Abstract Submitted
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Energy and Helicity Balance in Oscillating Field Current Drive Experiments[1] K.J. MCCOLLAM, F. EBRAHIMI, J.S. SARFF, D.R. STONE, A.F. ALMAGRI, J.K. ANDERSON, D.J. DEN HARTOG, G. FIKSEL, R. O'CONNELL, S.C. PRAGER, UW-Madison, D.L. BROWER, B.H. DENG, W.X. DING, UCLA, D. CRAIG, Wheaton College — Oscillating field current drive (OFCD) is a proposed method of efficient, steady-state toroidal plasma current sustainment using AC poloidal and toroidal loop voltages. OFCD is added to a standard RFP in the MST device, increasing the net plasma current by ∼10%. Magnetic fluctuations are modulated by the OFCD cycle, affecting energy and helicity balance. While the central electron pressure oscillation is large (∼50% amplitude), the total beta ($=2\mu_0 <p_e+p_i>/B^2(a)$) oscillation is smaller, and the cycle-average beta (∼7%) is about the same as the standard RFP case without OFCD. The energy confinement time also oscillates with a cycle-average (∼1 ms) about the same as the standard case. The measured helicity content is nearly equal to the measured injection minus the measured equilibrium dissipation. The residual may be coherent with the modulated MHD activity, implying some fluctuation-induced helicity dissipation, which will be measured in future tests. The experimental results are generally consistent with 3D resistive-MHD simulations.

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