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Modeling of DIII-D Discharges With Feedback Control of the Safety Factor Profile Evolution[1] J.R. FERRON, P. GOHIL, C.M. GREENFIELD, T.C. LUCE, C.C. PETTY, P.A. POLITZER, M.R. WADE, GA, V. BASIUK, F. IMBEAUX, CEA, T.A. CASPER, LLNL, M. MURAKAMI, ORNL, Y. OU, E. SCHUSTER, Lehigh U., Q. GAO, A. WANG, SWIP — Closed loop control of the q evolution is implemented by modifying the rate of relaxation of the current density through changes in the conductivity using neutral beam or electron cyclotron power for electron heating. Comparisons between the experimental q evolution and transport code (ONETWO, TRANSP, CRONOS, CORSICA) modeling are being used to develop the physics model of the control process. We find that the neutral beam current drive profile in the simulation must peak near the mid-radius, instead of near the axis as predicted by NBCD theory, in order for the predicted q evolution to match the experiment. Alfvén eigenmode type fluctuations observed in the experiment could have provided a mechanism for fast ion transport. A simplified physics model is being developed for use in design of a model-based q evolution controller which will be tested in CRONOS simulations and in the experiment.

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