# §8. Installation of a Target Plate for ECRH-power Evaluation

Takahashi, H., Shimozuma, T., Kubo, S., Yoshimura, Y., Igami, H., Nishiura, M., Mutoh, T., ECRH Group

In the LHD, the injected-ECRH power more than 3 MW has been realized due to the installation of the multi-megawatt gyrotrons. Although the plasma-deposition power of the EC beam of the first-O and the second-X mode has been evaluated as ~80%[1)], the deposition power is considered to decrease in lower-density experiments. The temperature rise of the cryogenic-pumping panel has been observed in the ECRH experiments with low density and/or long-pulse duration implying the existence of non-absorption RF in the resonance layer. Moreover there might exist shine-through power of EC-beam due to the shallow-incident angle on the resonance layer, especially in the case of beam injection from the vertical port. The importance of such problem has grown recently because the injected-ECRH power per transmission line has increased. Motivated by mentioned above, a beam absorber against the ECRH antenna has been installed in order to evaluate the single-path-absorption and/or the shine thorough power.

Figure 1 shows the schematic view of the system. The target plate has set at the 9.5L section of the LHD in order to receive the EC beam from the antenna at the 9.5U port and is 2.5 m underside from the equatorial plane. The target plate is made of isotropic graphite and is disc-shaped with the diameter of 280 mm and the thickness of 15 mm. The temperature rise of the plate is measured using an IR camera (thermo tracer TS9230, NEC/Avio). The camera is set inside the magnetic-shielding box made of PB permalloy. The IR signal from the plate was measured via the Al mirror and the vacuum window of $BaF_2$.

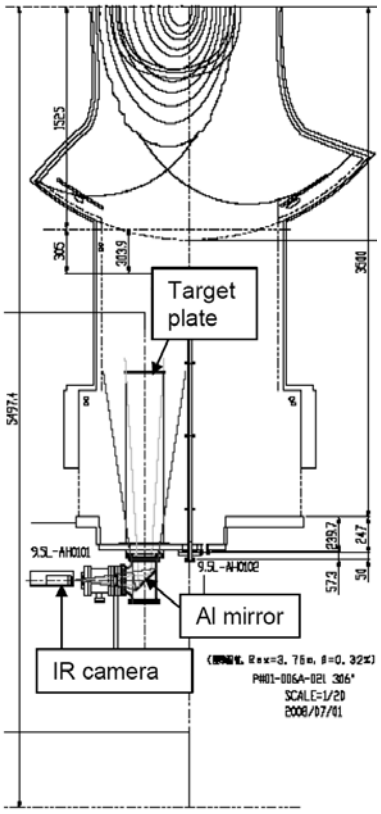


Fig. 1. The schematic view of the ECH target system.

Figure 2 shows (a) the profile of the beam waist calculated from the beam-propagation simulation and (b) the experimentally-measured-IR profile on the plate. The experiment was carried out without plasma under the configuration of $R_{ax}$ = 3.6 m/ $B_t$ = -0.95 T. The EC beam with the port-through power of 1 MW was focused on the center of the plate at $R$ = 3.59 m, $t$ = 0 m, $Z$ = -2.5 m. As can be seen from fig. 2, the ellipsoidal profile of the temperature rise corresponded to the beam-power profile and was consistent with the calculation even there was a slight displacement of the beam center in the outer and the counter-clockwise direction ($\Delta R$ = +43 mm, $\Delta t$ = +12 mm).

The quantitative evaluation of the ECRH power received on the plate and the experiments in the higher-magnetic-field conditions are the future works.

1) Takahashi, H. et al.: Fusion Sci. Technol. **57** (2010) 19.

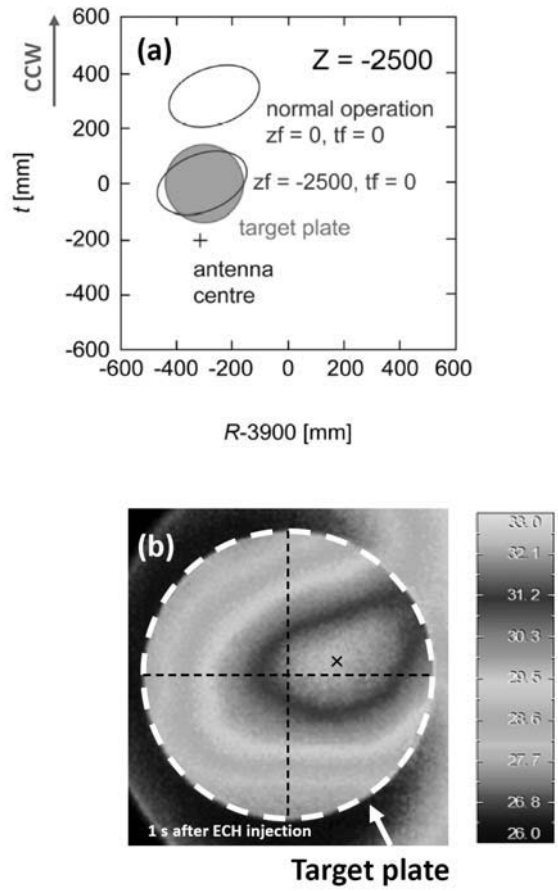


Fig. 2. (a) The profile of the beam waist calculated from the beam-propagation simulation and (b) the experimentally-measured-IR profile on the plate.