Closed-Loop Simulation of Model-Based Current Profile Control with the DIII-D Plasma Control System[1] J.E. BARTON, E. SCHUSTER, Lehigh University, M.L. WALKER, D.A. HUMPHREYS, General Atomics — Current profile control has proven to be a critical requirement for advanced operating scenarios with improved confinement and possible steady-state operation. Limitations exhibited by non-model-based controllers tested at DIII-D motivated the design of model-based controllers that account for the dynamics of the q profile evolution. A control-oriented model of the current profile evolution in DIII-D was recently developed and used to design both open-loop and closed-loop control schemes. In this work, we report on the design and implementation of these advanced model-based controllers in the DIII-D Plasma Control System (PCS) and on the evaluation of these controllers by connecting the PCS to a simulation of the current profile evolution represented by a magnetic diffusion equation.

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