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Data-driven Modeling of the Toroidal Rotation and Safety Factor Profile Dynamics for AT Scenarios in DIII-D[1] 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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