§3. Degradation of Core T_e Due to m/n = 2/1 Mode in High T_e Plasmas

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In the 18th experimental campaign of the LHD, degradation of core T_e due to the m/n = 2/1 mode was found in the relatively low n_e plasmas (< 2x10^{19} m^{-3}) produced using high power ECRH.

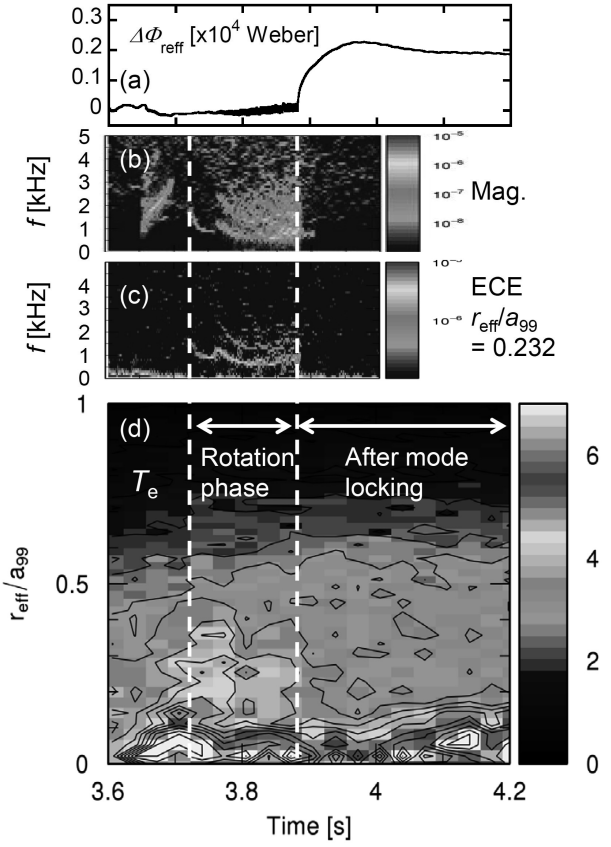

Figure 1. The typical time evolution of (a) the differential signal of the magnetic flux $\Delta\Phi_{reff}$, (b) the spectrum of the magnetic probe signal, (c) the spectrum of the ECE signal, and (d) the radial profile of T_e. The plasma was sustained using ~5 MW ECRH alone and the line-averaged n_e was ~1x10^{19} m^{-3}.

Figure 1 shows the typical time evolution of (a) the differential signal of the magnetic flux $\Delta\Phi_{reff}$ measured using the saddle flux loops, (b) the spectrum of the magnetic probe signal, (c) the spectrum of the ECE signal, and (d) the radial profile of T_e. The plasma was sustained using ~5 MW ECRH alone and the line-averaged n_e was ~1x10^{19} m^{-3}. Here $\Delta\Phi_{reff}$ corresponds to the magnitude of the magnetic fluctuation of m/n = 2/1. The rotation of the m/n = 2/1 mode with several 100 Hz ~ 3 kHz was observed during t = 3.72 ~ 3.88 s. Also the coherent fluctuation around 1 kHz existed in the ECE signal. The local flat structure in the T_e profile grew in the rotation phase of m/n = 2/1 mode. Although the local flat structure in the T_e profile steadily existed after the mode locking at t = 3.88 s, the central T_e gradually increased with spontaneous increase of the T_e gradient in the latter phase of the discharge.

Figure 2 shows the radial profile of the cross coherence between the magnetic probe signal and the ECE signal during 3.8 ~ 3.88 s. The cross coherence was particularly large in r_{eff}/a_{99} < 0.5 and the region corresponded to the position of the local flat structure in the T_e profile. Thus the magnetic fluctuation of m/n = 2/1 is considered to cause the local flattening in the T_e profile in the plasma core region, leading to the degradation of the central T_e.

In order to obtain the higher T_e plasmas, the clarification of the detailed mechanism and the criterion of the increase of the magnetic fluctuation of m/n = 2/1 are important and will be investigated in the near future.

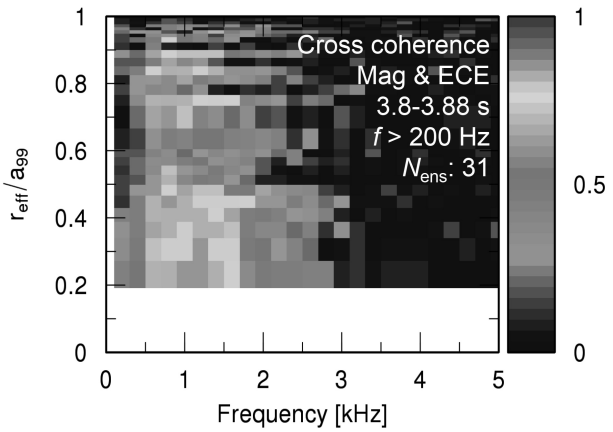

Figure 2. The radial profile of the cross coherence between the magnetic probe signal and the ECE signal during 3.8~3.88 s.