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ROM-Based Current Profile Control in DIII-D[1] C. XU, LeHigh University, Y. OU, E. SCHUSTER, LeHigh U., T.C. LUCE, J.R. FERRON, M.L. WALKER, D.A. HUMPHREYS, General Atomics, T.A. CASPER, W.H. MEYER, LLNL — The evolution in time of the current profile in a tokamak is related to the evolution of the poloidal flux, which can be modeled in cylindrical coordinates using a partial differential equation (PDE) usually referred to as the magnetic diffusion equation. Based on the proper orthogonal decomposition (POD) method, we propose a reduced-order model (ROM) for the magnetic diffusion equation (represented by an ordinary differential equation (ODE) with constrained diffusivity-interior-boundary actuators). We use a receding-horizon control scheme based on the reduced-order magnetic diffusion model to design a suboptimal control law that matches as close as possible a desired current profile within a pre-specified interval of time. Simulation results demonstrate the efficiency of the proposed control strategy.

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