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Status of the KSP VLBI Stations and IMT-2000 Interference

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Abstract

Two Keystone project (KSP) VLBI stations operated by the Communications Research Laboratory (CRL) have been closed, and the antennas and facilities have been moved to Hokkaido and Gifu Universities. VLBI observation at the Koganei station revealed radio interference at 2.14 GHz. The source of the interference was found to be IMT-2000 signal.

1. KSP/VLBI Closed

Since 1996, the Communications Research Laboratory has conducted the Keystone Project to monitor crustal deformation around the Tokyo metropolitan area using three space geodetic techniques, VLBI, SLR, and GPS. We made real-time VLBI observations every other day using a high-speed ATM network since June 1997. A remarkable crustal deformation caused by the volcanic activity on Miyake-jima Island was detected by the KSP-VLBI network in July 2000.

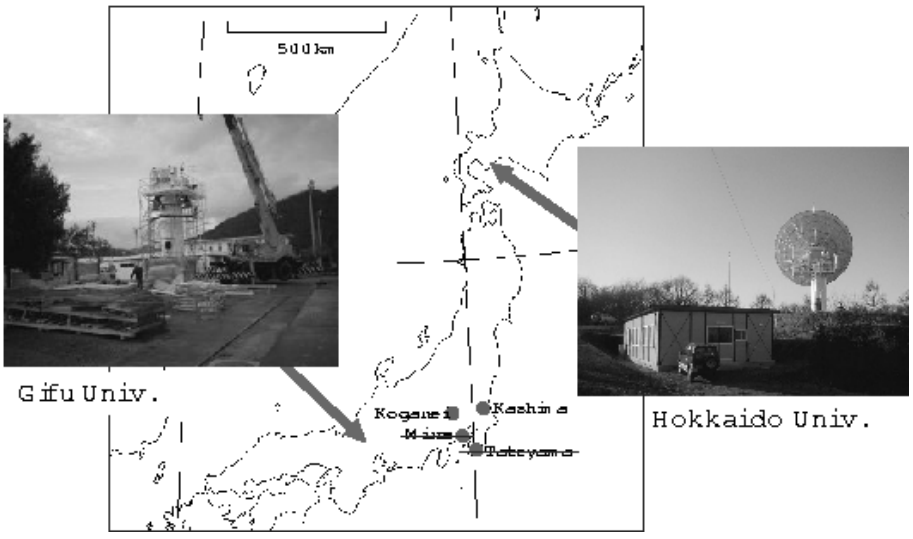

Figure 1. **Locations of the stations.**

Though CRL had planned to close the project by the end of 2000, we closed only the Miura station as scheduled, and continued routine VLBI observation using the Koganei, Kashima and Tateyama stations until the end of November 2001 to monitor crustal deformation after the event.

After closing stations, 11 m antennas and VLBI facilities used in the Miura and Tateyama stations were moved to Hokkaido University and Gifu University respectively and will be used for astronomical observations (Figure 1). The Koganei and Kashima stations are continuously maintained by CRL and used for R & D experiments.

2. IMT-2000 interference

Recently, VLBI observation at the KSP Koganei station experienced quite heavy radio interference in the S-band. Figures 2 (a) and (b) show the spectra of the RF and IF signals received at the Koganei station. We can see heavy interference at 2.14 GHz. The RF low noise amplifier (LNA)

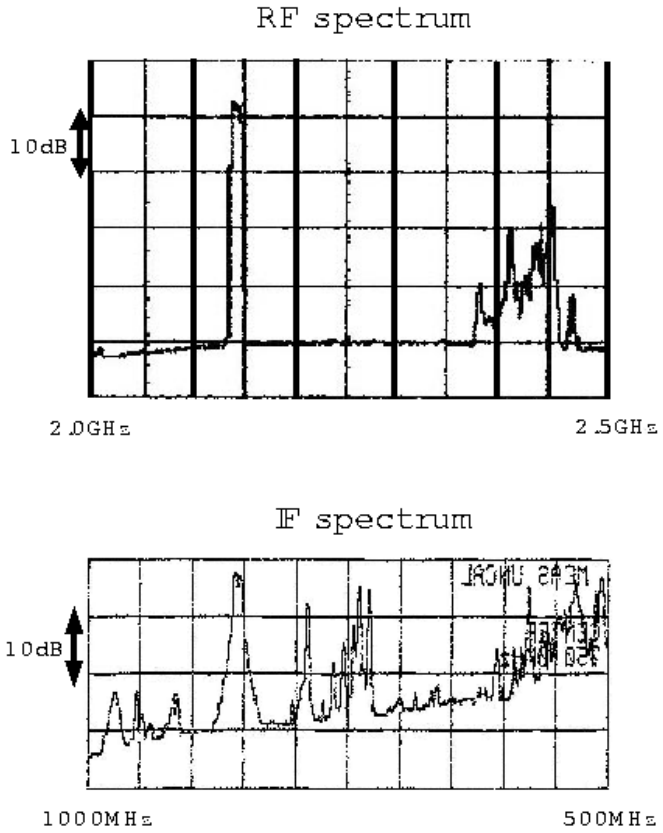

Figure 2. **(a) Spectrum of RF signals obtained when the antenna was directed toward the zenith at a maximum hold integration of 30 minutes. (b) Spectrum of IF signals obtained using maximum hold integration during 24 hours of VLBI observation.**

was not saturated, while the IF amplifier was saturated and the noise floor level of the amplifier was suppressed. We were forced to change the frequency arrangement to avoid this interference. Though a filter is needed after the LNA to avoid IF saturation, we have not yet found a suitable one.

We investigated the source of the interference and found that it was a signal that came from

Table 1. Specifications of IMT-2000 station near KSP Koganei station

Frequency	2137.6 - 2147.4 MHz (50 bands with 200 kHz spacing)
Modulation	G7W
Transmit power	16 W max
Antenna gain	21 dB
Antenna height	57.8 m

the antenna of a telecommunication company, 900 m from the Koganei station. On July 2, 2001, the company started transmitting IMT-2000 test signals, and since then the interfering signal has jammed our observation signal. The specifications of the transmission station are listed in Table 1. The incident power flux of the signal at our antenna is estimated to be very high. It is expected the IMT-2000 network will be extended to every major city in Japan before April 2002. Since other countries will face a similar situation, VLBI stations in many countries will likely be jammed by IMT-2000 signals and be forced to take measures to deal with the interference. We need to investigate the frequency band suitable for geodetic VLBI.

References

[1] IMT-2000: The global-standard for third generation wireless communications (http://www.imt-2000.org/portal/index.asp).