

## The rapid response of 2/1 tearing mode to electrode biasing in J-TEXT experiments

Tong Wang<sup>1</sup>, Zhipeng Chen<sup>1,\*</sup>, Qiming Hu<sup>2,\*</sup>, Q. Yu<sup>3</sup>, Hai Liu<sup>4</sup>, Mingxiang Huang<sup>1</sup>, Jie Yang<sup>1</sup>, Da Li<sup>1</sup>, Yuan Huang<sup>1</sup>, Daojing Guo<sup>1</sup>, Zhuo Huang<sup>1</sup>, Zhifeng Cheng<sup>1</sup>, Lizhi Zhu<sup>1</sup>, Zhoujun Yang<sup>1</sup> and J-TEXT Team

*<sup>1</sup>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*

*<sup>2</sup>Princeton Plasma Physics Laboratory, Princeton NJ 08543-0451, USA*

*<sup>3</sup>Max-Planck-Institut für Plasmaphysik, 85748, Garching, Germany*

*<sup>4</sup>Institute of Fusion Science, Southwest Jiaotong University, Chengdu, 610031, China*

\*Corresponding author E-mail: [zpchen@hust.edu.cn](mailto:zpchen@hust.edu.cn) and [qhu@pppl.gov](mailto:qhu@pppl.gov)

The effects of electrode biasing (EB) on the  $m/n = 2/1$  tearing modes(TM) have been experimentally studied in J-TEXT tokamak, where  $m$  and  $n$  are the poloidal and toroidal mode numbers. According to the response time, the response of 2/1 tearing mode to EB can be divided into two processes, the rapid response and the slow response. In the rapid response, what needs to be noted is that the variation of EB current is proportional to the variation of tearing mode frequency, regardless of the EB current rise time, position of electrode, and bias voltage. On the base of that EB can supply a torque to change the tearing mode frequency quickly, the EB has been applied to unlock the locked mode. The experimental results show that the mode locking can be avoided by the negative bias voltage. While, it's unfortunately that the EB can't unlock the locked mode in recent experiments, which is different from our conjecture. In summary, the experimental results suggest that applied electrode biasing is a possible method for the avoidance of mode locking and disruption.