The Medicina Station Status Report

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Abstract

General information about the Medicina Radio Astronomy Station, the 32 m antenna status and the staff in charge for VLBI observations, are provided. In 2005 the data from geodetic VLBI observations were acquired using the Mark 5A recording system with good results. An intense activity of local terrestrial measurements was performed and is 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 about 33 km East of Bologna. The Consiglio Nazionale delle Ricerche was the funding agency of the Istituto di Radioastronomia till the end of 2004. Since January 1st, 2005 the funding agency is the Istituto Nazionale di Astrofisica (INAF).

The antenna, inaugurated in 1983, takes regularly part in IVS observations since 1985. A permanent GPS station, which is part of the IGS network, is installed in the vicinity. The antenna is also an element of the European VLBI Network.

2. Antenna description

The Medicina antenna has a Cassegrain optics, consisting of a primary mirror of 32 m in diameter, and a secondary mirror, called subreflector, of convex shape and about 3 m in diameter. The subreflector, mounted on a quadrupode, is placed opposite the primary mirror, and focuses the radio waves at its centre, where the receiver system is located. For some observing frequencies, a simplified optical system is enough. The subreflector is therefore shifted from its normal position, and the receiving system is placed at the primary focus. The antenna can operate in the range between 327 MHz and 22 GHz.

The receivers are cooled with cryogenic techniques to improve the system sensitivity. The antenna is flexible in changing the operative receiver: only few minutes are needed to change the observing frequency. A recent picture of the antenna is shown in Figure 1.

3. The Staff

Many scientists and technicians are taking care of the observations. However, there is a limited number of people that is dedicated to maintain and improve the reliability of the antenna during the observations: Alessandro Orfei is the Chief Engineer, expert in micro-wave receivers; Giuseppe Maccaferri is the Technician in charge of the telescope's backend; Andrea Orlati is the Software Engineer who takes care of the observing schedules and regularly implements SKED&DRUDG and the Field System.

Figure 1. View of the Medicina 32 m dish taken during geodetic VLBI observations. Note that the subreflector is shifted to allow the use of the S/X receiver located in the primary focus of the radio telescope.

4. Current Status and Activities

During 2005 the Field System version 9.7.7 was installed. The Mark 5A recording system works fine. Almost all observations are made by using hard disks. A total storage capacity of 93TB is available at the station.

4.1. Front-end and Back-end Upgrading

A 7-horn multi-feed receiver is under construction. Almost all parts are available to be integrated in a complete receiver. A dual-feed system for contemporary observations at 305-425MHz and 1.3-1.8GHz is under design, as well as a 5.8-7.8GHz receiver (Figure 2).

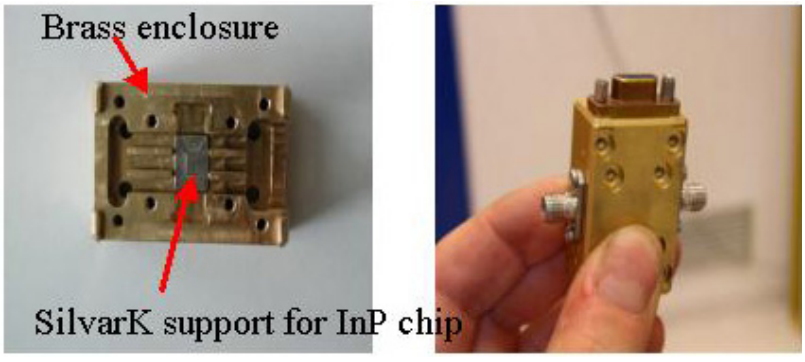

Figure 2. The 9 locations for Cassegrain receivers.

Medicina has completed the capability for changing all receivers in a fast and automatic way. Now up to 9 receivers can be placed in the Cassegrain cabin, each one to be selected for observing by tilting the subreflector (Figure 3). The changing between primary and Cassegrain receivers is accomplished by moving aside the secondary mirror (Figure 4).

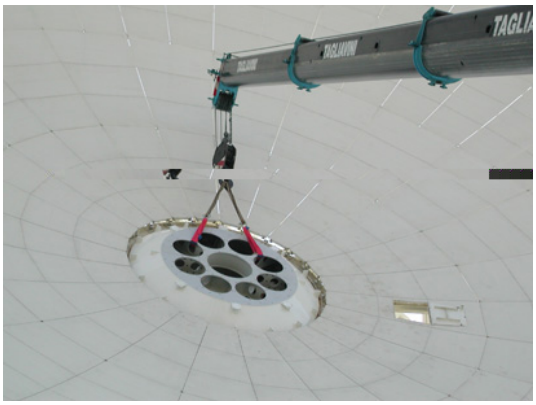

Figure 3. The 9 locations for Cassegrain receivers.

Figure 4. The primary focus receiver box and the subreflector.

4.2. Optic Fiber Link

The Institute of Radioastronomy, the Emilia-Romagna Regional Government and GARR (Italian Academic and Research Network) have signed an agreement under which the Regional Government provides a fiber optical link at 1 Gb/s between the Medicina Station and the GARR backbone in Bologna. The connection is now available. In 2006 EVN will perform many tests to routinely transfer observations using this data link.

5. Geodetic VLBI Observations

During 2005, the Medicina 32 m dish took part in 25 geodetic VLBI sessions, namely 2 IVS-T2, 8 IVS-R1, 11 IVS-R4 and 4 EUROPE experiments. Some of the above projects were observed by Medicina as substitute for the Matera antenna, which was stopped by failure in the azimuth rail. This was agreed upon after request from the IVS Coordinating Center.

6. Local Survey Activities

At Medicina, summer and early fall 2005 have been seasons of intense terrestrial surveying. The four levelling bolts mounted on the ground pillar of the VLBI antenna were surveyed using spirit levelling; similarly, levelling of the bolts installed on the pillars of the local network was performed. This set of measurements was performed in July 2005 as part of the surveying campaign carried out on the wide levelling network of Regione Emilia Romagna. The local ground control network in Medicina has also been surveyed in September 2005 in the context of the fourth local tie performed on the VLBI-GPS eccentricity. On this occasion, the structure of the VLBI radiotelescope was measured using targets on which triangulation and trilateration were performed. Furthermore, the dish was laser scanned at different elevations and this set of measurements was linked to the local network using targets observed by both terrestrial and laser scanning surveys. Similar surveys were performed in September 2005 on the VLBI radiotelescope in Noto, using the same methods and surveying approaches. Data acquired at both observatories are now being processed and should contribute in showing the presence as well as quantifying the magnitude of the possible gravitational deformations that might affect the observations of the two radiotelescopes.