

Instituto Geográfico Nacional of Spain

Jesús Gómez-González ¹, Francisco Colomer ¹, José Antonio López-Fernández ², Luis Santos ³, Pablo de Vicente ²

Abstract The National Geographic Institute (IGN) of Spain has been involved in space geodesy activities since 1995. The 40-m radio telescope at Yebes Observatory has been a network station for IVS since 2008 and participates regularly in IVS campaigns. IGN is developing an Atlantic Network of Geodynamical and Space Stations (project RAEGE). The first antenna saw its first light in 2014 at Yebes Observatory. The construction of a second antenna of RAEGE (in Santa Maria, Azores islands, Portugal) is complete, and commissioning is ongoing. Since March 2014, IGN Yebes Observatory has been a Technology Development Center for IVS; therefore many such developments are being described in the appropriate report in this Annual Report.

1 General Information

The National Geographic Institute of Spain (Instituto Geográfico Nacional, Ministerio de Fomento), has run geodetic VLBI programs at Yebes Observatory since 1995 and nowadays operates a 40-m radio telescope which is a network station for IVS. Yebes Observatory is also the reference station for the Spanish GNSS network and holds permanent facilities for gravimetry. A new VGOS-type antenna has been built at Yebes as part of the RAEGE project (the acronym RAEGE stands

1. Instituto Geográfico Nacional (IGN)

2. IGN Yebes Observatory

3. Secretaria Regional da Ciência, Tecnologia e Equipamentos (Azores, Portugal)

IGN-Yebes Network Station

IVS 2014 Annual Report

for “Red Atlántica hispano-portuguesa de Estaciones Geodinámicas y Espaciales”).

Since 2014, IGN Yebes Observatory has been a Technology Development Center for IVS. Activities are described in the corresponding report in this Annual Report.

2 Current Status and Activities

In 2014, the 40-m radio telescope has participated in 53 sessions (17 R1, 15 R4, two T2, and two EUROPE, two RD, and 15 in CONT14). All the data is being routinely transferred by Internet to the IVS correlators.

2.1 RAEGE

IGN, together with Portuguese colleagues in DSCIG (Azores Islands), continues the construction of a network of four new Fundamental Geodynamical and Space Stations. The RAEGE project was described in previous IVS Annual Reports. The Spanish-Portuguese VGOS network RAEGE will cover three continental plates, with sites in Spain at Yebes (Eurasian Plate) and Tenerife (African Plate), and in Portugal on the Azorean islands of Santa Maria (Eurasian Plate) and Flores (North American Plate).

First interferometric fringes of the RAEGE “Jorge Juan” radio telescope were obtained on November 26, 2014, in an observation together with the 40-m radio telescope at Yebes at X-band (see Figure 1).

The construction of a second antenna, in Santa María (Azores), is complete, and commissioning is

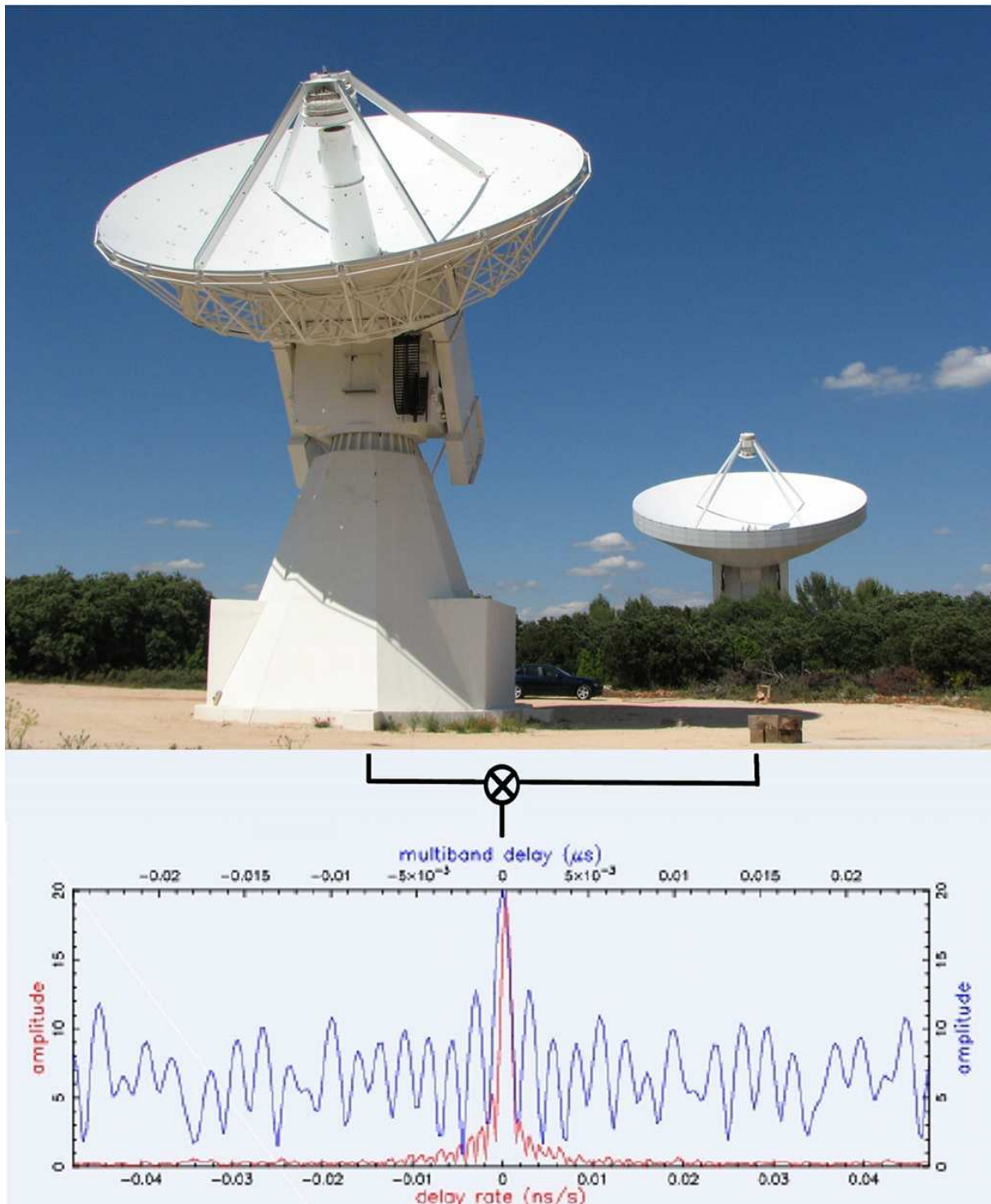


Fig. 1 First fringes of the RAEGE “Jorge Juan” radio telescope, obtained with the 40-m telescope also at Yebes Observatory.

ongoing. Also the construction of a control building is very advanced (see Figure 2). The official inauguration is scheduled on May 20, 2015, as a follow up of the 22nd meeting of the European VLBI

Table 1 Staff in the IGN VLBI group (e-mail: vlbitech@oan.es).

Name	Background	Role	Address*
Francisco Colomer	Astronomer	VLBI Project coordinator	IGN, Yebes
Jesús Gómez-González	Astronomer	Deputy Director for Astronomy, Geophysics, and Space Applications	IGN
José Antonio López-Fdez	Engineer	RAEGE Director	Yebes
Pablo de Vicente	Astronomer	VLBI technical coordinator	Yebes
José Antonio López-Pérez	Engineer	Receivers	Yebes
Félix Tercero	Engineer	Antennas	Yebes
Susana García-Espada*	Engineer	geoVLBI expert	Yebes
Javier López-Ramasco	Geodesist	Geodesist	Yebes

* At Azores since November 2014.

Group for Astrometry and Geodesy (EVGA, see <http://evga2015.raege.net/>).

Detailed information on RAEGE is available on the Web at <http://www.raege.net/>

2.2 Local Tie

A network of 24 monuments (concrete pillars) have been built in 2014 in the area of Yebes Observatory in order to relate the measurements taken by our two VLBI radio telescopes (40-m and 13-m) and two GNSS antennas (IGS code “YEBE”, on the roof of the office building, and “YEB1”, on the roof of the gravimeter building).

We have also investigated the possibility to measure the invariant reference point (IRP) of the 13-m radio telescope with a robotic total station, installed on the central pillar of the concrete tower. A tripod with an optical plummet is placed on the marked centered screw of the pillar. Then it is possible to measure the position of a corner cube reflector with a manufacturing precision of 0.0001 mm, which is attached magnetically to the inner sides of both antenna counterweights (see Figure 3). Measures of the reflector (CCR) can be taken every 30 seconds for both counterweights by moving the antenna around the elevation and azimuth axis. This operation can be done even when a regular VLBI session is occurring.

A detailed description, measured values, and modeling results are shown in the proceedings of the 8th IVS General Meeting (Gómez-González et al., Shanghai 2014).

3 IGN Staff Working on VLBI Projects

Table 1 lists the IGN staff who are involved in space geodesy studies and operations. The VLBI activities are also supported by other staff members such as receiver engineers, computer managers, telescope operators, secretaries, and students.

4 Future Plans

In order to comply with the VGOS specifications, a new broadband receiver is being developed at Yebes and should be available for observations in 2015. See the report of the IGN Yebes Observatory Technology Development Center for details. We look forward to participating in the early VGOS tests starting in 2015 with the new RAEGE 13.2-m “Jorge Juan” antenna.

The infrastructure works for the RAEGE station near the city of Tegueste (Tenerife, Canary Islands) will be deployed in 2015, followed by the erection of the antenna, built by MT Mechatronics GmbH.

Regarding the RAEGE station in Santa María, the official inauguration is scheduled on May 20, 2015 during the events of the EVGA meeting. Commissioning will be performed for an expected start of observations in 2016.

Preliminary work in Flores is being conducted to characterize the presence of radio frequency interference at the selected site for the RAEGE station there.



Fig. 2 Status of construction of the control building at the RAEGE station in Santa María (Azores).



Fig. 3 Left: Vertex monument in Yebes. Middle: Reflector RRR attached magnetically to the inner side of one counterweight. Right: Robotic Total Station Leica TS-30 set up above the central pillar.