

Geodetic Observatory TIGO in Concepción

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Abstract

During 2009, the eighth year of operation in Chile, TIGO participated successfully in 116 VLBI observations. Activities of the VLBI group at TIGO during 2009 and an outlook for 2010 are given.

1. General Information

The operation of TIGO is based on a bilateral agreement between the Republic of Chile and the Federal Republic of Germany, in which the following institutions participate:

- Universidad de Concepción (Chile)
- Instituto Geográfico Militar (Chile)
- Bundesamt für Kartographie und Geodäsie (Germany)

TIGO is located in the upper terrain of the Universidad de Concepción, 2.5 kilometers away from the University's campus (long. 73.025 degrees West, lat. 36.843 degrees South), in Concepción city, the second largest city of Chile, at a distance of 500 km from its capital, Santiago de Chile.

2. Component Description

The IVS network station TIGOCONC constitutes 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 to an SLR telescope (ILRS site), a GPS/Glonass permanent receiver (IGS site) and other instruments such as a seismometer, a superconducting gravimeter, and an absolute gravity meter.

The atomic clock ensemble of TIGO consists of three hydrogen masers, three cesium clocks and four 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.

3. Staff

The VLBI staff changed in two positions. Cristobal Jara left TIGO at the beginning of the year, as did Jenny Neumann, who was replaced by Tatjana Blum in the beginning of 2010. The 2009 TIGO VLBI group consisted of the persons listed in Table 1.

4. Current Status and Activities

During 2009 TIGO was scheduled to participate in 117 IVS experiments (see Table 2), and four 24-hour experiments in the frame of the TANAMI program [2]. TIGO also participated in the IYA2009 Very Large Astrometry session.

On November 18th, TIGO took part in the IVS contribution to the International Year of Astronomy (IYA) 2009 realizing together with 35 other radiotelescopes, the largest VLBI experiment ever.

The participation of TIGO in collaboration with O’Higgins in the TANAMI program significantly extended the Australian Long Baseline Array. TANAMI scientists achieved the most accurate images of Centaurus-A so far.

Table 1. TIGO-VLBI support staff in 2009.

Staff	Function	Email
Hayo Hase	Head	hayo.hase@tigo.cl
Sergio Sobarzo	Chief Engineer	sergio.sobarzo@tigo.cl
Eric Oñate	Electronic Engineer	eric.onate@tigo.cl
Cristian Herrera	Informatic Engineer	cristian.herrera@tigo.cl
Pedro Zaror	Mechanical Engineer	perdo.zaror@tigo.cl
Cristian Duguet	Electronic Engineer	cristian.duguet@tigo.cl
Miguel Soto	Electronic Engineer	miguel.soto@tigo.cl
Tatjana Blum	Secretary (since 2010)	tatjana.blum@tigo.cl
any VLBI-operator	on duty	vlbi@tigo.cl
all VLBI-operators		vlbistaff@tigo.cl



Figure 1. Current VLBI Staff (Hase, Soto, Duguet, Herrera, Oñate, and Sobarzo). Zaror was absent.

Table 2. TIGO’s IVS observation statistics for 2009.

Name	# of Exp.	OK	Failed
R1xxx	46	45	1
R4xxx	47	47	0
R&D	8	8	0
OHIGxx	5	5	0
T20xx	7	7	0
Tanami	3	3	0
IYA	1	1	1
Total IVS	117	116	1

4.1. Receiver Control and Monitoring Upgrade

Early this year a new self-developed receiver control and monitoring system was installed. Many alternatives were evaluated as replacement of the old 386 based system. The design objectives were resistance to vibrations, fast communication with the FS—preferably over Ethernet—modularity, and easy maintenance. Since the TIGO ACU system is partly based on Beckhoff components, which have proven their reliability throughout the years, the receiver monitoring system was also based on Beckhoff components.

The core of the system is the Beckhoff BK9000 Ethernet TCP/IP Bus Coupler which communicates with the FS using the ModBus protocol. Attached to this device are four analog input modules providing a total of 32 inputs and one relay module with two outputs.

The communication was realized by using media converters from twisted pair to coaxial in order to utilize an unused spare of the existing antenna cabling. Ethernet type communication allows higher data rates and a better reliability than the serial type used before.

A picture of the modules in the receiver is shown in Figure 2 (left). Monitoring of the receiver's parameters was added to the FS by a dedicated RX control window as is shown in Figure 2 (right).

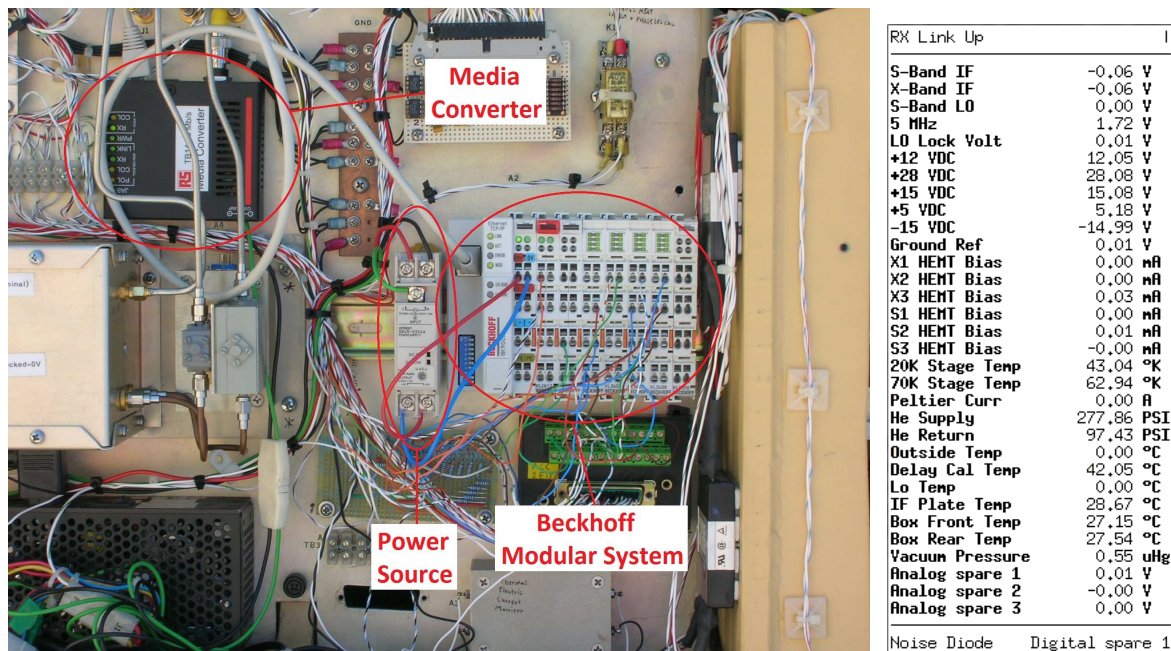


Figure 2. Left: New receiver control and monitoring installed in the receiver of the radio telescope. Right: New receiver monitoring windows added to the FS desktop.

4.2. Local Oscillator Upgrade

In late 2008, TIGO began having troubles with its local oscillator at the front-end. In February 2009, the TIGO VLBI team replaced the old 2020 MHz local oscillator model P-8333 of CTI Inc. in the telescope with a Phase Locked Dielectric Resonator Oscillator (PLDRO). This LO, designed by Gerhard Kronschnabl at Wettzell, consists of the elements listed in Table 3.

This new oscillator is much more stable and reliable, and it is able to work between -20°C and

45°C, with a power output higher than 13dB. After its installation, TIGO's operations did not suffer from LO problems anymore.

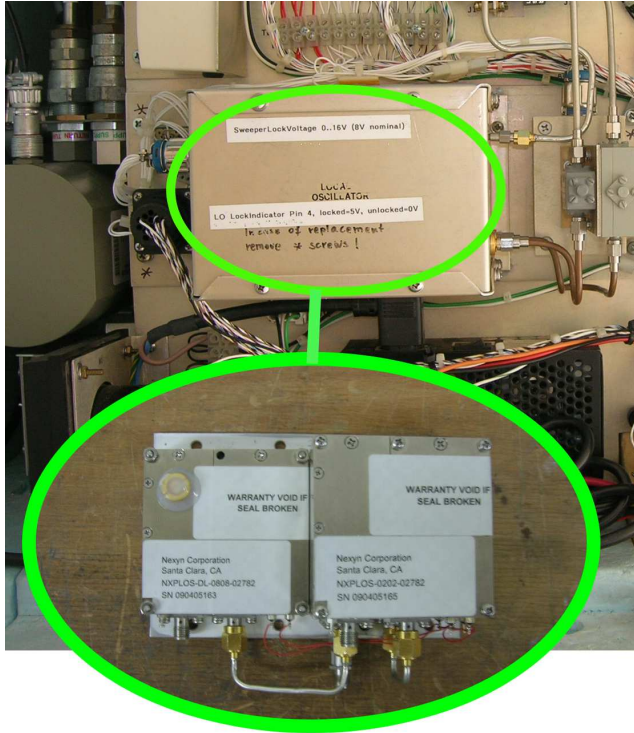


Figure 3. Replacement of the old Local Oscillator (upper circle) by the new LO (lower circle).

Table 3. Components of the new TIGO PLDRO.

Amount	Component
1	NXPLOS-0202-02782
1	NXPLOS-0808-02782
1	PLXO

5. Future Plans

The VLBI activities in 2010 will be focused on:

- execution of the IVS observation program for 2010
- continuation of developments, such as
 - investigations related to e-VLBI and
 - a new auxiliary power system for the cryogenic compressor and receiver
- repetition of the local survey

References

- [1] Vandenberg, N.R.: International VLBI Service for Geodesy and Astrometry 1999 Annual Report, NASA/TP-1999-209243, 1999.
- [2] M. Kadler, R. Ojha, S. Tingay and J. Lovell, *The TANAMI Program: Southern-Hemisphere VLBI Monitoring of Relativistic Jets in Active Galaxies*, American Astronomical Society, AAS Meeting #211, #04.13; Bulletin of the American Astronomical Society, Vol. 39, p. 732.