Abstract Submitted
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Investigation of equilibrium and nonlinear stability of high beta 3-D configurations[1] M. SCHLUTT, C.C. HEGNA, C.R. SOVINEC, University of Wisconsin - Madison, E.D. HELD, Utah State University, S.E. KRUGER, Tech-X Corporation — 3D MHD straight stellarator equilibria are generated with NIMROD. A vacuum equilibrium helical magnetic field is loaded in cylindrical geometry. This magnetic field is initialized to have a continuous symmetry or spoiled symmetry by adding 3D magnetic perturbations with helicities that are disproportionate with the dominant harmonic. These perturbations alter the magnetic spectrum, and produce magnetic islands and stochastic regions. Finite beta equilibria are generated via numerical simulation by introducing a heating source and employing self-consistent anisotropic pressure transport. A variety of magnetic configurations, including helically symmetric and spoiled symmetry cases, are investigated. To study the stability properties of 3D equilibria, finite beta equilibria are created which are helically symmetric. If the equilibrium is linearly unstable, MHD modes are triggered. The nonlinear consequences of violating MHD stability are simulated. These cases are compared to simulations of heated cases with fully 3D equilibrium fields, where symmetry-spoiling harmonics are added to the helically symmetric system and the degree of symmetry-spoiling is varied. Cases are shown where large differences are observed in the nonlinear time evolution of symmetric configurations compared with spoiled-symmetry configurations. The similarity between the effect of the magnitude of the symmetry-spoiling harmonics and the effect of varying the degree of anisotropic transport is studied.

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