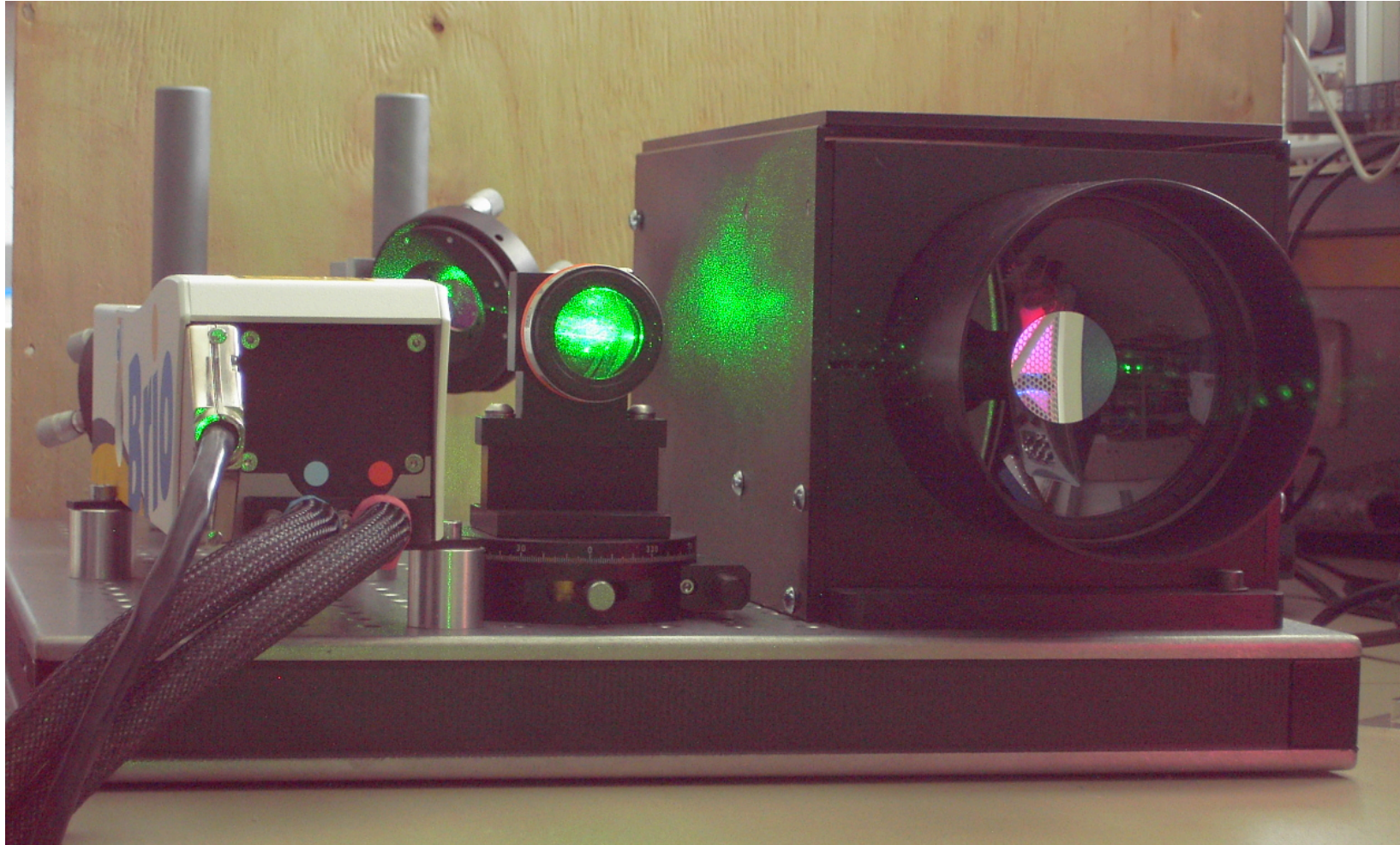


Transponder Testbed



Merging Timescales \approx put the 2 systems side by side

Altimeter Demonstrator

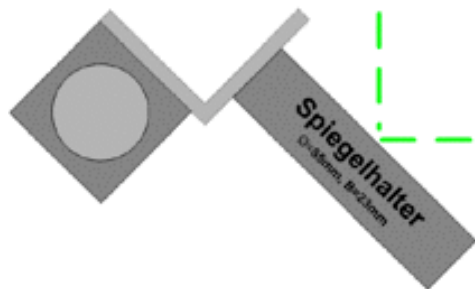
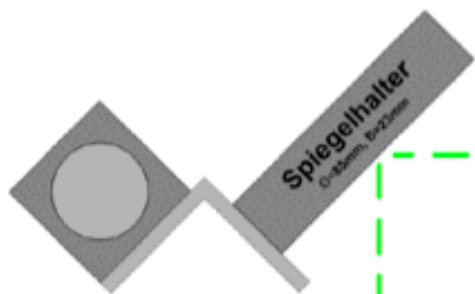


PMT
L=150mm, B=75mm

Teleskop
L=350mm, B=150mm, H=150mm

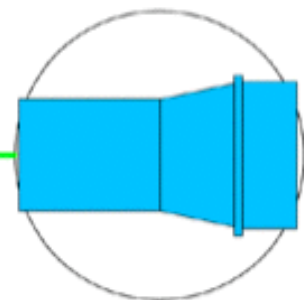
Strahlaufweitung

L=86,5, max Ø=46mm

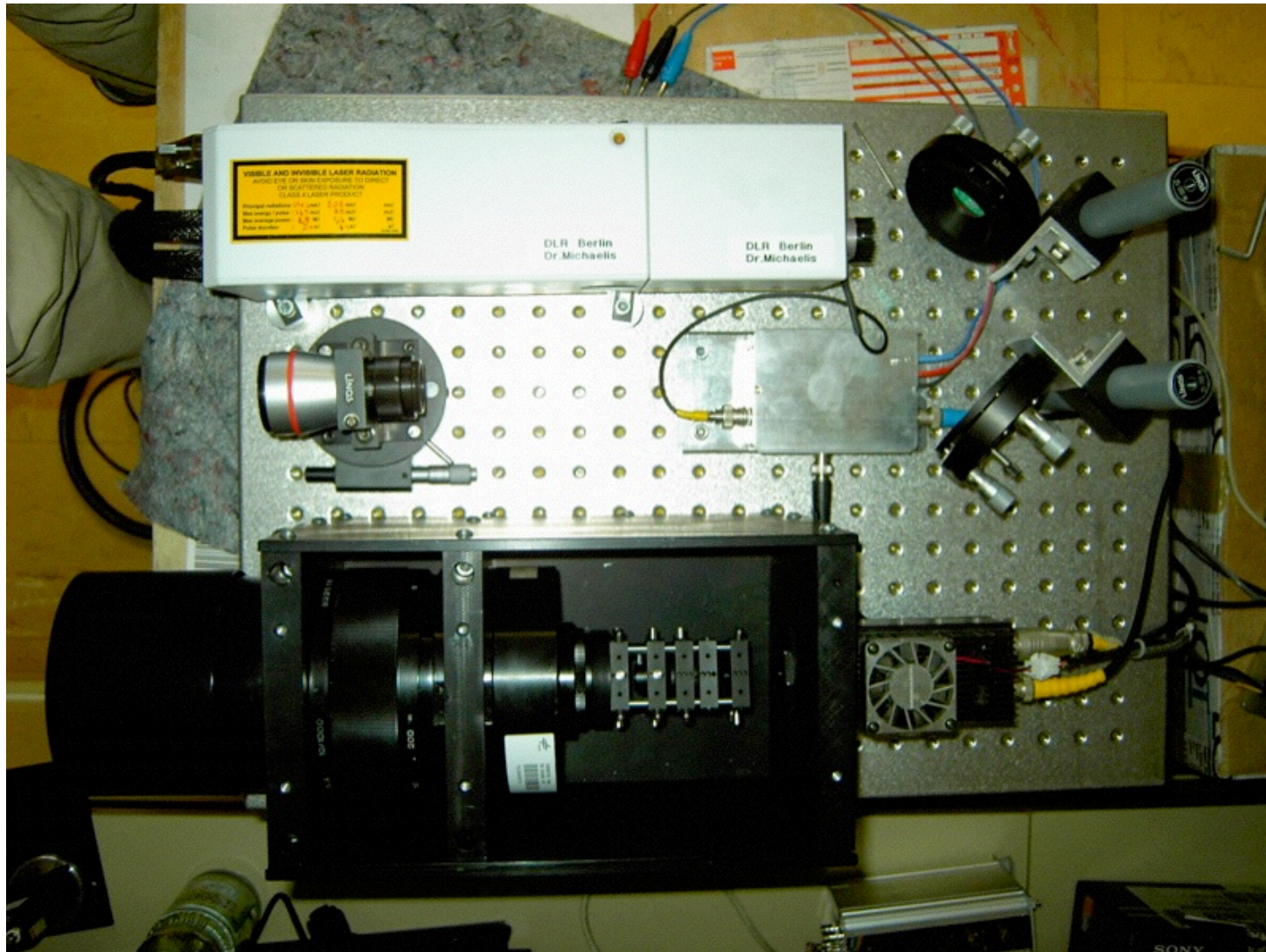


Frequenz-Verdoppler

Brio Laser
L=240mm; B=87mm; H=95mm
 $\lambda = 532\text{nm}$, P=65mJ, pulse=5ns



Laser: 5 ns, 40 mJ



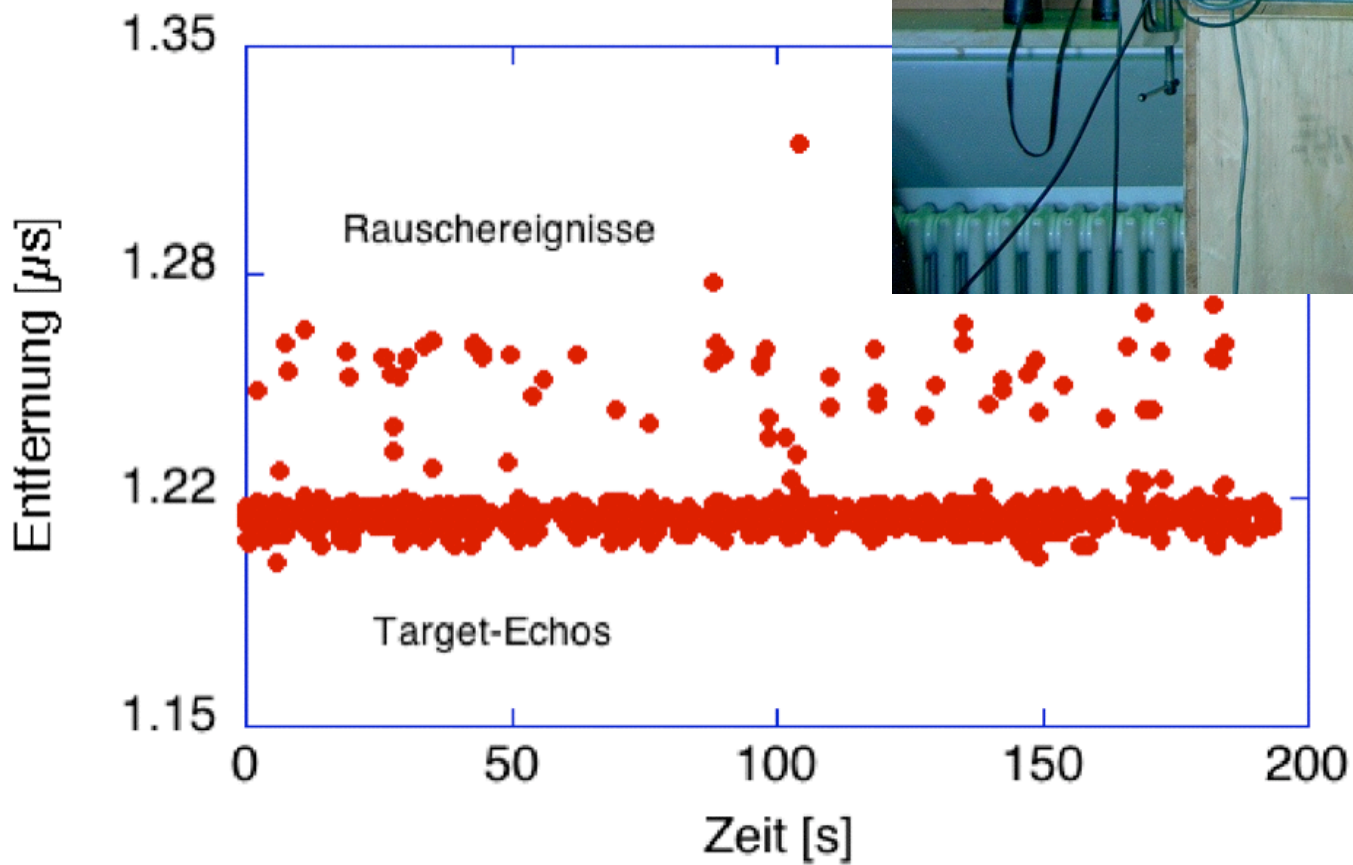
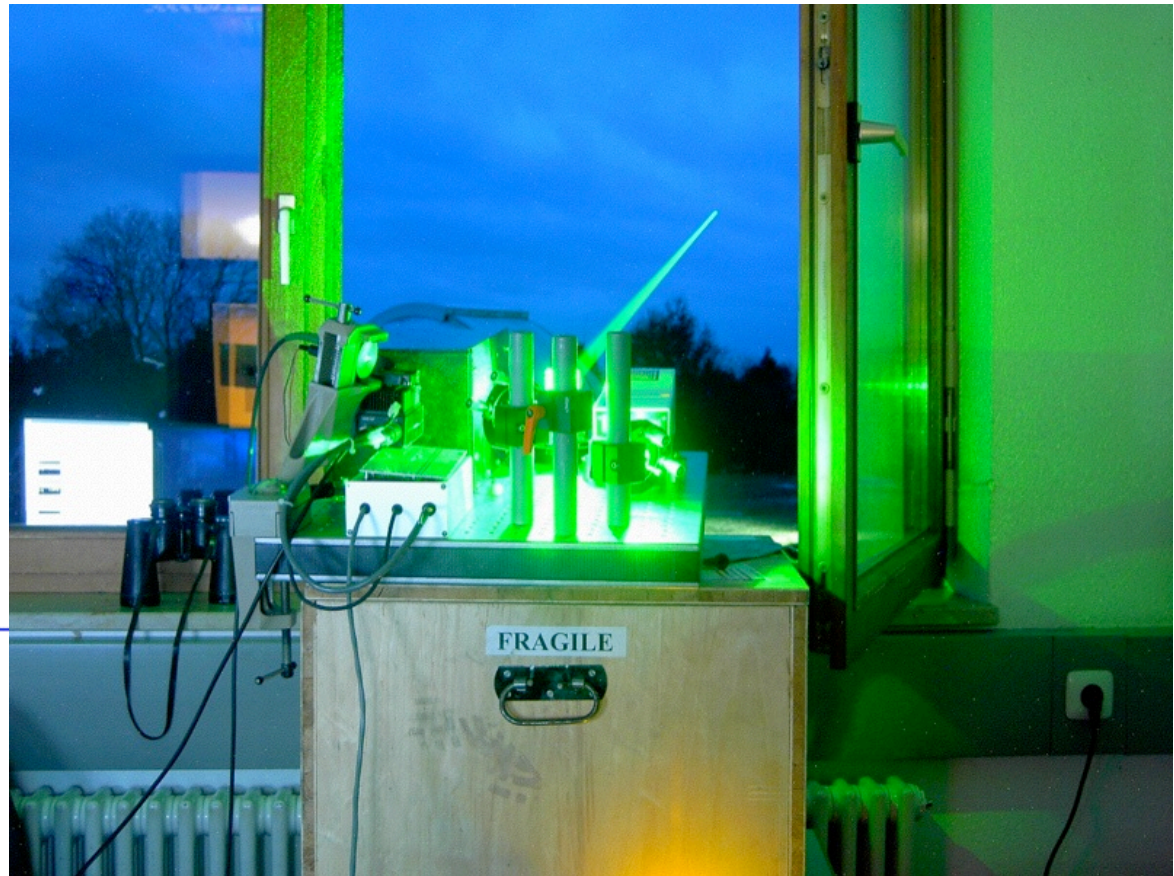
Mirror
Start-
Detector

8x Beam
Expander

Telescope: Maksutov, 10cm

PMT, SPCM, SPAD

Test-Operations @ Wettzell



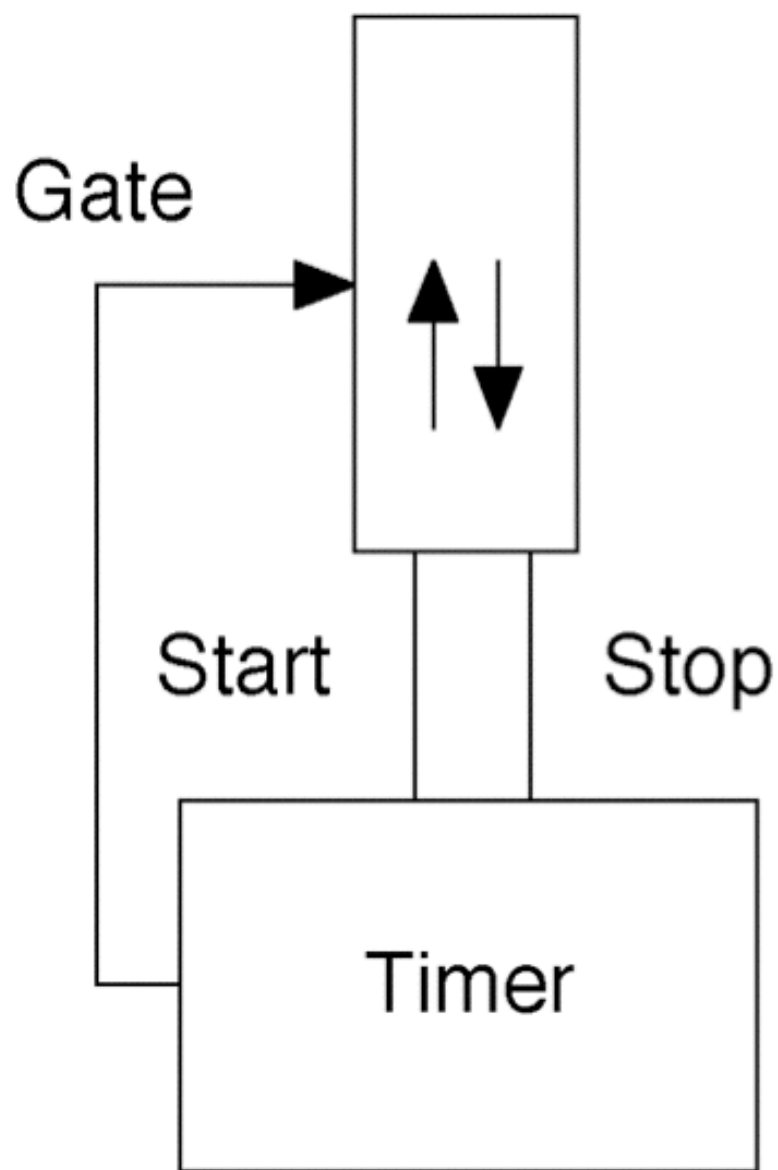


Alignment:

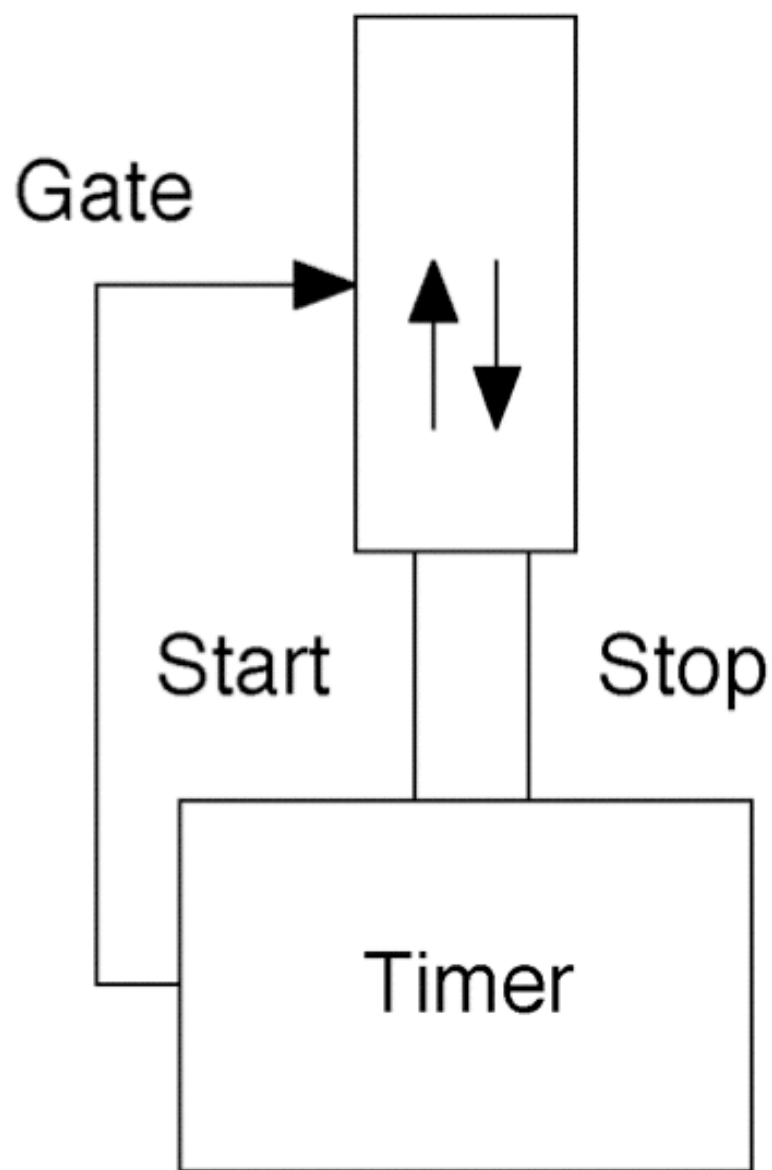
- a) Laser beam pointed at target ≈ 200 m away
- b) Receiver centered on laser beam spot
- c) WLRs pointed to landmark ≈ 6 km away
- d) AltiDemon platform aligned to be centered on landmark

Laser beam offset $\approx 25''$

WLRS

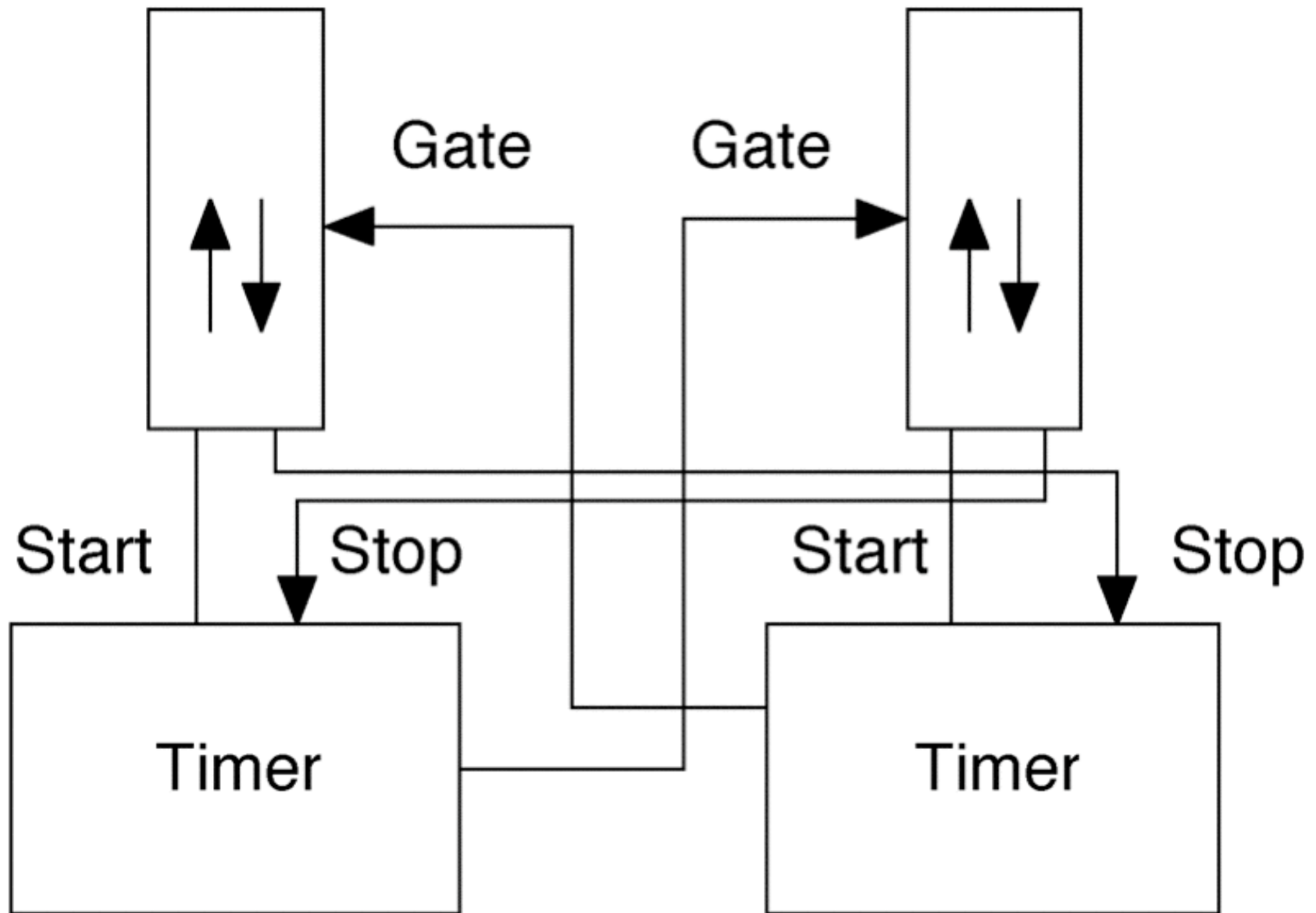


ALTIDEMON



WLRS

ALTIDEMON



Theoretical Link-Budget

Config.	n_{ph} Ajisai	n_{ph} ERS	n_{ph} Lageos
W - A	4.5k	1.5k	10
A - W	36.8k	12.3k	85
W - W	830k	275k	1.9k
A - A	816	272	1.9

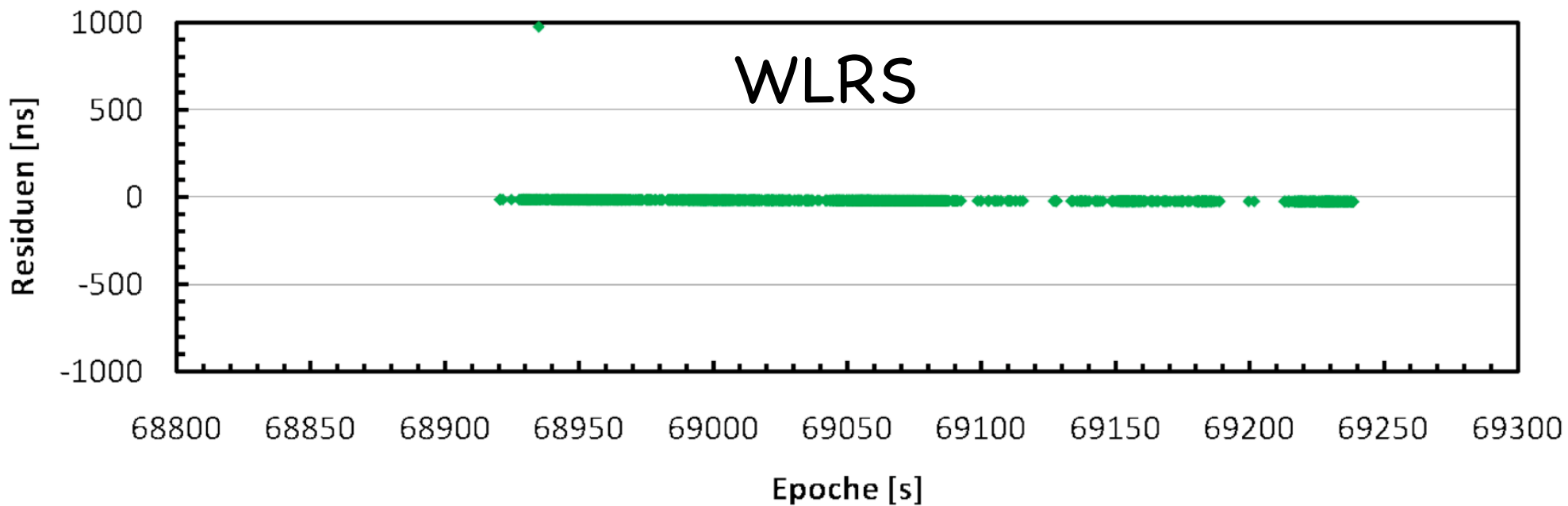
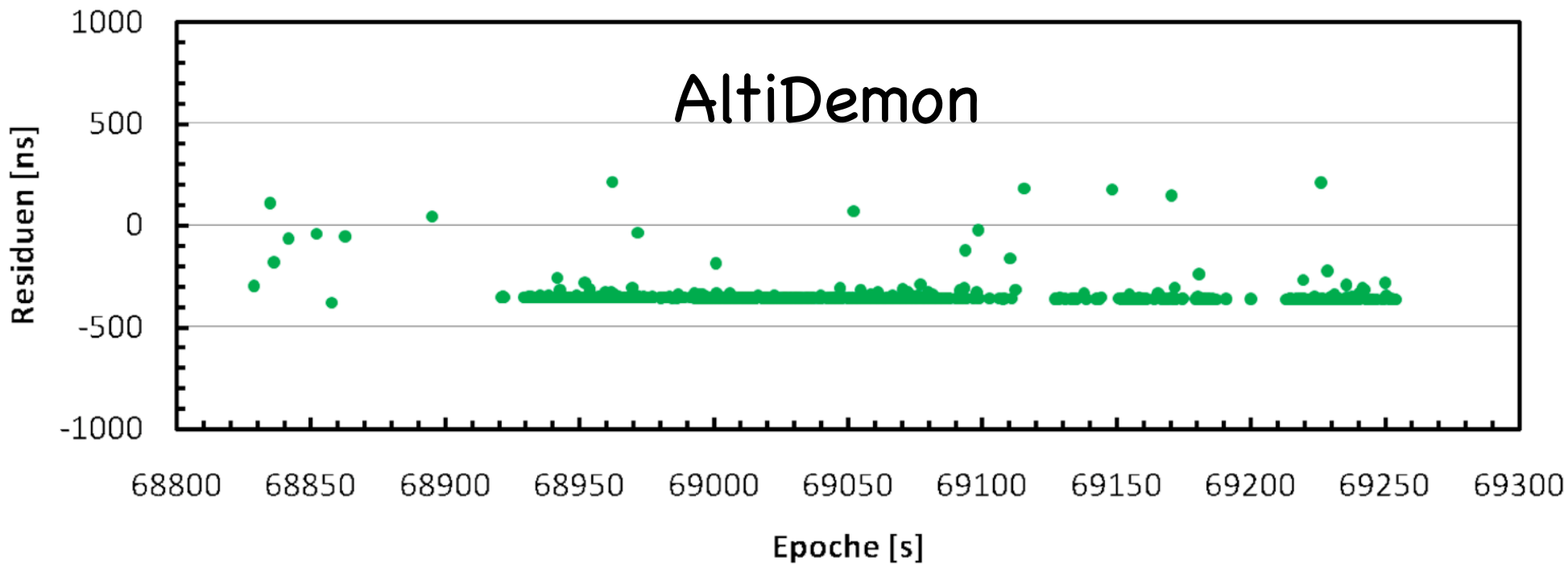
WLRS detector is APD; AltiDemon detector is SPAD

[Degnan 2006]

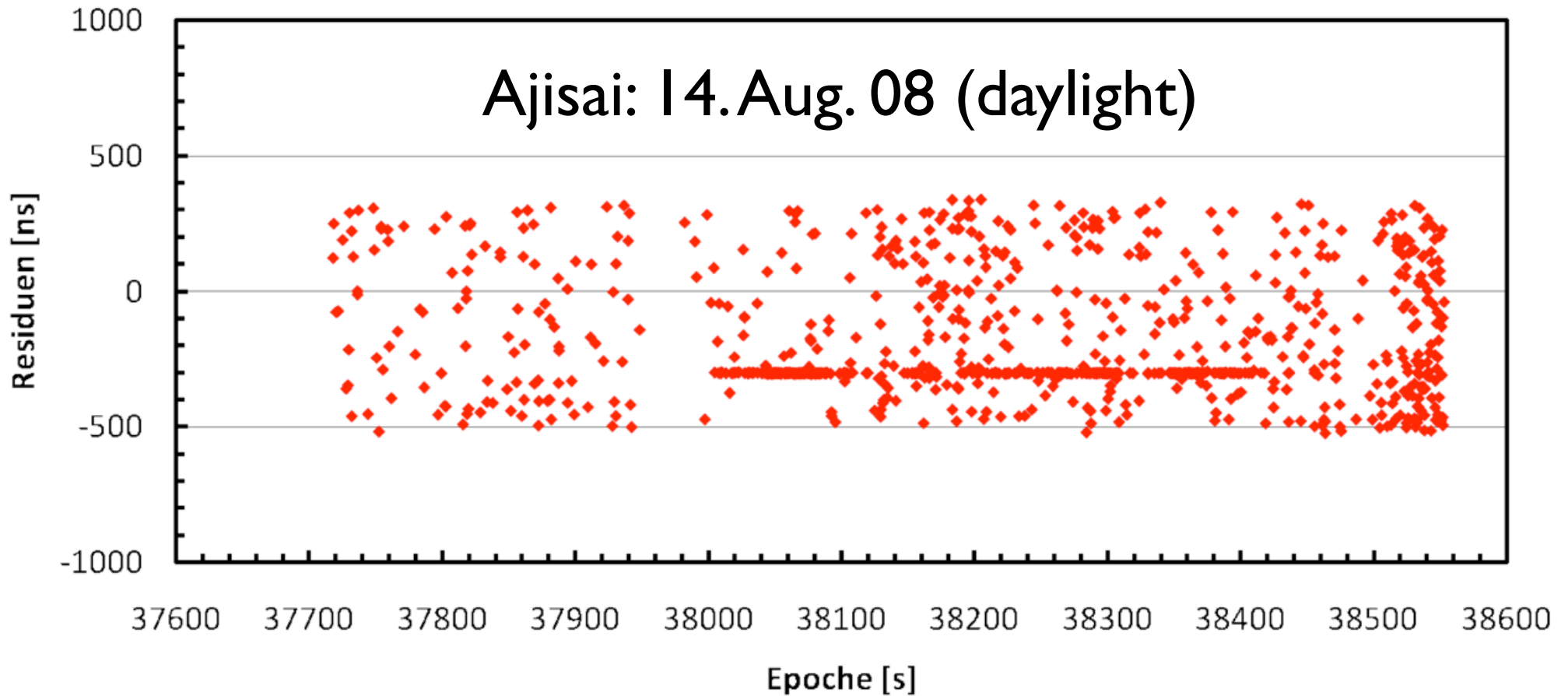
Zenith-Distance: 30° Atmosph. Transmission: 0.7

WLRS (TX)

WLRS (RX), AltiDemon (RX)



AltiDemon (TX) - WLRS (RX)

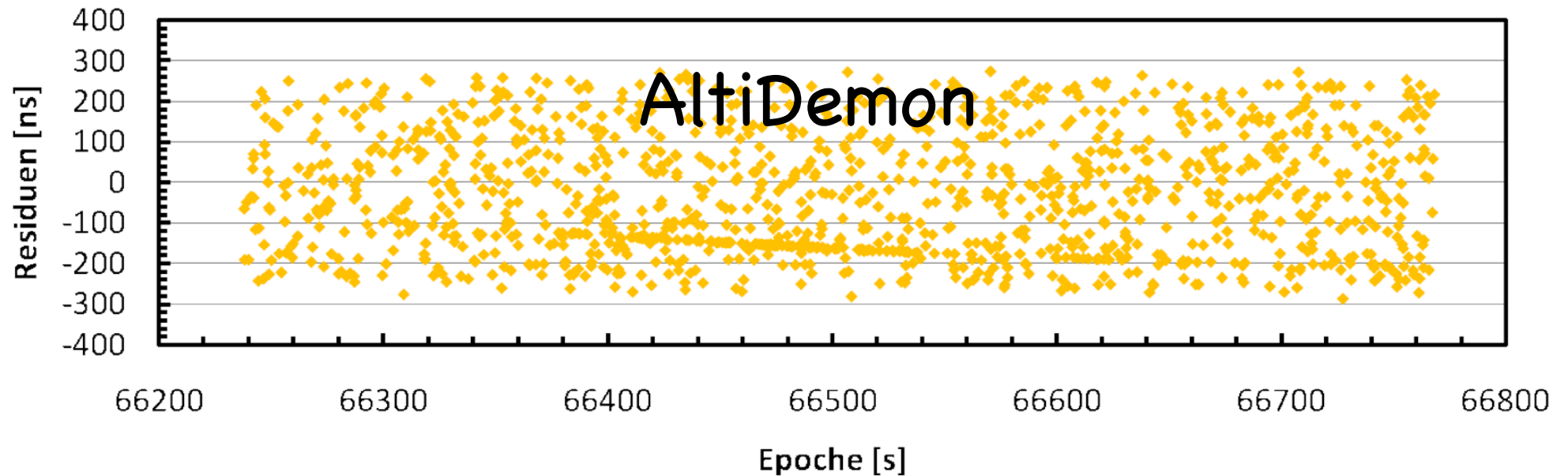
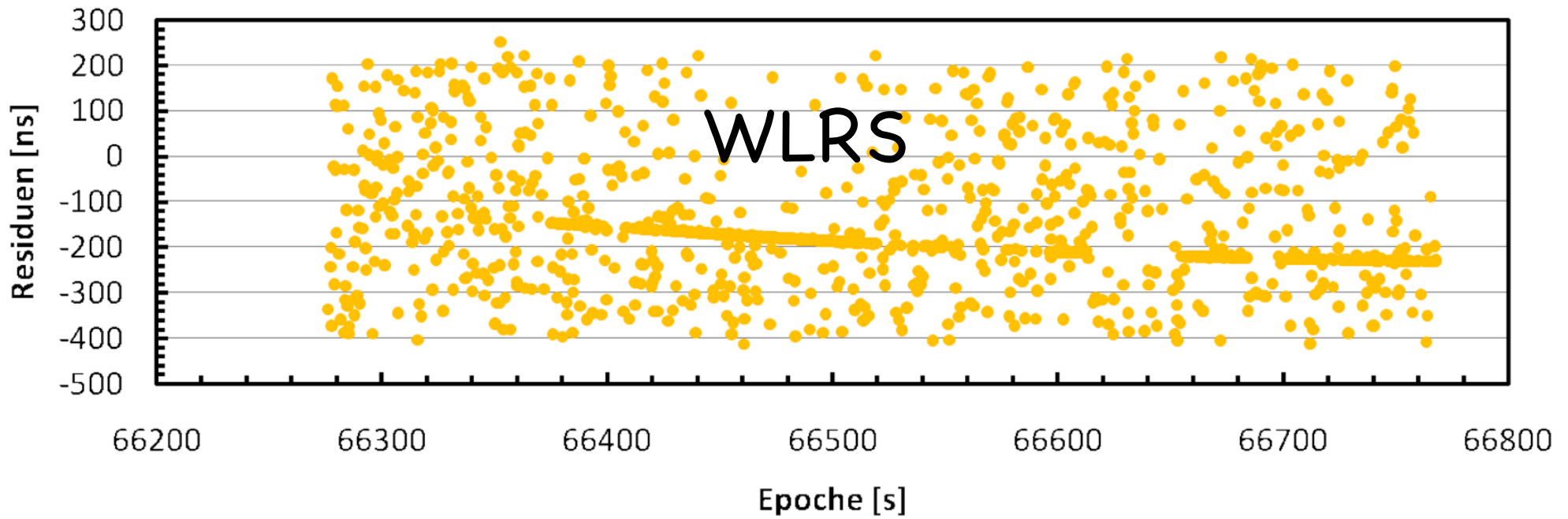


Transponder Operations

WLRS (TX: 10 Hz → RX: 20 Hz)

AltiDemon (TX: 20 Hz → RX: 20 Hz)

BeaconC 16.8.08



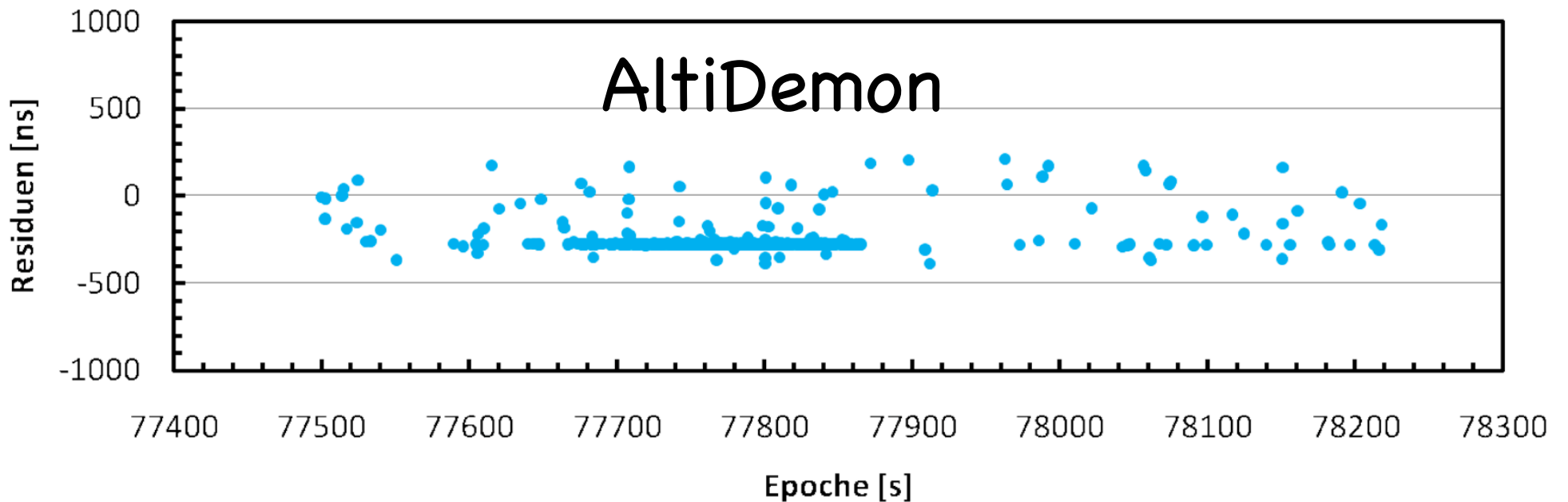
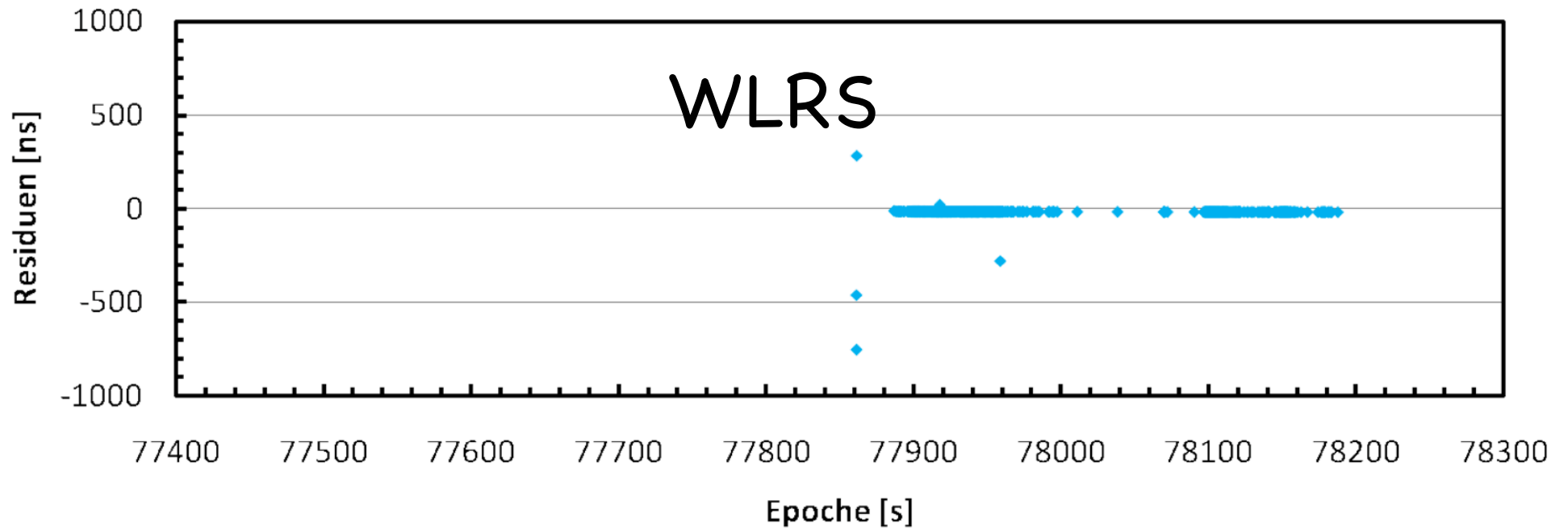
Parallel Operations

WLRS (TX: 10 Hz → RX: 10 Hz)

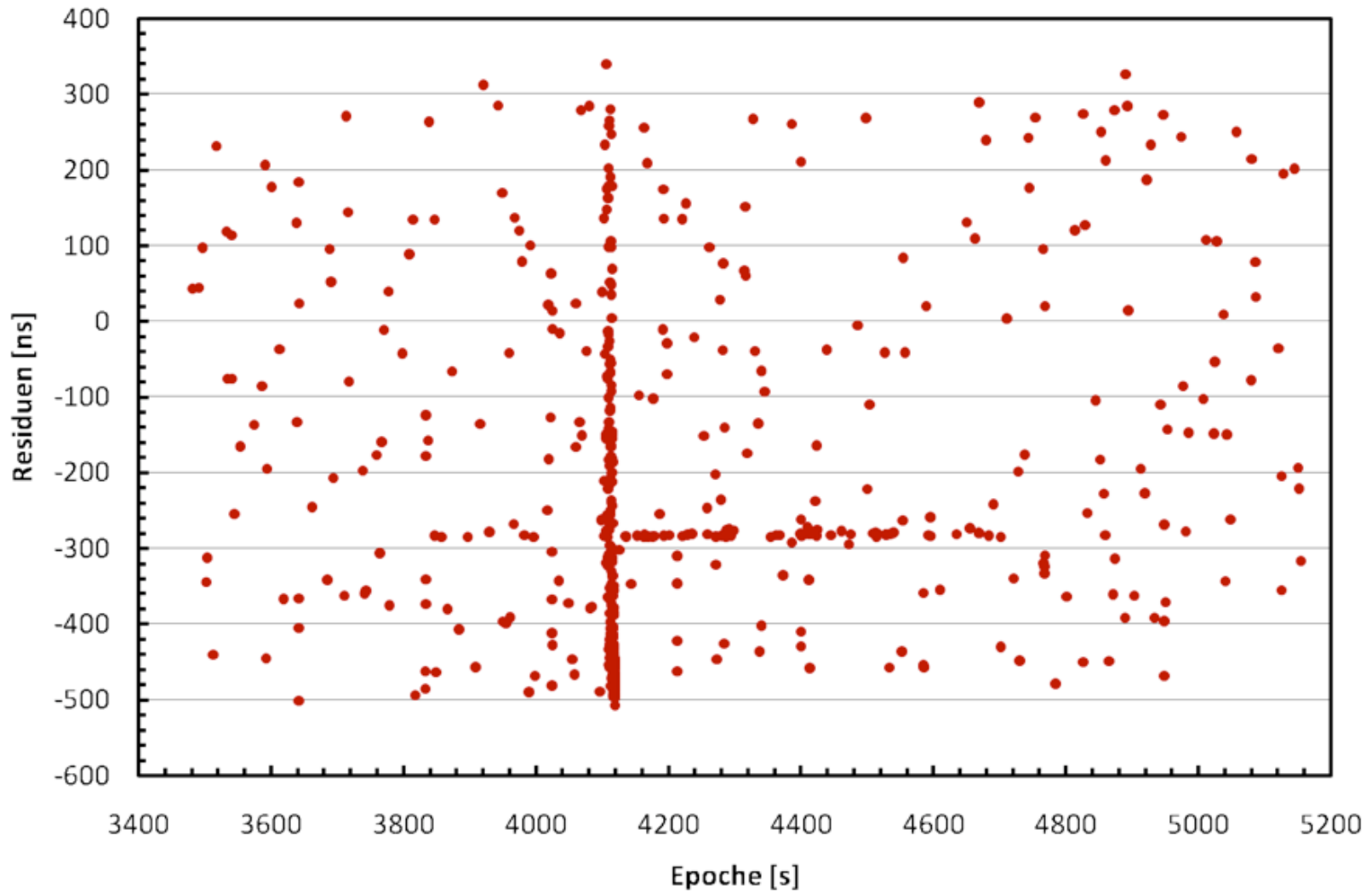
AltiDemon (TX: 20 Hz → RX: 20 Hz)

Problem: Alignment - Offset (25")

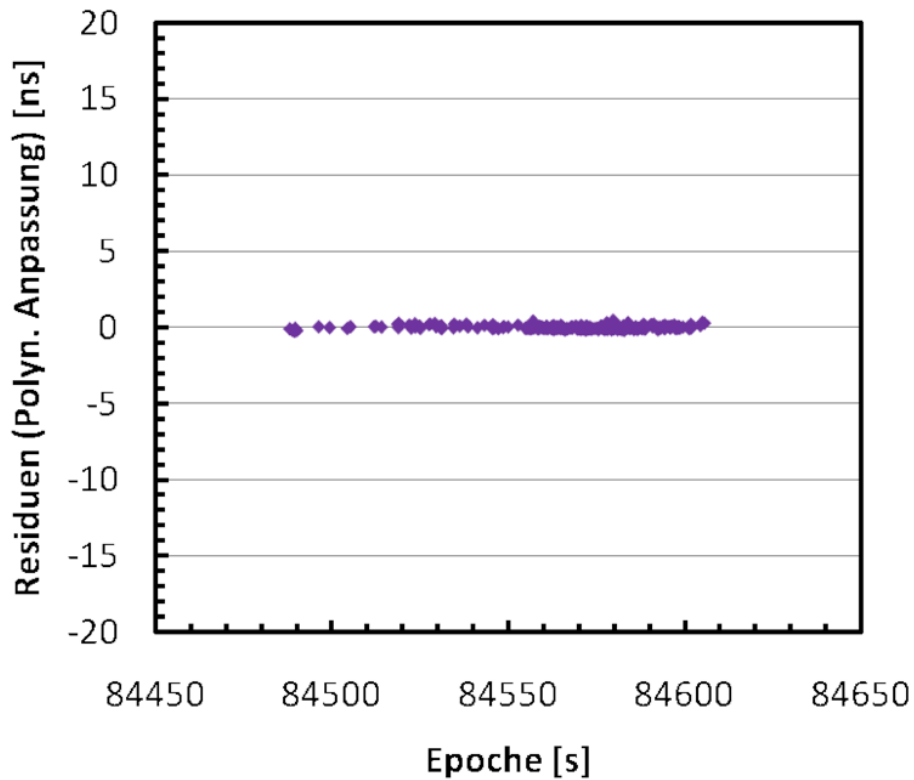
Starlette: 17.8.08



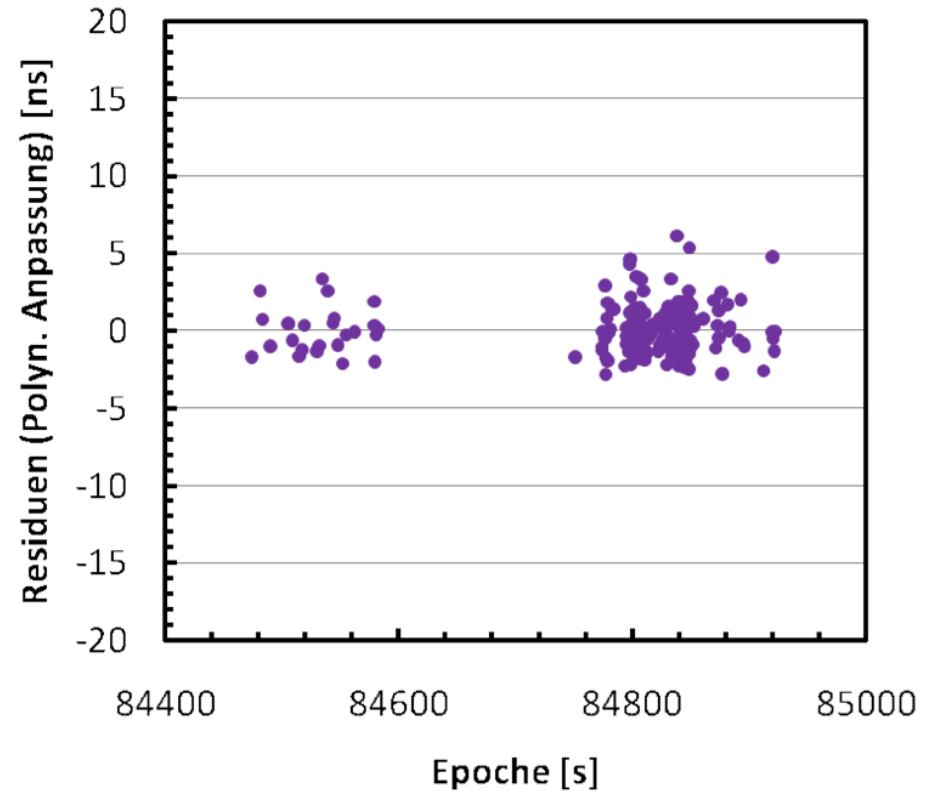
AltiDemon: LAGEOS Ranging



Difference in Laser Pulse Width

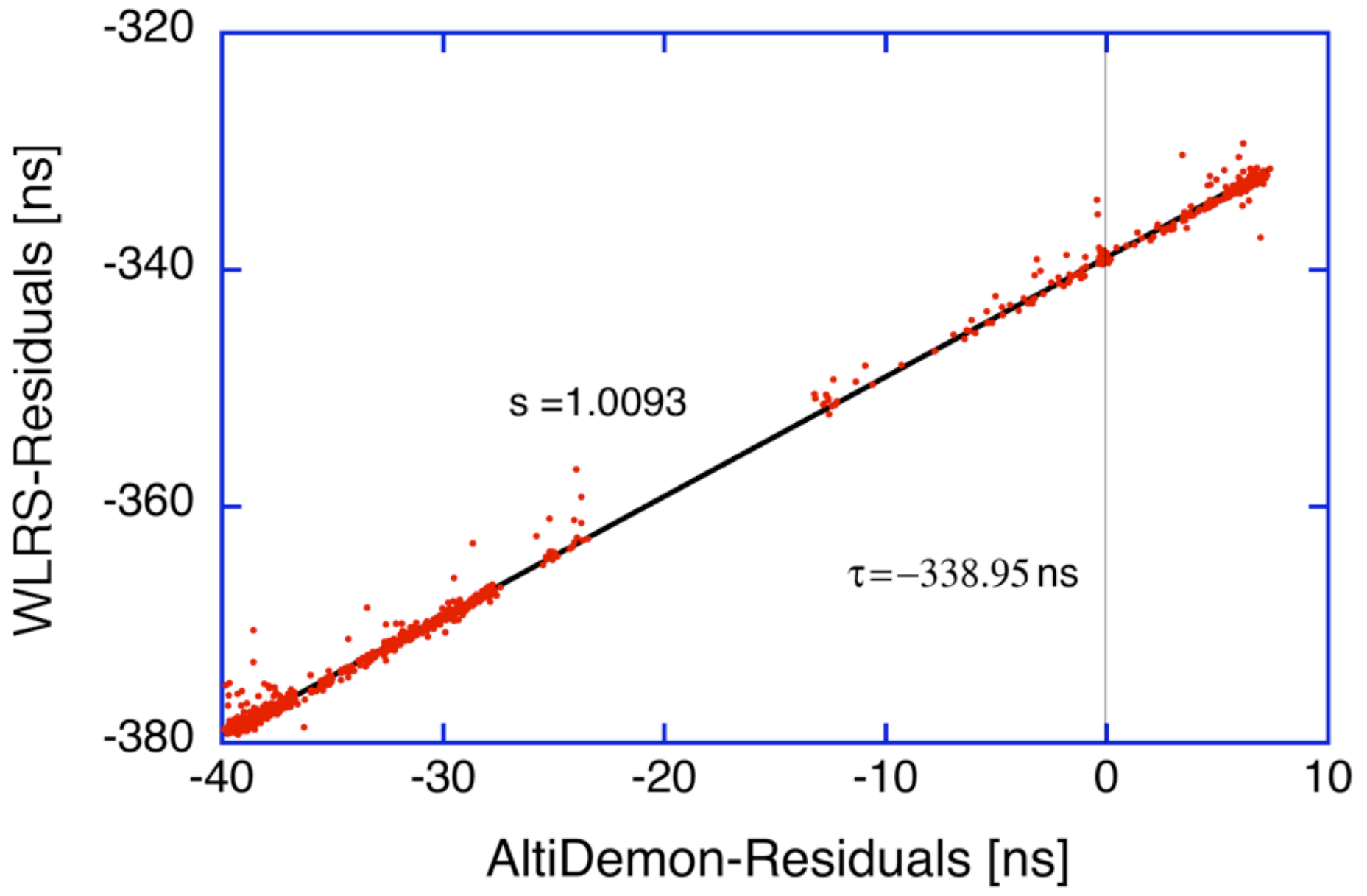


WLRS

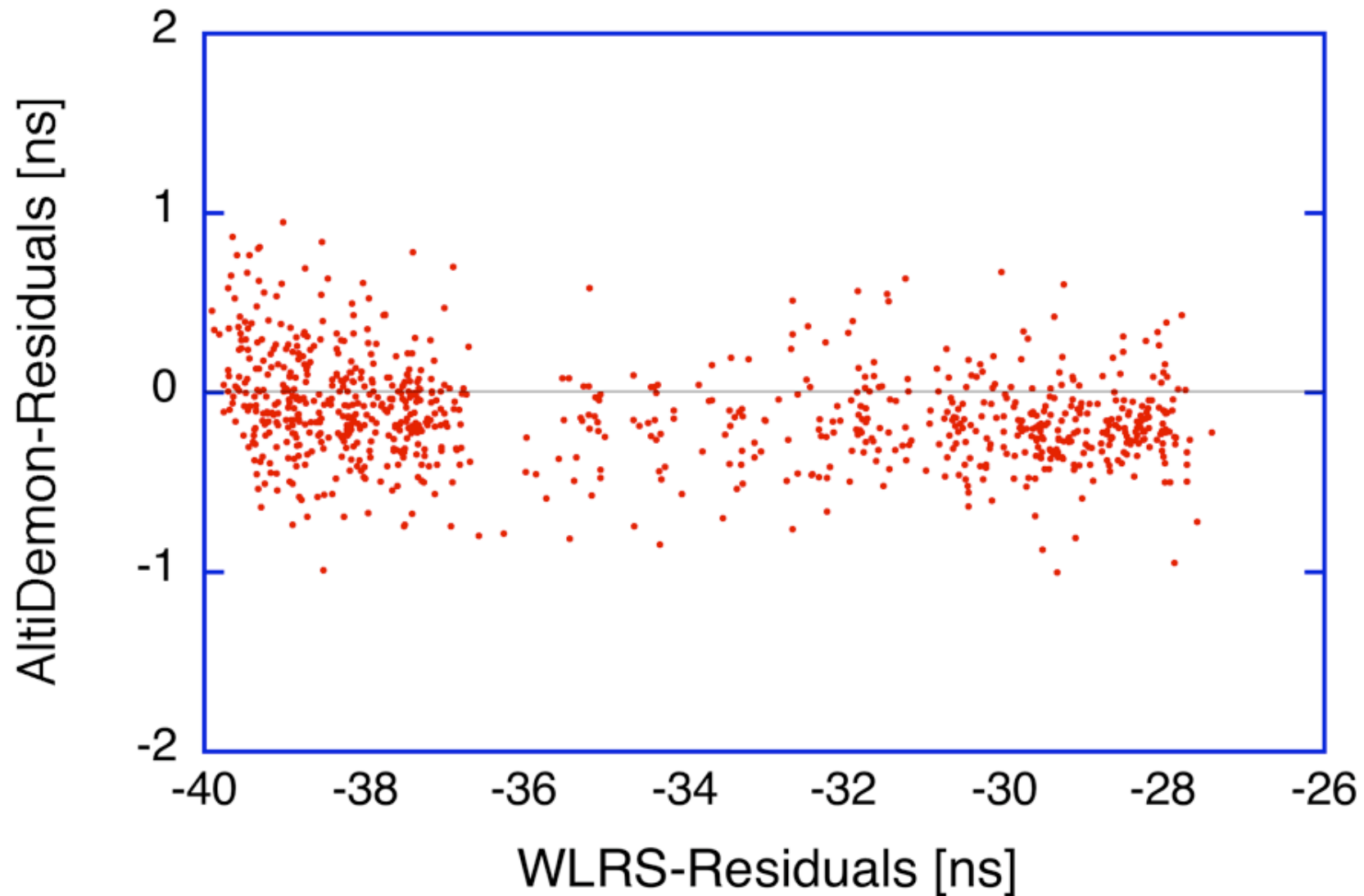


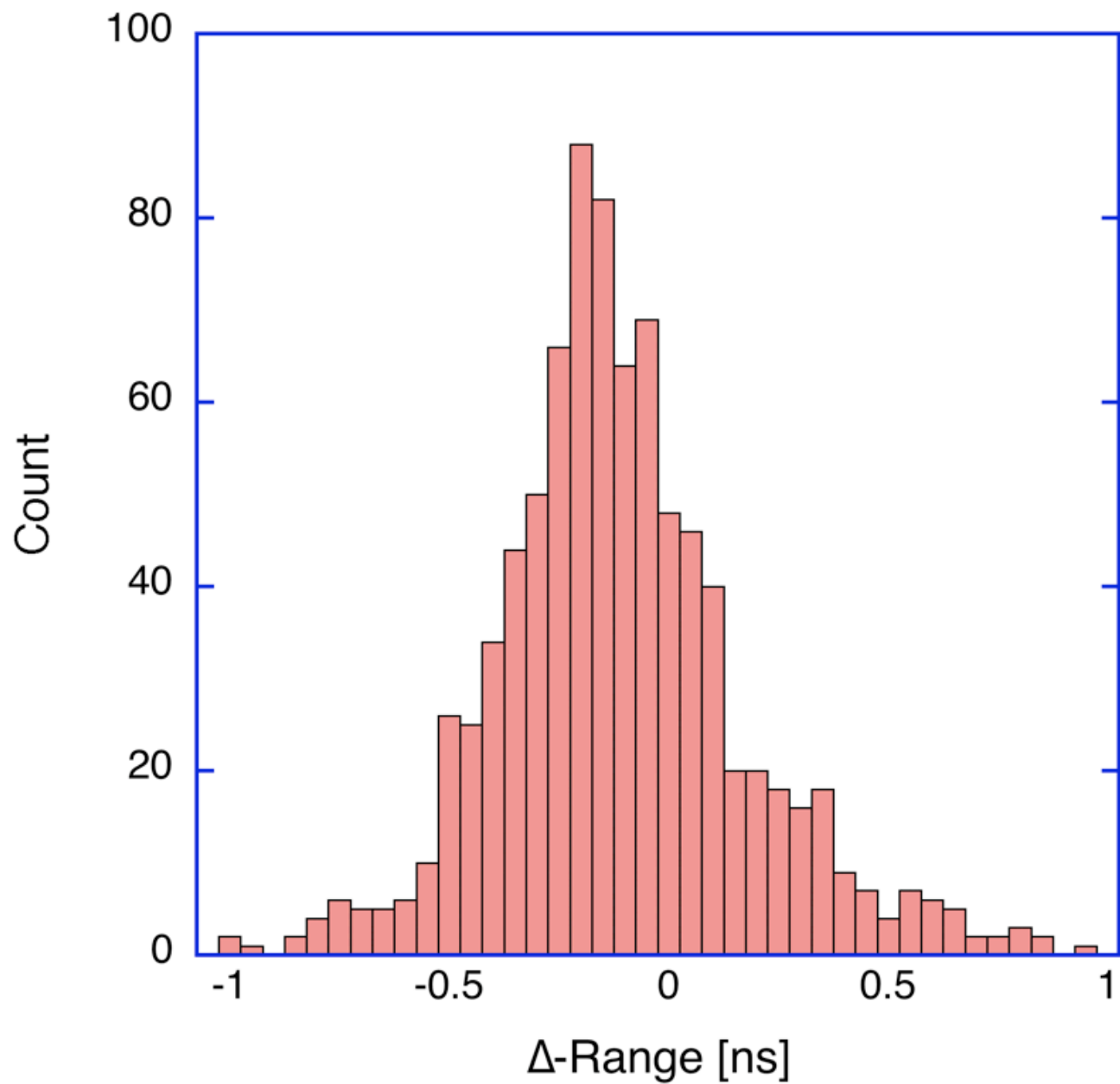
AltiDemon

GFO: 16:8.08



“Dual Receive Signals” may yield a clue on intra-Technic Systematics





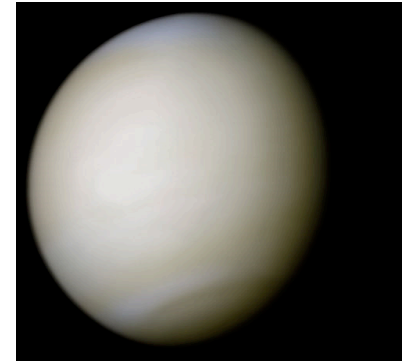
Timewalk?
WLRs-MCP
-
AltiDemon-SPAD

Equivalent Deep Space Range:

AltiDemon - WLRs: $D_{\max} \approx 0.41 \text{ AU}$



Konjunction
Earth to:



Mars $\approx 0.372 \text{ AU}$

Venus $\approx 0.256 \text{ AU}$

AltiDemon located on top of 8834

