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Strategies for Observing Self-excitation in the Madison Dynamo Experiment N.Z. TAYLOR, E.J. KAPLAN, R.D. KENDRICK, M.D. NORNBERG, K. RAHBARNIA, A.M. RASMUS, C.B. FOREST, University of Wisconsin-Madison, E.J. SPENCE, PPPL — In the Madison Dynamo Experiment(MDE) two counter-rotating impellers drive a turbulent flow of liquid sodium in a one meter-diameter sphere. One of the goals of the experiment is to observe the spontaneous generation of magnetic field. Initial runs of the MDE saw intermittent bursts of a transverse dipole field similar to the induced field predicted by laminar kinematics, but no sustained self-excited field was observed. This poster will present recent results from the MDE after an equatorial baffle was installed to stabilize the position of the shear layer between the two counterrotating hemispheres and to help in the reduction of of large-scale turbulence and the motors were run up to maximum power. Required motor power indicates that the baffle has decreased the amount of turbulence in the flow. When run up to full power still no self-excited dynamo was observed, but there was significant amplification of the transverse dipole field with extended decay rates indicating we may be approaching the dynamo threshold. Future modifications to the experiment will also be presented exploring a subcritical dynamo transition by supplying a sufficiently strong magnetic field and the addition of poloidal baffles to optimize the helicity of the mean flow. This work is supported by the NSF/DOE partnership in plasma physics.

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