

Medicina Station Status Report

Alessandro Orfei, Giuseppe Maccaferri

Abstract General information about the Medicina Radio Astronomy Station, the 32-m antenna status, and the VLBI observations is provided. Updates to hardware and software infrastructure have been made and are briefly described.

1 The Medicina 32-m Antenna: General Information

The Medicina 32-m antenna is located at the Medicina Radio Astronomy Station. The station is run by the Istituto di Radioastronomia and is located approximately 33 km east of Bologna. The Consiglio Nazionale delle Ricerche was the funding agency of the Istituto di Radioastronomia until the end of 2004. Since January 1, 2005, the funding agency has been the Istituto Nazionale di Astrofisica (INAF). The antenna, which was inaugurated in 1983, has regularly taken part in IVS observations since 1987 and is an element of the European VLBI Network.

A permanent GPS station (MEDI), which is a part of the IGS network, is installed in the vicinity. Another GPS system (MSEL) is installed near the VLBI telescope and is part of the EUREF network.

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2 Current Status and Activities

- **Antenna.** a) The telescope has been idle since mid-December 2019 due to a couple of mechanical issues. Two steel girders composing the reticular structure that supports the counterweights were broken. Mainly for safety reasons the antenna was stopped, and a structural investigation was done in order to make a survey of the problem over the whole antenna. Once we replaced the broken beams, we also found that a non-drive wheel showed a broken bearing. Covid-19 prevented us from quickly restarting operations, which were resumed at the end of July 2020.
b) An active surface system for the Medicina primary mirror has been funded. The upgrade will include new aluminum panels with enhanced surface accuracy, electromechanical actuators to move panels in order to compensate for gravitational deformation, and a completely new subreflector with low RMS surface (one will be provided for Noto as well). Once completed, Medicina will be able to observe at high frequencies up to 116 GHz with good overall efficiency. The timeline for completing the project is by 2022.
- **Receivers.** In 2019 INAF was awarded a call (National Operational Program, PON) issued by the Ministry of Research. As part of this funding, our institute requested the installation on the Medicina radio telescope of a simultaneous 3-band receiver (18–26, 34–50, and 80–116 GHz). The receiver is expected to be available by 2022.
- **VLBI backend.** The DBBC firmware version is currently DDC V107, PFB v16. The Flexbuff system works with jive5ab-3.2. As part of the PON



Fig. 1 An updated image of the 32-m Medicina antenna, June 2018.

funding program (see above), the new DBBC3 systems for both Medicina and Noto are being ordered.

- **Field System.** a) We have installed a new FSL10 Debian machine, and we are running the new FS 10.0.0-beta2. b) The Continuous_cal system is working for the Cassegrain receivers (6, 5, and 1.3 cm) and from session 2/2019 is available also for the primary focus receivers, 3.6 and 18/21 cm.

3 Geodetic VLBI Observations

Despite the long maintenance periods in the years 2019 and 2020, Medicina participated in 35 (23 and 12) routine geodetic sessions: four IVS-R1, 19 IVS-R4, two IVS-T2, one IVS-CRF, two EUROPE, and seven R&D experiments.

4 Transportable NICT VLBI Antenna

Since 2018, the Observatory of Medicina has hosted a 2.4-m antenna designed and built by NICT to carry out broadband VLBI measurements with the aim of comparing optical clocks on an intercontinental basis. This technique is innovative for overcoming the obstacles imposed by current clock comparison techniques in terms of cost/feasibility. Broadband VLBI observations were carried out between October 2018 and February 2019.