

Non-axisymmetric equilibrium reconstruction on the Compact Toroidal Hybrid Experiment using external magnetic and soft x-ray measurements

X. Ma, M. Cianciosa, J.D. Hanson, G.J. Hartwell, S.F. Knowlton, D.A. Maurer, D.A. Ennis, J.L. Her

Non-axisymmetric free-boundary equilibrium reconstructions of stellarator plasmas are performed for discharges in which the magnetic configuration is strongly modified by the driven plasma current. Studies were performed on the Compact Toroidal Hybrid device using the V3FIT reconstruction code[1] incorporating a set of 50 magnetic diagnostics external to the plasma, combined with measurements from soft X-ray (SXR) arrays. With the assumption of closed magnetic flux surfaces, the reconstructions using external magnetic measurements allow accurate estimates of the net toroidal flux within the last closed flux surface, the edge safety factor, and the outer boundary of these highly non-axisymmetric plasmas. Addition of SXR measurements allows better reconstruction of internal current and net rotational transform profiles. These reconstructions help us understand the stability and disruptive characteristics of high density plasmas in CTH.

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

*This work is supported by US Department of Energy Grant No. DE-FG02-00ER54610
