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Nonlinear Simulations of Magnetic Field Lines Stochastization in the Negative Central Shear Experiments in the DIII-D Tokamak[1] N.N. POPOVA, Y.Q. LIU, A.M. POPOV, *Moscow State University*, A.D. TURNBULL, M.S. CHU, *General Atomics* — Magnetic island structures excited by MHD instabilities in negative central shear equilibria have been analyzed with the NFTC and field line tracing FTRACK codes. NFTC solves the full MHD equations in general toroidal geometry using a straight field line flux coordinate system, including the effects of plasma rotation in the presence of resistivity and viscosity. The calculations were based on the equilibrium from a DIII–D discharge (#87009). With negative central magnetic shear (NCS) results in the presence of closely spaced resistive interchange modes with different toroidal numbers $n = 1, 2, 3$. Nonlinear calculations show strong nonlinear interaction of these modes. As a result many magnetic islands overlap and the central plasma zone becomes stochastic. This stochasticity strongly influences the transport coefficients and brakes the central toroidal rotation. The effect of this on the q-profile and resistivity was examined by analyzing the behavior of the magnetic field lines and Poincaré map. The width of the stochastization zone is obtained as a function of $q_{\rm centr} - q_{\rm min}$. It is shown that small changes in negative shear profile can result in collapse of the central plasma.

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