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Communications Research Laboratory  
National Astronomical Observatory  
Institute of Space and Aeronautical Science  
Nippon Telegraph and Telephone Corporation

**Real-time VLBI observation with the fastest data speed in the world  
- First real-time VLBI observation with the speed of 1Gbps -**

Communications Research Laboratory (CRL), National Astronomical Observatory (NAO), Institute of Space and Aeronautical Science (ISAS) and Nippon Telegraph and Telephone Corporation (NTT) have successfully achieved the first real-time VLBI (very long baseline interferometry) observation with the processing speed of 1Gbps in the world. The experiment has been carried out on June 23, 2001 by a group of researchers belong to the four organizations using two large antennas in Japan, the 64m radio antenna of ISAS Usuda Deep Space Center in Nagano prefecture and the 34m radio antenna of CRL Kashima Space Research Center in Ibaraki prefecture. By adopting the VLBI technology, a large virtual telescope can be constructed with multiple antennas. The synthesized virtual telescope has the same angular resolution of one very large telescope with the diameter which is equal to the distance between the remote antennas, in this case, 208km.

The very weak signals from the aimed radio sources in the space captured with Usuda 64m antenna were sampled at 1GHz and transmitted to Kashima Space Research Center in Ibaraki using NTT's ultra high-speed research network which has the speed up to 2.4Gbps. The data stream was then cross-correlated in real-time with the signals from the same radio sources received with Kashima 34m antenna. The real-time cross correlation at the speed of 1Gbps has been made possible with the new high-speed processing technology developed by CRL.

This success has also proved the effectiveness of the very high-speed communications technologies developed by NTT Laboratories in the advanced research fields. At the same time, this achievement has a great significance both for NAO and ISAS opening up a new vista in the field of VLBI radio astronomy by improving the detection sensitivity of the observation system. The detection of the very weak radio sources will also accelerate the study to construct space-time standard infrastructure in space, which is being conducted at CRL including the real-time and high time-resolution determination of the earth orientation parameters.

The four organizations will continue the experiment to evaluate the stability of the observation system as well as to actually conduct the real-time determination of the earth orientation parameters. The researchers plan to further improve the detection sensitivity of the real-time VLBI observation system by raising the transmission/processing speeds up to 2Gbps this year. Other research topics include the distributed cross-correlation using the networked computer systems and improving the connectivity of other antennas both in Japan and abroad to the current system.

- [Real-time VLBI Observation System](#)

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