

Abstract Submitted
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Advanced ECCD based NTM control in closed-loop operation at ASDEX Upgrade (AUG) MATTHIAS REICH, LAURA BARRERA-ORTE, KARL BEHLER, ALEXANDER BOCK, LOUIS GIANNONE, MARC MARASCHEK, EMANUELE POLI, CHRIS RAPSON, JÖRG STOBER, WOLFGANG TREUTTERER, Max-Planck-Institute for Plasmaphysics Garching, ASDEX UPGRADE TEAM — In high performance plasmas, Neoclassical Tearing Modes (NTMs) are regularly observed at reactor-grade beta-values. They limit the achievable normalized beta, which is undesirable because fusion performance scales as beta squared. The method of choice for controlling and avoiding NTMs at AUG is the deposition of ECCD inside the magnetic island for stabilization in real-time (rt). Our approach to tackling such complex control problems using real-time diagnostics allows rigorous optimization of all subsystems. Recent progress in rt-equilibrium reconstruction (< 3.5 ms), rt-localization of NTMs (< 8 ms) and rt beam tracing (< 25 ms) allows closed-loop feedback operation using multiple movable mirrors as the ECCD deposition actuator. The rt-equilibrium uses function parametrization or a fast Grad-Shafranov solver with an option to include rt-MSE measurements. The island localization is based on a correlation of ECE and filtered Mirnov signals. The rt beam-tracing module provides deposition locations and their derivative versus actuator position of multiple gyrotrons. The “MHD controller” finally drives the actuators. Results utilizing closed-loop operation with multiple gyrotrons and their effect on NTMs are shown.

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