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Reduction of Turbulence in the Madison Dynamo Experiment N.Z. TAYLOR, C.B. FOREST, N.S. HAEHN, E.J. KAPLAN, R.D. KENDRICK, University of Wisconsin-Madison, K. REUTER, Max-Planck-institut fuer Plasmaphysik, E.J. SPENCE, ETH Zurich — This poster describes efforts to observe spontaneous magnetic field generation in the Madison Dynamo Experiment. The experiment uses a turbulent flow of liquid sodium, driven by two counter-rotating impellers in a one meter-diameter sphere. The time-averaged flows are expected to be dynamos, but previous work has shown that turbulent fluctuations strongly increase the minimum speed required for self-excitation, beyond the design parameters of the experiment. Two approaches for accessing dynamos in the experiment seem feasible. First, a computational fluid dynamics code has shown that reduction of large scale turbulence and optimization of the helicity of the mean flow can be achieved through the addition of baffles to the experiment. Second, a sub-critical dynamo transition has recently been discovered using numerical simulations; by supplying a sufficiently strong magnetic field to the turbulent flow, the fluctuations are reduced, a dynamo grows and saturates, and can be sustained when the externally applied field is removed. The experimental modifications necessary to the experiment will be described, including a newly implemented set of magnetic probes for characterizing the eigenmodes.

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