Matera CGS VLBI Station

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Abstract

This report describes the status of the Matera VLBI station[1]. A major hardware failure that had happened at the beginning of 2004, was fixed and in July 2005 operations restarted. Also an overview of the station, some technical characteristics of the system and staff addresses are given.

1. General

The Matera VLBI station is located at the Italian Space Agency "Centro di Geodesia Spaziale" (CGS) near Matera, a small town in the South of Italy. The CGS came into operation in 1983 when

Figure 1. The Matera "Centro di Geodesia Spaziale" (CGS)

a Satellite Laser Ranging SAO-1 System was installed at CGS. Fully integrated in the worldwide network, SAO-1 has been in continuous operation from 1983 up to 2000, providing high precision ranging observations of several satellites. The new Matera Laser Ranging Observatory (MLRO), the most advanced Satellite and Lunar Laser Ranging facility in the world, has been installed in 2002 and has replaced the old SLR system. CGS hosted also mobile SLR systems MTLRS (Holland/Germany) and TLRS-1 (NASA).

In May 1990 the CGS extended its capabilities to Very Long Baseline Interferometry (VLBI) installing a 20-m radiotelescope. Since then, Matera performed 656 sessions up to December 2005.

In 1991 we started GPS activities, participating in the GIG 91 experiment installing in Matera a permanent GPS Rogue receiver. In 1994 six TurboRogue SNR 8100 receivers were purchased in order to create the Italian Space Agency GPS fiducial network (IGFN). At the moment 12 stations are part of the IGFN and all data from these stations, together with 24 other stations in Italy, are archived and made available by the CGS WWW server GeoDAF (http://geodaf.mt.asi.it).

Thanks to the co-location of all precise positioning space based techniques (VLBI, SLR, LLR and GPS), CGS is one of the few "fundamental" stations in the world. With the objective of

exploiting the maximum integration in the field of Earth observations, in the late 1980s ASI extended CGS involvement also in remote sensing activities for present and future missions (ERS-1, ERS-2, X-SAR/SIR-C, SRTM, ENVISAT).

2. Technical/Scientific Overview

The Matera VLBI antenna is a 20-meter dish with a Cassegrain configuration and AZ-EL mount. The AZ axis has ±270 degrees of available motion. The slewing velocity is 2 deg/sec for both AZ/EL axis.

The technical parameters of the Matera VLBI antenna are summarized in Table 1.

The Matera time and frequency system consists of three frequency sources (two Cesium beam and one H-maser standard) and three independent clock chains. The EFOS-8 H-maser from Oscilloquartz is used as a frequency source for VLBI.

The control computer is a SWT Pentium/233 PC running Linux and FS version 9.7.7.

Table 1. Matera VLBI Antenna Technical Specifications

Input frequencies	S/X	2210−2450 MHz / 8180−8980 MHz
Noise temperature at dewar flange	S/X	<20 K
IF output frequencies	S/X	190−430 MHz / 100−900 MHz
IF Output Power (300 K at inp. flange)	S/X	0.0 dBm to +8.0 dBm
Gain compression	S/X	<1 dB at +8 dBm output level
Image rejection	S/X	>45 dB within the IF passband
Inter modulation products	S/X	At least 30 dB below each of 2 carriers at an IF output level of 0 dBm per carrier
T_{sys}	S/X	55/65 K
SEFD	S/X	800/900 Jy

3. Staff

The list of the VLBI staff members of Matera VLBI station is provided in Table 2.

Table 2. Matera VLBI staff members

Name	Agency	Activity	E-Mail
Ing. Luciano Garramone	ASI	VLBI Manager	luciano.garramone@asi.it
Domenico Del Rosso	Telespazio	Operations Manager	domenico_delrosso@telespazio.it
Giuseppe Colucci	Telespazio	VLBI contact	giuseppe_colucci@telespazio.it

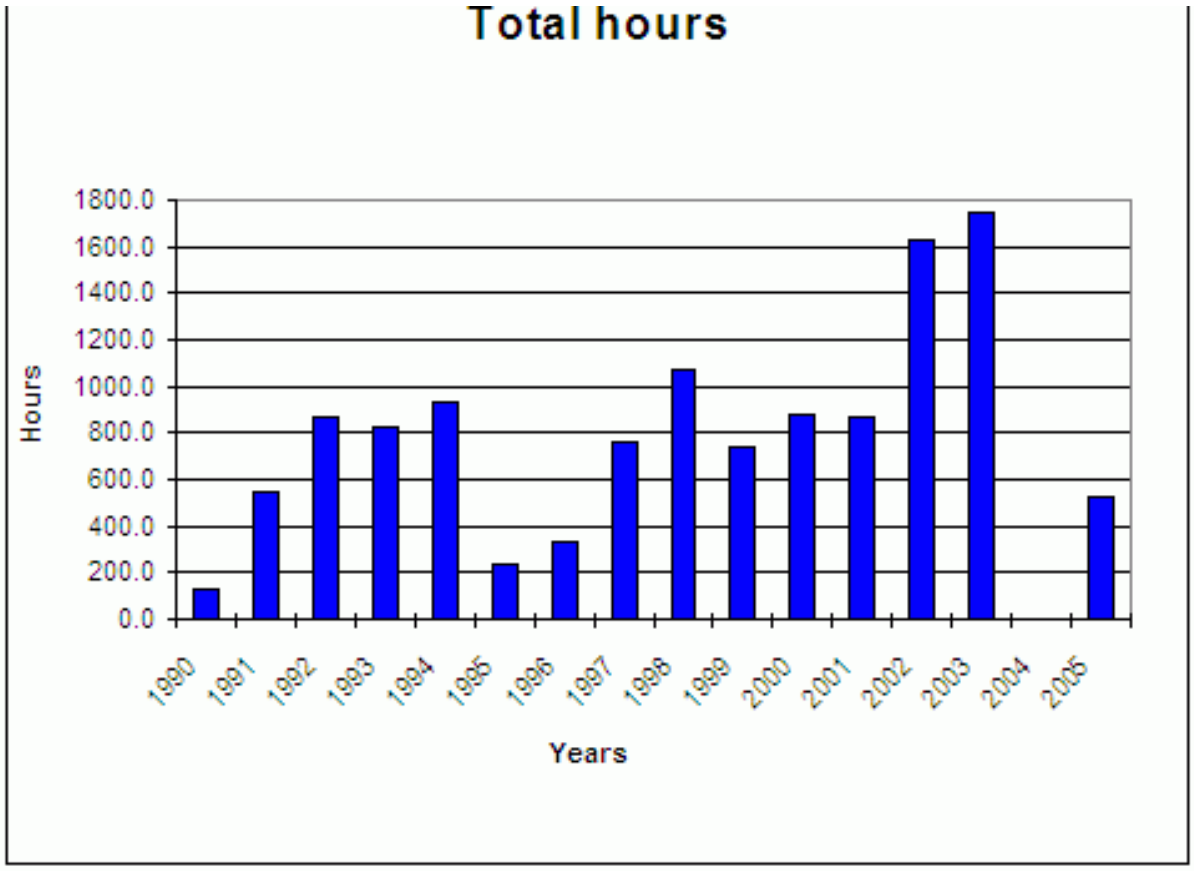

Figure 2. Yearly Acquisitions Summary

4. Status

After rail repair, operations restarted in July 2005. Till December 2005, 22 sessions were acquired. Fig. 2 shows the total Yearly Acquisitions Summary.

In May 2004, even though the station was not operating, a major upgrade was performed on the system. The new Mark 5 Recorder was installed and 7 memory modules (8x200 GB each) were bought to be included in the IVS pool.

In 2004, in order to fix all the rail problems, a complete rail replacement was planned. In 2005, due to financial difficulties, it was instead decided to rebuild concrete under the existing rail only. After concrete rebuilding, an epoxy resin (Epojet LV MAPEI) was injected under each plate supporting the rail. Before and after these works, several measurement sets were performed to verify circularity and planarity of the rail and to monitor the rail movements. Particularly, the rail movements were measured while an antenna wheel was running on top of the measuring point as showed in Fig. 3. Fig. 4 shows the vertical movements measure of before and after the repair work. Detailed measurements (horizontal movements and measures made on different plates) are described in Ref.[2]. The conclusions are good; the main rail problem seems to be fixed. Only marginal movements were noted and they are due to non-perfect status of the rail itself. The

option to replace the rail with a new shape one is still valid.

Before restarting operations, other activities, including RFI measurements, were carried out in order to have a complete check-up of the system. Details are described in [3] and [4].

Figure 3. Rail measurement

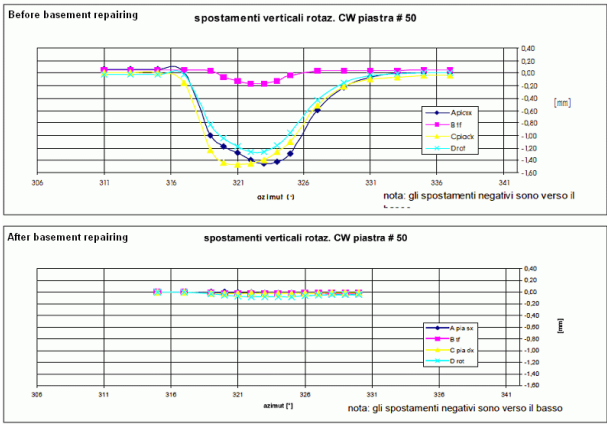

Figure 4. Rail measurement results

5. Outlook

Operations restarted, but the plan is to continue to work on the rail. The goal is to replace it with a new shape one and to replace the 4 azimuth wheels also.

References

[1] G.Colucci, D.Del Rosso, E.Lunalbi, M.Paradiso: "Matera VLBI Station Report on the Operational and Performance Evaluation Activities from January to December 2003", http://geodaf.mt.asi.it/html/surv_rep.html

[2] M. Mannarella "Relazione sulle misure effettuate sulla rotaia dell'antenna VLBI", Telespazio doc. OT-SPA-SM_REL_180010_1140_0222, 21/01/2004.

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[4] G. Colucci " Matera VLBI station. Report on the operational and performance evaluation activities from January to December 2005", Telespazio Doc. EO-DAP-MSC_TN_180010_1140_0865, 17/01/2006. http://geodaf.mt.asi.it/html/surv_rep.html