TRIGGERS of NON-LOCAL PROCESSES OF the TRANSPORT BARRIERS FORMATION IN plasmas with DIFFERENT directions of ECCD on the T-10 Tokamak

Neudatchin S.V., Borschegovskiy A.A., Kislov A.Ya., Pimenov I.S.

NRC Kurchatov Institute, Moscow, Russia, sneudat@yandex.ru

The transport falls in the zone of external transport barrier after traditional L-H transition. Under non-local (“global”) L-H transition found in various regimes of JET and JT-60U tokamaks [1–3], heat and density fluxes fall simultaneously nearly in all plasma volume. At the ITB-events in JT-60U and T-10, heat and density fluxes fall in narrower spatial zone within 30–50% of minor radius, see details in [3–5]. It is not clear how to name the transitions on T-10 discussed below. The electron heat diffusivity coefficient χe falls, for example, within 0.1 < r/a < 0.6 and electron diffusivity coefficient De falls nearly in all plasma volume. Let's call it a semi-global
L-H transition.

The neon puffing is the new trigger of semi-global L-H transition. The analysis of the experiments reported in [6–7] shows the appearance of the transition in 5 ms and 15 ms after the start of the neon puffing, correspondingly. The figure shows the radial profile of the electron heat jump wit co-ECCD (PECRH = 0.8 MW [6]), a similar jump occurs at co-ECCD by two gyrotrons [7]. As in the previously described spontaneous transitions [8] at co + counter current generation, the energy content of plasma W grows linearly with increasing density at the quasi-stationary heating phase. In all cases, the transition causes a strong and long-term increase in density in all plasma volume (the growth of Te is shorter than ~ 20 ms), and the dependence of W ~ ne masks an abrupt increase in the energy life time at the time of the transition (around 15% in [8] and ≈10% in the case given on the figure).

Short overview of ITB-events in plasmas with various directions of ECCD, created by spontaneous drop of the flakes with Li is presented also (see detail in poster report by I.S. Pimenov et al). The work was supported by ROSATOM contract N 1/15470-D

References

1. Neudatchin S V, Cordey J G and Muir D J, 20th EPS Conf. on Control. Fus. and Plasma Phys. (Lisboa,) vol. I (Geneva: EPS), p. 83 (1993).
2. Neudatchin S V, Takizuka T et al., Japan J. Appl. Phys. 35, 3595 (1996).
3. Neudatchin S. V., Takizuka T., et al., Plasma Phys. Control. Fusion 44, A383-389 (2002).
4. Neudatchin S V., Inagaki S, Itoh K., Kislov A.Ya. et al., 2004 J. Pl. and Fus. Res. Series 6, 134.
5. Neudatchin S.V, Shelukhin D.A., Mustafin N.A., 2017 J. Phys.: Conf. Ser. 907, 012015.
6. Kasyanova N.V.,Rasumova K.A. et al., in Procs. of 45th EPS Conf. on Pl. Ph. 2018, Prague, ECA, Vol. 42A, P4. 1106.
7. Kirneva N.A. et al., 45th EPS Conf. on Pl. Ph., 2018, Prague, ECA, Vol 42A, P4. 1081.
8. A. Borschegovskiy, S. Neudatchin, I. Pimenov et al., in EPJ Web of Conferences 2018.