

Goddard Geophysical and Astronomical Observatory

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Abstract

This report summarizes the technical parameters and the technical staff of the VLBI system at the fundamental station GGAO. It also gives an overview about the VLBI activities during the previous year. The outlook lists the outstanding tasks to improve the performance of GGAO.

1. GGAO at Goddard

The Goddard Geophysical and Astronomical Observatory (GGAO) consists of a radio telescope for VLBI, SLR site to include MOBLAS-7, SLR-2000 (development system), a 48" telescope for developmental two color Satellite Ranging, a GPS timing and development lab, meteorological sensors and a H-maser. In addition, we are a fiducial IGS site with several IGS / IGSX receivers.

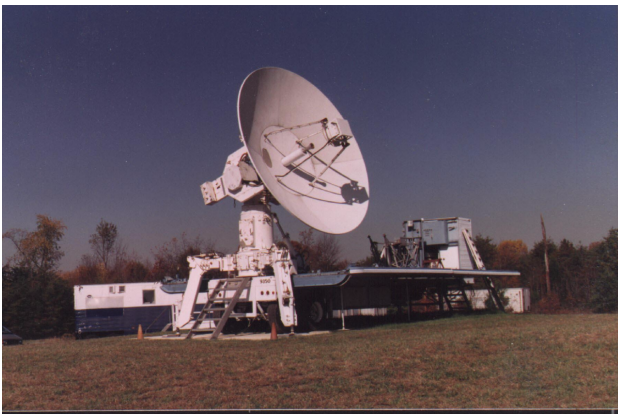


Figure 1. Old semi-permanent MV3 VLBI antenna.



Figure 2. New permanent MV3 antenna.

GGAO is located on the east coast of the United States in Maryland. It is about 15 miles NNE of Washington D.C. in Greenbelt, Maryland (Table 1).

2. Technical Parameters of the VLBI Antenna at GGAO

The radio telescope for VLBI at GGAO (MV3) was originally built as a mobile or transportable station. It was previously known as Orion and was part of the original CDP. It is now being used as a fixed site having been moved to Goddard and semi-permanently installed here since the spring of 1991 as shown in Figure 1. In the winter of 2002 the antenna was taken off its trailer and permanently installed at GGAO as shown in Figure 2. The design criteria were

- transportability on two tractor trailers utilizing a 5 meter dish size to maximize receive and mobility considerations,
- setup of the radio telescope within eight hours (although it has been used as a fixed site since the spring of 1991)

Table 1. Location and addresses of GGAO at Goddard.

Longitude	76.4935° W
Latitude	39.0118° N
MV3 Code 299.0 Goddard Space Flight Center, (GSFC) Greenbelt, Maryland 20771	
http://www.gsfc.nasa.gov	

The technical parameters of the radio telescope are summarized in Table 2.

Table 2. Technical parameters of the radio telescope of GGAO for geodetic VLBI.

Parameter	GGAO-VLBI
owner and operating agency	NASA
year of construction	1982
diameter of main reflector d	5m
azimuth range	0 ... 540°
azimuth velocity	3°/s
azimuth acceleration	1°/s ²
elevation range	0 ... 90°
elevation velocity	3°/s
elevation acceleration	1°/s ²
X-band	8.18 – 8.98 GHz
receiving feed	Cassegrain focus
T_{sys}	24 K
Bandwidth	800 MHz, -2dB
G/T	32.1 dB/K
S-band	2.21 – 2.45 GHz
receiving feed	primary focus
T_{sys}	19 K
Bandwidth	240 MHz, -2dB
G/T	21.2 dB/K
VLBI terminal type	Mark IV
recording media	thin-tape, Mark 5
Field System version	9.8.2

3. Technical Staff of the VLBI Facility at GGAO

The GGAO VLBI facility gains from the experiences of the staff from the Research and Development VLBI support staff. GGAO is a NASA R&D and data collection facility, operated under

contract by Honeywell Technology Solutions Incorporated (HTSI). Table 3 lists the GGAO station staff that are involved in VLBI operations.

Table 3. Staff working at the MV3 VLBI station at GGAO.

Name	Background	Dedication	Agency
Jay Redmond	engineering technician	100%	HTSI
Skip Gordon	engineering technician	20%	HTSI

4. Status of MV3 at GGAO

GGAO participated in several VLBI experiments which are listed in Table 4. In addition to the scheduled experiments listed in Table 4, MV3 has participated in several unscheduled experiments for VLBI developmental purposes and various other developmental activities.

Table 4. Participation of GGAO in VLBI Experiments from February 1, 2006 to December 5, 2006.

Date	Experiment
2006-02-01	RDV55
2006-02-07	T2043
2006-04-25	RDV59
2006-05-23	T2044
2006-06-27	T2045
2006-08-01	T2046
2006-10-28	T2047
2006-12-05	T2048

After 30 years of dedication and support of the VLBI program, Charles Kodak has decided to retire. GGAO and Honeywell wish him well and thank him for his years of service to the VLBI family.

5. Outlook

GGAO will continue to support both scheduled experiments and developmental activities. The plan for 2007 consists of:

1. Continue testing of pre-release versions of PC-FS and new Linux kernel releases.
2. Continue with support of Mark 5 and Digital Back End (DBE) hardware development.
3. Continually striving to improve the performance of the entire Mark 5 data collection and station specific equipment.
4. MV3 has installed Mark 5 and e-VLBI hardware and continues to test real-time VLBI from GGAO to Haystack. On January 26, 2007, MV-3 recorded two 480MHz bands that covered

all of the X-band IF, with two-bit sampling, for an aggregate data rate of $\sim 4\text{Gb/s}$. Two VSI data streams (each $\sim 2\text{Gb/s}$) were recorded on two Mark 5B's and the data were transferred to the Haystack correlator via high-speed internet connections. It was also demonstrated, by comparing to simultaneously recorded Mark IV data, that there appears to be no major sources of signal loss in the DBE system.

5. GGAO will continue to support the development and testing of VLBI2010 hardware and software.