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The role of system-scale turbulence on MHD activity in the Madison Dynamo Experiment KIAN RAHBARNIA, ELLIOT KAPLAN, ZANE TAYLOR, MARK NORNBERG, MIKE CLARK, JOHN WALLACE, ALEX RASMUS, CARY FOREST, UW-Madison, ERIC SPENCE, Princeton Plasma Physics Laboratory — The Madison Dynamo Experiment studies the onset conditions for magnetic field growth in a two-vortex flow of liquid sodium. Very high Reynolds numbers of the experiment lead to strong turbulence and an increase of the effective resistivity, which hinders self-excitation of magnetic field. An equatorial baffle has been installed to reduce the largest scale turbulent eddies in the flow and a set of rotatable baffles optimizes the flow ratio of poloidal and toroidal components. With the equatorial baffle only a spherical harmonic decomposition of the measured magnetic field shows a reduction of the largest scale magnetic fluctuations, consistent with a reduction of the large-scale velocity fluctuations. A decrease of the α-effect induced dipole moment together with an increase of the effective magnetic Reynolds number is observed. First time measurements of the local turbulent electromotive force confirm these observations. A strong flux compression in the center and increasing decay times of the expected dynamo mode are found. Present experiments investigate how the adjustment of the pitch of the rotatable baffles optimizes the flow and minimizes the critical velocity at which the dynamo onset occurs. This work is supported by the CMSO and NSF/DOE.

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