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MHD phenomena with AC loop voltages in RFP plasmas[1] K.J. MCCOLLAM, A.F. ALMAGRI, D.J. HOLLY, J.S. SARFF, D.R. STONE, J.C. TRIANA, UW-Madison — The plasma's MHD response is an important aspect of experiments with applied AC loop voltages. For example, when oscillating-field current drive (OFCD), a type of helicity injection entailing phased AC poloidal and toroidal loop voltages, is applied to RFPs in the MST device with an empirically optimum phase of $\sim \pi/8$ between the two voltages, there is a decrease in magnetic-fluctuation amplitudes. By contrast, for $\pi/2$, which is the phase of maximum helicity injection, additional bursts of magnetic fluctuations are induced, which internal measurements suggest are a linear MHD tearing response to the applied fields. Meanwhile, the AC loop voltages can entrain the normally quasiperiodic background sawtooth cycle in the RFP, triggering these discrete relaxation events to occur only at characteristic times within the OFCD cycle. This effect may involve criteria on the core safety factor and is investigated by equilibrium reconstructions of experiments in which AC fields of different frequencies and amplitudes are applied with a new programmable power supply. Finally, using internal probes, we plan to study the radial penetration of broadband AC fields from the switching of the solid-state programmable supply for possible effects on relaxation and current-profile control.

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