Abstract Submitted
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Magnetic helicity balance at Taylor relaxed states sustained by AC helicity injection[1] MAKOTO HIROTA, Tohoku University, PHILIP J. MORRISON, WENDELL HORTON, University of Texas at Austin, YUJI HATTORI, Tohoku University — Magnitudes of Taylor relaxed states that are sustained by AC magnetic helicity injection (also known as oscillating field current drive, OFCD) [F. Ebrahimi et al. Phys. Plasmas 10, 999 (2003), K. J. McCollam et al. Phys. Plasmas 17, 082506 (2010)] are investigated numerically in a cylindrical geometry. Compared with the amplitude of the oscillating magnetic field at the skin layer (which is normalized to 1), the strength of the axial guide field B_{z0} is shown to be an important parameter. The relaxation process seems to be active only when $B_{z0} < 1$. Moreover, in the case of weak guide field $B_{z0} < 0.2$, a helically-symmetric relaxed state is self-generated instead of the axisymmetric reversed-field pinch. As a theoretical model, the helicity balance is considered in a similar way to R. G. O'Neill et al. Phys. Plasmas 14, 112304 (2007), where the helicity injection rate is directly equated with the dissipation rate at the Taylor states. Then, the bifurcation to the helical Taylor state is predicted theoretically and the estimated magnitudes of the relaxed states reasonably agree with numerical results as far as $B_{z0} < 1$.

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