

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 changes and upgrading 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) Main computer and Field System

A new version of the Linux operating system has been installed on the computer which drives the antenna and the data acquisition system. The computer hardware has also been upgraded. The updated version of the FS (9.5.1) has been implemented. This happened four times in the last year to maintain the FS at the state of the art.

b) MK4 Phase Cal signal

A FS command to automatically switch ON/OFF the “phase cal” tone under computer control was set up. This command has been included in the new release of the FS.

c) Station Clock

The GPS–Formatter (Station Clock) difference is now continuously acquired in the log file of each VLBI observing project.

d) Two-Head recording

Two-Head recording is now available. Two new heads (triple cap) have been mounted. Local playback tests showed that recording is fine at 80 and 135 ips.

e) Formatter

The formatter has been upgraded with new chips.

f) Delay Unit

The Ground Delay Unit has been refurbished following the specification given by Haystack. The cable measurement system was unstable and noisy due to bad capacitors in the antenna unit.

g) Decoder Display

The MKIV Decoder Display has been installed.

1.2. The Upgrade of the Antenna

a) Antenna Pointing

The pointing model has been improved implementing two more parameters. The pointing rms accuracy achieved is ± 10 arcsecond. The further correction of non-systematic pointing errors is under investigation by using an electronic tiltmeter system.

b) Azimuth Mount

The special cement which supports the rail azimuth track of the 32-m dish has been completely replaced. A new support system for the rail has been introduced. The rail track has been replaced as well.

c) Project Vertex Room

The final design for the new vertex room is ready. The replacement has been postponed because of the upgrading of the Noto dish and urgent work on the azimuth track of the Medicina telescope. The goal of the project is to achieve full frequency agility at both Medicina and Noto 32-m telescopes. The vertex room will host 8 receivers which will cover the band 4.3–48 GHz. A wide-band receiver working in the frequency range 4.3–5.8 GHz is under test. The feed system (horn/directional coupler/polarimeter/omt) is under construction by CSELT.

d) High Frequency Cryogenic Low Noise Amplifier Development

A microwave laboratory is under development to allow the construction of LNA.

e) Antenna Control System

An up to date version of the Antenna Control System is under construction by Vertex Company and it will be installed in Spring 2003.

1.3. General Information

a) Local Survey

A Local Survey of the antenna has been performed in June/July using GPS technique and classical geodesy. The results (Vittuari et al. 2001) were presented at the 15th Working Meeting on European VLBI for Geodesy and Astrometry held in September 2001 in Barcelona.

b) Station Reliable Operations

An engineer has been hired thanks to the Infrastructure Cooperation Programme “Radionet” funded by EC. The main duties for this engineer will be:

- 1) check the observing schedules for VLBI projects and the requested data acquisition setup;
- 2) work on the completion of the “frequency agile” system for the antenna;
- 3) improve the station calibration information.

1.4. Geodetic VLBI Observations

During 2001, the Medicina 32-m dish has taken part in 28 Geodetic VLBI Observations as follows:

16 CORE projects,

- 6 VLBA projects,
- 3 EUROPE projects,
- 3 CONT projects.

2. The Sardinia Radio Telescope

The SRT is a 64-m radio telescope that is going to be built at San Basilio, Cagliari, Sardinia Isle, a site of elevation = 585-m, long = $-09^{\circ}14^{m}40^{s}$, lat = $+39^{\circ}29^{m}50^{s}$.

The project, proposed by the Istituto di Radioastronomia to achieve a flexible instrument with a large collecting area for radio astronomy and deep space communications, was funded by the Ministero Università, Ricerca Scientifica, Tecnologia, by the Agenzia Spaziale Italiana and by the Regione Autonoma Sardegna.

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.

The telescope will be implemented in three stages:

- Stage 1. Operation up to 22 GHz in the conventional (fixed) mode;
- Stage 2. Active control in open loop, by a lookup table;
- Stage 3. Loop control closed by laser metrology (up to 100 GHz).

The project will be hopefully completed in 2005.