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Abstract

This report updates the description of the OAN facilities as an IVS network station. The new 40-m radiotelescope has performed geodetic VLBI observations regularly since September 2008. Commissioning continues in particular for short wavelengths (3 mm). Yebes will become one of the new Space Geodynamics Stations in the RAEGE project, with the construction of a new radiotelescope of VLBI2010 specifications and an SLR facility in the near future.

1. General Information: the IGN Facilities at Yebes

The Yebes radiotelescopes (the new 40-m and the old 14-m which was an IVS network station since 2003 and is now being refurbished for VSOP-2) are located at the currently named “Technology Development Center” (CDT-Yebes), a department of the Instituto Geográfico Nacional (IGN, Ministerio de Fomento) together with the National Astronomical Observatory (OAN).

Yebes CDT is also the reference station for the Spanish GPS network and holds new facilities for gravimetry. As explained later in detail, the RAEGE project, which will build four Fundamental Geodynamical stations, will soon provide a new VLBI2010-type antenna in Yebes, together with an SLR system in a new control building.

2. IGN-OAN Staff Working on VLBI Projects

Table 1 lists the OAN staff who are involved in geodetic VLBI studies and operations. The VLBI activities are also supported by other staff such as receiver engineers, computer managers, secretaries, and students. Hiring of dedicated telescope operators is completed and available in Yebes in the first quarter of 2010.

<table>
<thead>
<tr>
<th>Name</th>
<th>Background</th>
<th>Role</th>
<th>Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>Francisco Colomer</td>
<td>Astronomer</td>
<td>VLBI Project coordinator</td>
<td>OAM, IGN</td>
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<tr>
<td>Susana García-Espada</td>
<td>Engineer</td>
<td>Ph.D. student</td>
<td>CAY</td>
</tr>
<tr>
<td>Jesús Gómez-González</td>
<td>Astronomer</td>
<td>Deputy Director for Astronomy, Geodesy and Geophysics</td>
<td>IGN</td>
</tr>
<tr>
<td>José Antonio López-Fdez</td>
<td>Engineer</td>
<td>CAY site manager</td>
<td>CAY</td>
</tr>
<tr>
<td>Pablo de Vicente</td>
<td>Astronomer</td>
<td>VLBI Technical coordinator</td>
<td>CAY</td>
</tr>
</tbody>
</table>

Addresses:

Table 2. Characteristics of the Yebes 40-m geodetic VLBI station.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
<th>DAR</th>
<th>VLBA5 (14) + VSI-C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diameter</td>
<td>40 meter</td>
<td>Recorder</td>
<td>Mark 5B</td>
</tr>
<tr>
<td>Receivers</td>
<td>2 - 115 GHz</td>
<td>H-maser</td>
<td>T4-Science iMaser 3000</td>
</tr>
<tr>
<td>S/X T$_{sys}$</td>
<td>180/60 K</td>
<td>GPS</td>
<td>TrueTime XL-DC</td>
</tr>
<tr>
<td>S/X SEFD</td>
<td>800/200 Jy</td>
<td>Weather station</td>
<td>SEAC-EMC</td>
</tr>
</tbody>
</table>

3. Status of Other Geodetic VLBI Activities at OAN

The 40-m radiotelescope has participated regularly in IVS geodetic VLBI campaigns, except during the summer due to a failure of the H-maser. In total, 16 campaigns were observed, and 3 were lost because of this problem.

The connection of Yebes to GÉANT at 1 Gbps, thanks to the EC project EXPReS, has been fully operational since April 2009.

A new Hydrogen maser has been purchased, to replace the Russian KVART-73 maser which failed in 2009 after 13 years of successful operation.

An absolute gravimeter is now permanently placed at the new building in Yebes. A superconducting gravimeter is expected in April 2010.

The new $\lambda = 3\,\text{mm}$ receiver was installed at the 40-m cabin, and first light was obtained in December 2009. This receiver will be mostly used for single dish and VLBI astronomical studies.

Cooperation with the geodesy group at Onsala Space Observatory in Sweden progresses by modeling the tropospheric effect caused by neutral atmosphere using the HIRLAM 3D-VAR numerical weather prediction model, where a direct improved mapping function is calculated using raytracing. Preliminary results will be presented at the IVS 2010 General Meeting in Hobart (Australia).
4. Future Plans: Project RAEGE

IGN intends to construct a network of four new Fundamental Geodynamical Stations in Spain and Portugal (see Figure 1). This project, named RAEGE (after “Red Atlántica de Estaciones Geodinámicas y Espaciales”), consists of the erection in Yebes (1), Canary Islands (1), and Azores Islands (2), of one radiotelescope of VLBI2010 class (i.e. of 12-m diameter, high slew rate, capable of operating in the 2-18 GHz bands), a permanent GNSS receiver, a superconducting gravimeter, and (at least in Yebes) an SLR station. The construction of the first three stations (in Yebes, Gran Canaria, and Azores-Santa María) will start in 2010.

Figure 2. Location of the new stations in the RAEGE project.

References


Figure 3. Elements of the future RAEGE station in Yebes (Guadalajara, Spain).