
Contribution ID: **661** Type: **not specified**

# P2.089 Phase-detection-based feedback control for the power supply in tearing mode control system on J-TEXT

*Tuesday, 18 September 2018 11:00 (2 hours)*

Tearing Mode (TM) creates magnetic islands in the tokamak, which will cause mode locking and major disruption. A new method for applying modulated magnetic perturbation is explored to suppress magnetic island and accelerate island rotation by using external resonant perturbation (RMP) coils in the J-TEXT tokamak. The phase difference between TM and external RMP is denoted by Φ. RMP has a stabilizing (destabilizing) effect on island when $0.5\pi<\phi<1.5\pi$ ($-0.5\pi<\phi<0.5\pi$) and an accelerating (decelerating) effect when $\pi<\phi<2\pi$ ($0<\phi<\pi$). Moreover, a net suppression effect has been proved by numerical simulation result when $\pi<\phi<2\pi$.
To verify the mechanism above, a variable frequency current-pulse power supply has been developed to suppress TM, which has the maximum frequency of 5 kHz and current of 3 kA. The phase-detection-based feedback control system is designed to control the power supply properly. The feedback control system contains two parts, TM phase detection and power supply control. The TM phase information is identified from the poloidal array of Mirnov probes. A phase prediction algorithm is developed to eliminate the phase difference between TM phase and actual RMP phase, which is caused by the delay of current rising time. The digital filter and the zero-crossing error correction algorithm are developed to make TM phase detection more accurate. The power supply control can achieve two kinds of control mode, bus voltage close-loop control and output current close-loop control. And the dynamic output current amplitude control is developed to adjust the flat-top of the current-pulse when the frequency of output current changes in a wide range in a short time. The system has been used in the experiment in the J-TEXT tokamak and has a good result.

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**Session Classification:** P2