Abstract Submitted
for the DPP11 Meeting of
The American Physical Society

Robust Control of the Toroidal Rotation and Safety Factor Profiles in the DIII-D Tokamak[1] W. SHI, W. WEHNER, E. SCHUSTER, Lehigh University, M.L. WALKER, D.A. HUMPHREYS, General Atomics — Because of the coupling between the different magnetic and kinetic plasma profiles, multi-input-multi-output (MIMO) model-based controllers are introduced to regulate the plasma rotation and safety factor profiles around particular target profiles. The approach is based on linear two-time-scale models identified from experimental data. The inputs are separated into slow and fast components by a low-pass filter that is incorporated into the overall plant. Then a singular value decomposition (SVD) of the plasma model is carried out to decouple the system and identify the most relevant control channels. Finally, the H_∞ technique is used to determine a stabilizing feedback controller that minimizes the reference tracking errors and rejects disturbances with minimal control energy. Computer simulation results illustrate the performance of the robust profile controller, showing potential for improved performance. Experimental results in DIII-D are also reported.

[1]Supported by the NSF CAREER award program ECCS-0645086 and the US DOE under DE-FG02-09ER55064 and DE-FC02-04ER54698.

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Date submitted: 15 Jul 2011 Electronic form version 1.4