

Geodetic Observatory TIGO in Concepción

Hayo Hase, Armin Böer, Stefan Riepl, Sergio Sobarzo, Cristobal Jara, Roberto Aedo, Gonzalo Remedi, Marcus Moreno, Matias Sanchez, Gonzalo Hermosilla

Abstract

During TIGO's second year of operation in Concepción, TIGO performed 106 24h VLBI observations and is hence one of the most scheduled IVS sites. The operational load is carried out by a relatively young team of Chilean students. Activities of the VLBI group at TIGO during 2003 and an outlook for 2004 are given.

1. General Information

One year after the arrival of TIGO in Chile in 2002, on January 15, 2003, the Geodetic Observatory TIGO was officially inaugurated with speeches by

- Intendente Jaime Toha (Representative of the President of Chile in the Eighth Region),
- Rector Sergio Lavanchy (Universidad de Concepción),
- Henning Rosen (Representative of German Minister of Interior),
- Prof. Dietmar Grünreich (President of Bundesamt für Kartographie und Geodäsie)

in the presence of the rectors of the two other partner universities, Hilario Hernandez of Universidad del Bío Bío and Fernando Jimenez of Universidad Católica de la Santísima Concepción, and the Commander in Chief of the Chilean Army, General Cheyre with the director of the Instituto Geografico Militar, General Pablo Gran and more than 180 invited guests.

During 2003 the existing commitments of TIGO towards the international services like IVS, ILRS, IGS and UT at BIPM had been kept by lots of data from Concepción.

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 collocated with a SLR telescope (ILRS site), a GPS/Glonass permanent receiver (IGS site) and other instruments like water vapour radiometer, superconducting gravity meter, seismometer.

The atomic clock ensemble of TIGO consists of 2 hydrogen masers, 2 cesium clocks and 3 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 November 2003 the first Mark 5 observations had been performed. Since then TIGO supports Mark 4 thintape, Mark 5 fixdisk and S2 VHS tape recordings.

TIGO's spare Mark 4 formatter was given on loan to Hobart, University of Tasmania, in order to improve the observation possibilities in the southern hemisphere within the IVS.

3. Staff

In 2003 chief engineer Eduardo Carvacho terminated his work at TIGO. As a replacement UdeC hired 2 doctorate students of the electrical department of the engineering faculty, Sergio



Figure 1. **Geodetic Observatory TIGO:** Instruments from left to right: water vapour radiometer, SLR Radar, SLR telescope, meteorological sensors, VLBI radiotelescope, local survey monument.

Sobarzo and Cristobal Jara. Both of them together with Hayo Hase participated in the IVS-TOW 2003. The actual TIGO-VLBI group consists of the persons listed in table 1.

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
Roberto Aedo	electronic engineer	roberto.aedo@tigo.cl
Gonzalo Remedi	programmer	gonzalo.remedi@tigo.cl
Marcos Moreno	geologist	marcos.moreno@tigo.cl
Matias Sanchez	geologist	matias.sanchez@tigo.cl
Gonzalo Hermosilla	geologist	gonzalo.hermosilla@tigo.cl
any VLBI-operator	on duty	vlbi@tigo.cl
all VLBI-operators		vlbistaff@tigo.cl

Table 1. TIGO-VLBI support staff in 2003.

4. Current Status and Activities

During 2003 TIGO was participating in 106 VLBI experiments (24h) and one 3h experiment within a students project of the Technical University of Vienna. The operation of the latter one at TIGOCONC was broadcasted via webcams and the internet based video conference system VRVS

(<http://www.vrvs.org>) to the classroom at Vienna, from where the students participated. Table 2 gives an overview about the observed experiment series.

Name	# of exp.	ok	failed
R10xx	51	49	2
T20xx	2	2	-
E30xx	11	9	2
R40xx	26	25	1
RDVxx	5	5	-
RDxxx	10	10	-
OHIGxx	6	6	-
Total IVS	106	101	5
VIExx	1	1	-

Table 2. TIGO's IVS observation statistic.

Besides ongoing VLBI observations a local site survey was executed in March/April 2003 by Rudolf Zerneck (TUM Wetzell), and Rodrigo Miranda (UdeC). This survey tied the VLBI radiotelescope reference points to those of the ILRS site and the IGS site at TIGO. In addition a precision levelling was executed to tie TIGO to the Chilean vertical reference system.

In April 2003 three borehole tiltmeters had been installed at each of the three international service platforms: at the radiotelescope fundament, at the laser telescope fundament and inside the GPS/GLONASS monument in order to monitor longterm inclinations [2], [3].

5. Future Plans

The VLBI-activities in 2004 will focus on

- execution of the IVS observation program for 2004,
- participation in the IVS-VLBI2010 working group,
- testing the spare Mark 5 unit,
- investigations related to eVLBI,
- development of a VLBI operators certification program,
- the installation of an upgrade for the antenna control unit and programming the Field System antenna interface (September/October 2004),
- repetition of the local survey.

In early 2004 a complementary regional GPS network will be installed with four permanent GPS receivers, Ashtec Z12, for the regional monitoring of the TIGO site stability. The selected sites are Dichato, Quellon, Santa Juana, Faro Hualpen and distances to TIGO range from 20-50km. At the coastal site of Dichato the GPS monument will be collocated with a tidegauge in order to connect TIGO to the mean sealevel. This regional GPS network will allow complementary studies of the local ionospheric and water vapour conditions.



Figure 2. **Logo of TIGO** symbolizes a reference point. It consists of a symbolic reference cross indicating the classical perpendicular orientation directions as it is used to indicate north-south and east-west. The *millimetric* reference point is located at the intersection of the four directions. The four letters “TIGO” are arranged in a circle, which allows the association with a sextant or a telescope tube with counter weights. This association is intended – connecting TIGO’s actual mission to the historical achievements of geodesy. The used colours are taken from the German and Chilean flags, symbolizing the cooperation within this bilateral project.

References

- [1] Vandenberg, N.R.: International VLBI Service for Geodesy and Astrometry 2000 Annual Report, NASA/TP-1999-209243, 1999
- [2] Hase, H., Böer, A., Riepl, S., Avendaño, M., Sobarzo, S., Aedo, R., Remedi, G., Moreno, M., Sanchez, M., Hermosilla, G.: First Results of TIGO Borehole Tiltmeters in Concepción, in: Proceedings of the 16th Working Meeting on European VLBI for Geodesy and Astrometry, BKG, 2003
- [3] Avendaño, M.: Los Inclinómetros de TIGO, unpublished diploma thesis, Universidad del Bío Bío, 2003