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Abstract Submitted
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Non-axisymmetric equilibrium reconstruction and suppression of density limit disruptions in a current-carrying stellarator¹ XINXING MA, D. A. ENNIS, J. D. HANSON, G. J. HARTWELL, S. F. KNOWLTON, D. A. MAURER, Auburn University — Non-axisymmetric equilibrium reconstructions have been routinely performed with the V3FIT code in the Compact Toroidal Hybrid (CTH), a stellarator/tokamak hybrid. In addition to 50 external magnetic measurements, 160 SXR emissivity measurements are incorporated into V3FIT to reconstruct the magnetic flux surface geometry and infer the current distribution within the plasma. Improved reconstructions of current and q profiles provide insight into understanding the physics of density limit disruptions observed in current-carrying discharges in CTH. It is confirmed that the final scenario of the density limit of CTH plasmas is consistent with classic observations in tokamaks: current profile shrinkage leads to growing MHD instabilities (tearing modes) followed by a loss of MHD equilibrium. It is also observed that the density limit at a given current linearly increases with increasing amounts of 3D shaping fields. Consequently, plasmas with densities up to two times the Greenwald limit are attained. Equilibrium reconstructions show that addition of 3D fields effectively moves resonance surfaces towards the edge of the plasma where the current profile gradient is less, providing a stabilizing effect.

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