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Tethered mass-spring experiment in a quasi-Keplerian Taylor-Couette device[1] DEREK MAN HON HUNG, Princeton Plasma Physics Laboratory, STEVEN STEMMLEY, University of Illinois, Urbana-Champaign, KYLE CASPARY, ERIK GILSON, PETER SLOBODA, Princeton Plasma Physics Laboratory, HANTAO JI, Princeton Plasma Physics Laboratory, Princeton University, ERIC BLACKMAN, University of Rochester — Angular momentum transport in astrophysical accretion disks is primarily attributed to the magnetorotational instability (MRI). High electrical conductivity in these disks causes magnetic field lines to be frozen-into matter, and spring-like magnetic tension between neighboring fluid elements arises. The tethered mass-spring model is commonly used to describe this system. We attempt to demonstrate this analog in the laboratory. The behavior of such a model is explored in a quasi-Keplerian Taylor-Couette device with neutrally buoyant test masses, metal springs, and water as the medium. Masses, spring strengths, and flow profiles are varied to investigate stability conditions. Motion capture and video analysis are utilized to examine the trajectories of test masses. Results obtained are presented and compared to predictions from MRI theory. Complications from hydrodynamic turbulence, secondary flows, and finite-size effects are discussed. Corresponding mitigation efforts are also proposed.

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