§2. Millimeter-Wave Remote Experiment System Using Super-SINET

Mase, A., Kogi, Y., Uchida, K. (KASTEC, Kyushu Univ.)
Nagayama, Y., Kawahata, K.

In the end of FY 2002, the remote experiment system using super science information network (super-SINET) has been introduced to electron cyclotron emission imaging (ECEI) and ultra-short pulse reflectometry (USRM) systems installed in LHD as collaborating research programs. Bandwidth of the main backbone and branch line is 10 Gbps and 1 Gbps, respectively. We can now participate in the LHD experiment via remote control system and transfer the experimental data for online data processing from NIFS to Kyushu. In this paper, the present state of the system is reported.

In FY 2004, we have concentrated in the fabrication of the USRM remote experiment system. The schematic of the USRM system is shown in Fig. 1. The output of an impulse generator is fed to a 30 cm WRD-750 waveguide to obtain a chirped pulse with frequency range of 7-20 GHz. The chirped pulse is fed to an active doubler after passing through a 15 m low-loss coaxial cable in order to double the frequency range into 26-40 GHz, and amplified by a power amplifier. The transmitter and receiver are identical conical horn antennas with collimating lens. The reflected wave is amplified by low noise amplifiers to compensate the transmission loss of another coaxial cable. The signal is then digitized by a sampling scope with equivalent sampling frequency of 250 GHz.

The remote experiment system is as follows. The control client can operate the control server by using the super-SINET. The general-purpose interface bus (GPIB) card is installed in the control server. The remote console, which has graphical user interface (GUI) is prepared to control the instruments of the USRM via GPIB. The operations such as adjustment of supply voltage fed to amplifiers and the doubler, timing control of the impulse, data acquisition and monitoring can be performed from the remote site (Kyushu University). The monitor can display the current view of sampling scope for various times and their analyzed data such as the frequency spectra as well as the machine parameters as shown in Fig. 2.

In FY 2004, the position control of the transmitter and receiver horn antennas has been installed as shown in Fig. 3. The angle between the two antennas can be adjusted depending on the various plasma conditions even between the plasma shot.

By using this system, the reflected signal from the cutoff layer has been obtained, and the electron density profiles have been reconstructed using the signal record analysis.

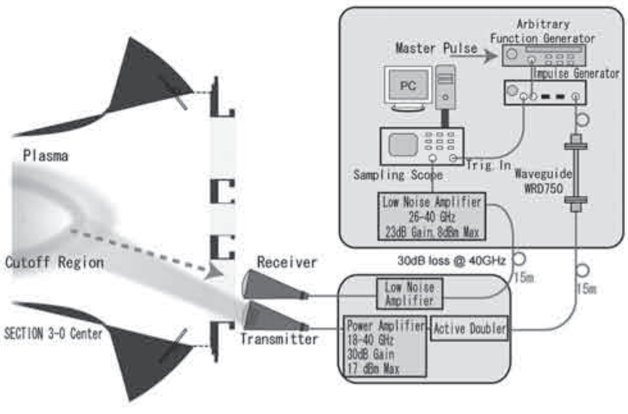

Fig. 1 Schematic of the USRM system.

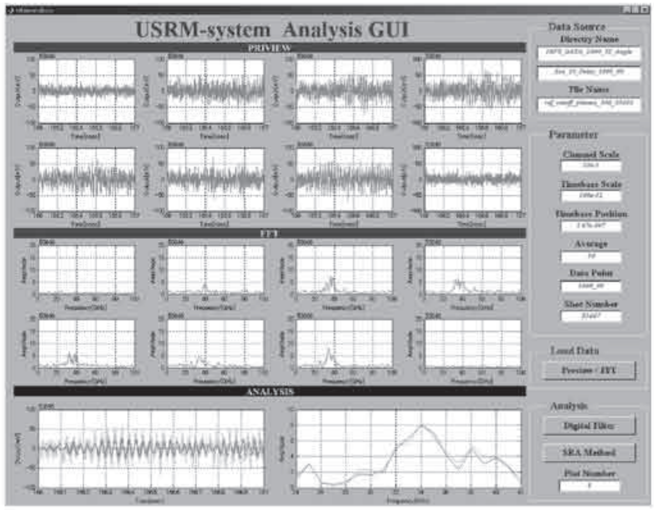

Fig. 2 Graphical user interface (MATLAB-GUI).

Fig. 3 Remote control system of the USRM antennas.