

# Matera CGS VLBI Station Report

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**Abstract** This report presents the status of the Matera VLBI station. An overview of the station, some technical characteristics of the system, and the addresses of the staff are also given.

## 1 General Information

The Matera VLBI Station is located at the Italian Space Agency's 'Centro di Geodesia Spaziale G. Colombo' (CGS) near Matera, a small town in the south of Italy. The CGS came into operation in 1983 when the Satellite Laser Ranging SAO-1 System was installed. Fully integrated into the worldwide network, SAO-1 was in continuous operation from 1983 up to 2000, providing high-precision ranging observations of several satellites. The new Matera Laser Ranging Observatory (MLRO), one of the most advanced Satellite and Lunar Laser Ranging facilities in the world, was installed in 2002, replacing the old SLR system. CGS also hosted 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 radio telescope. Since then, Matera has observed in 1,467 sessions up to December 2022.

In 1991, we started GPS activities by participating in the GIG 91 experiment and installing a permanent GPS Rogue receiver at Matera. In 1994, six TurboRogue SNR 8100 receivers were purchased

to create the Italian Space Agency GPS fiducial network (IGFN). At the moment, 15 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 Web server GeoDAF (<http://geodaf.mt.asi.it>). Six stations are included in the IGS network, while 12 stations are included in the EUREF network.

In 2000, we started activities with an Absolute Gravimeter (FG5 Micro-G Solutions). The gravimeter operates routinely at CGS and is available for external campaigns on request.

Thanks to the co-location of all precise positioning space-based techniques (VLBI, SLR, LLR, and GPS) and the Absolute Gravimeter, 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 to include remote sensing activities for present and future missions (ERS-1, ERS-2, X-SAR/SIR-C, SRTM, ENVISAT, and COSMO-SkyMed).

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

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

The Matera time and frequency system consists of the following frequency sources:

- Active H-maser standard
- Passive Maser disciplined by GNSS receiver
- GNSS receiver disciplined by Rubidium

1. Agenzia Spaziale Italiana (ASI)

2. e-geos - an ASI/Telespazio company



Fig. 1 VLBI antenna.

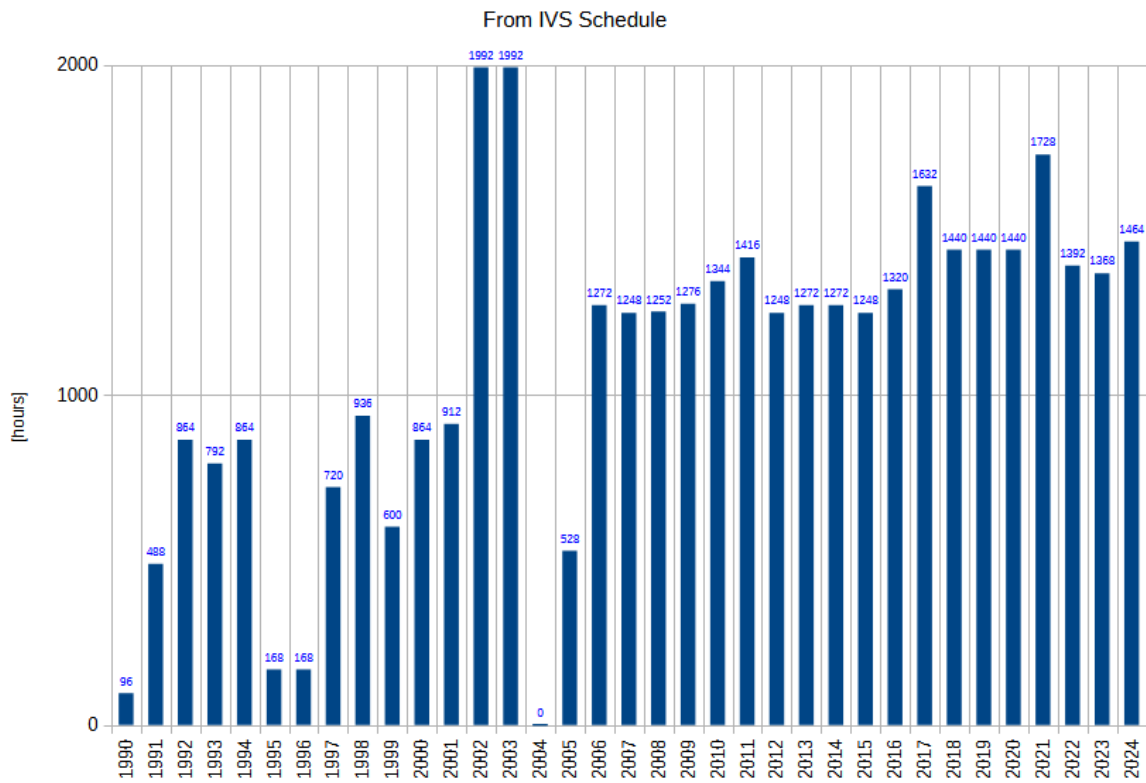


Fig. 2 Observation time.

**Table 1** Matera antenna technical specifications.

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

The Active iMaser 3000 H-maser from T4Science is used as a frequency source for VLBI.

The specifications for this new maser can be found here: <https://www.t4science.ch/products/imaser3000/>.

## 2 Activities During the Past Years

At the end of 2024, the elevation encoder was replaced by a modern one with the same 21-bit resolution. This follows and completes the azimuth encoder replacement that occurred in 2022.

Data files are now electronically transferred to the correlators using a 1-Gbps link available at the station.

In 2023, the new Matera VGOS antenna was installed on site. Currently, final acceptance tests are ongoing.

## 3 Current Status

Figure 2 shows a summary of total acquisitions per year, starting in 1990.

## 4 Future Plans

After final acceptance by the Italian Space Agency, the process of including the Matera VGOS antenna into IVS station networks will be started.

## References

1. 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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