ROM-Based Current Profile Control in DIII-D\textsuperscript{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.

\textsuperscript{1}Supported by the Pennsylvania Infrastructure Technology Alliance (PITA), the NSF CAREER award program (ECCS-0645086), and the US DOE under DE-FG02-92ER54141, DE-FC02-04ER54698, and W-7405-ENG-48.

C. Xu
LeHigh University

Date submitted: 22 Jul 2007