

## §12. Edge Plasma Behavior During Auxiliary Heating

Komori, A., Morisaki, T.

The temporal evolution of radial profiles of the electron density  $n_e$  and its fluctuations  $\tilde{n}_e$  during NBI plus ICRF heating has been measured in the CHS edge plasma with a thermal neutral lithium beam probe.

The plasma was initially produced by ECRH using the second harmonic resonance with  $B_t$  of 1.4 T and a magnetic axis position  $R_{ax}$  of 91.1 cm in the vacuum. The microwave power was 150 kW at 53.2 GHz. The line-averaged electron density  $\bar{n}_e$  was obtained to be  $(5 - 6) \times 10^{13} \text{ cm}^{-3}$  by the tangential NBI with 1 MW at 40 keV. The ICRF with 150 – 500 kW at 22 MHz was applied to the NBI sustained plasma.

Figure 1 shows  $n_e$  in the edge plasma, measured with the beam probe, together with  $\bar{n}_e$ ,  $W_{\text{dia}}$  and the time sequence of the ICRF, NBI and gas puffing. It is clear that  $n_e$  after turning on the ICRF oscillates with a very low frequency [Fig. 2(a)] till  $\sim 92$  msec, and then, its fluctuation amplitude is reduced. This very-low frequency oscillation is always observed just after turning on the ICRF, and usually continues for one or two periods. A decrease in  $\tilde{n}_e/n_e$  near the last closed flux surface (LCFS,  $\xi = 0$  cm) is also found during the NBI plus ICRF heating after the very-low frequency oscillation is stabilized, accompanied by the steepening of density gradient and a little inward shift of the plasma boundary, as shown in Fig. 2(b). An important point is that the density gradient near the LCFS ( $\xi < 0.7$  cm) becomes steeper and the density decreases in the region of  $\xi > 0.7$  cm even if the ICRF is switched off. The density fluctuation level  $\tilde{n}_e/n_e$  is also found to be kept low near the LCFS [Fig. 2(c)]. On the basis of these experimental results, it is concluded that the vague edge plasma can be removed by applying the ICRF to the NBI sustained plasma, and that, once the vague edge plasma is removed, it cannot be produced

again even if the ICRF is turned off.

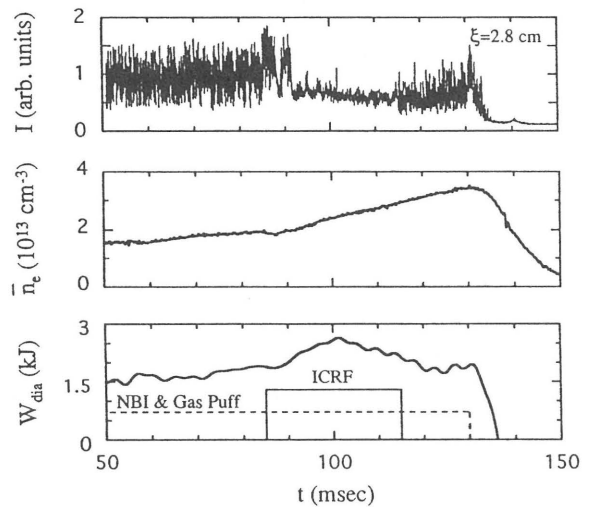


Fig. 1. A beam probe signal, together with  $\bar{n}_e$ ,  $W_{\text{dia}}$  and the time sequence.

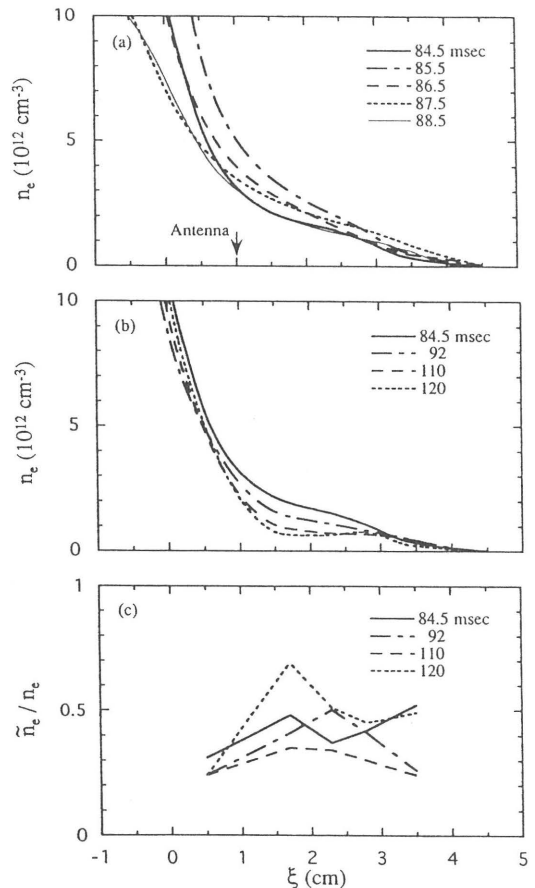


Fig. 2. Radial profiles of (a) and (b)  $n_e$  and (c)  $\tilde{n}_e/n_e$ . (a) shows the edge plasma behavior just after the ICRF is turned on, when there is a very low frequency oscillation. (b) represents the behavior after the very-low frequency oscillation is stabilized.