

# Kokee Park Geophysical Observatory

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## Abstract

This report summarizes the technical parameters and the staff of the VLBI system at Kokee Park on the Island of Kauai.

## 1. KPGO

Kokee Park Geophysical Observatory (KPGO) is located on the Island of Kauai in Hawaii and is located in Kokee State Park, hence its name. It is located at an elevation of 1100 meters near the Waimea Canyon, which is often referred to as the Grand Canyon of the Pacific.

Kokee Park Geophysical Observatory first participated in VLBI operations as part of the GAPE experiments in 1984. At that time the station was part of NASA's STDN (Satellite Tracking Data Network). The 9-m system was modified by installing a focal point receiver, hydrogen maser, data acquisition terminal, tape drive and computer system. This was operational for the summer of 1984. The system was removed after the GAPE '84 experiments and reinstalled again for the summer of 1985. It was not until 1986 that we became a continuous participant in VLBI operations.

In October 1989 NASA phased out the STDN operation on Kauai and the station was transferred to the Crustal Dynamics Project at the Goddard Space Flight Center. The station started weekly operation for the U.S. Naval Observatory as part of the NAVNET network.

Early in 1992 construction of USNO's present 20-meter antenna was started. The foundation work was completed in August 1992 and the structure was started in September just as Hurricane Iniki struck on September 11, 1992. Installation was completed in 1993 and first light was in June 1993. Later in 1993 the use of the 9-meter system was discontinued.

Starting in July 2000 Kokee Park began daily (Monday through Friday) participation in the Intensive schedule for USNO.

S2 recorder system was installed in 2000. Mark IV system was installed during 2001.

In May of 2002 Mario Bérubé and Bill Petrachenko arrived on site for installation and testing of an S2 DAS. We have since that time supported the E3 series of experiments on a monthly basis.

In May of 2002 Kokee Park received a Mark 5 system that was first run in parallel with the tape drive during the daily Intensive sessions (three times a week). Correlation was first done at Haystack; after several weeks of comparison we then started to ship the disk to USNO. During CONT02 the Mark 5 was used in stand alone mode. Switching between Intensive sessions and other experiments then became much simplified.

During November 2002 a survey team was on station to verify our antenna footprint and to survey the new (replacement) Doris beacon antenna.

A new MET package (MET3) was installed in February 2003.

In mid 2004 we started having problems with our Azimuth Gear Reducers. One was removed and shipped back to the manufacturer for refurbishment (this was found to be too expensive) so an additional unit was procured. The new Gear Reducer was finally received and installed in time for CONT05.

A new F.S. Computer was installed in 2005.

In 2006, use of the tape recorder ceased and we now use the Mark 5 for all VLBI supports with the exception of the Australian S2 supports, which run on their own system using VHS tapes.

Canadian S2 support ended late in 2006 due to Canadian government budget cuts leading to the demise of their program. Also this year, PRARE support ended when the equipment became no longer supportable due to lack of spares. We will miss both of these projects and wish those we have met working on these programs the very best in the future.

Late in 2006, we had problems with our primary (Sigma Tau) maser and have been using our backup (NASA NR-1) maser as our primary while awaiting parts to be procured for the Sigma Tau repair.

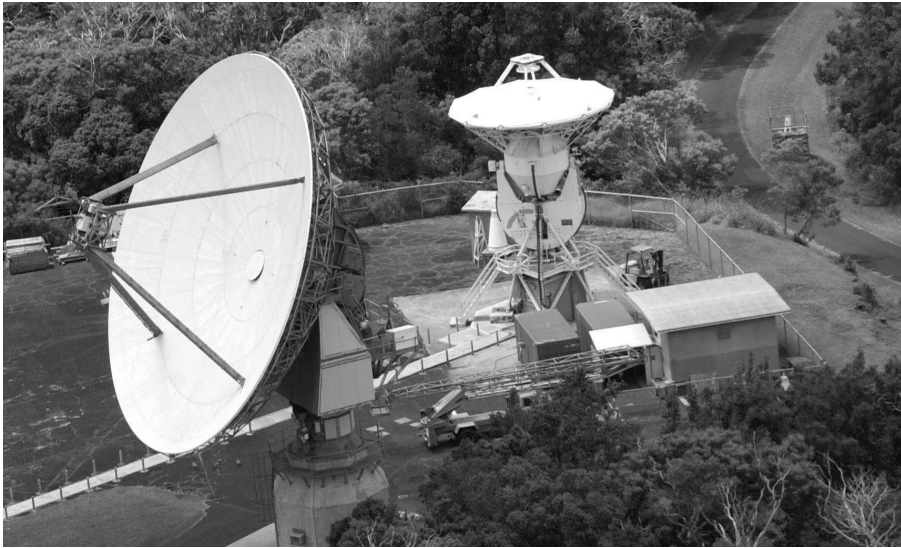


Figure 1. Kokee Park Geophysical Observatory 9m & 20m antennas.

Table 1. Location and Addresses of Kokee Park Geophysical Observatory.

Longitude	159.665° W
Latitude	22.126° N
Kokee Park Geophysical Observatory P.O. Box 538 Waimea, Hawaii 96796 USA	

## 2. Technical Parameters of the VLBI System at KPGO

The receiver is of NRAO (Green Bank) design (dual polarization feed using cooled 15 K HEMT amplifiers). The DAR rack and tape drive were supplied through Green Bank. The antenna is of the same design and manufacture as those used at Green Bank and Ny-Ålesund.

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

Timing and frequency is provided by a Sigma Tau Maser with a NASA NR Maser providing

backup. Monitoring of the station frequency standard performance is provided by a CNS (GPS) Receiver/Computer system. The Sigma Tau performance is also monitored via the IGS Network.

Table 2. Technical parameters of the radio telescope at KPGO.

Parameter	Kokee Park
owner and operating agency	USNO-NASA
year of construction	1993
radio telescope system	Az-El
receiving feed	primary focus
diameter of main reflector $d$	20m
focal length $f$	8.58m
$f/d$	0.43
surface contour of reflector	0.020inchesrms
azimuth range	0... 540°
azimuth velocity	2°/s
azimuth acceleration	1°/s <sup>2</sup>
elevation range	0... 90°
elevation velocity	2°/s
elevation acceleration	1°/s <sup>2</sup>
X-band (reference $\nu = 8.4GHz, \lambda = 0.0357m$ )	8.1 – 8.9 GHz
$T_{sys}$	40 K
$S_{SEFD}(CASA)$	900 Jy
$G/T$	45.05 dB/K
$\eta$	0.406
S-band (reference $\nu = 2.3GHz, \lambda = 0.1304m$ )	2.2 – 2.4 GHz
$T_{sys}$	40 K
$S_{SEFD}(CASA)$	665 Jy
$G/T$	35.15 dB/K
$\eta$	0.539
VLBI terminal type	VLBA/VLBA4-Mark 5
Field System version	9.7.6

### 3. Staff of the VLBI System at KPGO

The staff at Kokee Park during calendar year 2006 consisted of five people who are employed by Honeywell International under contract to NASA for the operations and maintenance of the Observatory. Staffing was reduced in 2006 due to budget reductions. VLBI operations was conducted by Matt Harms and Kelly Kim. Ben Domingo does antenna maintenance with Amorita Apilado providing admin, logistical and numerous other support functions.

#### 4. Status of KPGO

Kokee Park has participated in many VLBI experiments since 1984. We started observing with GAPE, continued with NEOS and CORE, and are now in IVS R4 and R1. We also participate in the RDV experiments.

We averaged 1.5 experiments per week during calendar year 2000 and increased to an average of 2 experiments of 24 hours each week with daily Intensive experiments during year 2002 and into 2006.

Kokee Park also hosts other geodetic measurement systems, including PRARE, a DORIS beacon, and a Turbo-Rogue GPS receiver. Kokee Park is an IGS station.

#### 5. Outlook

We are looking at real time e-VLBI testing in early 2007 to see if our “last mile” connectivity issue can be resolved.

2007 will also be a year of rebuilding for the crew of KPGO as long time site manager Clyde Cox retired. We will be filling the staff vacancy and look forward to adding to the history of operational competency this site has provided in past years.



Figure 2. Kokee Park also hosts other systems; DORIS Beacon, PRARE, and IGS (GPS).