

Goddard Geophysical and Astronomical Observatory

Chris Szwec, Katie Pazamickas

Abstract This report summarizes the technical parameters of the Very Long Baseline Interferometry (VLBI) systems at the Goddard Geophysical and Astronomical Observatory (GGAO) and provides an overview of the activities that occurred in 2017–2018, the outlook for 2019, and lists the outstanding tasks to improve the performance.

1 Location

The Goddard Geophysical and Astronomical Observatory (GGAO) consists of a 12-meter radio telescope for VGOS development, a 1-meter reference antenna for microwave holography development, an SLR site that includes MOBILAS-7, the SGSLR development system, a 48" telescope for developmental two-color Satellite Laser Ranging, a GPS timing and development lab, a DORIS system, meteorological sensors, and a hydrogen maser. The 5-meter radio telescope for VLBI is no longer in service. In addition, the site is a fiducial IGS site with several IGS/IGSX receivers.

GGAO is located on the east coast of the United States in Maryland. It is approximately 15 miles NNE of Washington, D.C. in Greenbelt, Maryland.

- Longitude 76.4935
- Latitude 39.0118
- MV3
- Code 299.0
- Goddard Space Flight Center (GSFC)

Peraton

GGAO Network Station

IVS 2017+2018 Biennial Report

- Greenbelt, Maryland 20771
- cddis.nasa.gov/ggao/

2 Technical Parameters

The 5-m radio telescope for VLBI at MV3 was originally built as a transportable station; however, it was moved to GGAO in 1991 and has been used as a fixed station. In the winter of 2002 the antenna was taken off its trailer and permanently installed at GGAO. This antenna has not been operable for the past several years and it is not operable at the present time.

In October of 2010, construction of the new 12-meter VGOS developmental antenna was completed. This antenna features all-electric drives and a Cassegrain feed system. Integration of the broadband receiver and the associated sub-systems is underway as a joint effort between Peraton and the MIT Haystack Observatory. The technical parameters of the 12-m radio telescope are summarized in Table 1.

3 Staff of the VLBI Facility at GGAO

GGAO is a NASA research and development and data collection facility. It is operated under the Space Communication Network Services (SCNS) contract by Peraton. The staff at GGAO consists mainly of two operators. The Peraton staff includes Katie Pazamickas and Jay Redmond conducting VLBI operations and maintenance at GGAO with the support of the sustaining engineering Peraton team.

Table 1 Technical parameters of the GGAO 12-m radio telescope.

Parameter	12-m Antenna
Owner and operating agency	NASA
Year of construction	2010
Diameter of main reflector	12m
Azimuth range	± 270 deg
Azimuth velocity	5 deg/sec
Azimuth acceleration	1.3 deg/sec/sec
Elevation range	5–88 deg
Elevation velocity	1.25 deg/sec
Elevation acceleration	1.3 deg/sec/sec
Focus	Cassegrain
Receive Frequency	2–14 GHz
Bandwidth	512 MHz, four bands
VLBI terminal type	VGOS
Recording media	Mark 6

4 Mission Support

Having ceased VLBI operations in May 2007, the MV3 5-m antenna is retired due to issues with the obsolete controller. The 12-m VGOS antenna has participated in many VLBI Global Observing System (VGOS) 24-hour experiments, including CONT17 and VGOS Trial observations on a regular, twice-a-month basis.

5 Recent Activities

Much of the 2017 and 2018 activities at GGAO have been focused on experiments using the VGOS 12-m antenna. However, there were some other activities worth noting:

- Conducted IVS observations using the Mark 6 recorders to demonstrate the VGOS capabilities on a regular, twice-a-month schedule
- Performed testing of the 16-Gbps VLBI recording capability, demonstrated using Mark 6
- Investigated movement of cables along the azimuth wrap to understand how and why it degrades cables
- Obtained cable delay measurements to use along with the observation data
- Participated in the CONT17 campaign
- Repaired both azimuth gearbox seals to prevent oil contamination and resolved the cold start problem
- Participated in mixed-mode test observations
- Supported developmental testing of video monitoring devices for the VLBI site at MGO in Texas.

6 Outlook

GGAO will continue to support VGOS, e-VLBI, and other developmental observations and activities during the upcoming year. Tentative plans for 2019 include:

- Conduct IVS observations using the Mark 6 recorders to demonstrate the VGOS capabilities on a regular, at least twice-a-month schedule
- Continue to investigate how and why the cables are degrading at the azimuth wrap
- Continue taking cable delay measurements for observation data correlation
- Support testing and implementation of MIT signal chain upgrade efforts at GGAO