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## Real-time control of tearing modes with ECRH on HL-2A

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The plasma performance in a tokamak is strongly affected by neoclassical tearing modes (NTMs), which routinely occur in larger tokamaks, such as ASDEX-U[1], DIII-D[2], JT-60U[3], TCV[4] and FTU[5]. A widely used method for controlling NTMs is to deposit the power of electron cyclotron resonance heating/current drive (ECRH/CD) on a relevant rational surface. With the newly developed NTM real-time control system, classical tearing modes (TMs) control by ECRH has been successfully tested as the first step toward NTMs control. In the experiment, a typical time response of 250ms has been achieved for effective suppression of TMs. The preliminary experimental result of TMs control is shown in Fig.1. In the experiment, the detection of magnetic island is based on Mirnov coils signals and its location is determined through real-time EFIT and ECE signals. PCS send the information of magnetic island every 50ms, and the time delay in the ECRH motor controller is around 30ms. Detecting the existence of (2,1) tearing mode, PCS sends a switch-on command to the ECRH system and the position information to the motor controller at  $t = 300$ ms. In 250ms, TM is completely suppressed in which the poloidal injection angle is tuned from perpendicular injection to  $-12^\circ$  injection, where the magnetic island is located at  $r/a \sim 0.6$ . In order to reduce the time response, direct communication with the motor without PLC is envisaged in the future experimental campaign.

References:

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Figures:

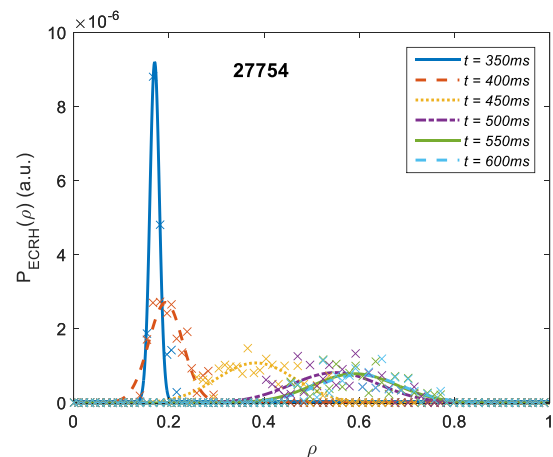
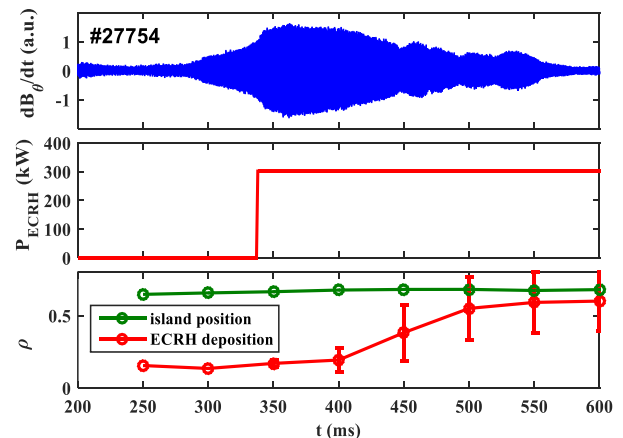


Figure 1. Real time control for the tearing mode on HL-2A