

# LCONT18 - The local continuous measurement campaign at Wettzell of 2018

**Torben Schüler, Christian Plötz, Gerhard Kronschnabl, Walter Schwarz**  
BKG, Geodetic Observatory Wettzell

**Alexander Neidhardt, Martin Brandl**  
FESG/TUM, Geodetic Observatory Wettzell

**Laura La Porta, Simone Bernhart**  
Reichert GmbH/BKG, Bonn VLBI Correlator



Geodetic Observatory Wettzell, Germany

3 VLBI Radio Telescopes,  
2 Satellite Laser Ranging Systems,  
Local + Regional GeoSensorStations



AGGO Modular Observatory, La Plata, Arg.

VLBI Radio Telescope  
Satellite Laser Ranging System  
GNSS Reference Stations



Receiving Station O'Higgins, Antarctica

German receiving station of DLR for remote sensing satellites; operated by BKG for Geodetic VLBI + GNSS Reference Stations

# Contents / Overview

- Motivation
- Local position and relation to global observations
- Overview
- Receivers and setup
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- A first look at the results
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# Motivation for LCONT18 and local telescope position in general

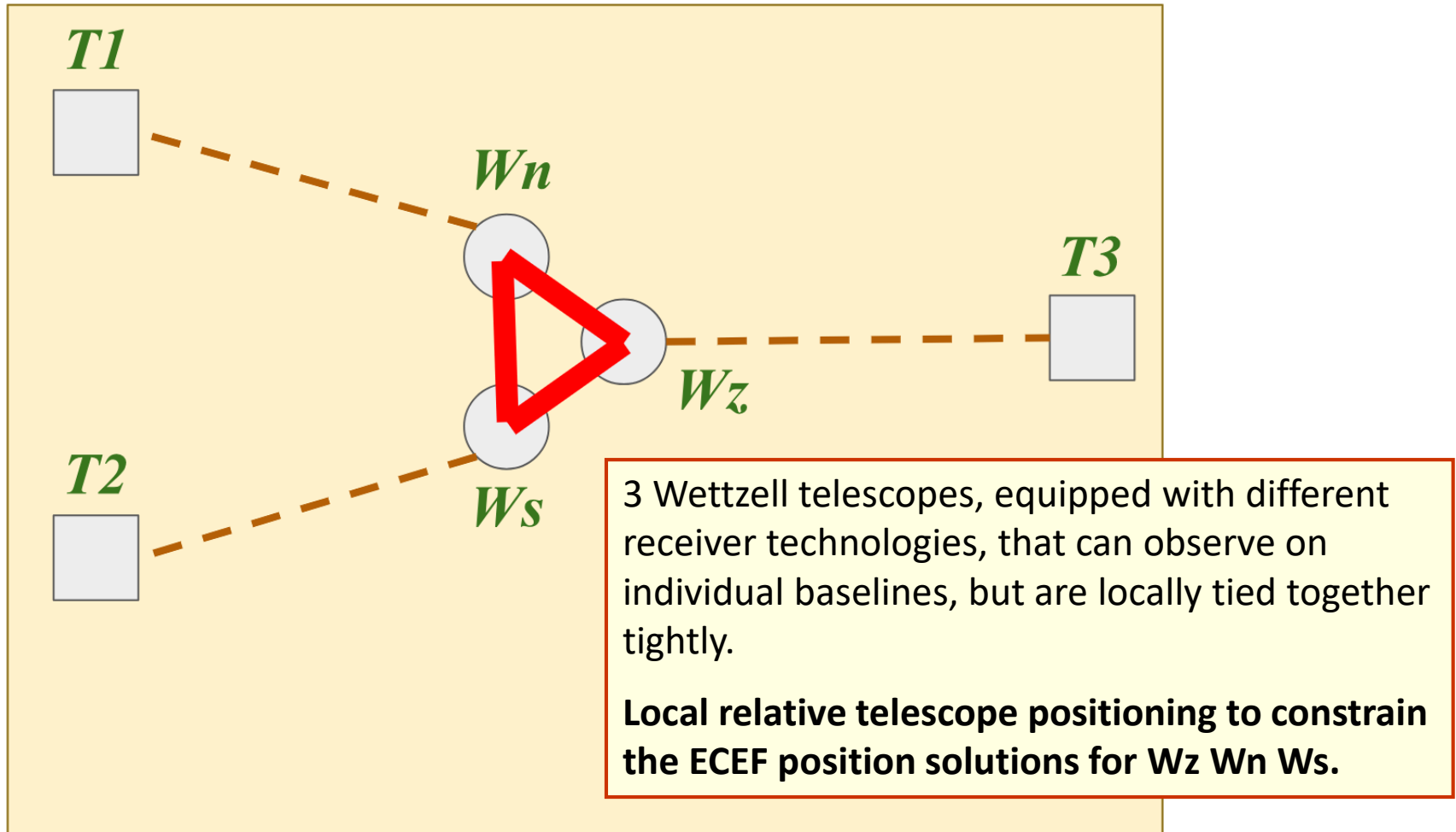
## In general ...

1. Local telescope positioning as a hobby
2. Precise local coordinates (telescope ties) as tight constraints
3. Stability monitoring and comparison to terrestrial survey
4. Quality assurance

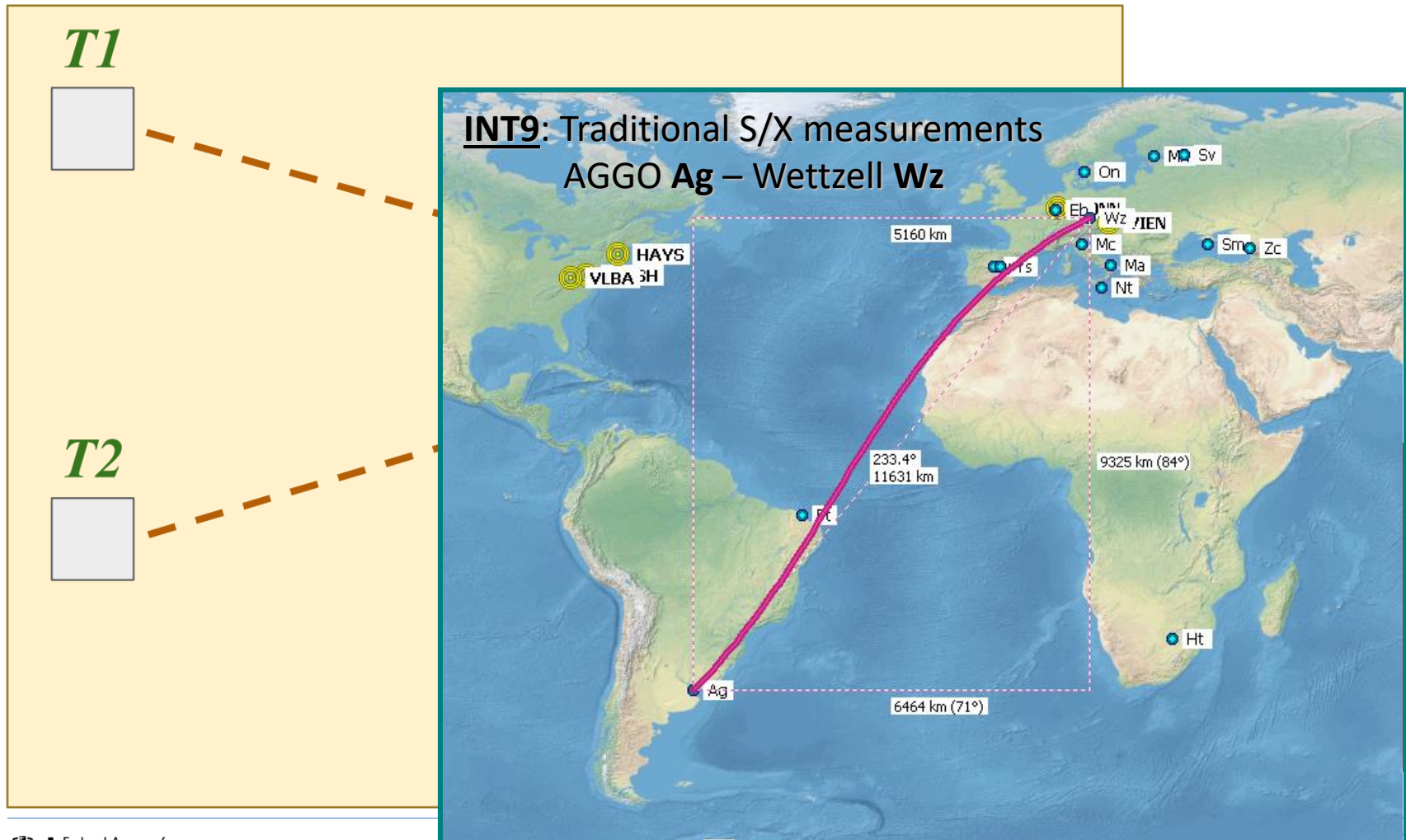
## ... and specifically regarding LCONT18:

1. Determination of day-to-day stability of local solutions
2. Assessment of adequate compromise between observation time and baseline accuracy
3. Investigation of loop-misclosure errors

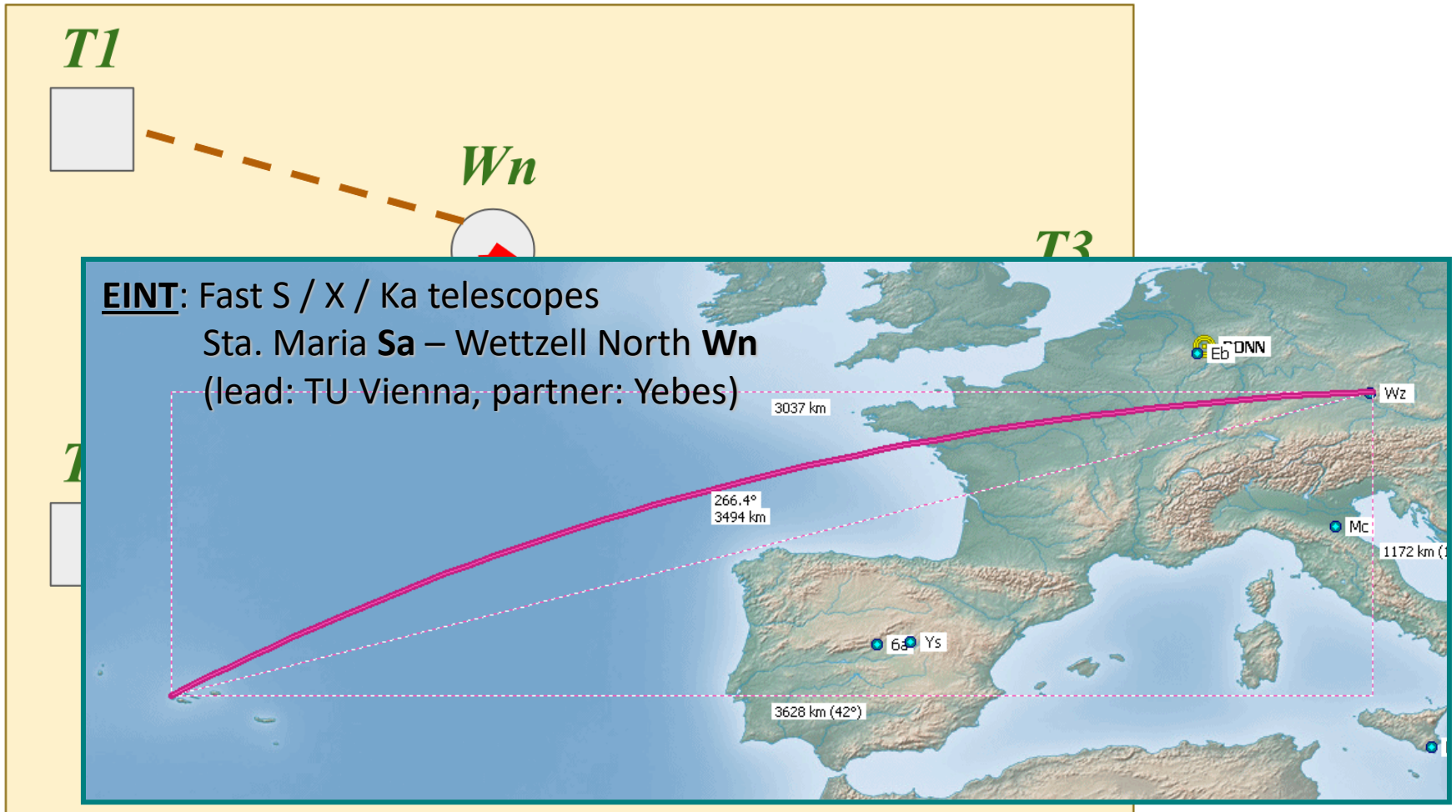
# Local telescope positioning and its relation to global observations



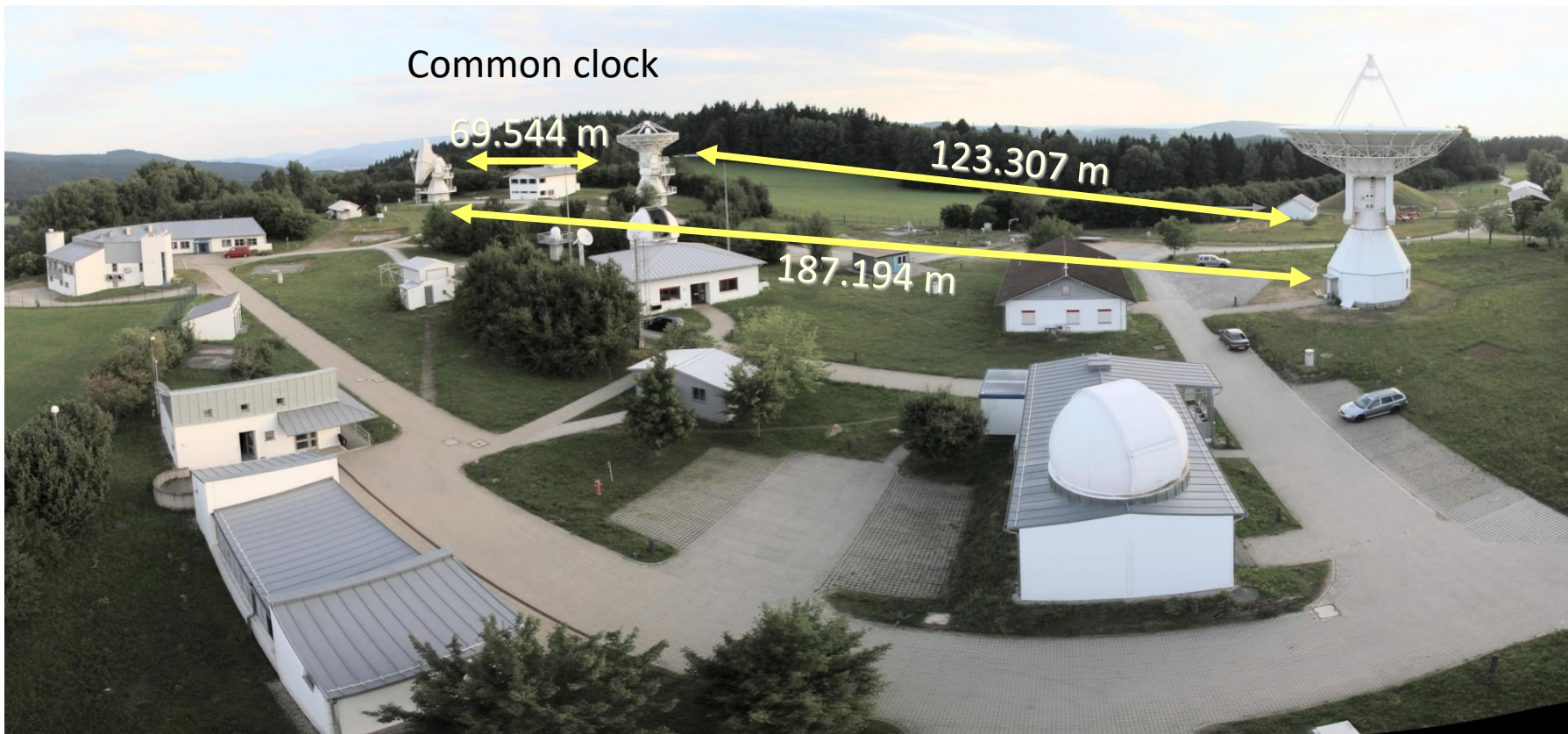
# Local telescope positioning and its relation to global observations



# Local telescope positioning and its relation to global observations



# LCONT18: First time to collect, correlate and analyse data from the complete local array



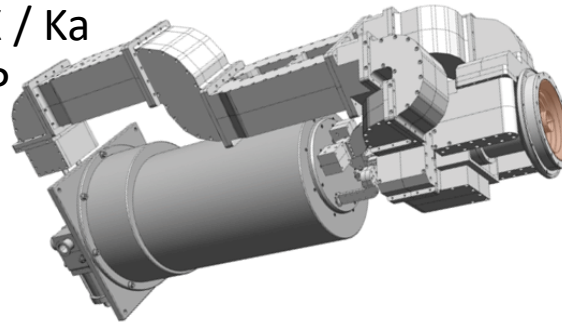
# Receiving systems

$W_z$   
RTW

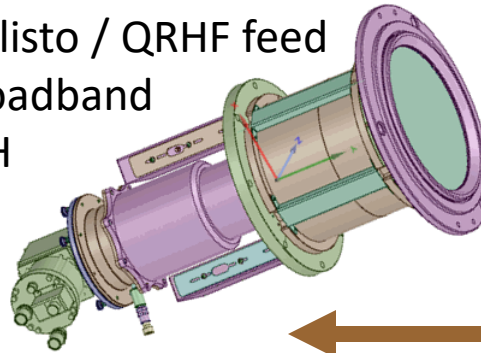
Traditional S / X  
2.2 / 8.2 GHz  
RHCP

$W_n$   
TWIN1

MIRAD tri-band feed  
S / X / Ka  
2xCP



Callisto / QRHF feed  
Broadband  
V/H



$W_s$   
TWIN2



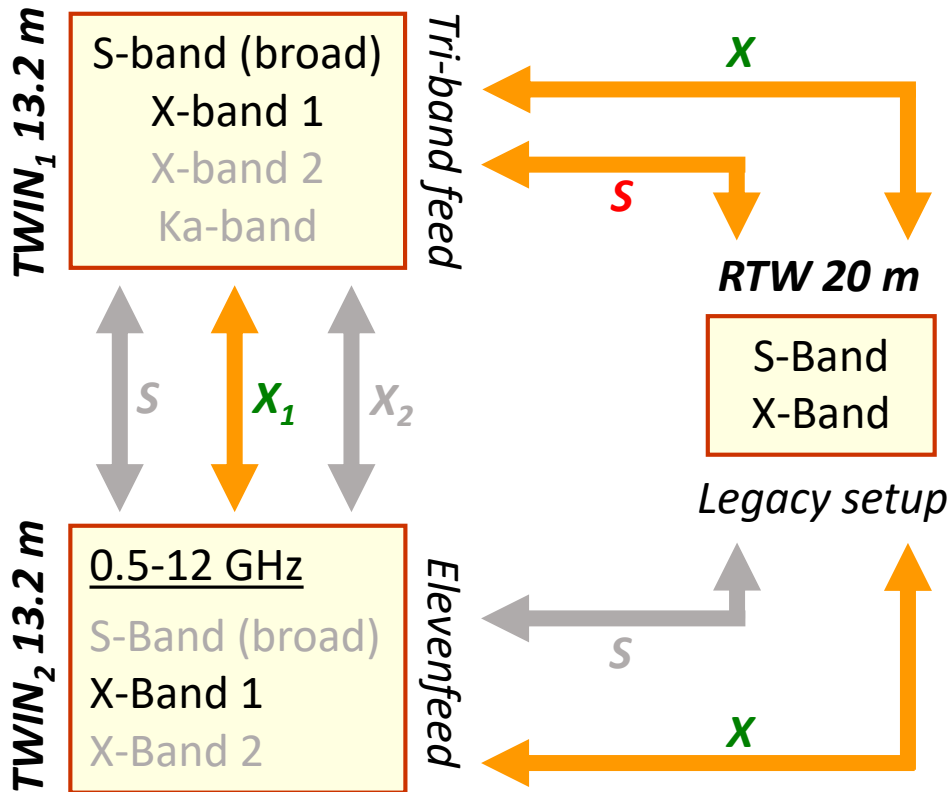
Omnisys / Elevenfeed  
Broadband  
V/H





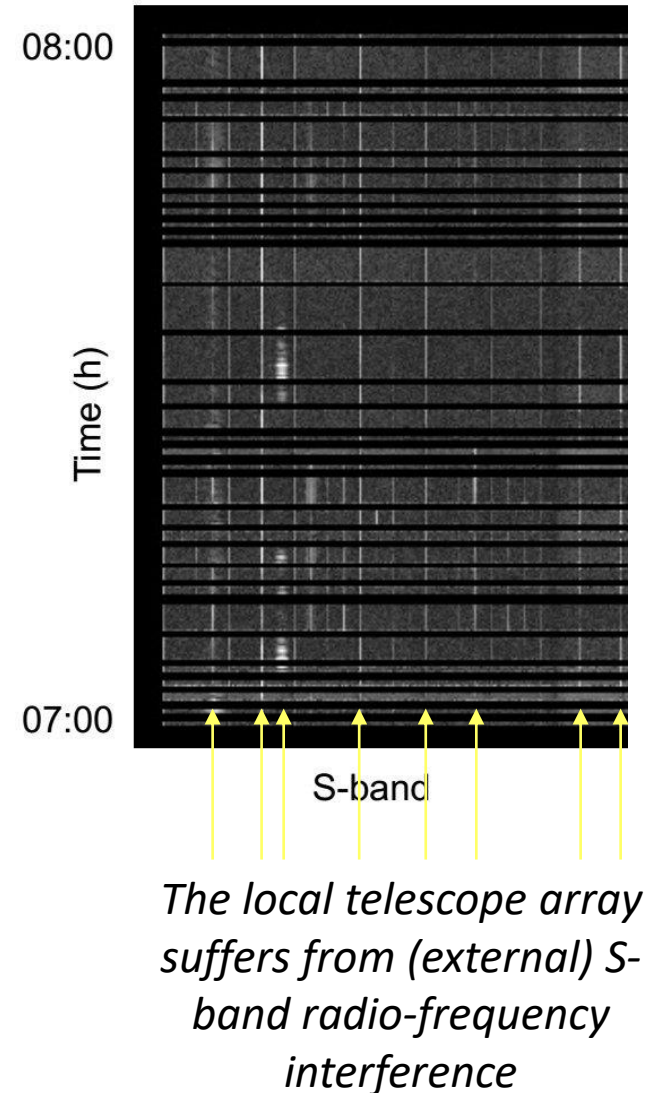
# Receivers and setup used for LCONT18

Dates & duration: Dec, 3<sup>rd</sup>-14<sup>th</sup> 2018, 2 x 5 days, up to 24 h each



Sampling mode: 256 Mbit/s (traditional)

RFI Spectrum TTW1/RTW

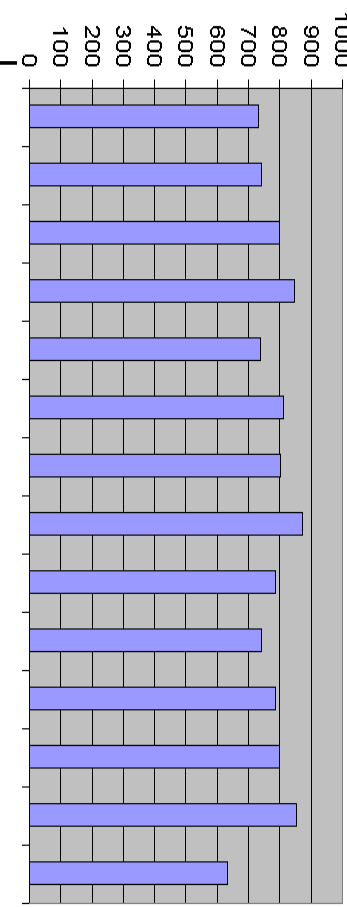


# On few notes on processing ...

- Correlation of baselines containing telescope TWIN2 Ws (broadband) carried out for H- and V-polarisation separately.
- Data pre-fit screening carried out in most of the cases (semi-automatic, user-guided).
- Adaptive clock estimation interval assignment based on given precision target (usually 20 ps).
- Just 4 out of 10 days under investigation in this study (pending correlation/processing).
- In-house software used for vector estimation.

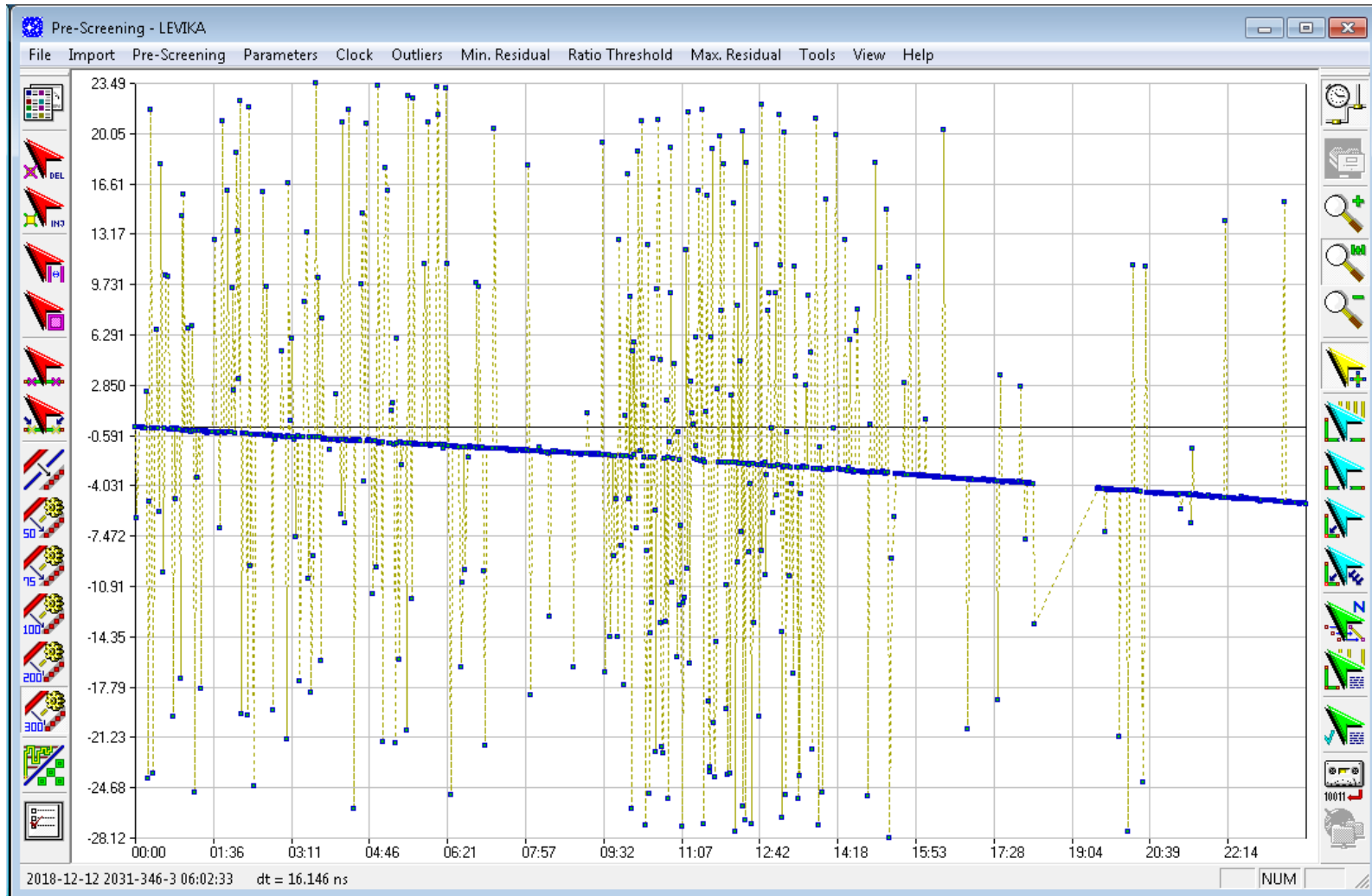
# Summary of results: # obs

Date	Pol	Baseline	$n_{\Delta T}$	n	$S_0$ mm
2018-12-03	H	WETTZ13N -> WETTZ13S	0	733	3.1
2018-12-03	V	WETTZ13N -> WETTZ13S	0	741	2.6
2018-12-11	H	WETTZ13N -> WETTZ13S	0	800	2.8
2018-12-11	V	WETTZ13N -> WETTZ13S	0	848	2.4
2018-12-12	H	WETTZ13N -> WETTZ13S	0	738	2.1
2018-12-03		WETTZ13N -> WETTZELL	10	810	3.0
2018-12-03		WETTZ13N -> WETTZELL	12	803	3.1
2018-12-11		WETTZ13N -> WETTZELL	12	873	3.2
2018-12-12		WETTZ13N -> WETTZELL	11	785	3.6
2018-12-03	H	WETTZ13S -> WETTZELL	5	741	4.5
2018-12-03	V	WETTZ13S -> WETTZELL	5	786	4.5
2018-12-11	H	WETTZ13S -> WETTZELL	17	798	3.7
2018-12-11	V	WETTZ13S -> WETTZELL	12	853	3.7
2018-12-12	H	WETTZ13S -> WETTZELL	10	631	4.4



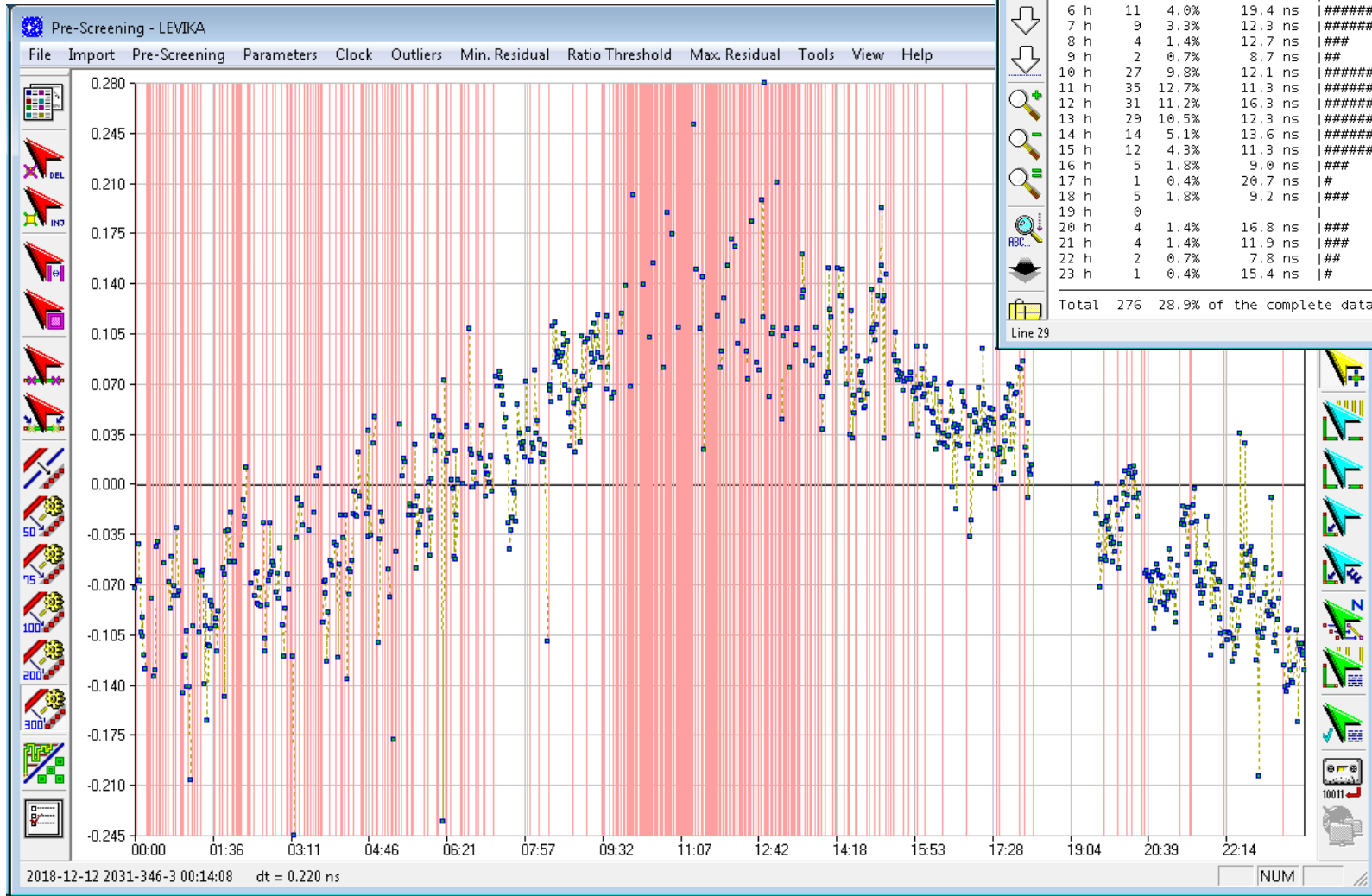
# Days with strong interference

y-axis is in nanoseconds | Baseline Ws - Wz



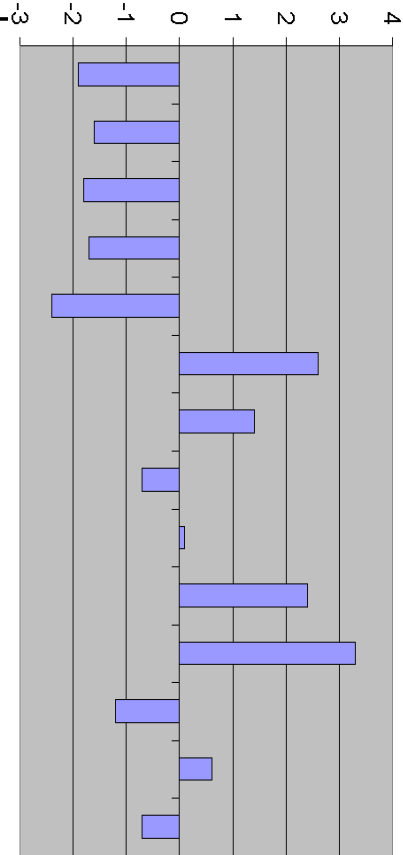
# Days with strong interference

y-axis is in nanoseconds | Baseline Ws - Wz



# Summary of results: 3D distance

Date	Pol	Baseline	$n_{\Delta T}$	$\Delta S$ [mm]
2018-12-03	H	WETTZ13N -> WETTZ13S	0	-1.9
2018-12-03	V	WETTZ13N -> WETTZ13S	0	-1.6
2018-12-11	H	WETTZ13N -> WETTZ13S	0	-1.8
2018-12-11	V	WETTZ13N -> WETTZ13S	0	-1.7
2018-12-12	H	WETTZ13N -> WETTZ13S	0	-2.4
2018-12-03		WETTZ13N -> WETTZELL	10	2.6
2018-12-03		WETTZ13N -> WETTZELL	12	1.4
2018-12-11		WETTZ13N -> WETTZELL	12	-0.7
2018-12-12		WETTZ13N -> WETTZELL	11	0.1
2018-12-03	H	WETTZ13S -> WETTZELL	5	2.4
2018-12-03	V	WETTZ13S -> WETTZELL	5	3.3
2018-12-11	H	WETTZ13S -> WETTZELL	17	-1.2
2018-12-11	V	WETTZ13S -> WETTZELL	12	0.6
2018-12-12	H	WETTZ13S -> WETTZELL	10	-0.7



# Conclusions / Outlook

- Some surprises experienced so far – not just related to strong interference in X-band (not present in previous local observations) ...
- Much work to do, e.g. investigation of interference problems, analysis of full data set, investigation of possible systematic errors, looking a loop misclosure errors at observation level, ...
- Much potential for an LCONT20, e.g. closer investigation of phase cal handling, polarisation conversion, exploitation of broader frequency bands, ...