Abstract Submitted
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Current Profile Control in DIII-D[1] E.M. SCHUSTER, J.E. BARTON, M.D. BOYER, W.P. WEHNER, Lehigh University, J.R. FERRON, D.A. HUMPHREYS, A.W. HYATT, G.L. JACKSON, T.C. LUCE, M.L. WALKER, General Atomics — Experimental results successfully demonstrate the potential of physics-model-based control for systematic attainment of desired q profiles, with the subsequent benefit of enabling exploration and reproducibility. The control scheme is constructed by embedding a nonlinear, control-oriented, physics-based model of the plasma dynamics into the control design process. This modeling approach combines first-principles laws with empirical correlations obtained from physical observations, which leads to PDE models capturing the high-dimensionality and nonlinearity of the plasma response. Model-based control design includes not only the synthesis of feedback controllers for robust regulation or tracking, but also the determination of optimal feedforward actuator trajectories for a systematic approach to scenario planning. Feedforward+feedback (closed loop) control experiments in DIII-D consistently demonstrate improved current-profile control performance relative to feedforward (open loop) control alone.

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