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New Mexico Dynamo Experiment: an Experiment to Demonstrate $\alpha\omega$-dynamos in Accretion Disks JIAHE SI, RICHARD SONNENFELD, AUTHOR COLGATE, JOE MARTINIC, New Mexico Institute of Mining and Technology, MARK NORNBERG, University of Wisconsin-Madison, HUI LI, Los Alamos National Lab — The New Mexico Liquid Metal $\alpha\omega$-dynamo experiment uses two coaxial cylinders to generate Couette flows to simulate the differential rotation of accretion disks. By varying the speed ratio of both cylinders, the flow can be made stable or unstable. Experimental research in both regions have made contributions to our knowledge of the dynamo mechanism. In the stable region, we have demonstrated an 8-fold ω-amplification by minimizing turbulence. In unstable region, we used two methods to study the effect of the turbulence. The first method is to measure the omega-effect over a range of Magnetic Reynolds numbers ($17 < Rm < 86$) by varying the cylinder rotation rate. The second method is to measure the decay time of the axial field Bz over the same range of Rm's. By using both methods, we have demonstrated that at very high Reynolds number ($> 5 \times 10^6$) rotating shear flow can be described entirely by mean flow induction with very little contribution from correlated velocity fluctuations. The experimental apparatus is being upgraded. The upgrade is intended to demonstrate a complete $\alpha\omega$-dynamo, as well as obtain more details to understand the dynamo in highly turbulent Couette flow.

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