

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 2005, the station performed a total of 138 domestic/international VLBI sessions including the CONT05 campaign. All of its observations except for the RDV sessions have been performed using the K5 system since mid-May of 2005 and all of international observation data were transferred via the high-capacity global internet.



Figure 1. Tsukuba 32-m VLBI station

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. TSUKUB32 began operation in 1998. This was a turning point, as GSI shifted its aim of 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 3). 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 around TSUKUB32, are placed to surround the Japanese mainland.

2. Component Description

The current configuration of TSUKUB32 is shown in Table 1. In 2005, we have made some improvements to our system. The current version of Field System we are using is FS-9.7.7. We

established a semi-automated observation system, based on the K5 system directly recording Linux files with the control utilities from FS9 and checking the raw observation data. This enabled a significant increase in the number of sessions. Additionally we added hot-ejectable Serial ATA disks so that observation data can be shipped to correlator during observation.

Table 1. 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

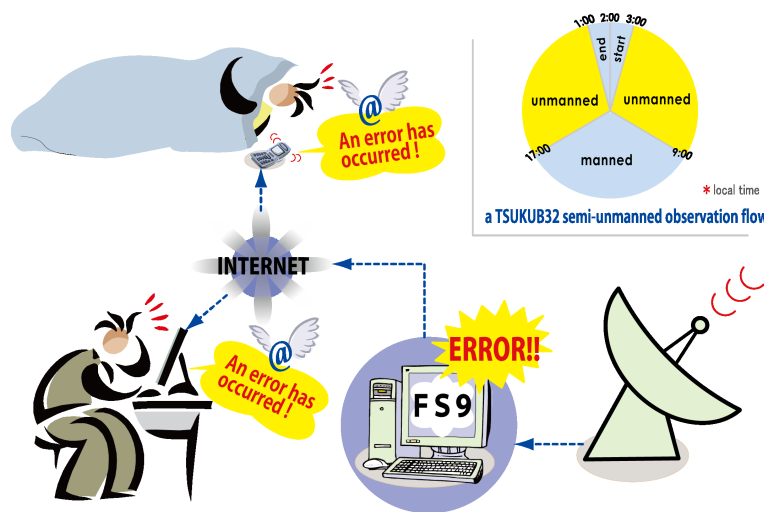


Figure 2. The semi-automated system at TSUKUB32

3. Staff

The regular operating staff of the GSI VLBI group are listed in Table 2.

In April 2005, Shinobu Kurihara (Operator) left our group and Kensuke Kokado joined. Shigeru Matsuzaka is a member of the IVS Directing Board (Networks Representative). Yoshihiro Fukuzaki is in charge of the analysis of SYOWA experiments, although he is not a regular member.

Table 2. Staff of the 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, K5, Operation
Junichi FUJISAKU	Operation chief	Experiments coordination, Operation
Kensuke KOKADO	Operator	Analysis, Operation
Daisuke TANIMOTO	Operator	e-VLBI, Field System

4. Current Status and Activities

Table 3 lists all of the regular sessions that TSUKUB32 has performed in 2005. The total number of sessions increased from 108 in 2004 to 138 this year. Details of this increase are as follows: 18 more UT1 sessions with the K4 or the K5 system, 3 more R-sessions and 15 more CONT05 sessions with the K5 system.

Table 3. The regular experiments at Tsukuba 32-m VLBI station in 2005

Experiment	Code	Number
IVS-R	R1158-R1201,	25
IVS-T	T2038,2039,2040,2042	4
CONT05	C0501-C0515	15
VLBA	RDV49,52	2
APSG	APSG16,17	2
JADE	JD0501-0512	12
UT1	K05002-K05352	78
Total		138

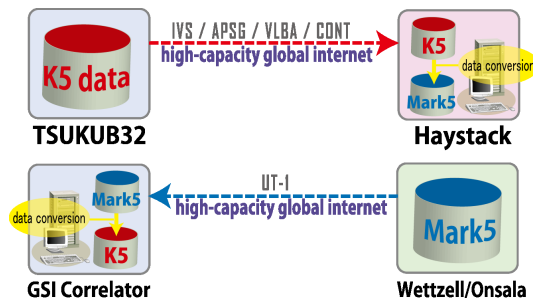


Figure 3. The data transfer in international observations

After trial operations TSUKUB32 went into full-scale operation with the K5 system. In September 2005, TSUKUB32 participated in its first CONT campaign. In CONT05, TSUKUB32 was

the only participant using the K5 system and was quite successful—98.9% data acquisition of all observations. Using Serial ATA disks, we transferred the previous session’s data during the next session via the high-capacity global internet and rapidly completed it within 18 days.

In Intensive series, we had 88 sessions with the TSUKUB32-WETTZELL baseline with the K4 or K5 system and 3 sessions with the TSUKUB32-ONSALA60 baseline with the K5 system. All Intensive sessions with the K5 system have used network data transfer since mid-May of 2005. The Mark 5 data recorded at WETTZELL or ONSALA60 were transferred to the Tsukuba VLBI correlator via internet and were converted to K5 data. The correlator submitted the weekend observation database on Monday. This short latency contributed to the success of the Deep Impact mission, providing the newest UT1 parameter.

All regular international sessions except RDV have been performed using K5 with network data transfer since mid-May. In these sessions, the K5 data recorded at TSUKUB32 were transferred to MIT Haystack Observatory via a large-capacity network and were recorded to Mark 5-diskpack through data conversion. The transfers were managed at Haystack.

All domestic sessions have been performed using K5 system since April. In 2005, as in the previous years, the JADE experiments, while being open to any VLBI stations with the K5 recording system, had several participating stations from outside, including GIFU11 and VERAMZSW. All of the results are available on our website:

<http://vlbdb.gsi.go.jp/sokuchi/vlbi/sess/index.html>.

The optical-connected real-time VLBI observations have been performed in cooperation with universities and research institutes in Japan including the Gifu University and the National Astronomical Observatory of Japan. The data are transferred via a dedicated high-speed optical fiber network (2.4 Gbps) called “Super-SINET”.



Figure 4. K5 sampling/recording system with hot-ejectable Serial ATA disks

5. Future Plans

In 2005, TSUKUB32 went to full-scale operation of the K5 system in mid-May, following a trial operation. In 2006, all of domestic/international sessions including all of the IVS sessions will be performed using the K5 system and network data transfer.

References

- [1] J. Fujisaku, S. Kurihara, K. Takashima: Tsukuba 32m VLBI station, IVS 2004 Annual Report, February 2004