Matera CGS VLBI Station

Giuseppe Colucci, Domenico Del Rosso, Luciano Garramone

Abstract

This report describes the status of the Matera VLBI station[1], after the major hardware failure happened at the beginning of 2004. Also an overview of the station, some technical characteristics of the system and staff addresses will be 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 634 sessions up to December

2003. In 1996 the receiver was upgraded to standard wideband and at the end of 1999 a Mark IV formatter and decoder were installed by MIT Haystack.

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 colocation 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

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 summarised in Table 1.

The Matera time and frequency system is composed 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 9.6.9.

Table 1. Matera VLBI Antenna Technical Specifications

Input frequencies	S/X	2210 MHz to 2450 MHz / 8180 MHz to 8980 MHz
Noise temperature at dewar flange	S/X	<20 K
IF output frequencies	S/X	190 MHz to 430 MHz / 100 MHz to 900 MHz
IF Output Power with 300 K at the input 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@asi.it

Figure 2. Rail at one of the damaged points (concrete was manually removed)

4. Status

During 2004, the Matera Station did not acquire any data due to a major antenna failure. During periodical tests, an abnormal rail movement was noted and 2 out of 8 rail segments resulted not properly in-line. A temporary fix was attempted, but after few acquisition sessions, another dangerous problem was noted on a different rail segment. At this point, the rail tended to move radially because of some problem with the concrete (see Figure 2). Additional tests revealed that the rail was irregularly worn too, so it was decided to replace it with a totally new rail (of different shape). Figure 3 shows the present and new project rail shape.

5. Outlook

In summary, the following steps are planned in order to have a complete new rail system for the antenna:

- replacement of the 4 wheels to adapt them to the new rail shape
- replacement of the rail and of the concrete under it (using high quality grout)
- upgrade of the rail-concrete interface
- set up of a new concrete ring around the rail in order to have more stability.

Before and after all these steps, a detailed local survey on the antenna is also planned.

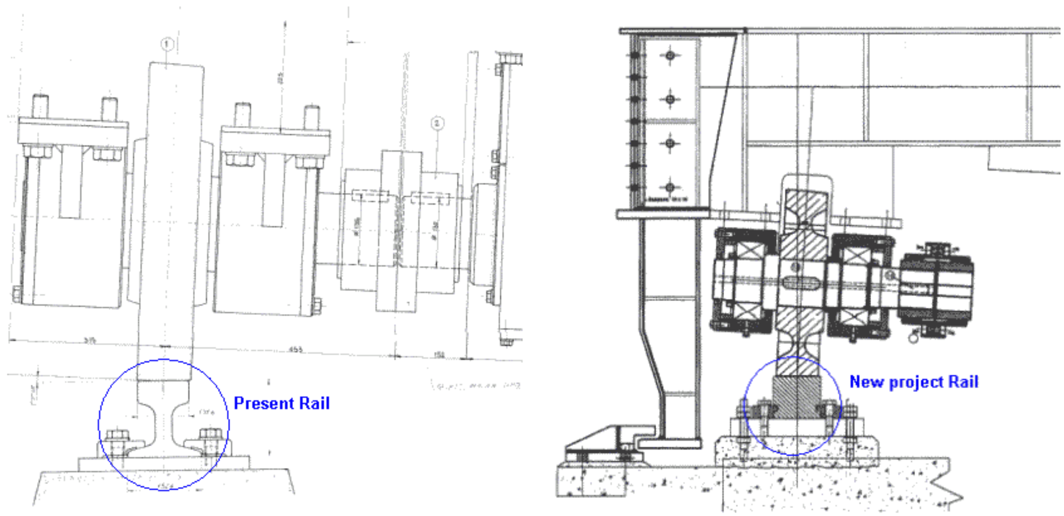

Figure 3. Present and new project rail shape (different scales)

Due to the extent of the works, they will not be finished before the end of 2005.

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", available soon at this address: http://geodaf.mt.asi.it/html/surv_rep.html