

The Medicina Station and the Sardinia 64-m Radio Telescope: Geodetic Activities and Status Report

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Abstract

In the following we will briefly summarize the activities done at the Medicina radio astronomy station. Status report on the Sardinia Radio Telescope project will also be given.

1. Main Activities at the Medicina Station

The activities at the Medicina Station were mainly addressed to improve the data acquisition quality. Most of the upgrading work was done in the electronic hardware and to improve the efficiency of the 32-m dish. Great care was also taken to increase the reliability of the station during VLBI sessions.

1.1. The Upgrade of the Data Acquisition System

a) Frequency Agility

The integration of the Medicina agility receiver system with the Field System has been completed. Now the receiver change could be completely done via a SNAP command. This simplifies the frequency agility, particularly important for switching between astronomic and geodetic VLBI experiments, avoiding manual intervention.

b) Mark 5 System

The prototype version of the new Mark 5 system has been delivered from Haystack. Tests recording performed during geodetic observations were successfully processed at the MPIfR Bonn correlator.

c) A New Backend

A 1.4 GHz pulsar acquisition system has been installed as new back end of the 32-m antenna.

1.2. The Upgrade of the Antenna

a) Painting

The primary mirror of the antenna has been repainted.

b) Active Surface

In 2002, measurements on the Noto antenna using the active surface system were done at 22, 32 and 43 GHz (preliminary) showing that the system is working well. Moreover the actuators facility allowed us to correct the inaccuracies of the subreflector surface enhancing the antenna efficiency at 43GHz (Orfei et al. 2002a,b).

1.3. The Microwave Laboratory

A facility to design and construct high frequency cryogenic Low Noise Amplifiers has been made available at the station. A bonding machine and a milling machine are on the work to provide various types of amplifiers. Two different kinds of 22 GHz LNA are on the way. The first one, following the scheme usually used at NRAO, is a 18-26 GHz hybrid solution. The second one, in the same band, use the MMIC solution and will be produced at TRW foundry. Both the designs are complete and the construction phase is in progress (Cremonini et al. 2002).

1.4. Geodetic Activities

a) VLBI Observations

During 2002, the Medicina 32-m dish has taken part in 25 geodetic VLBI observations namely for the R1, T2, VLBA and EUROPE projects.

b) Local Survey

The geodetic activity has being continued with the third survey of the local network using terrestrial geodesy and GPS. Considering the importance of co-locations and local ties in different aspects of space geodesy and especially in ITRF computation, for the second year a survey of the co-located VLBI and GPS antennas has been performed. New value of the eccentricity vector between these two techniques has been obtained. A detailed study of the operational and theoretical difficulties related to these kind of activities has led to a complete methodology for estimating eccentricities between VLBI, GPS, SLR/LLR and DORIS. This methodology covers all the different aspects of the computation: from the surveying and adjustment of the local network to the analitical and statistical aspects related to eccentricity estimation. Results will be presented in Nice during the next EGS to be held in April 2003.

2. The Sardinia Radio Telescope

The SRT is a 64-m radio telescope under construction near San Basilio, Cagliari, Sardinia Isle, a site of elevation = 585-m, long = $-09^{\circ}14^{m}40^{s}$, lat = $+39^{\circ}29^{m}50^{s}$, with the supervision of the Istituto di Radioastronomia.

The SRT will be used for VLBI and Single Dish observations in the frequency range 300 MHz – 100 GHz and for DSN-type support to ad hoc projects in radio science and spacecraft tracking. The wide spectral region will be covered making use of three focal points:

- primary (300 MHz – 1.4 GHz),
- secondary (2.2 GHz – 100 GHz),
- tertiary (1.4 GHz – 8.8 GHz and 32 GHz),

with transmitting capability for Deep Space Network activity. Main technicalities are alt-azimuth drives, homologous backup structure up to 22 GHz and an active primary surface with 100μ panel accuracy.

2.1. Present Status

The build up of the telescope foundation started in summer (see Fig. 1 below). This part has been funded by the Regione Autonoma Sardegna together with the buildings that will host the offices at the site. The construction of the buildings has started as well.

The definite project for the mechanical structure of the telescope has been approved. A tender has been completed and the company selected for the construction of the structure and for the installation of servo-systems. The company will start its activities at the beginning of 2003.

Funds for the active surface (panels, actuators, etc...) are also available. and the hardware is under construction. It will be ready before the mechanical structure of the telescope will be completed.

Funds are also available for several receivers, namely the 1.4 GHz receiver for the primary focus, the 34 GHz hosted in the Gregorian focus and a third receiver at a frequency that will be in the band between 2 and 15 GHz.

Figure 1: View of the SRT site near San Basilio.



References

- [1] A. Orfei, M. Morsiani, G. Zacchiroli, G. Maccaferri, J. Roda, F. Fiocchi The active surface system of the Noto radiotelescope Proceedings of the 6th European VLBI Network Symposium, Bonn 25-28 June 2002a
- [2] A. Orfei, M. Morsiani, G. Zacchiroli, G. Maccaferri, J. Roda, F. Fiocchi The active surface for the Noto

radiotelescope Proceedings of the XXVIIth General Assembly of URSI, Maastricht (The Netherlands)
18-25 August 2002b

- [3] A.Cremonini, E. Limiti, R. Nesti, A. Orfei, G. Tofani 18-26 GHZ CRYOGENIC MULTIFEED HETERODYNE RECEIVER MMIC INP/GAAS BASED TECHNOLOGIES European Microwave Conference, Milan Italy 23-27 September 2002