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Category Number and Subject: 7.6.3 Plasma Control Systems

Theory Experiment

Robust Control of Resistive Wall Mode in DIII-D Based on Eigenmode Approach,* J. Dalessio, E. Schuster, *Lehigh U.*, D.A. Humphreys, M.L. Walker, *GA*, Y. In, J.S. Kim, *FAR-TECH, Inc.* – Control of the resistive wall mode (RWM) is a major focus of the DIII-D experimental program. The FAR-TECH DIII-D/RWM model represents the plasma surface as a toroidal current sheet and represents the wall using an eigenmode approach [1]. The magnitude and phase of the RWM plasma deformation is determined from a set of 22 poloidal field probes and saddle loops, and 12 in-vessel coils are used to oppose the deformation. The resulting model is reformulated into a robust control framework, with a parameter that maps to the growth rate of the system modeled as an uncertain parameter. A robust controller that stabilizes the system for a range of practical growth rates is proposed, tested through simulations, and compared to other control techniques. Implications for experimental implementation and use are discussed.

[1] Y. In, *et al.*, *Phys. Plasma* **13**, 062512 (2006).

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