German Antarctic Receiving Station O'Higgins (GARS)

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Abstract

The German Antarctic Receiving Station O'Higgins (GARS) participated in the year 2002 in eight VLBI sessions carried out in two campaigns in the periods from January to February and November to December. The antenna drive unit was repaired and adjusted to maintain full antenna operation and to keep the required reliability for VLBI observations. The local geodetic network was re-observed, to control and determine the ties between the geodetic systems after the movement of the GPS antenna (IGS station) to a new location. A new TAC (total accurate clock) was implemented to the timing system. The report gives an overview on the observations, summarizes the technical refinements and gives prospective for future plans such as the transition to Mark 5 and the implementation of remote control functions.

1. The Observation Campaigns at O'Higgins in 2002

The VLBI system at German Antarctic Receiving Station (GARS) was successfully involved in eight international VLBI observations sessions during two campaigns in 2002:

- Four sessions (OHIG17, OHIG18, OHIG19, T2002) observed in February 2002,
- Four sessions (OHIG20, OHIG21, T2011, OHIG22) observed in November 2002.

After more than 9 years of operations under the Antarctic conditions the electronic components of the antenna drive unit failed. At the beginning of the first observation campaign the antenna control system required urgent repair and adjustments. A servo-motor had to be replaced and a failure of the Tacho sensing system had to be fixed. Finally new adjustment and tuning was necessary to optimise the interaction between Servo-Amplifiers and Servo-Control-Unit. After the repair and maintenance the full driving and pointing functions of the antenna system were recovered and the antenna shows a reliable behaviour.

During the VLBI observations in the first campaign the VLBA recorder showed remarkable parity errors in irregular time intervals, which at the end of the first observation campaign became a permanent problem. For further investigations and for repair those modules were disassembled and shipped to Max Planck Institute for Radioastronomy (MPIfR)/Bonn. We thank Michael Wunderlich, he is experienced in the area of tape drives, for repairing the modules.

During the second campaign in 2002 some additional hardware problems had to be solved. At first the read/write head unit, which returned after it was repaired in Bonn, and all corresponding dismounted modules of the tape recorder unit had to be reassembled and had to be adjusted electronically and mechanically. The irregular parity errors was fixed. The next significant system problems were detected after the repair of the tape drive: there was no S-band signal due to a defective mixer/amplifier module in the receiver box, the time interval-counter had a dried out power supply capacitor, the TAC-port connection to the PC showed a shortcut, and furthermore the power supply connectors for the +5 Volts to the baseband converters need maintenance and improvement. A significant improvement of the time system could be achieved through the installation of a new TAC (total accurate clock). Furthermore the latest chipset version V4.1 of the MK4 Formatter was installed and tested succesfully.

During the second campaign construction work was performed at the Chilean Military Base. A new building was established in order to provide more comfortable accommodations for the Chilean staff at the base. It requires some re-arrangements of the GPS antenna installations, which was set up permanently in collocation with the radio telescope. Figure 1 shows the local situation at the beginning of the second observation period. Figure 2 shows the view from the GPS Turbo Rogue antenna toward the military base and Figure 3 shows the progress of the construction at the end of the second campaign. The visibility of the VLBI telescope is not affected by the new buildings.

Figure 1. Geodetic Observatory O'Higgins - Antarctica: Air view to the German Antartic Receiving Station (GARS) on the right hand and the Chilean Military Base on the left hand (picture taken at end of October 2002).

2. Current Status of the Collocated Geodetic Equipment

In collocation to the VLBI radio telescope a permanent GPS receiver, a GPS/GLONASS receiver, and a PRARE station are continuously operated all year. In addition a meteorological station and a tide gauge station is established in O'Higgins.

During the first campaign a new meteorological station specified for the strong conditions was installed. During the last Antarctic winter the meteorological sensors has been destroyed by strong winds and are partly replaced meanwhile.

The local survey of the terrestrial network, consisting of local pillars and the reference points of all geodetic systems, was performed in the first campaign. Results are expected soon. The

survey was urgently required as the antenna of the permanent GPS systems OHIG (Turbo Rogue) had to be moved, due to the new building which is established at Chilean Military base. The new building close to the antenna changed tremendously the elevation mask for the GPS observations. A new monument was build for the IGS point (Turbo Rogue) some meters apart from the former monument.

Figure 2. Geodetic Observatory O'Higgins - Antarctica: Horizon view of shifted Turbo rogue antenna in the direction of the new construction at the Chilean military base.

The cable to the tide gauge sensor was also destroyed during the last Antarctic winter because ocean ice was scratching over the rocks. In January 2003 the cable was repaired and the sensor was connected with the recorder so that the tide gauge observations could be continued. It has to be mentioned that the O'Higgins tide gauge sensor is involved in the GPS Tide Gauge Benchmark Monitoring Pilot Project (TIGA–PP).

3. Outlook

Plans are under development to upgrade the VLBI system at O'Higgins to a Mark 5 Station during the second campaign 2003. Mark 5 will allow us to extend the access period of the telescope in the rough Antarctic area from four months to six and even more months. However as no more resources will be available the key for such an extension is the remote access to the telescope. Developments are planned to install the full remote controlled access from Wettzell via Internet to the radio telescope in O'Higgins. The final objective is to reach a full year access to O'Higgins with

only one basic maintenance visit. The situation in O'Higgins will be improved due to the extended new Chilean military base, which will house additional staff and Chilean scientists. Discussions for enhancing the collaboration with BKG and DLR are ongoing, supported by the challenges given through the cooperation with TIGO in Concecpión.

Figure 3. Geodetic Observatory O'Higgins - Antarctica: View from Rancagua mountain to the Chilean Military Base with the new constructed three-storied building. The GARS Station is hidden behind the building, only the antenna is visible (picture taken at middle of January 2003).

4. Technical Staff for Working at O'Higgins Station

Table 1 lists the staff which was working during VLBI campaigns in Antarctica.

Table 1. Staff working in O'Higgins VLBI project.

Name	Background	Agency	New E-mail addresses
Christian Plötz	electronics engineer	BKG/TUM	christian.ploetz@bkg.bund.de
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Walter Schwarz	electronics engineer	BKG	walter.schwarz@bkg.bund.de
Reiner Wojdziak	computer science	BKG	reiner.wojdziak@bkg.bund.de