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The role of system-scale turbulence on MHD activity in the Madison Dynamo Experiment KIAN RAHBARNIA, MIKE M. CLARK, ELLIOT J. KAPLAN, MARK D. NORNBERG, ALEX M. RASMUS, NICHOLAS Z. TAYLOR, JOHN P. WALLACE, CARY B. FOREST, Department of Physics, University of Wisconsin-Madison, 53706 Madison,WI — The Madison Dynamo Experiment studies the onset conditions for magnetic field growth in a turbulent flow of liquid sodium and is investigating the turbulent electromotive force (EMF) $\varepsilon = \left\langle \widetilde{v} \times \widetilde{b} \right\rangle$. This work analysis the influence of a recently installed equatorial baffle to reduce the largest scale turbulent eddies in the flow. The averaged magnetic fluctuations drop about 20%. A spherical harmonic decomposition of the magnetic field indicates a reduction of the largest scale magnetic fluctuations, consistent with an unmeasured reduction of the large-scale velocity fluctuations. Amplification of a transverse seed magnetic field (the expected dynamo eigenmode) show a gain of about 50%, in contrast to experiments without the baffle which had negligible gain. These observations may also indicate a reduction of the beta-effect. A two-axial velocity probe will provide velocity fluctuations by measuring potential differences in a uniform field of a small permanent magnet. In combination with Hall sensors detailed investigations of the local EMF are possible. This work is supported by the NSF/DOE partnership in plasma physics.

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