

Abstract Submitted
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Design of a Linear-Quadratic-Gaussian controller for resistive wall mode stabilization in NSTX¹ OKSANA KATSURO-HOPKINS, S.A. SAB-BAGH, J.M. BIALEK, Columbia University, S.P. GERHARDT, PPPL — Stabilization of the resistive wall mode (RWM) in the NSTX is important to achieve and sustain high-beta plasmas. State-space control algorithms for improved RWM control performance using the existing external control coils and off-midplane poloidal magnetic field sensors in NSTX are investigated numerically. At reduced plasma rotation, normalized beta of 5.6 was achieved experimentally with the present proportional gain controller. The proposed linear quadratic Gaussian (LQG) controller is capable of reaching normalized beta of 6.7 for modes with low natural rotation speed and the ideal wall limit normalized beta of 7.1 for plasma modes with higher natural rotation speed. A Kalman filter, an integral part of the LQG controller, is tested using NSTX experimental data off-line and the RWM mode phase and amplitude are compared to results from the present RWM control system using proportional gain. The LQG algorithm is developed for use in real-time NSTX experiments using current control and voltage control methods.

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