§18. Electron Density and Temperature Profiles of ICRF Heated Plasma

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Electron temperature and density profiles have been measured in the CHS ICRF heating experiments by a single channel ruby-laser Thomson scattering. Time evolutions of the temperature and density are also measured at the plasma center. For the ICRF experiments, new four P- port and one U-port antennas have been installed on CHS. The measurements have been made at B=1.7 T and R_{ax}=92.1 cm.

The electron temperature and density profiles are shown in Fig.1. The legend shows the used antenna and total radiated power. In the experiments in which P-port antennas are used, two profiles have been measured under the almost same experimental conditions but different experimental run, verifying good reproducibility of plasmas. Hollow density profile is found in the experiments with P-port antennas, while somewhat flattened ones are observed in U-port antenna cases. The temperature profiles are peaked in both cases, however, the profile is more fat in the case with U-port antenna.

Fig.2 shows the temporal evolution of the electron temperature and density at the plasma center for the 300 kW P-port antenna experiments. The ICRF is applied from 62 to 110 msec. The density is kept constant to the end of ICRF heating while the temperature cannot be sustained. The temporal behavior of the temperature is consistent with that of stored energy. The cooling is considered to be caused mainly by the increased radiation loss due to impurity influx.

In order to sustain high temperature, high density ICRF heated plasmas, suppressing impurity release is necessary. We are planning to apply boronization [1] to the vacuum vessel wall and ICRF antennas. The increase in the plasma temperature and stored energy is expected as well as prolonged discharge duration.

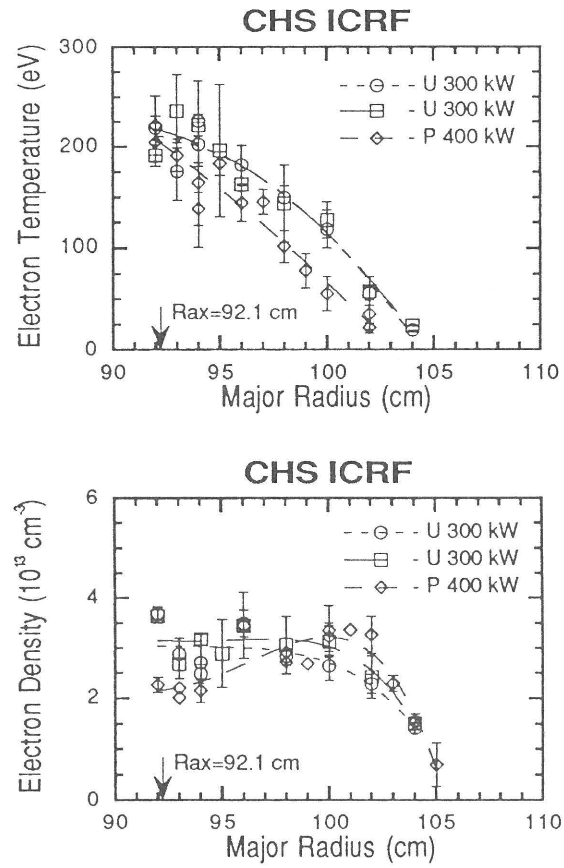

Fig.1. Electron temperature and density profiles of the ICRF heated plasmas in CHS.

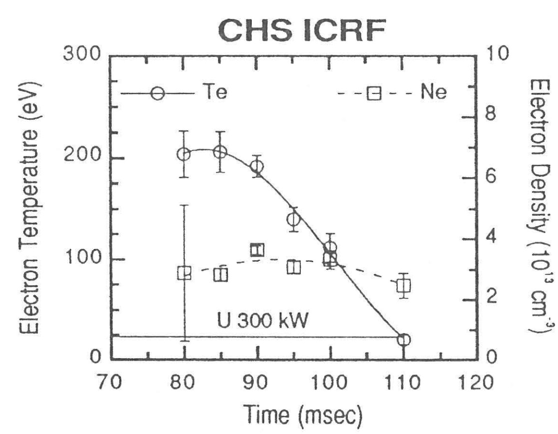

Fig.2. Temporal evolutions of temperature and density at the plasma center.

Reference

1) Yamada, H., *et al.*, J. Jpn. Appl. Phys., to be published.