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Category Number and Subject: 6.1.3 Plasma Control Systems or 5.6.2 DIII-D Tokamak

[ ] Theory [X] Experiment

Data-driven Modeling of the Toroidal Rotation and Safety Factor Profile Dynamics for AT Scenarios in DIII-D,* W. Wehner, W. Shi, C. Xu, E. Schuster, *Lehigh University*; D. Moreau, D. Mazon, *CEA IFRM*; M.L. Walker, D.A. Humphreys, *General Atomics*; Y. In, *Far-Tech Inc* – First-principle predictive models based on flux averaged transport equations often yield complex expressions not suitable for real-time control. As an alternative to first-principle modeling, data-driven modeling techniques involving system identification have the potential to obtain low-complexity, dynamic models without the need for ad hoc assumptions. This work focuses on the evolution of the toroidal rotation and safety factor profiles in response to magnetic, heating and current-drive systems. Experiments are conducted during the current flattop, in which the actuators are modulated in open-loop to obtain data for the model identification. The plasma profiles are discretized in the spatial coordinate by Galerkin projection. Then a linear model is generated by the prediction error method to relate the rotation and safety factor profiles to the actuators according to a least squares fit.

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