

Goddard Geophysical and Astronomical Observatory

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Abstract This report summarizes the technical parameters of the Very Long Baseline Interferometry (VLBI) systems at the Goddard Geophysical and Astronomical Observatory (GGAO), provides an overview of the activities that occurred in 2019–2020, provides the outlook for 2021, and lists the outstanding tasks to improve 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 MOBLAS-7, the next generation Space Geodesy Satellite Laser Ranging (SGSLR) 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 61A

Peraton

GGAO Network Station

IVS 2019+2020 Biennial Report

- Goddard Space Flight Center (GSFC)
- Greenbelt, Maryland 20771
- <https://cddis.nasa.gov/ggao/>

2 Technical Parameters

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. The antenna has a VGOS broadband receiver and associated subsystems. The technical parameters of the 12-m radio telescope are summarized in Table 1.

Table 1 Technical parameters for GGAO.

Parameter	12-m Antenna
Owner and Operating agency	NASA
Year of construction	2010
Diameter of main reflector	12 m
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

3 Staff of the VLBI Facility at GGAO

GGAO is a NASA research and development and data collection facility. The VLBI facility at GGAO is operated under the Space Exploration Network Services and Evolution (SENSE) contract by Peraton. The Peraton staff includes Katie Pazamickas (Station Manager) and Jay Redmond (Station Engineer) conducting VLBI operations and maintenance at GGAO with the support of the sustaining engineering Peraton team.

- Participated in 13 VGOS Intensive sessions in 2020
- Participated in two mixed-mode sessions in 2020
- Obtained regular cable delay measurements to use along with the observation data
- Replaced primary azimuth gearbox with site spare after a failure
- Participated in mixed-mode test observations
- Supported developmental testing for the VLBI site at MGO
- Started e-transferring entire VGOS Intensive sessions to the correlator

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, VGOS Trial, and VGOS Intensive observations. The antenna currently observes VGOS-O observations on a regular twice a month basis.

5 Recent Activities

Much of the 2019 and 2020 activities at GGAO have been focused on experiments using the VGOS 12-m antenna. Other activities worth noting include:

- Conducted IVS observations using the Mark 6 recorders to demonstrate the VGOS capabilities on a regular twice a month schedule
- Participated in 46 VGOS-O sessions in 2019 and 2020

6 Outlook

GGAO will continue to support VGOS, e-VLBI, and other developmental observations and activities during the upcoming year. Tentative plans for 2021 include:

- Conduct IVS observations using the Mark 6 recorders to demonstrate the VGOS capabilities on a regular at least twice a month schedule. In mid-2021 GGAO will begin supporting weekly VGOS-O sessions
- Continue to investigate how and why the cables are degrading in the azimuth wrap
- Continue taking cable delay measurements for observation data correlation
- Support testing and implementation of MIT signal chain upgrade efforts at GGAO
- Upgrade the VLBI facility's network infrastructure as part of a larger site modernization effort
- Complete the replacement of the jackscrew, elevation gearbox, and brake assembly.