

Abstract Submitted  
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**3D Equilibrium Reconstruction with Improved Magnetic Diagnostics on the Compact Toroidal Hybrid**<sup>1</sup> X. MA, M. CIANCIOSA, J.D. HANSON, G.J. HARTWELL, S.F. KNOWLTON, D.A. MAURER, Auburn Univ — We present non-axisymmetric equilibrium reconstruction of stellarator plasmas whose magnetic configuration is strongly modified by ohmically driven plasma current. These experiments were performed on the Compact Toroidal Hybrid device using the V3FIT reconstruction code [1] and a set of 50 magnetic diagnostics external to the plasma edge. The reconstructed equilibria gives accurate estimates of the toroidal flux within the last closed flux surface and information near the plasma boundary region including the edge safety factor, plasma shape, and current density of these highly non-axisymmetric plasmas. While the poloidal cross-section of these discharges becomes more circular with the addition of driven plasma current, toroidally the underlying  $n = 5$  stellarator periodicity is enhanced. Eddy current effects are small for the eddy current model considered in the presence of plasma current. The remaining systematic error is associated with a vertical shift of the plasma breaking stellarator symmetry along with the use of only external magnetic diagnostics.

[1] J. D. Hanson et al., Nucl. Fusion **49**, 075031 (2009)

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