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MHD Turbulence in the Madison Dynamo Experiment
M.D. NORNBERG, R.A. BAYLISS, C.B. FOREST, C.M. JACOBSON, R.D. KENDRICK, E.J. SPENCE, University of Wisconsin-Madison, MADISON DYNAMO EXPERIMENT TEAM — The inductive response of flowing liquid sodium in the Madison Dynamo Experiment is used to study properties of MHD turbulence. External coils generate a field which is advected by the flow. The turbulence and mean flow are investigated by measuring the induced magnetic field. The Ω-effect is demonstrated by measuring the mean toroidal magnetic field. The power spectrum of magnetic field fluctuations is consistent with Kolmogorov-type turbulence with an apparent resistive dissipation scale within the inertial range. Fluctuations of the magnetic field corresponding to eddies passing the probe are used to measure the mean local velocity. Measurements of the internal toroidal field exhibit occasional bursts due to structures that are correlated over large regions within the flow. Conditional averaging is used to determine the characteristic size and speed of the structures. This technique is used to search for the filamentary structures responsible for dissipation in MHD turbulence.

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