Abstract Submitted
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Investigation of equilibrium plasma beta limits in 3-D magnetic topologies[1] M.G. SCHLUTT, C.C. HEGNA, C.R. SOVINEC, University of Wisconsin, E. HELD, Utah State University, M. SCHLUTT, Tech-X Corporation — 3D MHD equilibria are modeled using NIMROD. A vacuum equilibrium helical magnetic field is loaded into the geometry of a straight stellarator. The symmetry of the vacuum field with a dominant magnetic harmonic can be spoiled by adding small perturbations. These perturbations alter the magnetic spectrum, and produce magnetic islands and regions of stochasticity. Finite-β equilibria are generated via numerical simulations that include the effect of a heating source and 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 finite-β 3D equilibria, nearly helically symmetric configurations are subjected to a symmetry-spoiling perturbation. If the equilibrium is linearly unstable, MHD modes are triggered. The nonlinear consequences of violating MHD stability is subsequently simulated. These cases are compared to simulations of heated configurations that have no intrinsic symmetry - the equilibrium fields are fully 3D. The connection between high beta properties of systems with saturated instabilities and equilibrium beta limits is discussed.

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