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Recent progress of pellet injection system in Experimental Advanced Superconducting Tokamak

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Pellet injection, which is regarded as the most promising technique for the research of edge plasma physics, can control the edge localized mode (ELM) [1] and reduce the power threshold of L-H transition [2]. Since the installation of the 10 Hz pellet injection system [3] in Experimental Advanced Superconducting Tokamak (EAST), lots of experiments have been carried out. The 10 Hz pellet injection system in EAST can continually produce pellets with both diameter and length of 2 mm, containing $\sim 3.78 \times 10^{20}$ atoms in each pellet. Except for the normal fueling effect, high-confinement (H-mode) plasma was achieved by injecting frozen deuterium pellets in EAST. Interesting phenomena of simple and two-stage low-high confinement (L-H) transitions are observed in EAST with radio frequency heating after shallow pellet injection. The results of the L-H transitions induced by pellets are discussed in detail with different theories. It is found that pellet injection in EAST can reduce the power threshold of H-mode. Furthermore, the pellet-induced edge density gradient is one of the important parameters affecting the L-H transition. Comprehensive researches will be carried out in the next campaign with the development of a new 50 Hz pellet injection system recently [4, 5] in EAST, which is capable of injecting pellets with different sizes. Besides, it is also observed in EAST that a deep penetration pellet can cause severe snake-like perturbation in the core plasma region [6]. This snake phenomenon, which was clearly monitored by the soft X-ray diagnostic, had a long life time of ~ 1 s. These investigations prove that pellet is a powerful tool to investigate not only the edge plasma physics but also the core plasma physics. This research is funded by the National Nature Science Foundation of China under Contracts No. 11625524, No. 11321092, and No. 11605246 and the National Magnetic Confinement Fusion Science Program under Contract No. 2013GB114004.

Reference

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Eligible for student paper award?

Yes

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