Dynamics of core peaked density profile during repetitive low-field-side pellet injection on EAST tokamak

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Abstract

High-density H-mode plasma is one of the fundamental operations for ITER, which plans to utilize pellet injection as the primary method for core fueling [1-2]. Core plasma fueling using repetitive Low-Field-Side (LFS) shallow pellet injection (PI) has been studied on EAST [3-4]. Due to the effect of ∇B drift, most of the fueling particles deposited at the edge will be gradually expelled from the LCFS, resulting in low fueling efficiency for LFS PI [5]. Recent experimental results from EAST indicate that effective core fueling with core plasma density exceeding 6×10^{19} m^{-3} was achieved by continuous shallow LFS PI. It is shown that LFS pellet injection leads to a significant increase in density in the edge, forming a positive density gradient region (i.e., a hollow peaked profile). Additionally, the core plasma density and plasma stored energy increase and density turbulence weakens, accompanied by significantly enhancement of core impurity. Therefore, achieving efficient core fueling and avoiding impurity accumulation in the core will become a critical challenge for future fusion devices aiming to maintain high-density H-mode through core pellet fueling. Finally, the impact of PI on core turbulence and transport is further analyzed through integrated transport code TGLF (Trapped Gyro-Landau-Fluid).

References

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