Exciting of MHD modes during the penetration of massive gas jet on J-TEXT tokamak

Y. Huang[1], Z. Y. Chen[1,*], Qiming Hu[2,*], Mingxiang Huang[1], Y N Wei[1], Daojing Guo[1], Z.J.Yang[1], X.M.Pan[1],Tong Wang[1], Z. F. Lin[1], R. H. Tong[1], W. Yan[1], Z.P.Chen[1], Y. H. Ding[1], Y. Liang[1] and J-TEXT Team

[1]*International Joint Research Laboratory of Magnetic Confinement Fusion and Plasma Physics, State Key Laboratory of Advanced Electromagnetic Engineering and Technology, School of Electrical and Electronic Engineering, Huazhong University of Science and Technology, Wuhan, 430074, China*

[2]*Princeton Plasma Physics Laboratory, Princeton NJ 08543-0451, USA*

*Corresponding author: Z.Y.Chen and Qiming Hu E-mail: zychen@hust.edu.cn and qhu@pppl.gov

The massive gas injection and the shattered pellet injection of a large amount of impurities is essential to the mitigation of disruptions on large scale tokamaks. The deposition of impurities to the center of plasma is the key for the radiation of plasma energy and runaway suppression. The penetration of gas jet has been found to be limited by the q=2 surface. The interaction of the gas jet with the rational surfaces has been studied by scan the plasma current. Experimental results show that injection of massive argons can cool the plasma from edge to core region and the cooling process is accompanied by different magnetohydrodynamics (MHD) modes when the gas jet reach corresponding rational surface. It is observed that with different edge safety factors, electron density, gas injection can induce different poloidal mode at first. Then the poloidal mode will traverse lower m (poloidal mode number) MHD activities until 2/1 mode initiated and thermal quench (TQ) was onset. The experimental results show that the penetration of gas jet across the rational surfaces is faster in the plasmas with pre-existing large 2/1 tearing mode, which indicates that 2/1 mode plays an important role in the penetration process.