Geodetic Observatory TIGO in Concepción

Sergio Sobarzo, Cristobal Jara, Eric Oñate, Cristian Herrera, Carlos Verdugo, Hayo Hase, Armin Böer, Bernd Sierk

Abstract

During 2006 TIGO performed 111 24-hour observations and one 4-hour student experiment. In January, TIGO was the host of the Fourth IVS General Meeting and the Seventh IVS Analysis Workshop. In September, TIGO observed the SMART-1 crash on the moon. Also, this year was the beginning of eVLBI transfers at TIGO.

1. General Information

The operation of TIGO is based on an agreement between Chile and Germany in which

- Universidad de Concepción
- Universidad del Bío Bío
- Instituto Geográfico Militar
- Bundesamt für Kartographie und Geodäsie

are committed until the end of 2007. A prolongation of the cooperation for the period 2008 through 2011 is under discussion. TIGO is located near the Universidad de Concepción, at longitude 73.025 degrees West and latitude 36.843 degrees South, 500 kilometers south of Santiago, Chile's capital.

2. Component Description

The IVS network station TIGOCONC is the VLBI part of the Geodetic Observatory TIGO, which was designed to be a fundamental station for geodesy. Hence the VLBI radiotelescope is co-located with an SLR telescope (ILRS site), a GPS/Glonass permanent receiver (IGS site) and other instruments like water vapour radiometer, seismometer, superconducting gravimeter and absolute gravity meter.

The atomic clock ensemble of TIGO consists of two hydrogen masers, three cesium clocks and three GPS time receivers realizing the Chilean contribution to the Universal Time scale (Circular T, BIPM).

The technical parameters of the TIGO radiotelescope as published in [1] have not been changed.

In 2006 Mark IV tape recording was completely replaced by Mark 5 disk recording. S2 cassette recording of TIGO terminated with the close down of Canadian VLBI operation.

3. Staff

During 2006 Gonzalo Remedi terminated his work at TIGO and was replaced by electronic engineer Eric Oñate. Roberto Aedo joined the TIGO SLR team and was replaced by Cristian Herrera, informatic engineer, whose support will improve the eVLBI development. In 2006, TIGO's VLBI group consisted of the persons listed in Table 1.

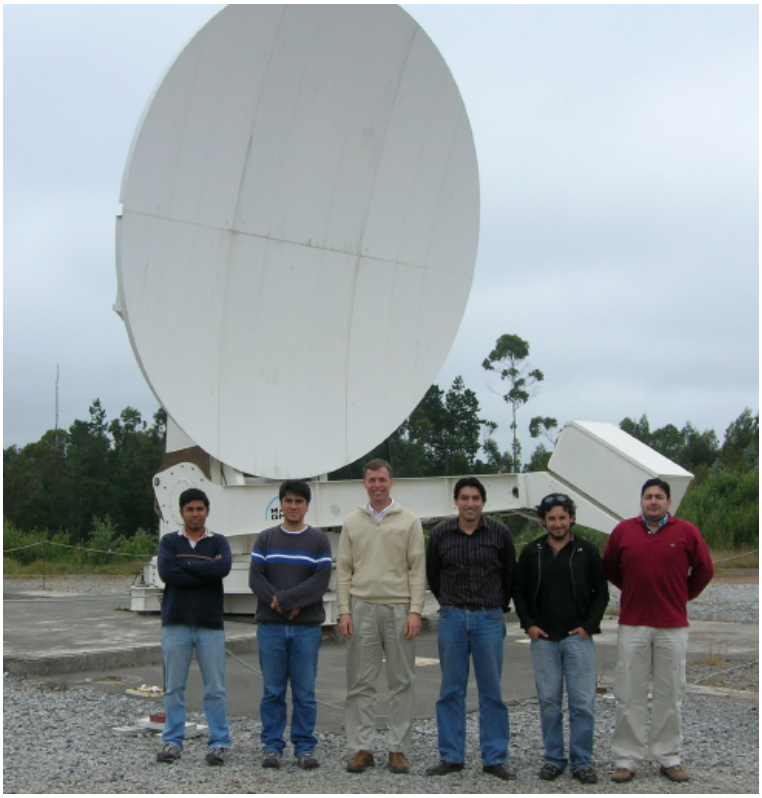

Figure 1. Current VLBI staff (Jara, Sobarzo, Hase, Herrera, Verdugo and Oñate).

Table 1. TIGO VLBI support staff in 2006.

Staff	Function	Email
Hayo Hase	head	hayo.hase@tigo.cl
Sergio Sobarzo	chief engineer	sergio.sobarzo@tigo.cl
Cristobal Jara	electronic engineer	cristobal.jara@tigo.cl
Eric Oñate	electronic engineer	eric.onate@tigo.cl
Cristian Herrera	informatic engineer	cristian.herrera@tigo.cl
Carlos Verdugo	mechanical engineer	carlos.verdugo@tigo.cl
any VLBI operator	on duty	vlbi@tigo.cl
all VLBI operators		vlbistaff@tigo.cl

4. Current Status and Activities

During 2006 TIGO was scheduled to participate in 112 IVS experiments and one 4-hour experiment with students of the Technical University of Vienna (see Table 2).

In January 2006 both the Fourth IVS General Meeting and the Seventh IVS Analysis Workshop were held in Concepción. During 6 days the VLBI and Earth science communities discussed about applications and research fields of VLBI, as well as the future of this geodetic technique.

Table 2. TIGO's IVS observation statistics for 2006.

Name	# of exp.	ok	failed
R1xxx	48	48	0
T20xx	2	2	0
E30xx	9	8	1
R4xxx	44	44	0
RDVxx	3	3	0
OHIGxx	6	6	0
Total IVS	112	111	1
VIExx	1	1	0

Also during this year TIGO joined the EXPReS project, which aims at connecting 21 VLBI radiotelescopes in 6 continents using high-speed networks allowing real time VLBI. In this frame, numerous tests have been conducted in order to evaluate and improve the Internet connection of the TIGO observatory, which is the only South American participant in EXPReS.

A first evaluation of the TIGO Internet connection was made on July 2nd where a 2 Mbps limit was found. However using parallel streams it is possible to increase the speed up to a theoretical ceiling of 5 Mbps, the contractual limit, as is shown in Figure 2.

The support of the Chilean Academic Network REUNA, GEANT and RedCLARA increased the available TIGO bandwidth to 90 Mbps. On January 5th, 2007 a test was made where a top speed near 55 Mbps was reached, as is shown in Figure 3.

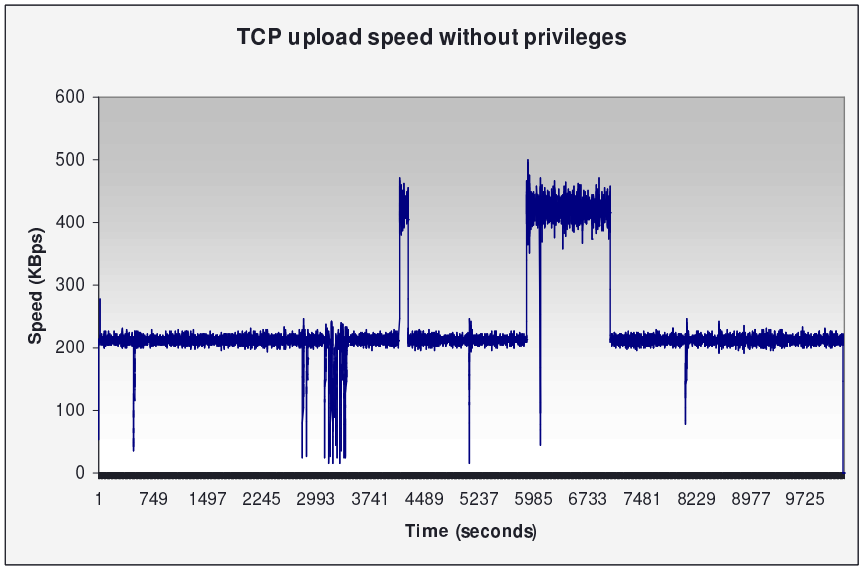

Figure 2. Speed evolution of a file transfer without privileges.

On September 3rd, the first European lunar mission with the satellite SMART-1 terminated with its crash into the moon. TIGO observed together with Hobart and ATCA the last signals

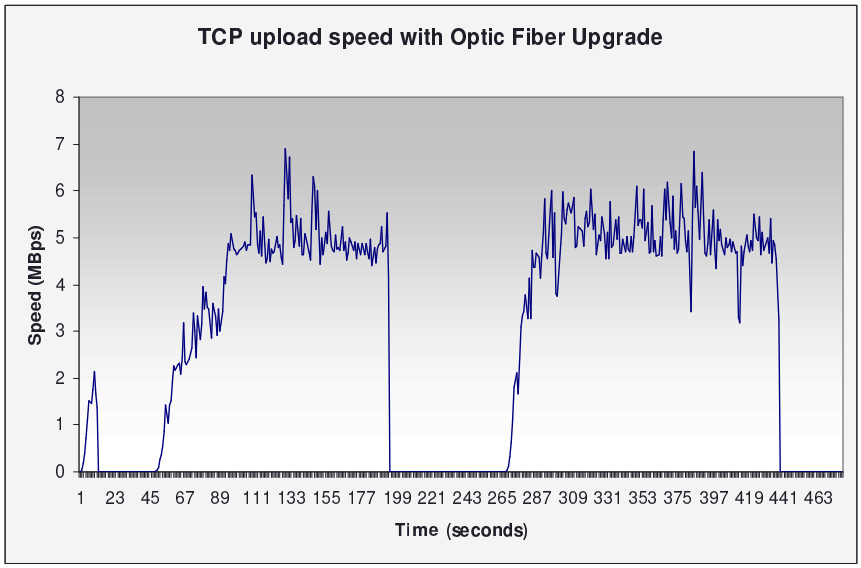

Figure 3. Speed evolution of a file transfer with privileges.

of SMART-1 using VLBI. The signal was recorded on 8-packs and was also visually monitored to determine the precise time of impact. As a result, SMART-1 was declared dead at 05:42:22.394076 $\pm$0.000010 s UT on 03 September 2006. Due to the high temporal resolution by VLBI it was possible to determine the place of the impact with an error of only $\pm$2 cm, a fantastic geodetic achievement.

5. Future Plans

The VLBI activities in 2007 will focus on

- execution of the IVS observation program for 2007,
- investigations on the realization of VLBI2010 in Concepción,
- investigations related to eVLBI and EXPReS,
- fund allocation for eVLBI to get more bandwidth,
- experimental satellite trackings,
- repetition of the local survey.

References

[1] Vandenberg, N.R.: International VLBI Service for Geodesy and Astrometry 2000 Annual Report, NASA/TP–1999-209243, 1999