Study on the L–H transition power threshold with RF heating and lithium-wall coating on EAST - DTU Orbit (09/11/2017)

Study on the L–H transition power threshold with RF heating and lithium-wall coating on EAST

The power threshold for low (L) to high (H) confinement mode transition achieved by radio-frequency (RF) heating and lithium-wall coating is investigated experimentally on EAST for two sets of walls: an all carbon wall (C) and molybdenum chamber and a carbon divertor (Mo/C). For both sets of walls, a minimum power threshold P_{thr} of ~0.6 MW was found when the EAST operates in a double null (DN) divertor configuration with intensive lithium-wall coating. When operating in upper single null (USN) or lower single null (LSN), the power threshold depends on the ion ∇B drift direction. The low density dependence of the L–H power threshold, namely an increase below a minimum density, was identified in the Mo/C wall for the first time. For the C wall only the single-step L–H transition with limited injection power is observed whereas also the so-called dithering L–H transition is observed in the Mo/C wall. The dithering behaves distinctively in a USN, DN and LSN configuration, suggesting the divertor pumping capability is an important ingredient in this transition since the internal cryopump is located underneath the lower divertor. Depending on the chosen divertor configuration, the power across the separatrix P_{loss} increases with neutral density near the lower X-point in EAST with the Mo/C wall, consistent with previous results in the C wall (Xu et al 2011 Nucl. Fusion 51 072001). These findings suggest that the edge neutral density, the ion ∇B drift as well as the divertor pumping capability play important roles in the L–H power threshold and transition behaviour.

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