Abstract Submitted
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Advanced control for inductive programming of MST plasmas[1] I. R. GOUMIRI, K. J. MCCOLLAM, A. SQUITIERI, D. J. HOLLY, J. S. SARFF, C. M. JACOBSON, University of Wisconsin, Madison — MST is a reversed field pinch whose poloidal and toroidal magnetic fields (Bp and Bt) can be sourced by IGBT-based programmable power supplies. In order to provide real-time simultaneous control of both Bp and Bt circuits, a time-dependent integrated modeling code is developed. Relaxed-state RFP physics simulations provide prediction and interpretive analysis of MST experimental data. The actuators considered for the control are the Bp and Bt primary currents. However, the physical quantities which MST operators want to demand can vary for different experiments and can have complicated dependences on the two actuator quantities as well as time. To develop our advanced control system, we choose to focus on two demand quantities, the plasma current Ip, directly related to Bp, and the reversal parameter F, closely related to Bt. To understand the response of Ip and F to the actuators and to enable systematic design of control algorithms, a linearized dynamic response model is generated using a system identification method. A multi-variable model based control scheme that accounts for the coupled dynamics of the system while mitigating the effect of actuator limitations is designed. A series of experiments are planned to test our controllers and validate our modeling.

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