Abstract Submitted
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Modeling Edge Plasma Response to Non-Axisymmetric Fields in Tokamaks[1] N.W. FERRARO, L.L. LAO, General Atomics, D.M. ORLOV, R.A. MOYER, UCSD, R.J. BUTTERY, General Atomics — The application of non-axisymmetric fields to H-mode tokamak plasmas is observed to have significant effects on transport, rotation, and edge-localized mode (ELM) stability. Here, a two-fluid model is used to calculate the edge plasma response in order to elucidate the physical mechanism of these effects. This model self-consistently includes rotation, two-fluid physics, resistivity, and viscosity, as well as the full plasma and scrape-off layer in diverted toroidal geometry. The M3D-C1 code is used to perform the two-fluid modeling. The plasma response to applied $n = 3$ fields of both ELMing and ELM-suppressed DIII-D discharge fields is considered, with a focus on the stochastization of the edge and the penetration of islands near the top of the pedestal. Empirically, shifts in the density and temperature pedestal location of more than one centimeter are observed, far in excess of the predictions of vacuum modeling. The results of two-fluid calculations compare favorably with data from Thomson scattering and beam emission spectroscopy diagnostics for several DIII-D discharges. The electromagnetic and neoclassical toroidal viscous torques on the plasma are estimated.

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