

Abstract Submitted  
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**Development of a Robust Current Profile Feedback Controller in DIII-D**<sup>1</sup> Y. OU, E. SCHUSTER, Lehigh University, J.R. FERRON, T.C. LUCE, M.L. WALKER, D.A. HUMPHREYS, General Atomics, T.A. CASPER, W.H. MEYER, LLNL — Setting up a suitable current profile has been demonstrated to be a key condition for one candidate advanced tokamak scenario with improved confinement and steady-state operation. A control-oriented model of the current profile evolution in DIII-D was recently developed for the plasma current ramp-up and early-flat-top phases [1] and used to synthesize open-loop control schemes tested both in simulations and experiments [2]. A robust closed-loop controller is proposed to regulate the current profile under the presence of model uncertainties in the plasma resistivity. Using the POD/Galerkin technique, the control-oriented PDE model is reformulated into a low-dimensional ODE model that preserves the dominant dynamics, and an  $H_\infty$  controller is designed to minimize the regulation/tracking error. A Corsica-based simulation assessment is presented.

[1] Y. Ou, et al., Fusion Engin. Design **82** (2007) 1153.

[2] Y. Ou, et al., Plasma Phys. Control. Fusion **50** (2008) 115001.

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