

# Transportable Integrated Geodetic Observatory

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## Abstract

This report summarises the activities within the TIGO project to provide a new fundamental station for geodesy at Concepción, Chile. The VLBI module of TIGO will serve as a new IVS network station.

## 1. Progress in the TIGO Project

The Transportable Integrated Geodetic Observatory (TIGO) consists of a 6 m radio telescope for VLBI, a 50 cm optical telescope for SLR, a GPS array of four GPS permanent receivers, a super-conducting gravity meter, a broad spectrum seismometer, meteorological sensors including a water vapour radiometer and an ensemble of atomic clocks like cesium clocks and hydrogen masers (see [1]). In 2000 TIGO was still located at the site of the Fundamentalstation Wettzell, where it was constructed and tested during the last 5 years (see Fig. 1).



Figure 1. TIGO at the Fundamentalstation Wettzell 1999-2000.

During 1999 an “Announcement of Opportunity” was sent worldwide to many agencies, institutions and universities which are working in geodesy or geoscience. By the deadline September

30, 1999, twelve promising locations had been proposed which were inspected during November/December 1999 (see Fig. 2).

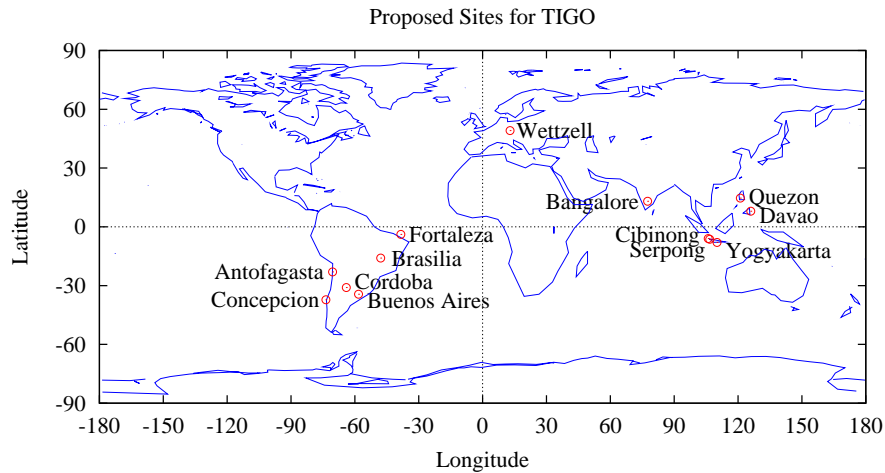


Figure 2. TIGO sites which were proposed by interested institutions, September 30, 1999.

On January 21, 2000, the German Scientific Committee of the Research Group for Satellite Geodesy (FGS) gave first priority to the applying Chilean consortium of Universidad de Concepción (UdeC), Universidad del Bío Bío (UBíoBío), Universidad Católica de la Santísima Concepción (UCSC) and Instituto Geográfico Militar (IGM), Santiago, which offered to host TIGO at Concepción. Concepción is the most southern location among the offers, which is of importance for improving existing networks. The consortium could also fulfill the demand of BKG to supply 11 engineers/operators which will work under the supervision of three experts from BKG in the operation of TIGO.

In March 2000 several sites in the surroundings of Concepción had been investigated due to the microwave pollution in S- and X-band. Finally a hill about 2.5 km distance from the university campus was defined to be the selected TIGO site (see Fig. 3, Tab. 1).



Figure 3. The selected TIGO site is on top of the left hill at the campus area of Universidad de Concepción.

On June 21, 2000, an arrangement between BKG and UdeC on behalf of the Chilean consortium for hosting TIGO was signed at BKG Frankfurt by the president of BKG, Prof. Dietmar Grünreich,

Table 1. Approximate coordinates of the TIGO site in Concepción (taken from topographic map). The IVS letter code is “Tc = TIGOCONC”.

Longitude	+73°01'25" W ( $\approx +73.023611^\circ$ )
Latitude	-36°50'30" S ( $\approx -36.841667^\circ$ )
Altitude	150 m

and the rector of UdeC, Prof. Sergio Lavanchy. TIGO will be in Concepción for a minimum period of 3 years with the option of extensions year by year.

In August/September 2000 the three BKG experts visited Concepción for discussions of platform details for the construction and for taking Spanish classes. Among the five cooperating partner institutions a scientific board for the scientific use of TIGO constituted itself. The scientific board selected the first four Chileans who will work at TIGO in the future.

In October/November/December 2000 the four Chileans Eduardo Carvacho (UdeC), Carlos Bustamante (UBíoBío), Raul Escobar (UCSC), Oscar Cifuentes (IGM) visited Wettzell for a first introduction and training on the TIGO instruments.

In order to ship TIGO to Chile and get residential and work permission for the BKG experts a bilateral note needs to be exchanged between Chile and Germany. This bureaucratic process was initiated in August 2000 and is hoped to be finished during 2001. The ratification is a necessity before TIGO can be shipped from Wettzell to Concepción.

In the beginning of 2001 a platform for TIGO and the access road to the platform will be built. It is envisaged that the TIGO operation will start at Concepción in mid 2001.

## 2. Status of the TIGO VLBI module

TIGO's VLBA4 terminal was finally completed with the installation of the Mk4 formatter and decoder during 2000.

It is intended to equip the VLBI module of TIGO also with the Canadian S2 VLBI data acquisition system in order to complete existing S2 VLBI networks across the Pacific. The delivery is anticipated for 2001.

TIGO participated also during 1999/2000 in several VLBI experiments (see Tab. 2).

## 3. Outlook

During 2001 a new fundamental station will be realized by TIGO in Concepción for a minimum period of 3 years. The joint operation between BKG and the Chilean consortium will be dedicated to the international services like IVS, ILRS, IGS and BIPM. Scientific projects in relation to TIGO will be supervised by the Scientific Board of TIGO, while the operation of TIGO will be supervised by the three TIGO experts from BKG.

The VLBI part of TIGO will be operated under the supervision of the author by three Chilean engineers who will be novices to geodetic VLBI, but with some experience in microwave techniques, electronics and computers.

Due to the lack of a dense space geodetic network in South America we expect a regular scheduling of the TIGO instruments. The VLBI module of TIGO is prepared for serving the IVS

with regular observations.

Table 2. Participation in VLBI-Experiments of TIGO 1999-2000. Experiments with reference frequency offset (5MHz - 0.1Hz) allowed short baseline determinations with the Wettzell 20m-radio-telescope.

Date	Experiment	Remarks
1999-02-01	EUROPE-47	reference frequency offset
1999-02-04	WZTIE-1	reference frequency offset
1999-02-23	NA304	
1999-02-25	WZ4TS	reference frequency offset
1999-06-29	EUROPE-49	reference frequency offset
1999-07-01	BRD01	reference frequency offset
1999-08-16	EUROPE-50	reference frequency offset
1999-10-11	EUROPE-51	reference frequency offset
2000-01-28	EUROPE-52	reference frequency offset
2000-02-07	EUROPE-53	reference frequency offset
2000-05-16	EUROPE-56	reference frequency offset
2000-06-19	IRIS-S151	reference frequency offset
2000-07-24	IRIS-S152	reference frequency offset
2000-11-13	IRIS-S156	
2000-12-18	IRIS-S157	

## References

- [1] Hase, H., Böer, A., Riepl, S., Schlüter, W., Cecioni, A.: TIGO - Transportable Integrated Geodetic Observatory, VI Congreso Internacional de Ciencias de la Tierra, Santiago de Chile, August 7-11, 2000, <http://www.wettzell.ifag.de/publ/wtz153.pdf>