Multi-Technique Ground Target

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[1]Technical University Munich, Geodetic Observatory Wettzell

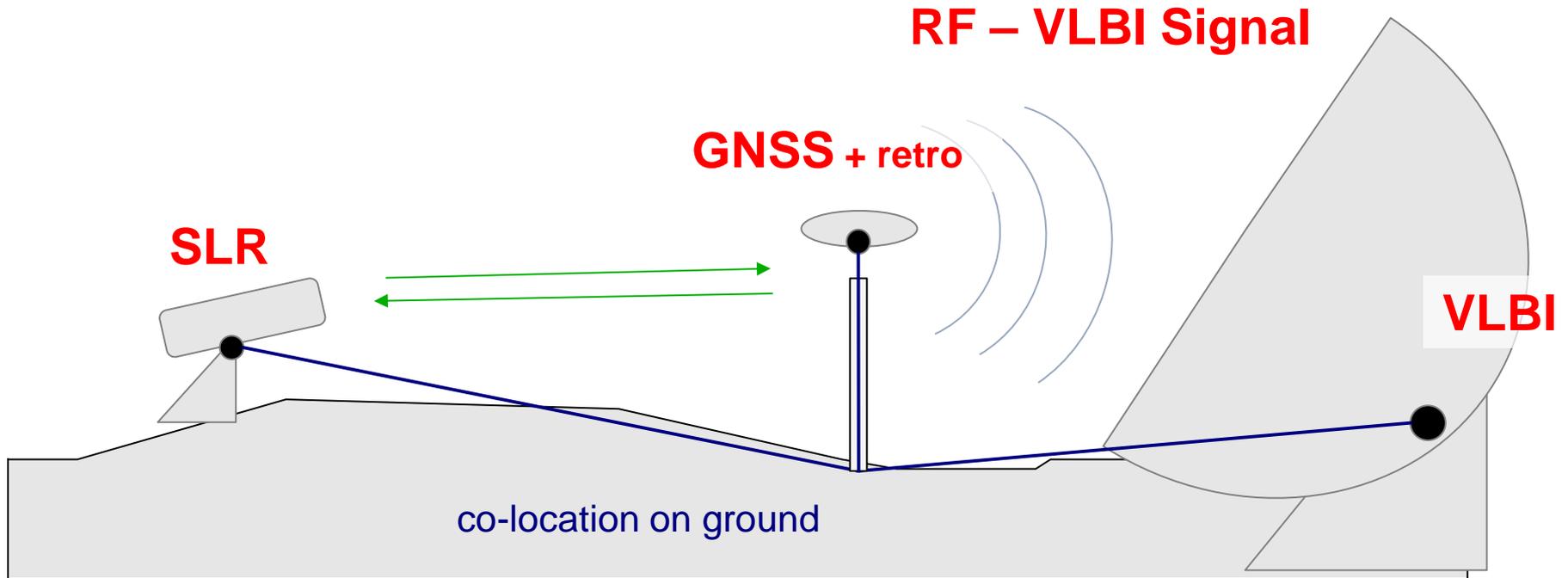[2]Federal Agency of Cartography and Geodesy, Geodetic Observatory Wettzell

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Multi-Technique Ground Target

Multi-Technique Ground Target

RF – VLBI Signal

GNSS + retro

SLR

VLBI

co-location on ground

Multi-Technique Ground Target must be visible from WLRS, SOS-W, RTW, TWIN1 and TWIN2 => Not Trivial!

Multi-Technique Ground Target Design

GNSS Antenna

SLR Reflector
mounted on
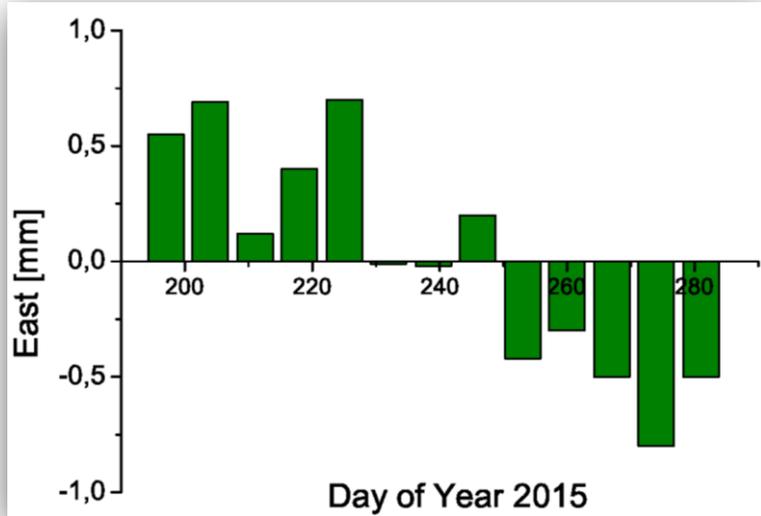rotating table

VLBI Radio-source
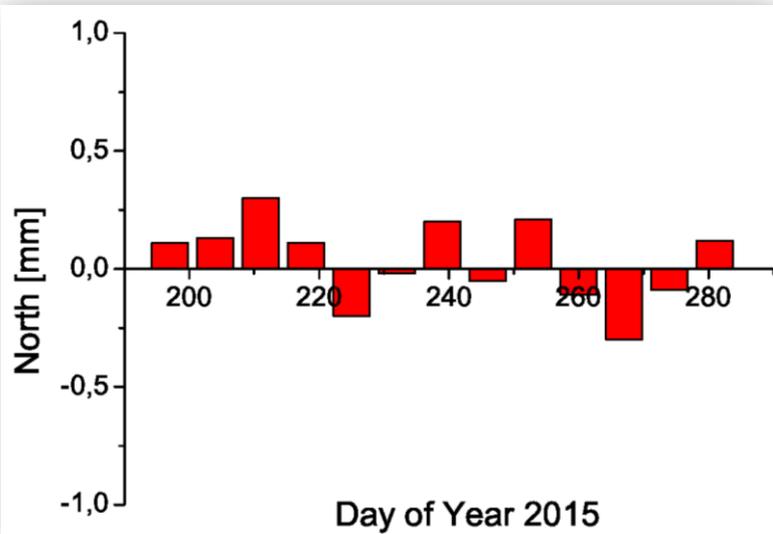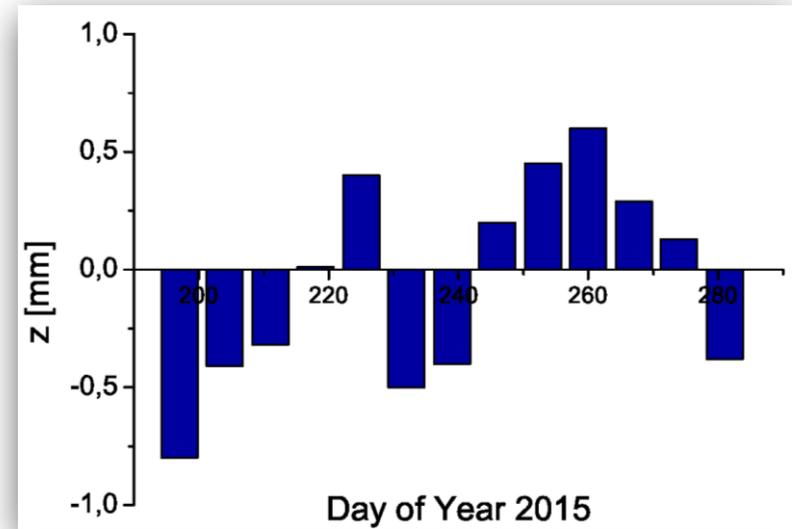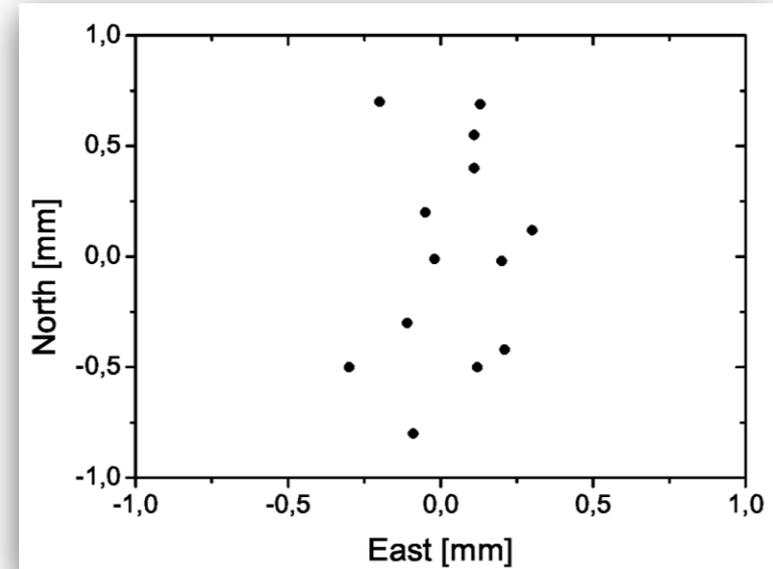
Multi-Technique Ground Target Construction

5.5m high

Multi-Technique Ground Target GPS Solution

Multi-Technique Ground Target
Calibration with SLR (WLRS)

Multi-Technique Ground Target
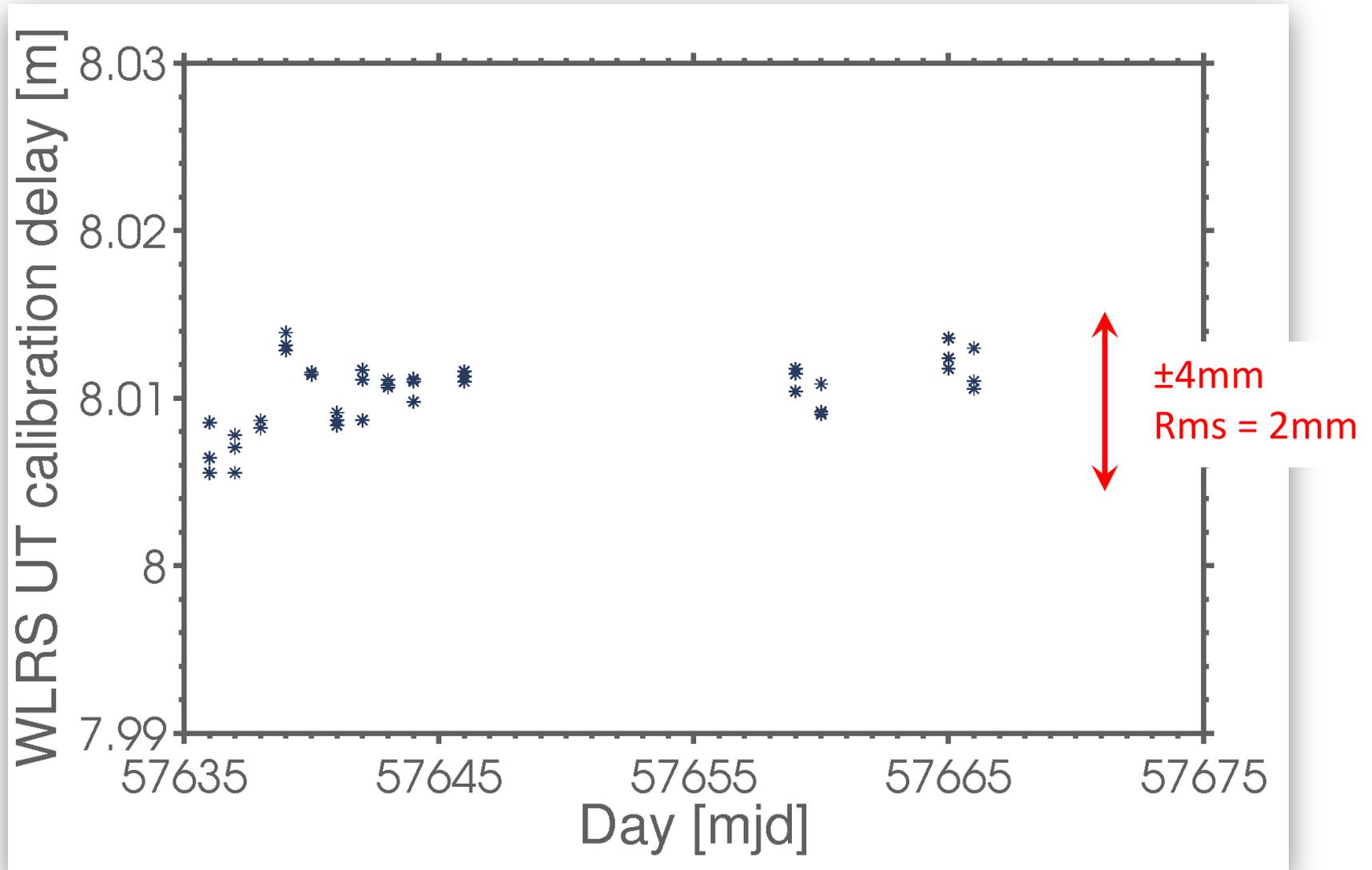
External Calibration Target

WLRS Telescope

Range UT

Range ET

WLRS – Monostatic mount

- We have modifiing WLRS laser to eye safe mode; 100Hz

WLRS UT Calibration = Range UT – Range ET

Multi-Technique Ground Target
Calibration with SLR (WLRS)

Multi-Technique Ground Target Calibration with SLR (SOSW)

Multi-Technique Ground Target

External Calibration Target
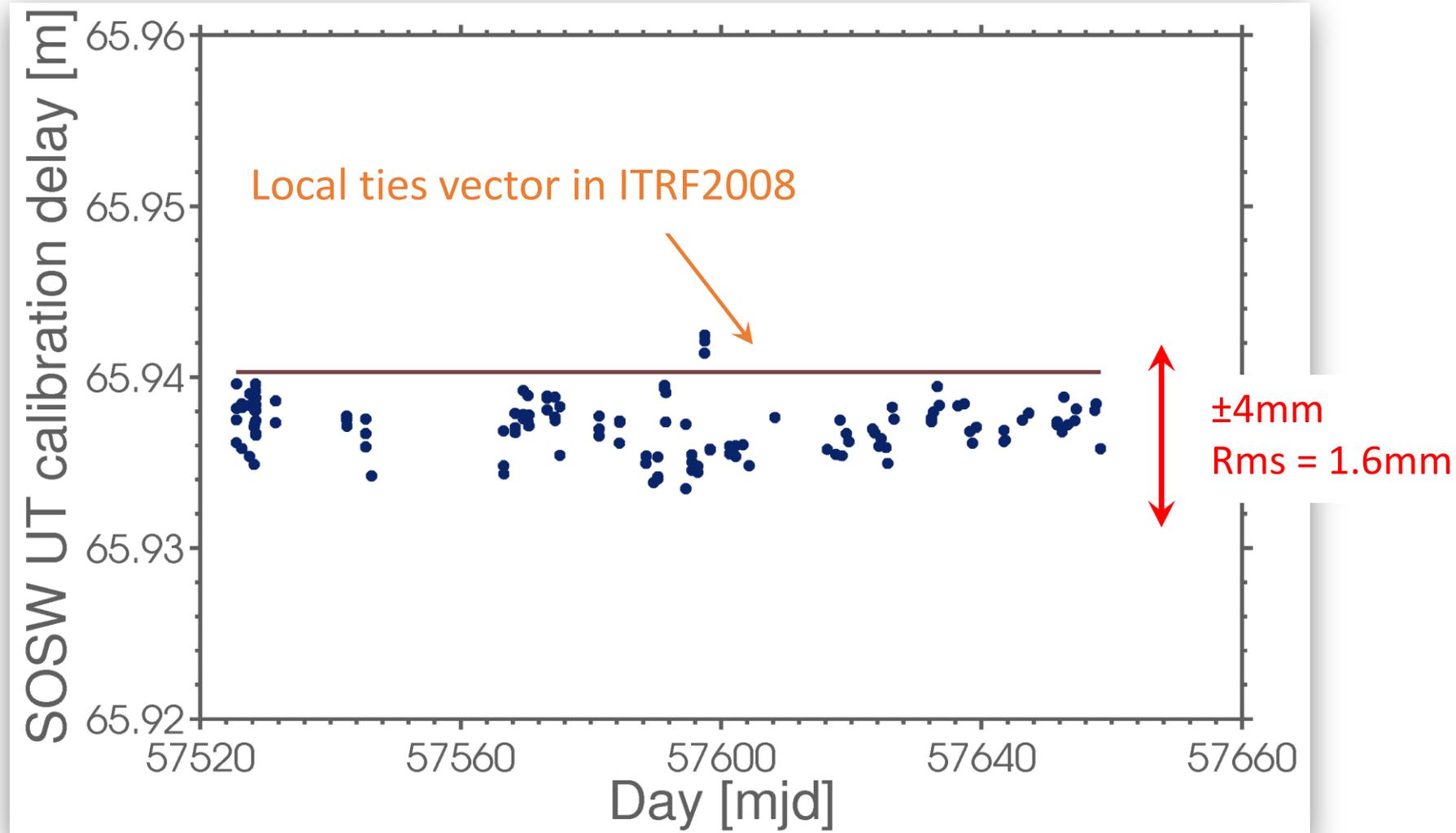
SOSW Telescope

Range UT

Range ET

Range Tx

SOSW – Bistatic mount

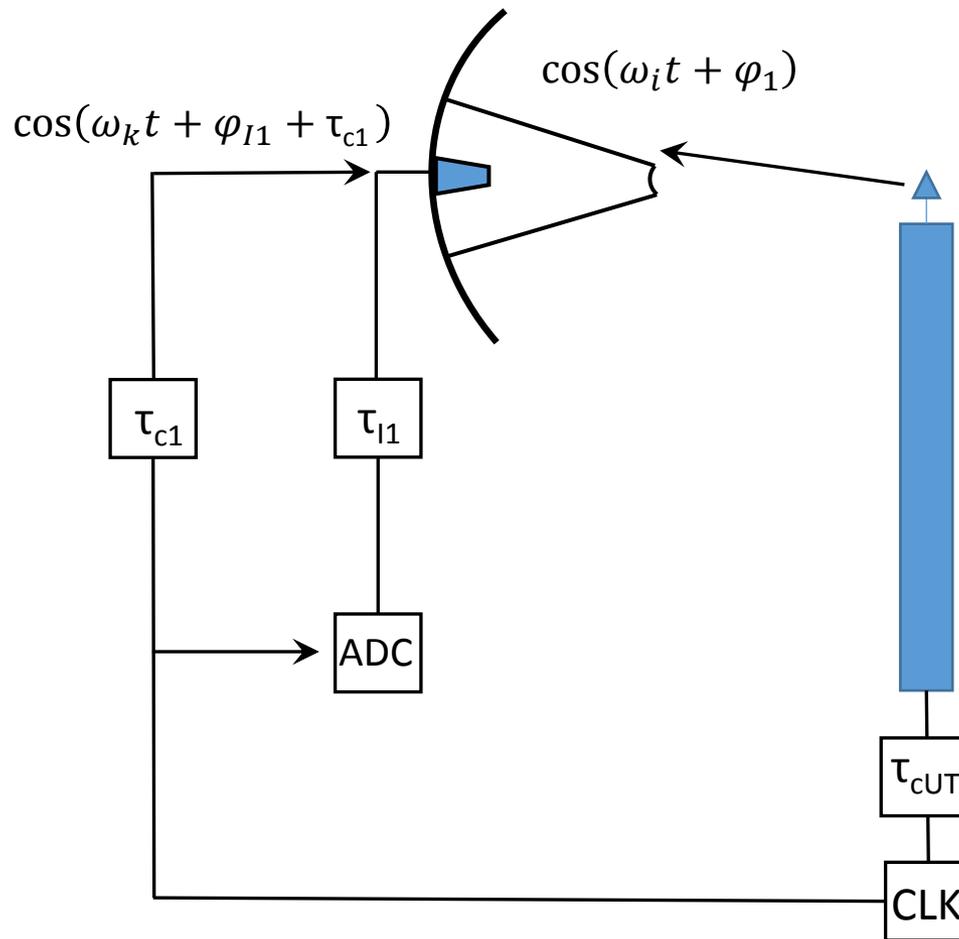**SOSW UT Calibration** = Range UT – Range Tx – Range ET Tx path

Multi-Technique Ground Target
Calibration with SLR (SOSW)

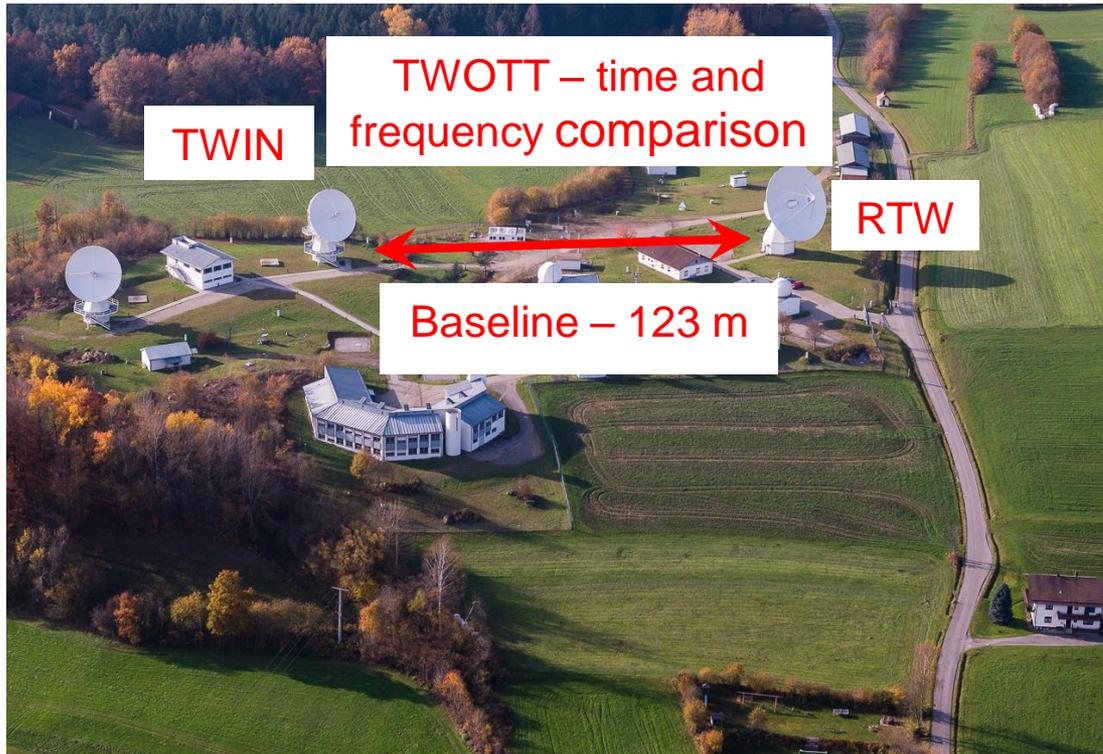# Multi-Technique Ground Target VLBI Concept

Comparing Time Scales Between Two Radio-telescopes

- Comparison of Clocks between VLBI TWIN1 and RTW using Two Way Optical Time Transfer, since beginning of September 2015

TWOTT – time and frequency comparison
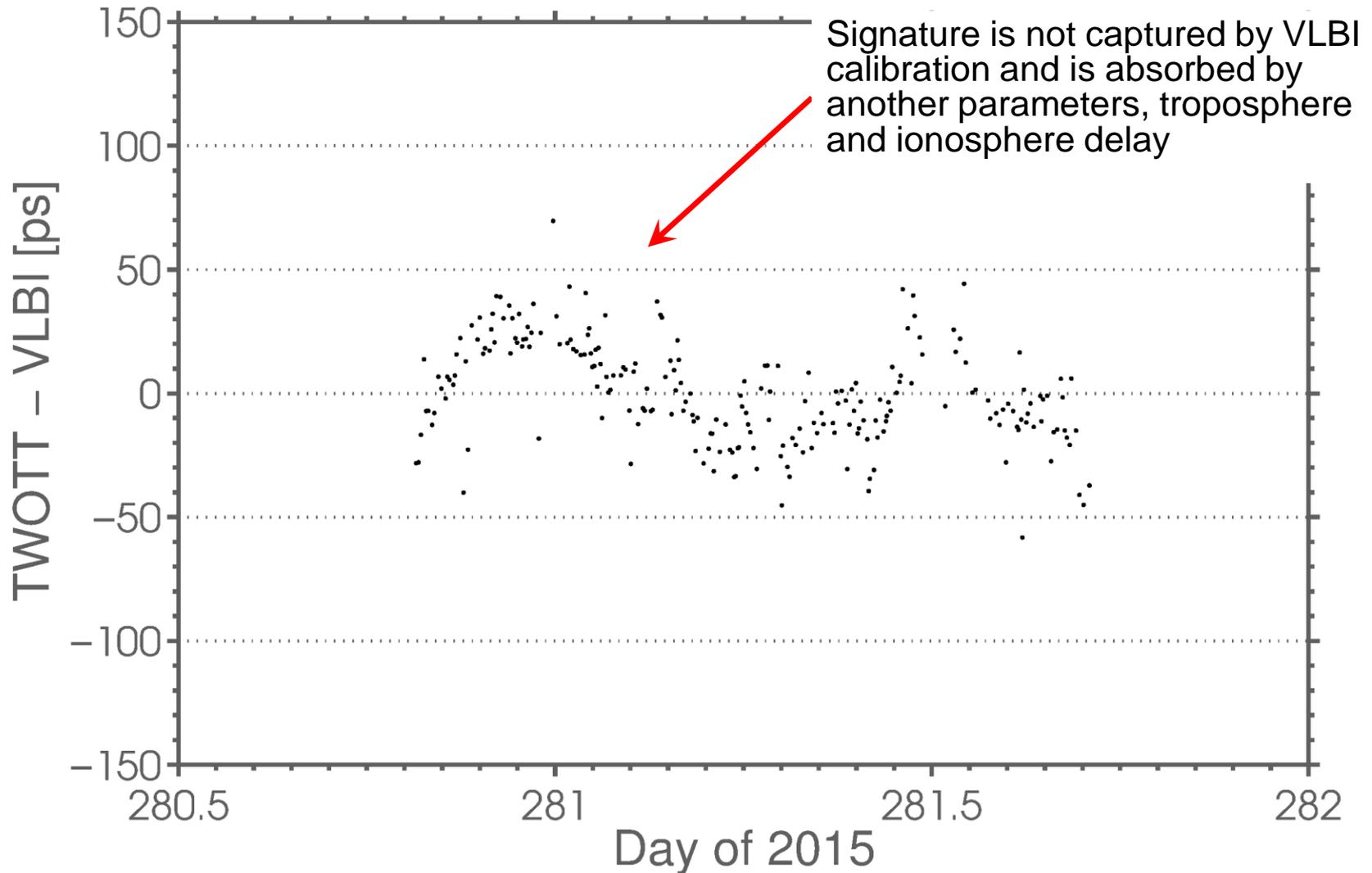
TWIN

RTW

Baseline – 123 m

We did two VLBI data evaluations using two different software packages.

- Local network - **Levika** sw
  - ✓ Constrains to baseline, ionosphere and troposphere zenith delay
- Global network - project version of the **Bernese GNSS**
  - ✓ All parameters are estimated 2h
    - ✓ Tropospheric wet delay
    - ✓ Tropospheric gradients
    - ✓ Receiver clock offset
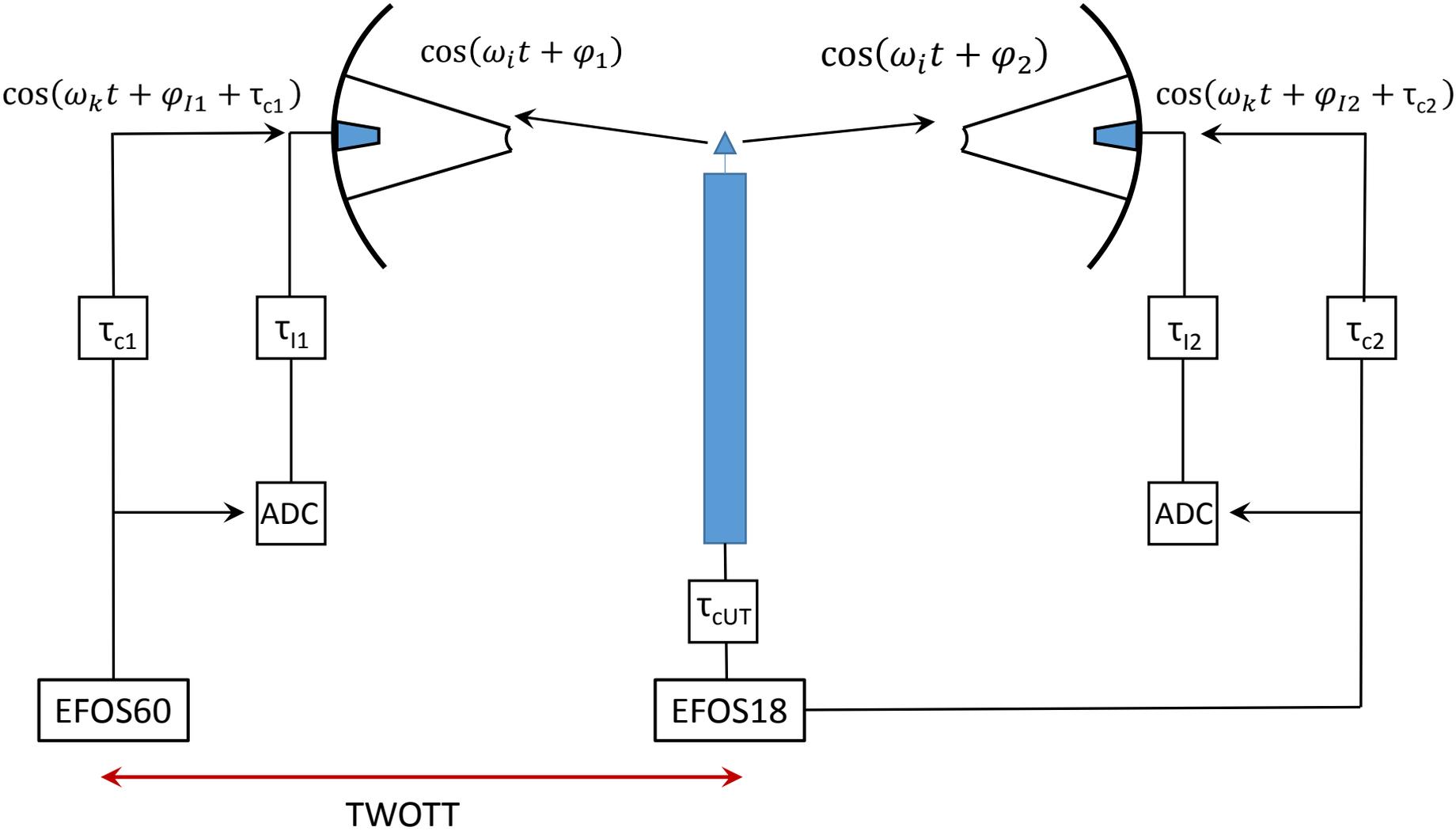   - ✓ Earth rotation parameters

Comparing Time Scales Between Two Radio-telescopes
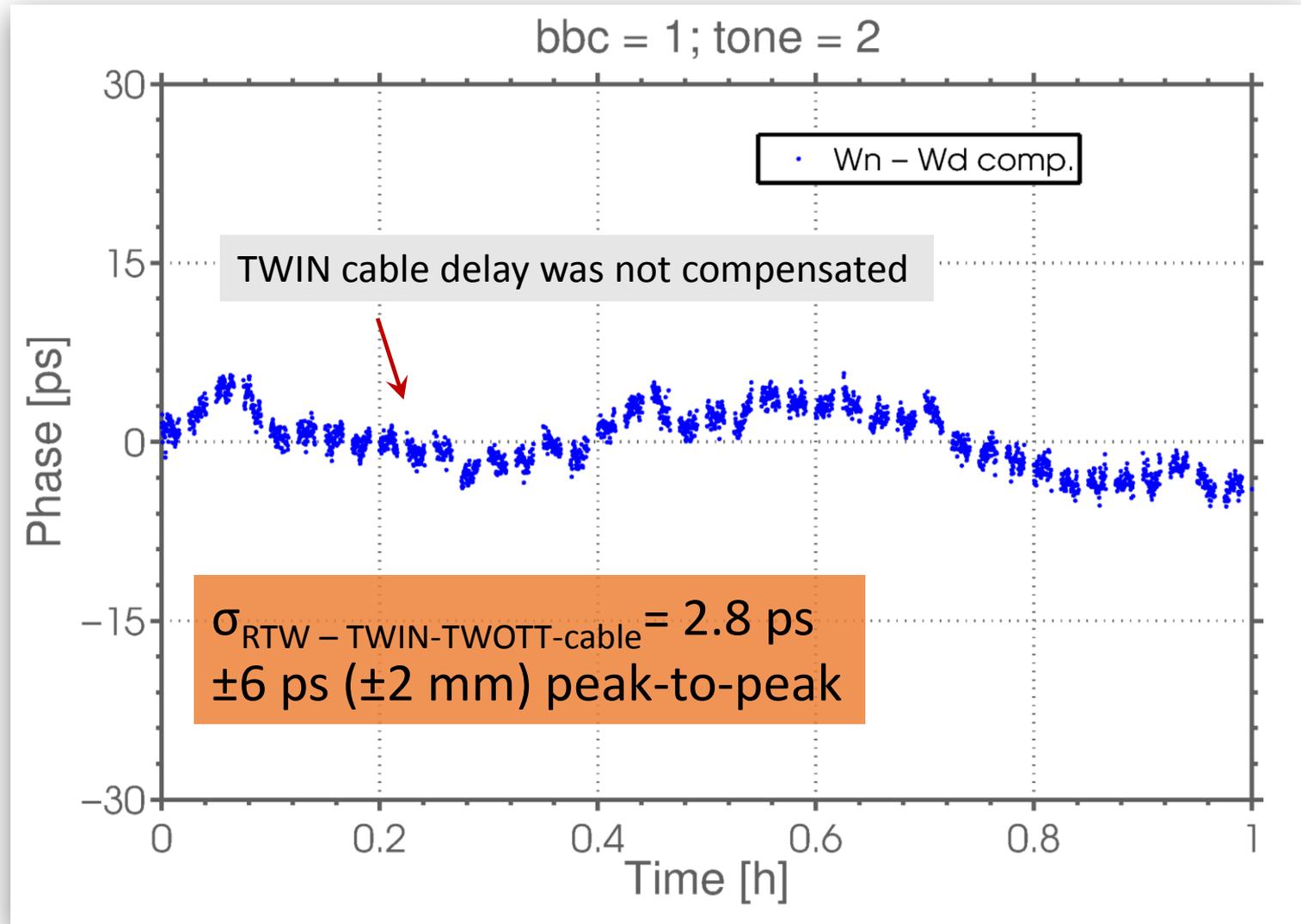
TWOTT – VLBI local network solution

Signature is not captured by VLBI calibration and is absorbed by another parameters, troposphere and ionosphere delay

Multi-Technique Ground Target VLBI Experiments

Multi-Technique Ground Target
RTW - TWIN 1 all known delays distracted

bbc = 1; tone = 2

· Wn − Wd comp.

TWIN cable delay was not compensated

$\sigma_{RTW - TWIN\text{-}TWOTT\text{-}cable}$ = 2.8 ps
±6 ps (±2 mm) peak-to-peak

Phase [ps]

Time [h]

Multi-Technique Ground Target
RTW - TWIN 1 all known delays distracted

Thank you

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