§2. Toroidally Non-uniform Formation of Edge-Transport-Barrier by Low-to-High Confinement Transition on the Compact Helical System

Takeuchi, M., Toi, K., Akiyama, T., Isobe, M., Minami, T., Nagaoka, K., Nishimura, S., Suzuki, C., Takahashi, C., Yoshimura, Y., Matsuoka, K., Okamura, S.

In the Compact Helical System, the radial structure of the edge transport barrier (ETB) and the characteristics of electrostatic fluctuations were measured for the first time at three toroidally separated locations (upper side of the vertically elongated section: U-location, and outboard: O-location and inboard sides: I-location in horizontally elongated section) by using triple Langmuir probes. The arrangements of three LPs are shown in Fig. 1. Electron density (n_e) near the plasma edge increased noticeably across the low-to-high confinement (L-H) transition without clear electron temperature rise. The formed ETB is rapidly shifted outward due to the increase in the plasma beta value just after the transition in the horizontally elongated section, and expanded vertically in the vertically elongated section as shown in Fig. 2. Radial profiles of n_e and radial electric field at the inboard of the torus evolved to a peculiar shape across the transition, being suggested the presence of a sizable magnetic island at the rational surface of $\iota / 2\pi = 1$ ($\iota / 2\pi$: rotational transform). Turbulent particle flux derived experimentally was clearly reduced at the upper and outboard-locations just after the transition, but enhanced at the inboard location as shown in Fig. 3. Total turbulent flux passing through a whole LCFS is inferred to be reduced, because the line averaged density does increase with reduced particle recycling. This interpretation may be supported by taking account the size of each surface area that has decreased or enhanced particle flux.

1) M. Takeuchi *et al.*, Nuclear Fusion **48**, 024015-1-024015-9 (2008)

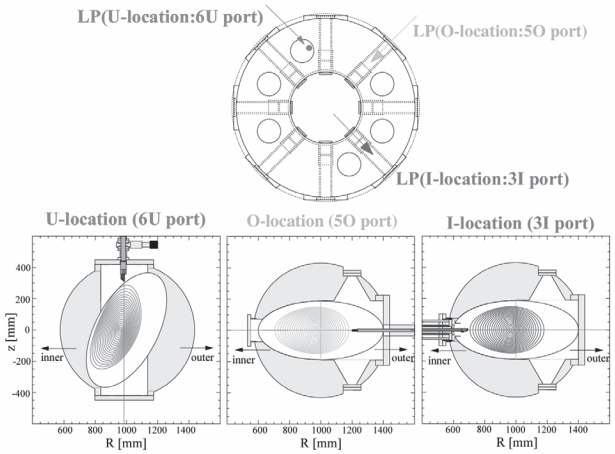

Fig. 1 The arrangements of three LPs at toroidally different sections.

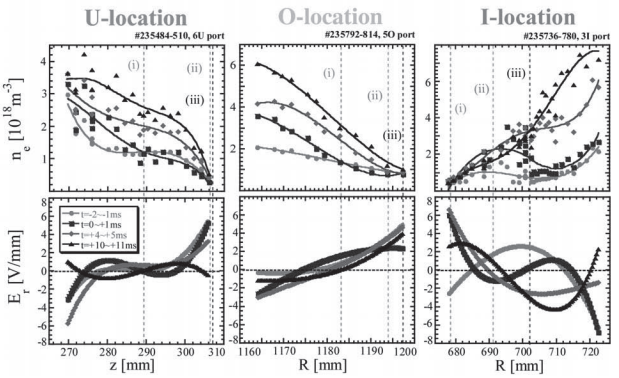

Fig. 2 Radial profiles of n_e and E_r at the U-, the O- and the I-locations. The vertical dashed lines of (i), (ii) and (iii) stand for the ETB foot points or LCFS at the time of t = 0~+1 ms, t = +4~+5 ms and t = +10~+11 ms, respectively.

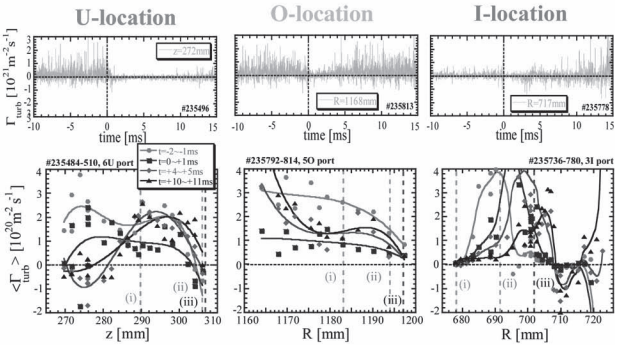

Fig. 3 Time evolutions and radial profiles of turbulent particle flux at the U-, the O- and the I-locations.