Station Report of 20-m Radio Telescope at Wettzell

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Abstract

During 2002 the 20-m radio telescope continued observing of geodetic and astrometric VLBI measurements thus contributing to the actual IVS observing program. Necessary technical improvements of hard and software have been performed to keep the antenna in good shape. Mark 5 disk recording system has been employed for the INT series. In addition a pretest has been done for data transmission of INT data using Internet. The local survey has been repeated.

1. Participation in Observing Programs

Since 1983 the 20-m radio telescope in Wettzell has participated continuously in geodetic and astrometric observing programs for almost 20 years. The table below is an overview of our observing activity in 2002.

Table 1. Summary of Wettzell observation activity

#	Experiment
39	R1-sessions (CORE)
49	R4-sessions (CORE)
03	T2-sessions (CORE)
15	CORE-INTENSIVE-sessions
06	RDV-sessions
07	R&D-sessions
04	Europe-sessions
03	Gravity-sessions
202	Δ(UT1−UTC)-sessions in Mark 4/5 recording of data
20	Δ(UT1−UTC)-sessions in K-4 recording of data
03	Astronomy sessions for MPIfR
some	FringeTests

R1, R4 and T2 sessions are part of the international IVS observing program; R stands for "rapid turn around" between observation and correlation, the number "1" or "4" for the day of the week the session is starting. Wettzell observed all R4 sessions scheduled in 2002 and was invited to participate in most of the R1 sessions. T2 sessions are part of IVS observing program and start at Tuesday in 2002 about once a month. In October 20-m RT-Wettzell participated in CONT02 sessions including 15 24 hour VLBI sessions without any interruption from October 16 until October 31.

To determine Δ(UT1−UTC) RT-Kokee and RT-Wettzell run on Mon, Tue, Wed and Fri single-baseline-sessions; these sessions have a long observing history back to 1984; during 2002 recording of data has been switched from Mark 4 to Mark 5 (on fixed disk instead of magnetic tapes). Additionally RT-Tsukuba and Wettzell ran 20 VLBI experiments also as single-baseline to determine Δ(UT1−UTC), but with K4-recording and correlation of data in Japan.

Furthermore RT-Wettzell observed together with VLBA stations in 6 RDV sessions and in 7 R&D sessions to help "research & development" of VLBI observing technique. In 2002 Wettzell continued to observe 4 sessions in "EUROPE" program, starting 1988. Wettzell participated in 3 sessions "GRAVITY" determining the relativistic influence, when planet Jupiter passed Quasar J0842+1835, hoping to determine speed of gravity as well. Wettzell was also engaged in 3 astronomical VLBI sessions in S and X band, originated by EVN/MPIfR and correlated at JIVE.

2. Technical Improvements and Activities

During 2002 the staff of RT-Wettzell performed several improvements increasing for instance the reliability of the antenna drive system. Transistor power switches are used to drain braking energy of azimuth and elevation motors into load resistors. A short circuit of the final stages in the power switch modules came up, because of aging which overcharged the load resistors. Therefore a thermal monitoring of the load resistors was installed. In case of overtemperature the servo drive power supply is switched off to avoid the danger of fire in the electronic racks.

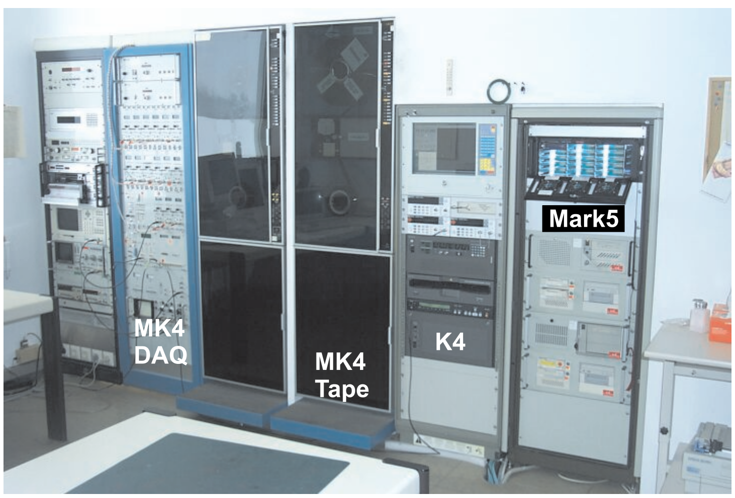

Figure 1. VLBI Data Acquisition System Wettzell.

In 2002 Haystack Observatory delivered a prototype of the new Mark 5 data recording system (fig. 1), which writes data on removeable magnetic disks (IDE) instead of magnetic tapes. The module has room for 16 individual magnetic disks with a capacity of 120 GByte. The possible data recording rate is presently 1024 MBit/sec. Since June 24 RT-Kokee and Wettzell record their daily INTENSIVE-sessions on a single magnetic disk sent to USNO correlator in Washington. Mark 5 has the potential to connect an antenna via high speed data highway to the correlator in near future.

Wettzell performed a first e-VLBI pretest with MIT Haystack Observatory in connection with University of Regensburg. The goal of this pretest was

- to establish a high speed Internet link from Uni Regensburg to Haystack Observatory,
- to test the possible transfer speed

with standard connection Germany - USA via G-Win, Geant-Net and Abilene Gigapop networks. Wettzell is at the moment connected only via 2 Mbit/s to the Internet. Therefore we have used the DFN (Deutsches ForschungsNetz) node at University of Regensburg with a transfer capability of 155 MBit/s.

We transferred files of different size (80 MByte to 500 MByte) and observed the performance. The files were stored at the server in Haystack and deleted later. For this test we have used a standard PC (P4/1.8GHz) with a 100 MBit Ethernet card and 512 Mbyte RAM. The protocol to transfer the data was standard FTP.

Results: At the beginning of the test the transfer rate was about 2 MBit/s. After tuning the Windows size, the socket buffer size and the TCP timestamps the transfer speed reached 5.3 MBit/s (of theoretical possible 155 MBit/s). The overall round trip time was about 115 milliseconds. Next steps to get better performance are to try different providers (Surfnet) and to verify the transfer rate within Europe.

3. Local Survey

Due to the increasing importance of local ties, a classical geodetic survey of high precision has been performed again in 2002 to connect the reference points of VLBI, WLRS and the 6 GPS antennas to the local network. The height, distance and angle measurements were performed separately with different instruments, as there are the LEICA DNA03 levelling instrument, the KERN MEKOMETER ME5000 distance meter and the KERN DKM2AC and LEICA TCA2003 theodolites. The survey network exists of 8 reference points, 10 survey pillars, 5 heightened GPS pillars, 9 ground markers, 11 markers on platforms, and about 12 auxiliary points. At the radio telescope also the small errors of the azimuth and elevation axis were measured, while the height variations (fig. 2) are tracked since 1997 continuously with an Invar wire, tensioned by a $1kg$-weight, which was increased to $2kg$ on 2-18-2000. At the laser telescope a platform was mounted to place an instrument or reflector on it. This platform moves on a sphere and the center of it is the reference point of WLRS. The network was analyzed with two different programs, PANDA and CREMER.

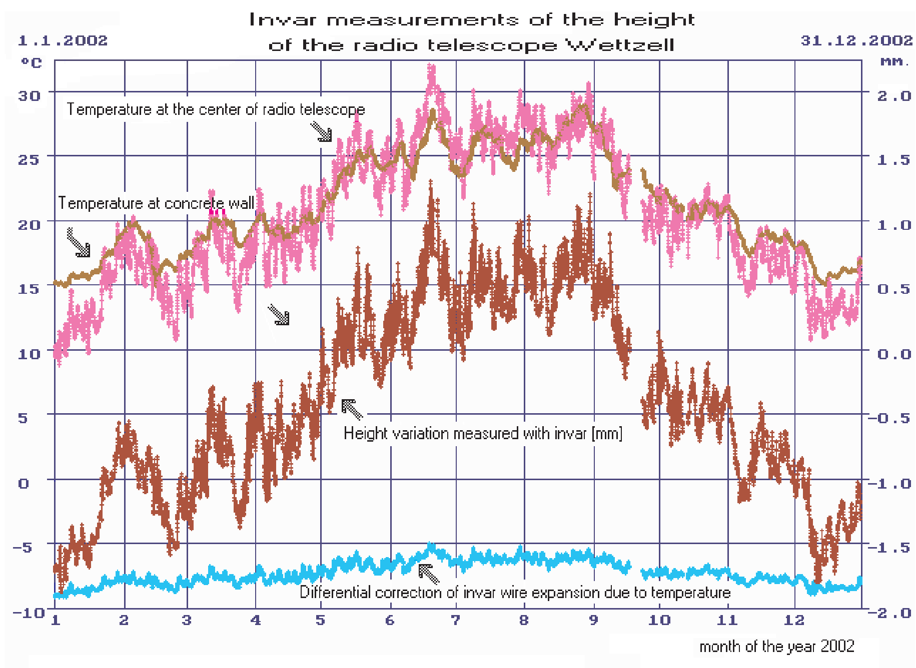

Figure 2. Height variation of the VLBI reference point in the year 2002.