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Using unmagnetized plasmas to produce dynamos[1] M.D. NORNBERG, M.M. CLARK, C. COLLINS, E.J. KAPLAN, K. RAHBARNIA, A.M. RASMUS, E.J. SPENCE, N.Z. TAYLOR, J.P. WALLACE, C.B. FOREST, University of Wisconsin-Madison — Constructing a laboratory example of a homogeneous dynamo is a long-standing problem with several examples of qualified successes. Studies using the Madison Dynamo Experiment have demonstrated the robust contribution of large-scale eddies to the mean field induction. By controlling the formation of eddies from unstable shear flow, we demonstrate that the concept of a turbulent resistivity is robust in low magnetic Prandtl number flows. Estimates based on rough mean-field theory β-effect calculations are in good agreement with experimental measurement. The limitations of liquid metal experiments lead to the desire for a different approach. A new platform for creating, driving, and diagnosing unmagnetized plasmas is being developed to facilitate a dynamo experiment that can explore broad parameter ranges of fluid viscosity and resistivity. Such a device provides both opportunities and challenges in incorporating physics beyond MHD such as ion-neutral drag and collisionless plasma phenomena.

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