

# Tsukuba 32-m VLBI Station

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## Abstract

This report summarizes the observation activities at the Tsukuba 32-m VLBI station by the Geographical Survey Institute (GSI) VLBI group. In 2004, the station had 36 international, 12 domestic and 60 intensive UT1 sessions. Some of these experiments, such as IVS-R&D and several UT1 sessions, were carried out using the disk-based K-5 sampling/recording system with internet data transfer. We plan to use this system for most of our sessions in 2005.

## 1. General Information

The Tsukuba 32-m VLBI station (TSUKUB32) is located at GSI in Tsukuba Science City, a core area of public and private scientific research institutes, about 50 km northeast of the capital Tokyo. GSI started VLBI experiments in 1981 with a 5-m mobile station and expanded its activities with a 3.8-m mobile station and the Kashima 26-m station.

Table 1. Location and address of Tsukuba 32-m VLBI station

Latitude (deg)	36.1031 N
Longitude (deg)	140.0887 E
Altitude	44.7 m
Address	Geographical Survey Institute(Kitasato 1 Tsukuba Ibaraki 305-0811 JAPAN)
Web	<a href="http://vlb.db.gsi.go.jp/sokuchi/vlbi/english/">http://vlb.db.gsi.go.jp/sokuchi/vlbi/english/</a>

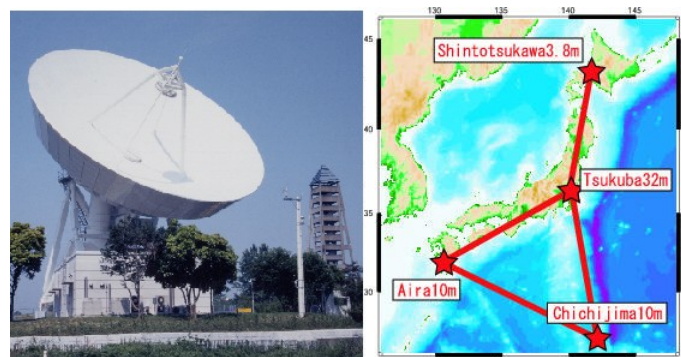


Figure 1. Tsukuba 32-m VLBI station and GARNET (GSI VLBI network)

TSUKUB32 began operation in 1998. With this as a turning point, GSI shifted its aim for the experiments from the existing mobile observations to fixed regular ones. TSUKUB32 has been operating as a main dish of GSI with three other permanent VLBI stations, AIRA, SINTOTU3 and CHICHI10, performing geodetic VLBI experiments on a regular basis in a variety of international,

domestic and other scientific experiments (Table 4). These four stations owned and run by GSI form a network named GARNET. The main purposes of GARNET are to define the framework of Japan and to monitor the plate motions for the advanced study of crustal deformations. For this reason the GARNET stations, centered on TSUKUB32, are placed to surround the Japanese mainland (Figure 1).

## 2. Component Description

The current configuration of TSUKUB32 is shown in Table 2. In 2004, we have made some improvements to our system. The Field System version we are currently using is FS-9.7.4. Field System has been installed in each of the three other GARNET stations for the first time, and now can carry out remote-controlled observations using Field System as well as TSUKUB32.

Table 2. Configuration of Tsukuba 32m antenna

Site 8-letter code	TSUKUB32	2-letter	Ts
IERS DOMES number	21730S007	CDP number	7345
X band SEFD (Jy)	320	S band SEFD (Jy)	360
X band Tsys (K)	50 (Zenith)	S band Tsys (K)	75 (Zenith)
Az slew 3.0 deg/sec	Range 10.0 - 710.0	El slew 3.0 deg/sec	Range 5.0 - 88.0
S-band w/BPF	2215-2369 MHz	X1-band	7780-8280 MHz
X2-band	8180-8680 MHz	X3-band	8580-8980 MHz

## 3. Staff

The regular operating staff of the GSI VLBI group are listed in Table 3.

Table 3. Staff working at GSI VLBI group

Name	Position	Jobs
Kazuhiro TAKASHIMA	Leader of VLBI group	Management
Morito MACHIDA	Analysis chief	Correlation, Operation
Masayoshi ISHIMOTO	Network chief	Network, e-VLBI, Operation
Junichi FUJISAKU	Operation chief	Experiments coordination, Operation
Shinobu KURIHARA	Operator	Analysis, Operation
Daisuke TANIMOTO	Visiting researcher	e-VLBI, Field System, Operation

In April 2004, three members left our group: Hiromichi Tsuji (Supervisor of VLBI group), Kozin Wada (Operation chief) and Takashi Tsutsumi (Collocation chief). Three new members joined our group: Satoshi Fujiwara (Supervisor of VLBI group), Junichi Fujisaku (Operation chief) and Daisuke Tanimoto (Visiting researcher).

Shigeru Matsuzaka is an IVS Directing Board member (Networks Representative). Yoshihiro Fukusaki is in charge of SYOWA experiment analysis, although he is not a regular staff member.

#### 4. Current Status and Activities

Table 4 lists all of the regular experiments that TSUKUB32 performed in 2004. The total number of experiments increased from 74 in 2003 to 108 this year. Details of this increase are as follows: 28 more UT1 experiments with the K4 or the K5 system, 5 more experiments with the Mark IV system and 1 more JADE experiment. As for the regular experiments listed in Table 4, we have added 34 experiments compared with last year. Most of them were UT1 experiments with K4 or K5 system. The number of other regular experiments with the Mark IV (VLBA) system has increased by 5 experiments compared with the past few years. In UT1, we had 60 intensive sessions with the TSUKUB32—WETTZELL baseline, performing not only on Saturday but also on Sunday starting in August 2004. The results of these sessions are shown in Figure 2. The UT1 Intensive sessions on the last Sunday of every month were performed with the K5 recording system (Figure 3). The Mark 5 data recorded at WETTZELL were transferred to the Tsukuba VLBI Correlator via internet and were converted to K5 data. In some of these sessions, we completed the data processing within 2 days after observations. We also carried out an extra UT1 session on 19th February. This session was for the Jet Propulsion Laboratory (JPL) to make a position prediction for the probe Opportunity for its landing on Mars.

Table 4. The regular experiments at Tsukuba 32-m VLBI station in 2004

Experiment	Code	Number
IVS-R	R1106,07,08,10,11,16,20,24,25,26,28,29,30,38,39,46,48,49,51,52,53,54	22
IVS-T	T2027,2028,2029,2034	4
IVS-R&D	RD0404,0405,0408	3
VLBA	RDV43,45,46,47,48	5
APSG	APSG14,15	2
JADE	JD0401-0412	12
UT1	K04010-K04354	60
Total		108

In international experiments, the K5 system was used also in the IVS-R&D sessions. In these sessions, the K5 data recorded at TSUKUB32 were transferred to MIT Haystack Observatory via a large-capacity network and were recorded on Mark 5 diskpacks after data conversion.

In domestic experiments, 3 of total 12 JADE sessions were carried out with parallel recording both on the K4 and the K5 system: JADE-0405, JADE-0408, and JADE-0410. In 2004 as in previous years, the JADE experiments, while being open to any VLBI stations with the K4 and/or the K5 recording system, had several participating stations from outside, including GIFU11 and VERAMZSW. All of the results are available on our website:

(<http://vlbldb.gsi.go.jp/sokuchi/vlbi/sess/index.html>)

We utilized “Super-SINET”, a very high-speed optical fiber network (2.4 Gbps) installed at TSUKUB32 in 2002, to perform a number of real-time VLBI observations. These included some of the JADE sessions for system accuracy verification that were recorded both on the K4 and K5 recording system at both TSUKUB32 and GIFU11, as well as a number of mass data transfers, including UT1 and IVS-R&D mentioned above.

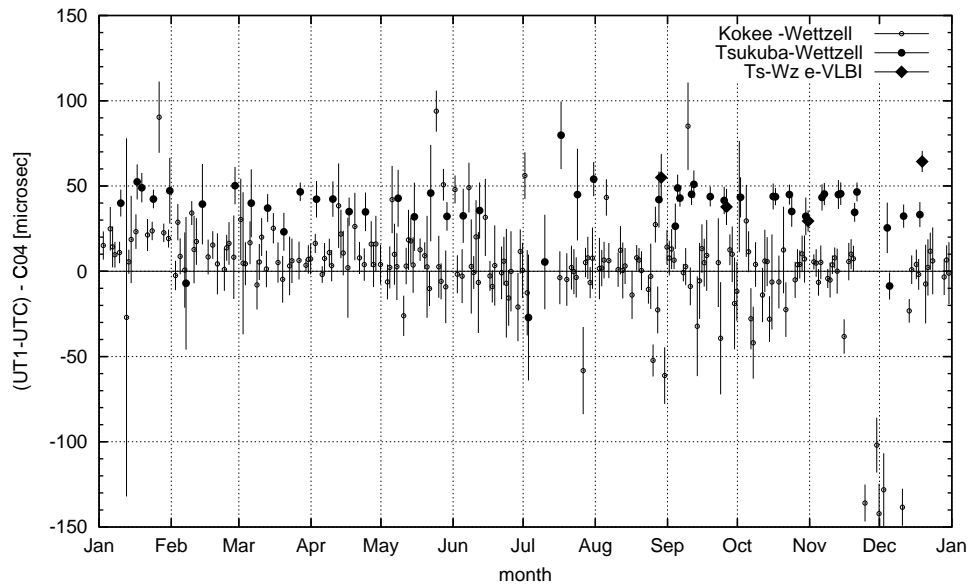


Figure 2. The results of UT1 sessions



Figure 3. K-5 sampling/recording system

## 5. Future Plans

In 2004, using the K5 recording system in some of our sessions, we developed the K5 control utilities with the Field System. In 2005, all of the domestic experiments and the UT1 sessions will be performed with the K5 system. As for the IVS series, we hope to use the K5 recording system with network data transfer in all of our assigned sessions. We are aiming to increase the number of our regular international sessions by reducing the cost of labor and data transfers in running the K4 system.

## References

- [1] Wada, K., S. Kurihara, K. Takashima: Tsukuba 32m VLBI station, in IVS 2003 Annual Report, edited by N. R. Vandenberg and K. D. Baver, NASA/TP-2004-212254, 2004.