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Evidence of closed flux during CHI formation of a spherical tokamak in the HIT-II experiment W.T. HAMP, T.R. JARBOE, R. RAMAN, A.J. REDD, B.A. NELSON, R.G. O'NEILL, R.J. SMITH — The Helicity Injected Torus - II (HIT-II) experiment has demonstrated current drive by transformer action (OH), Coaxial Helicity Injection (CHI) and combinations of both. The electron temperature and density profiles of plasmas in HIT-II are measured by multi-point Thomson scattering (MPTS), and magnetic equilibria are reconstructed with EFIT. Internal probing of relaxed CHI discharges shows significant poloidal flux amplification. EFIT reconstructions of relaxed CHI discharges indicate significant closed flux, and poloidal flux increase in time. CHI initiated OH plasmas generate closed flux during the purely CHI startup. Temperature profiles of purely CHI plasmas do not match open flux models. When CHI is added to an ohmic plasma, the edge temperature drops by 75%, and the edge density doubles, while the core plasma properties remain similar to OH only discharges, indicating a transport barrier. The simplest explanation of the data is the formation and sustainment of closed flux during CHI current drive. The limitations on HIT-II CHI discharges are discussed, suggesting refinements to future experiments.

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