



Results from the TWIN Commissioning Phase

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Geodetic Observatory Wettzell, Germany

3 VLBI Radio Telescopes,
2 Satellite Laser Ranging Systems,
6 Local + 6 Regional GNSS Reference Stations



AGGO Modular Observatory, La Plata, Arg.

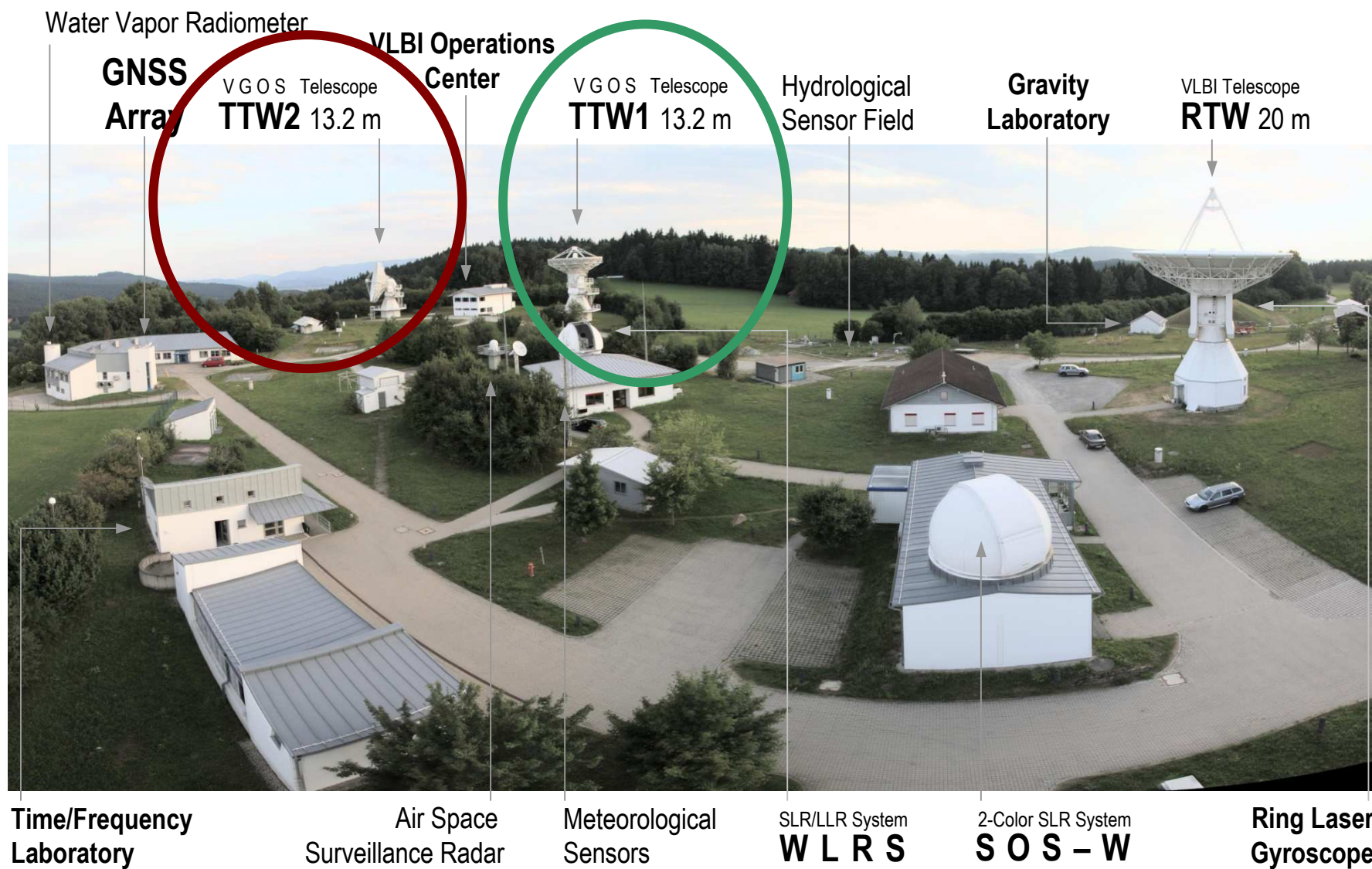
VLBI Radio Telescope
Satellite Laser Ranging System
GNSS Reference Stations



Receiving Station O'Higgins, Antarctica

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

Contents of Presentation

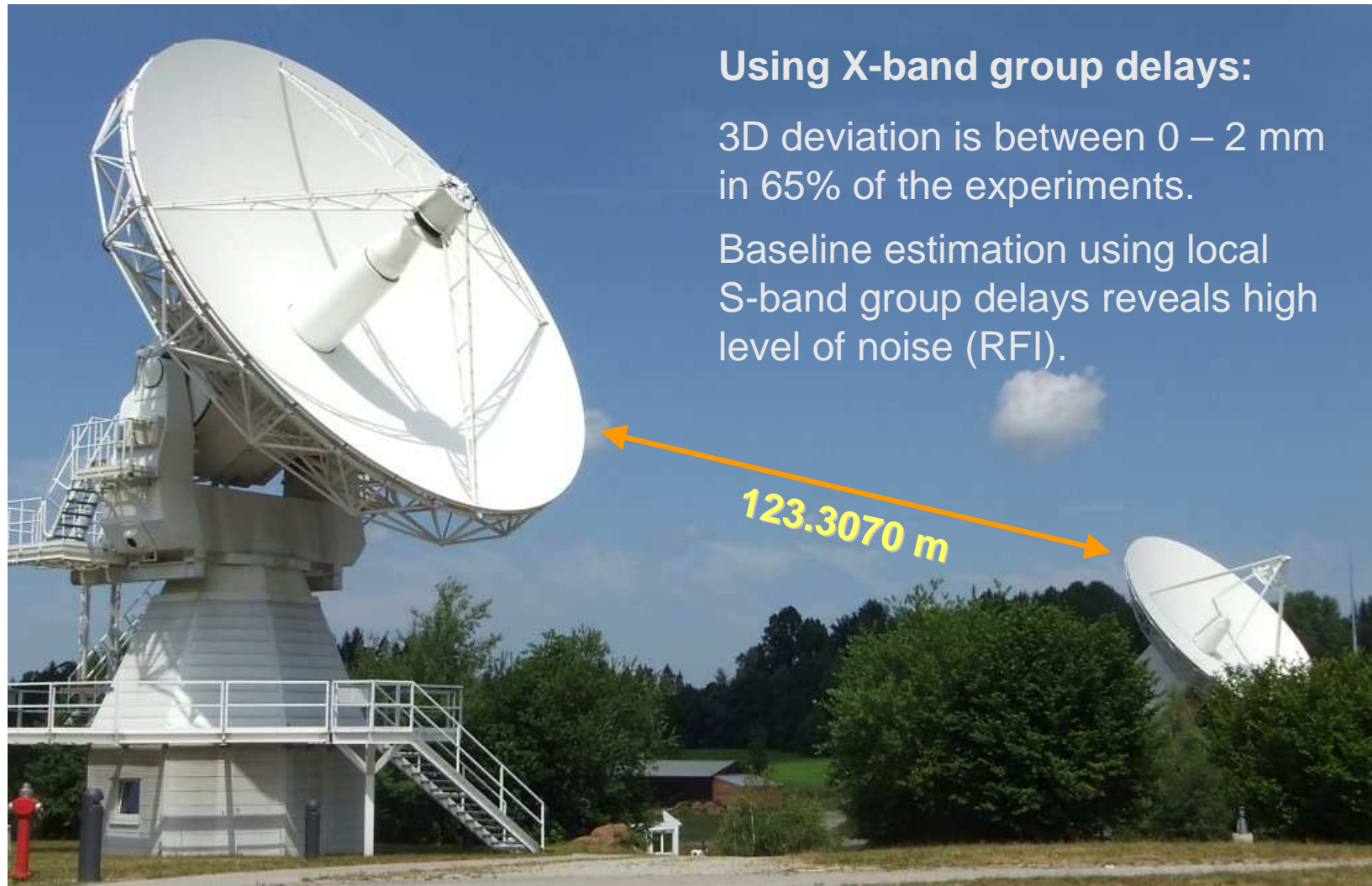


TTW1 Commissioning Phase

Overview / Summary

- TTW1 equipped with tri-band feed (S, X, Ka)
- Commissioning started in June 2014 using a legacy S-/X-band receiver (down converter)
- Regular parallel sessions with 20 m RTW and 13.2 m TTW1 (INT 1 h) as well as one EUR experiment (24 h) and several special WHISP experiments (24 h)
- End-to-end analysis at local level possible
- Final S/X/Ka down converter integrated in March 2015 (upgrade pending)

Very Short Baseline Interferometry



Using X-band group delays:

3D deviation is between 0 – 2 mm in 65% of the experiments.

Baseline estimation using local S-band group delays reveals high level of noise (RFI).

Long Baseline Results

Can we successfully (i.e. accurately) perform long baseline vector estimation despite of RFI?

Vector RTW-TTW1 estimated via the long baselines from the EUR-130 experiment reveals:

Session	Differences RTW-TTW1			Baseline length [m] σ [m]
	dX [m] σ [m]	dY [m] σ [m]	dZ [m] σ [m]	
Reference (mean of Whisp-Sessions)	-88,033 0,010	-38,729 0,013	77,168 0,008	123,3075 0,0120
Europe-130	-88,027 0,027	-38,728 0,004	77,178 0,025	123,3089 0,0207
Difference [mm]	-6,1	-0,8	-9,6	-1,4

Processing performed by S. Halsig and A. Nothnagel, IGG, Bonn

Conclusion: We should worry about RFI, but it does not seem to be a show-stopper ...

Tri-Band Receiver for TTW1



- S/X/Ka-band receiver; compact design
- Broadband capability for VGOS sessions (IF bandwidth 1 GHz at X- and Ka-band)
- IF-Bands outputs for coaxial and fiber cables
- 19" modular system; same design is also useable for TTW2

S-/X-/Ka-band receiver for TTW1

More Details on Initial Results

More details regarding the initial results for TTW1:
Paper submitted, review reports received ...

Sensors **2015**, *15*, 1-x manuscripts; doi:10.3390/s150x0000x

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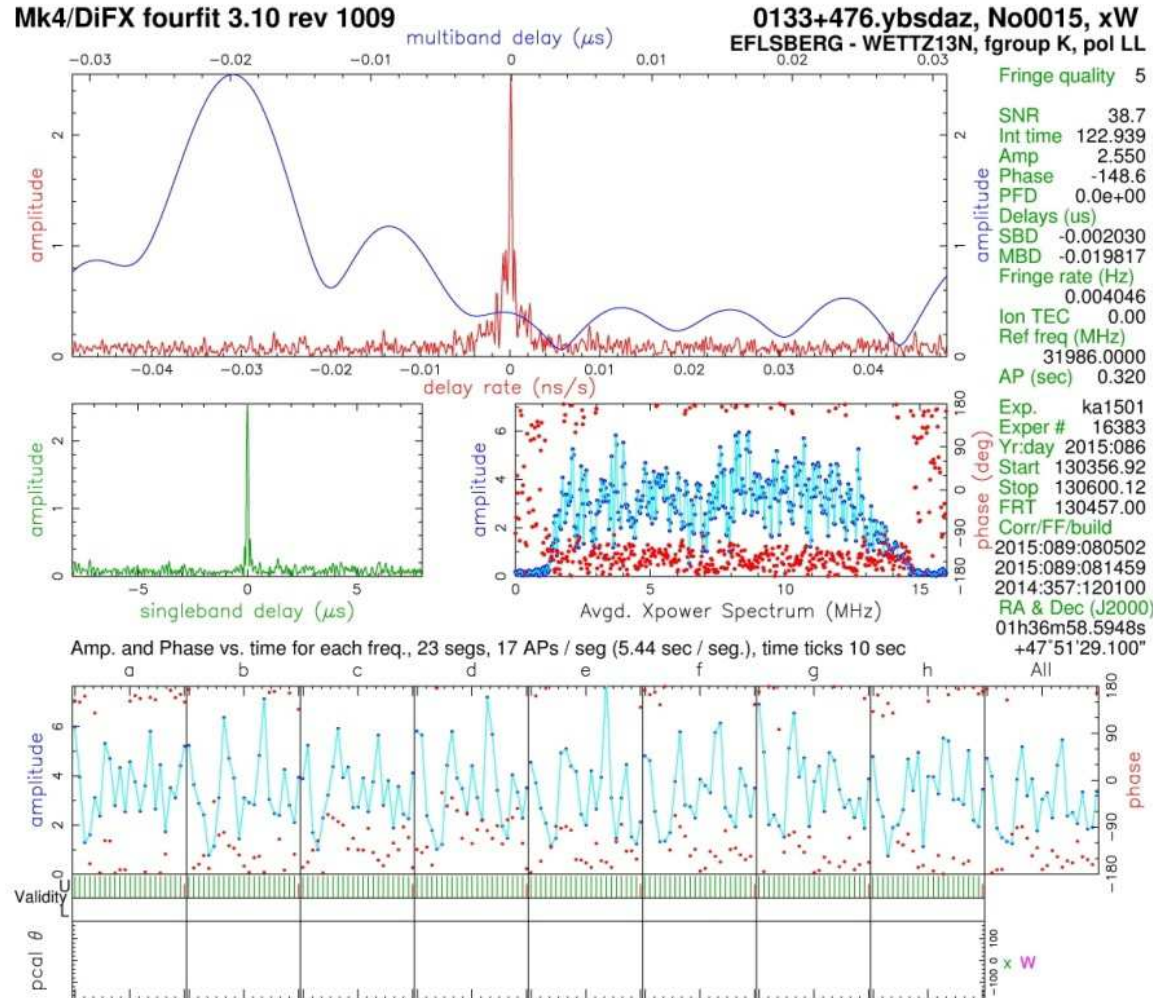
Article

Initial Results Obtained with the First TWIN VLBI Radio Telescope at the Geodetic Observatory Wettzell

Torben Schüler^{1,3,*}, Gerhard Kronschnabl¹, Christian Plötz¹, Alexander Neidhardt², Alessandra Bertarini^{4,5}, Simone Bernhart⁴, Laura La Porta⁴, Sebastian Halsig⁴ and Axel Nothnagel⁴

Ka-Band Experiments/Results

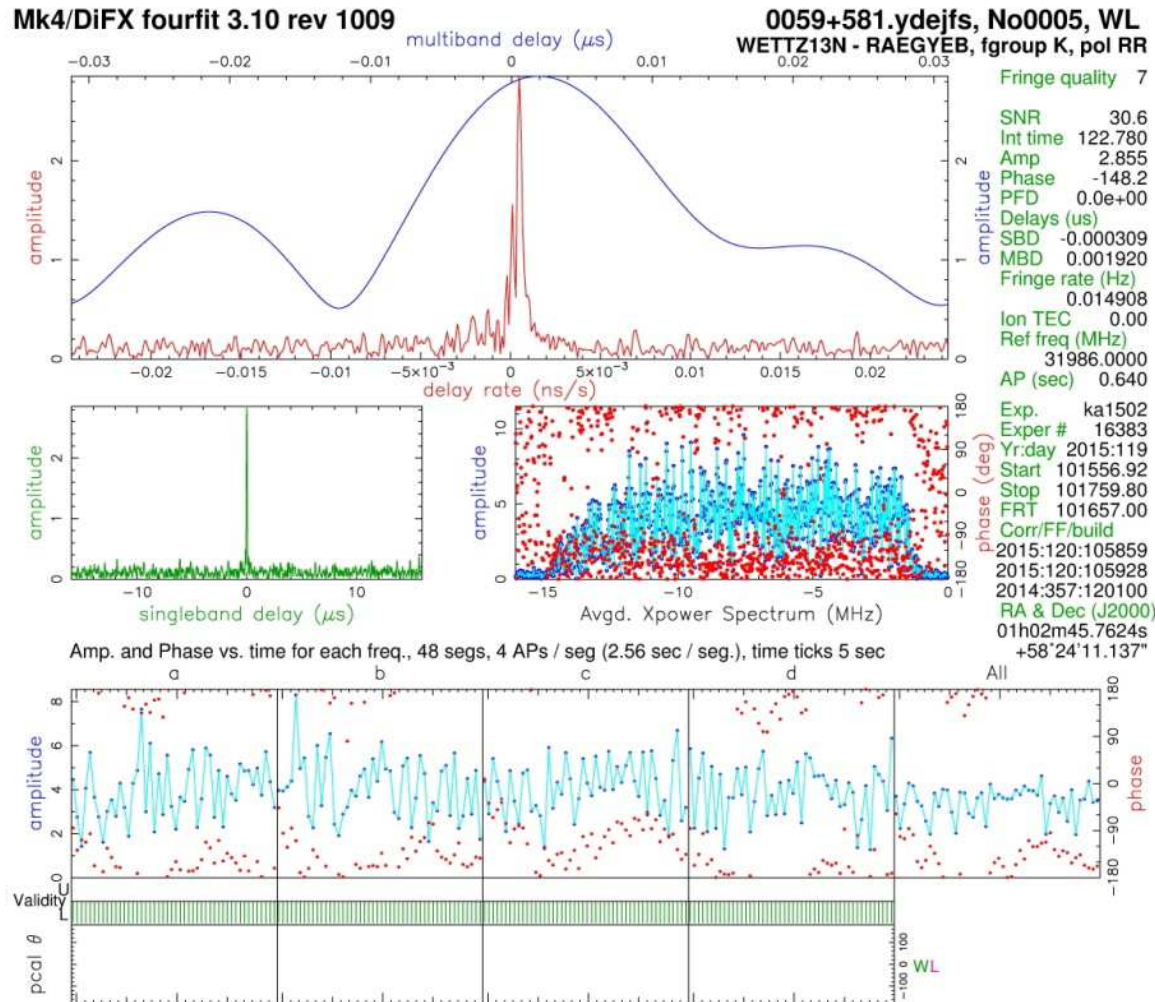
First Ka-Band Experiment with Effelsberg



- Calibration (Moon/Jupiter) by VERTEX indicate: Measured system temperature ~ 100 K
- Calculated Eta ~ 70–78 % (28–32 GHz)
- First VLBI-Test on 27 March 2015 together with the Effelsberg radio telescope (MPI)
- 1 hour observation at 32 GHz (8 channels x 16 MHz bandwidth) in LHCP mode
- Fringes despite of the bad weather conditions at Wettzell

Ka-Band Experiments/Results

Second Ka-Band Experiment (international)

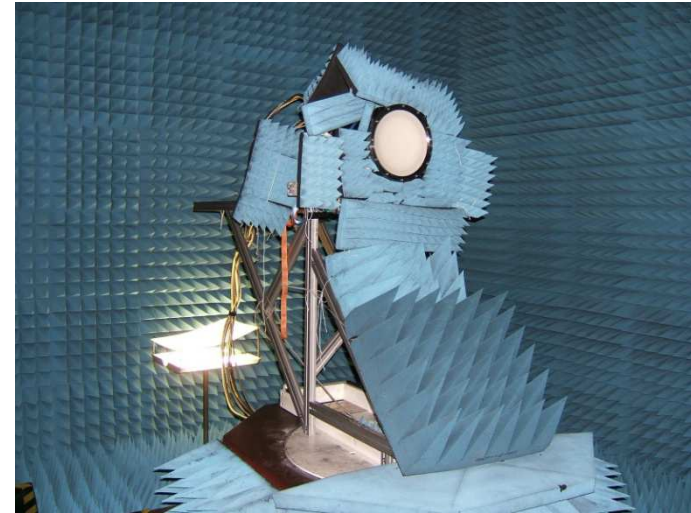


- Second VLBI-Test on 29 April 2015 together with Yebes (13 m), Badary (13 m) and Zelenchukskaya (13 m) telescopes
- 2 hour observation at S/X/Ka (16 channels x 16 MHz bandwidth) in RHCP mode
- good fringes in all bands despite of some problems related to data conversion (DAQ)

Eleven-Feed/TTW2 Telescope

Status and Schedule towards Commissioning Phase

- Pattern measurement was done at MIRAD in Switzerland
- The feed performs as required from 1.5 GHz to 14 GHz
- Phase center was measured and verified to be stable over the whole frequency band (2 – 14 GHz)
- Performance evaluation of Elevenfeed will be repeated when inserted into the antenna
- The feed cone for the Elevenfeed was constructed new to provide an easier dismount from the antenna
- Problem: Time delay in manufacturing the precise mechanical parts at a contractor → delayed up to August 2015
- First tests expected to be done (no earlier than) around Sep./Oct. 2015



Conclusions / Outlook

- TTW1 performance is very satisfactory, pending tests using final tri-band down-converter.
- TTW1 to accompany experiments regularly.
- Ka-band experiments to fully exploit TTW1 features are highly welcome.
- Broadband feed (“Elevenfeed”) for TTW2 shows good performance, but integration is significantly delayed.