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Magnetic Relaxation with Oscillating Field Current Drive on MST D.R. STONE, A.F. ALMAGRI, K.J. MCCOLLAM, J.S. SARFF, UW Madison — In oscillating field current drive (OFCD) poloidal and toroidal ac magnetic fields are inductively applied to the plasma to drive dc plasma current through magnetic relaxation. In OFCD experiments on the MST RFP up to 10% additional current is added. Measurements of Ohm's Law terms including the dynamo mechanisms associated with magnetic relaxation are conducted during OFCD to better understand the relaxation dynamics and to possibly aid in optimizing OFCD performance. The fluctuation-induced dynamo $\left\langle \tilde{E} \cdot \tilde{B} \right\rangle \Big/ B \cong \left\langle \tilde{V} \times \tilde{B} \right\rangle - \left\langle \tilde{J} \times \tilde{B} \right\rangle \Big/ ne$ and its constituent Hall dynamo $\left\langle \tilde{J} \times \tilde{B} \right\rangle \Big/ ne$ are measured in the edge ($r/a = .9$) using inserted probes, and compared to $\eta J - E$. A passive secondary-emission capacitive probe was developed to measure the electric field fluctuations (accurate when the plasma temperature >20 eV). Ohm's Law balance is observed during OFCD. During sawtooth relaxation events with OFCD the edge dynamo is enhanced compared to events without OFCD. Between events the edge dynamo is a few V/m and opposes the edge current. This opposing dynamo is required to balance Ohm's Law during OFCD since the oscillating electric field adds excess current at the plasma edge and the dynamo tends to flatten the current profile. Supported by the US DOE and the NSF.

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