§6. Remote Participation for Plasma Experiments on the Mini-RT Device by Use of SuperSINET System

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The internal coil device Mini-RT has been developed and constructed in the collaboration with the University of Tokyo, National Institute for Fusion Science and Kyushu University. The Bi-2223 High-Temperature Superconducting (HTS) wire is employed for the internal coil, and the device is operated in a persistent current mode. The levitation of the HTS coil is a first time in the world.

SuperSINET system is connecting between the University of Tokyo and NIFS for remote experiments. Remote system is shown in Fig. 1.

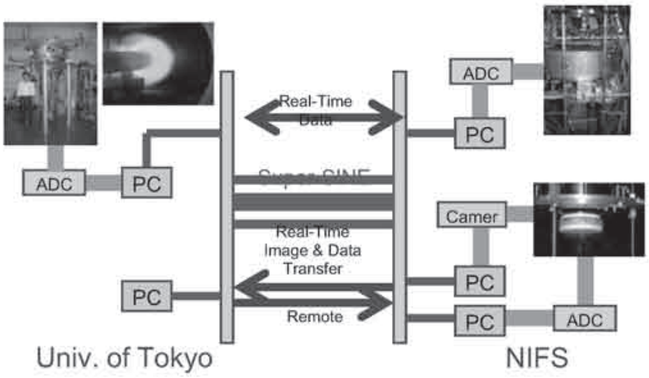

Fig. 1 Remote experimental system with the SuperSINET between the University of Tokyo and NIFS.

We have several R&D equipments in NIFS; e.g., cryogenic chamber for testing HTS wire, levitation system for HTS miniature coil and so on. While, in the University of Tokyo the Mini-RT device is operating for plasma experiments. The cooling and excitation of the Mini-RT HTS coil is not so reliable, because several new techniques are introduced. Sometimes we need further development of these components in collaborating the University of Tokyo and NIFS. Almost all of the data for cooling and excitation are transferred to the NIFS in the real-time by use of SupeSINET system, and the condition of the HTS coil can be monitored at the NIFS laboratory room.

The internal coil in the Mini-RT device should be levitated during a long time for plasma experiments. Preliminary experiments have been carried out in the NIFS with a small device called FB-RT. The miniature of the HTS coil is cooled with liquid nitrogen. The levitation experiment has been demonstrated in the atmosphere. The feedback control of the floating coil has been studied through the University of Tokyo by use of the SuperSINET system.

Figure 2 shows the photograph of the internal coil which is floating in the vacuum vessel of the Mini-RT device. Figure 3 shows the time history of the coil position during the coil levitation. We have succeeded to levitate the HTS coil during one hour with an accuracy of a few tens micrometers.

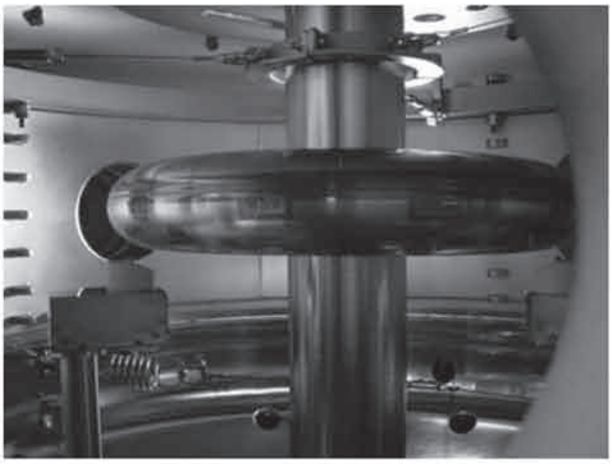

Fig. 2 Photograph of the floating HTS coil at the Mini-RT device.

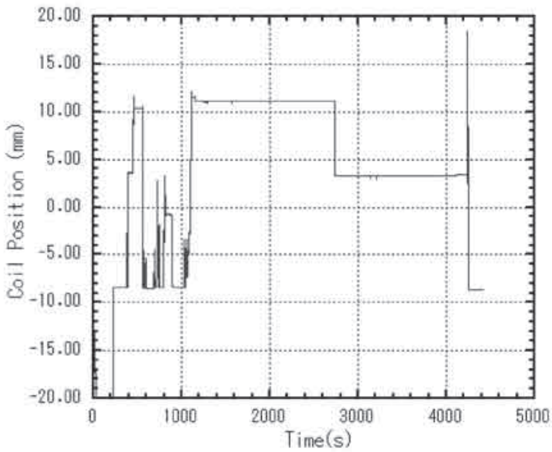

Fig. 3 Time history of the floating coil position.

Plasma experiments with the floating HTS coil has been carried out. Figure 4 shows the photograph of the plasma. The internal coil is pulled up with the levitation coil located at the upper region of the vacuum vessel. The magnetic surface is a combination of the HTS and levitation coils. That is a reason why the plasma cross section in Fig. 4 is deformed.

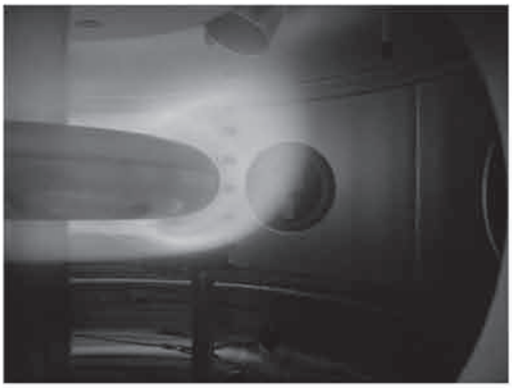

Fig. 4 Photograph of the plasma with the levitated HTS coil.