The Medicina Station Status Report

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Abstract

The activities done at the Medicina radio astronomy station are briefly summarized. Those activities were mainly related to the geodetic VLBI observations and to the upgrading of the 32-m dish.

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 32-m Dish

The Medicina 32-m dish has been heavily upgraded during Summer 2003. A new antenna servo system has been installed. This uses modern components and digital electronics. A higher degree of reliability and less maintenance interventions are expected. The software developed for pointing and traching of the antenna has been adapted to the new system.

All the cables routing on the antenna were changed after over 20 years of the antenna observing activities. Together with usual metallic wires, high quality coaxial cables were installed together to several fiber optics links.

The vertex cabin was fully renewed. A completely new mechanical structure was installed to allow the allocation of many receivers at the same time as part of a long term plan to achieve full frequency agility of the telescope. This is the second step of that plan, which is related to the secondary focus of the antenna. In the first step, a robotic system was implemented to shift the secondary mirror of the telescope under computer control. The same system also allowed the shift of the primary focus receiver box which hosts the 22 GHz, S/X and 1.6 GHz receivers. Moreover, a new control hardware was installed in order to check housekeeping data coming from the receivers and allowing the switching among receivers hosted in the secondary focus receiver cabin.

1.2. The Mark 5 recording system

The prototype version of the new Mark 5 system, delivered in 2002 from Haystack, was upgraded to Mark 5A. The present status of the Mark 5 system looks fine. Many tests were done with good results. One of the tests implied the transferring of data from the Bologna gate of the backbone to the JIVE Correlator in Dwingeloo, via the high data rate GARR/GEANT network.

Disks and disks enclosures were acquired. Four (4) modules are available now with 8×120 GB disks each and 4 modules with 8×250 GB disks are going to be assembled. Twenty more empty modules are available at the station ready to be filled with disks.

Figure 1 – *Left*: View of the cover of the vertex room. Eight receivers can be permanently mounted, one for each of the external holes. The hole on-axis will host receivers under test. *Right*: View of the top of the vertex room.

1.3. Development of Control Software

In-house codes have been written to keep under control the status of the Mark 5 operations. The new software is under test at the moment.

On request of the European VLBI Network Technical Operation Group, a dedicated software is under development to keep under control the recording tracks of the Mark 4/Mark 5 systems. As soon as the software is ready, it will be made available to the EVN stations and to any interested IVS station on request. A beta version is available and under test.

1.4. Geodetic Activities

a) VLBI Observations

During 2003, the Medicina 32-m dish has taken part in 10 geodetic VLBI observations namely IVS–T, RDV and EUROPE projects. Due to delays in the upgrading, the antenna could not observed during three sessions in September 2003 as originally scheduled. One more project was skipped by the IVS Coordinating Center in December.

b) Local Survey

In September 2003 the VLBI Reference Point (RP) in Medicina has been surveyed for the fourth time. It has also been the third determination of the IGS-GPS RP and consequently of the GPS-VLBI eccentricity. A method based on Classical Geodesy measurements for determining eccentricities between co-located space geodesy techniques has been developed and tested on the data acquired during the three surveys (Sarti et al. 2004). In Table 1 eccentricity values for the three surveys expressed in a local frame are shown. The variability of the yearly estimated

Table 1. Local tie

Eccentricity	2001	2002	2003
XVLBI(m)	45.5356±0.0003	45.5360±0.0002	45.5348±0.0001
YVLBI(m)	21.5805±0.0004	21.5825±0.0003	21.5764±0.0001
ZVLBI(m)	17.6995±0.0008	17.7024±0.0006	17.7003±0.0003
XGPS (m)	29.9692±0.0010	29.9692±0.0008	29.9840±0.0003
YGPS (m)	79.9215±0.0011	79.9268±0.0006	79.9209±0.0003
ZGPS (m)	0.5699±0.0008	0.5701±0.0005	0.5684±0.0003

coordinates of both endpoints of the eccentricity vector suggests an instability of the pillars used to define the local frame. This latter is defined fixing its planimetric origin on pillar P3 (recently assigned IERS DOMES number: 12711M006) while its altimetric origin is fixed on pillar G7. Only two other pillars (P1 and P2 with IERS DOMES numbers 12711M004 and 12711M005, respectively) establish the local ground control network. In Table 2 coordinates of markers P1, P3 and G7 obtained adjusting terrestrial observations acquired during 2001, 2002 and 2003 surveys are shown.

Table 2. Survey

Coordinates	2001	2002	2003
XP1(m) (fixed)	0.0	0.0	0.0
YP1(m)	42.6586±0.0002	42.6628±0.0002	42.6636±0.0002
ZP1(m)	2.0772±0.0003	2.0783±0.0003	2.0772±0.0002
XP3(m) (fixed)	0.0	0.0	0.0
YP3(m) (fixed)	0.0	0.0	0.0
ZP3(m)	2.0195±0.0003	2.0177±0.0003	2.0154±0.0003
XG7(m)	6.1261±0.0005	6.1309±0.0002	6.1386±0.0003
YG7(m)	72.7897±0.0006	72.7924±0.0002	72.7907±0.0003
ZG7(m) (fixed)	0.0	0.0	0.0

It is therefore urgent to enlarge the local ground control network adding properly positioned pillars so as to ensure a high stability of the local frame. This activity has been planned for spring

2004 when at least three new triplets of pillars will be added to the local network. A detailed geological survey is also scheduled in order to complete the relevant set of information regarding the stability at the observatory and distinguish between local scale and large scale movements. Considerations on local soil characteristics suggest the use of triplets of 22 meters long micro pillars so as to ensure a reliable three-dimensional framing of the eccentricity.

References

[1] Sarti P., Sillard P., Vittuari L., 2004. Surveying co-located Space Geodesy techniques for ITRF computation. Journal of Geodesy, in press.