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Model-Based Shape Control Design for the National Spherical Torus Experiment (NSTX)[1] MAJED ALSARHEED, EUGENIO SCHUSTER, Lehigh University, DAVID GATES, Princeton Plasma Physics Laboratory, JIM LEUER, MICHAEL WALKER, DAVID HUMPHREYS, General Atomics —
Plasma shape and position control is a challenging problem due to the difficulties associated with real-time shape identification, plasma parameters measurement, and control method selection. The recent implementation of the real-time equilibrium reconstruction code rtEFIT on NSTX allows plasma shaping by controlling the magnetic flux at the plasma boundary. A non-model-based shape controller that exploits this capability has been recently proposed [1]. We describe current efforts to develop a robust model-based multi-input-multi-output (MIMO) controller to provide real-time shaping and position control in the presence of disturbances and uncertainties in the plasma parameters. The control design is based on linear plasma response models derived from fundamental physics assumptions. Computer simulation results illustrate the performance of the model-based shape control method. [1] D.A. Gates, et al., Nucl. Fusion **46** (2006) 17–23.

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