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Theory Experiment

Measurement and Modeling of the Response of the Current Profile Evolution to Feedback Control Actuators in DIII-D,* J.R. Ferron, P. Gohil, C.M. Greenfield, T.C. Luce, C.C. Petty, P.A. Politzer, *GA*; V. Basiuk, F. Imbeaux, M. Schneider *CEA*; T.A. Casper, *LLNL*; M. Murakami, *ORNL*; Y. Ou, E. Schuster, *Lehigh U.*; Q. Gao, A. Wang, *SWIP* – For closed loop control of the q evolution during the plasma current ramp up, available actuators are electron heating power, I_p ramp rate, electron density and co-counter beam balance to modify the net neutral beam current drive. Measurements of the effects of these actuators on the current profile evolution are compared to transport code predictions from ONETWO, TRANSP, CRONOS, and CORSICA to test the model of the plasma response in the control process. Measurements of the dynamic response of the q evolution, particularly to electron heating, provide input to the controller development process. A proportional/integral controller with empirically determined gains and provision to avoid β_N excursions has been demonstrated to regulate q_{\min} at the start of the high-performance phase of the discharge for a variety of initial and target conditions.

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