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Influence of Thermal Anisotropy on Equilibrium Stellarator Beta Limits[1] T. A. BECHTEL, C. C. HEGNA, C. R. SOVINEC, University of Wisconsin - Madison — The effect of anisotropic heat conduction on the upper beta limit of stellarator plasmas is studied using the nonlinear, extended MHD code NIMROD. The configuration under investigation is an l=2, M=10 torsatron with vacuum rotational transform near unity. Finite-beta plasmas are created using a volumetric heating source and temperature dependent resistivity; modeled with 22 stellarator symmetric (integer multiples of M) toroidal modes. Extended MHD simulations are then performed to generate steady state solutions that represent 3D equilibria. With increased heating, Shafranov shifts occur, and the associated break up of edge magnetic surfaces limits the achievable beta. Due to the presence of finite parallel heat conduction, pressure profiles can exist in regions of magnetic stochasticity. Here, we present results of independently varying the parallel and perpendicular thermal anisotropy. In particular, simulations show that the attained stored energy is a function of the magnitude of parallel and perpendicular thermal conduction for a given heat source, indicating that equilibrium beta limits are sensitive to anisotropic transport properties. Preliminary studies of MHD stability with non-stellarator symmetric modes, near the highest achievable beta, are also presented.

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