

Geodetic VLBI Test Observations with K5 and Gigabit Systems

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Geodetic VLBI test observations were performed with K5 and Gigabit VLBI systems from January 31 to February 1, 2003 by using the Kashima 11-m and Koganei 11-m VLBI stations. Fringes were detected with both systems and the processing of observed data is in progress along with the software developments of the processing system. The observations were also performed with K4 VLBI system and the results will be compared to evaluate the performance of K5 and Gigabit VLBI systems.

K5 VLBI system is currently under development to realize real-time VLBI observation and correlation using commonly used shared network. The system is also capable to record sampled digital data in the internal hard disks for near real-time VLBI processing. These capabilities allow to transfer observed data in real-time if the connecting network is fast enough, or in near real-time if data buffering is required. The K5 observation system is consisted with four FreeBSD PC systems each with a newly developed data sampling board called IP-VLBI board. The system is capable of sampling 16 base-band signals at various sampling speeds and quantization bits up to 16 Msps (samples-per-second) and 8 bits-per-sample, respectively. The sampled data can be transferred to the network by using TCP/IP protocol or can be recorded to internal hard disks as ordinary data files. The current prototype unit has achieved data recording at the data rate of 128 Mbps. It is expected that the maximum speed will be increased along with the technical innovation of the PC industry because the K5 architecture is adopting standard PC peripheral devices. The K5 correlation system is also under development using FreeBSD PC systems. The correlation system is a software correlator which receives data from observation systems over the network and then performs cross correlation processing. Since easily re-writable software programs and general PC systems are used, the processing capacity and the function of the correlator can be easily expanded and upgraded.

On the other hand, Gigabit VLBI observation system consists of Gigabit data recorder unit and VSI (VLBI Standard Interface or Versatile Scientific Interface) A/D sampling unit. The A/D sampling unit, ADS1000, can sample wide base-band signal with the bandwidth of 512 MHz at the sampling rate of 1024 Msps either with 1 bit or 2 bits sampling levels. The Gigabit data recorder, GBR2000D, is the redesigned model of the former Gigabit data recorder, GBR1000. Both recorders can record digital data at the data rate of 1024 Mbps, but the GBR2000D is fully compliant with the base hardware specifications of VSI. The Gigabit VLBI correlator, GICO2, is also redesigned from former system, GICO, to clear compliance with the base hardware specifications of VSI. By using these systems, the entire data stream of the VLBI observations and processing became compliant with base hardware specifications of VSI for the first time.

Similar test observations with K5 VLBI system by using longer international baselines are currently under preparation and the plan is to demonstrate the capability of estimating Earth Orientation Parameters with unprecedented turnaround time for international geodetic VLBI observations. Software developments of the real-time data transfer and processing will also be continued to realize real-time VLBI observations with international baselines.