

**Abstract Submitted for the 51st Annual Meeting  
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**Development of a Robust Current Profile Feedback Controller in DIII-D\***, Y. Ou, E. Schuster, *Lehigh U.*; 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-flattop 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 Eng. and Design* 82 (2007) 1153.

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

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