OAN - Yebes station report
Cyberspace TOG meeting 8 February 2022

1 General status

A new elevation shutter for the Nasmyth receiver cabin was installed at the end of May solving the problem caused by the strong snowstorm experienced in January 2021. Since the repair, the observations resumed without problems, apart from minor antenna problems related to the sub-reflector and the antenna servo system.

2 VLBI Equipment

Details of the equipment used in EVN observations:

- DBBC2
  - 4 CoMo boards (Unica 4).
  - 4 ADB2.
  - 4 Core2.
  - Internal Fila10G.
  - Software available:
    - DDC:
      - v105_1 (June 10 2015). This firmware is used with channel bandwidth narrower than 4 MHz.
      - v107 (beta 4)(June 7 2019). This firmware is used with 4 MHz channel bandwidth or wider.
    - PFB (hardly ever used):
      - v16_2 (October 13 2017).
    - Fila10G:
      - fila10g_v4_1 (reported as 2.8.0, October 20 2017).
- Flexbuffs
  - flexastro:

        - 36 disks of 10 TB capacity. Total capacity of 360 TB
        - Software version: jive5ab : 2.9.0 : 64bit : dev : flexastro
    - flexbuff:
        - 36 disks of 6 TB capacity. Total capacity of 216 TB

          A third flexbuff type machine has been purchased together with 36 10-TB hard disk drives.
- We use a Harrobox running Debian Jessie (8.2) as a proxy between the FS and the DBBC to allow concurrent connections to DBBC2. JIVE correlator uses this feature to control the flow of data from the Fila10G when doing eVLBI. This host is in the public LAN but allows connections from the private LAN.

At present time RT40m's spare DBBC2 is on lend to Santa María station in Azores. A third Flexbuff system with 144 TB of capacity (36 disks of 4 TB each) has been devoted to correlation tasks.

The DBBC3-2L-2H still shows problems when configured with DDC U_125 firmware, one of the Core3H boards does not report detected power. Since the system upgrade to DBBC3-6L-6H is planned for the end of February (the parts are already awaiting in Bonn) we have decided not to send the equipment twice and take advantage of the update to make the necessary repairs.

3 Field System

We run three FS computers:

- RT40m: FS version 9.13.2 on Debian 7.11 Wheezy, kernel 3.2.0-6-686-pae
- RT13.2m: FS version 9.12.11 on Debian Jessie 8.10, kernel 3.16.0-4-686-pa.
- A test computer which can be connected to any of the non-used backends. Debian Buster and FS 10.

4 EVN observations

Following are the statistics for Yebes' 40-m radio telescope participation in the EVN during 2021, since last reported in previous TOG meeting:

- EVN session 2021-2: participated in 15 observations
    - K band: 3/3 successful. Observation ec071l impacted by gain instabilities, mostly in LCP.
    - C band: 12/12 successful observations. Three observations (ec077a, ec077b and es099b) affected by a problem with the noise diode, gain calibration not performed and antabfs file not provided. The noise diode problem was solved during the session. For ec071m, 40% of scans lost due to an antenna controller problem.
- EVN session 2021-3: participated in 15 observations (plus 5 CL calibration runs)
    - C band: 5/5 successful, NME n21c3 was impacted by a station power cut affecting to scan 7 and to the ftp transfer for the real-time fringe test.
    - M band: 3/3 successful. NME n21m1 ftp transfer performed manually due to a disk space issue at the astronomy flexbuff (flexastro).

    - X band: 3/3 successful. For observation eb085b lost first 2 scans.
    - K band: 2/2 successful, NME affected by a noise diode instability. Rest of the observations were calibrated with the ambient load, during preobs. There is no phase calibration available in this receiver. Observation gp058a impacted by gain instabilities, mostly in LCP, due to an IF distributor. The unit has been removed from the signal chain.
    - Q band: 2/2 successful. There is no noise diode for this band, calibrations were performed with the ambient load, during preobs. There is no phase calibration available in this receiver. During gp058b lost first 2 scans due to a power cut.
- EVN e-VLBI: 1 out of 1 successful observation in C band. Rest of the e-VLBI observations in the reported period were performed in L-band, not available in Yebes.
- EVN ToO: 4 out of 5 successful observations for the RG012 program. Yebes could not participate in one of the observations (rg012c) due to problems with the antenna servo system.
- EVN fringe test for new CX band receiver: successful fringe test to demonstrate correct performance of the new receiver at C, M and X bands in VLBI observations.

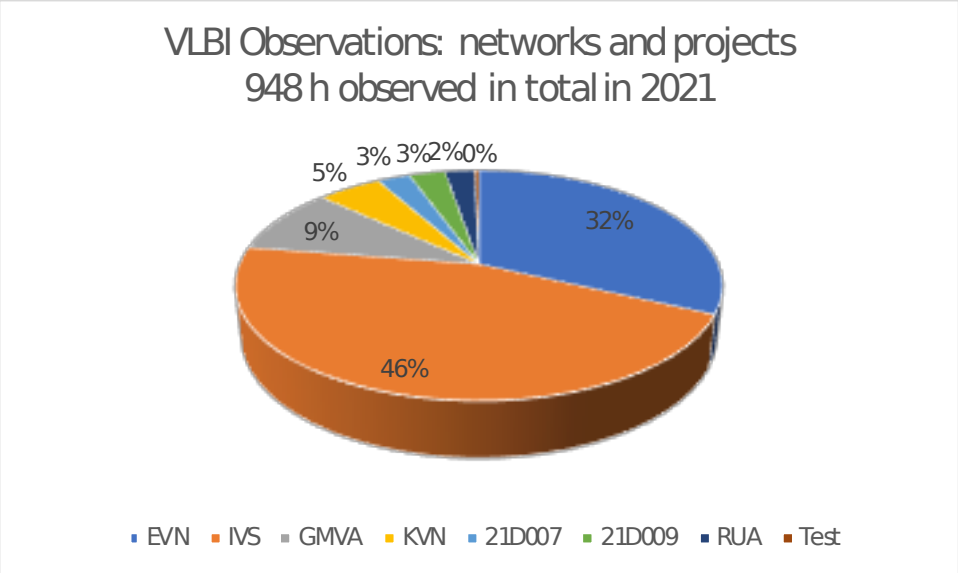
Summary: 36 successful observations out of 37 scheduled.

5 Other VLBI observations

Apart from the EVN, we regularly participate in several VLBI programs with the Yebes' RT40m: IVS (geodetic observations), GMVA (Global millimetre VLBI), and other projects with the KVN, INAF time transfer experiments (21D009 observing code), Russian experiments (RUA), etc. This October we have also participated in the campaign to measure the solar wind during the Mars solar conjunction (21D007 observing code).

Additionally, a fringe test was performed with the RAEGE Santa Maria antenna to demonstrate their correct performance, and another fringe test with Hartebeesthoek radio telescope in K-band to check a 4 Gbps configuration for future Global Astrometry supports with both telescopes.

Following plot shows the antenna time percentages dedicated to each VLBI network and VLBI projects during year 2021.



6 Continuous calibration

Continuous calibration mode (80 Hz applied to a noise diode) works in C, M, X and K bands.

7 Storage

We have purchased two Flexbuff units, populated with 10 TB disks model Seagate Enterprise EXOS. One of the units has been sent to JIVE and installed there. The current storage capacity at the station is 720 TB.

8 Spares

One Mark5B+ system together with some old DBBC2 pieces are available at the station.

9 Internet connection

Yebes is connected to RedIris, the Spanish NREN using a 10 Gb/s dark fiber since May 2012. This year RedIRIS has initiated the tasks to upgrade their Point of Presence at Yebes Observatory to 100 Gbps. Most part of the equipment is already in place, including the internal network elements upgraded to 100 Gbps. In the following months RedIRIS will made the handover to 100 Gbps.

10 40m radiotelescope

All the dichroic mirrors, together with the respective lambda/quarter polarizers are now available at the station to perform W/Q/K simultaneous observing. Once the DBBC3 gets upgraded to 6H-6L (hopefully this summer) the system will be available for VLBI.

11 13.2 m radiotelescope

The VGOS compatible radiotelescope continues its routinely participation in the IVS VGOS program. Currently, a new VGOS receiver built in-house is being commissioned. This receiver will be shipped to Santa María to equip the RAEGE antenna at the island after the end of the validation period.

Yebes VLBI group
08/02/2022