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Laboratory Study of Magnetorotational Instability (MRI) in a Helicon Plasma H. JI, Princeton Plasma Physics Laboratory, J. FOLEY, F. LEVINTON, Nova Photonics, B. FETROE, Y. RAITSES, J. KEFELI, M. NORNBERG, S. ZWEBEN, M. YAMADA, Princeton Plasma Physics Laboratory — Fast angular momentum transport in accretion disks has been an outstanding problem in astrophysics for more than three decades. Classically estimated transport due to molecular viscosity of a neutral fluid is too small to account for the fast observed accretion rates. The magnetorotational instability (MRI) has been identified as a powerful mechanism to transport angular momentum. Experiments using liquid metal are underway to study the MRI in the incompressible MHD limit. A new frontier in accretion disk research is to explore physics beyond the incompressible MHD. Possible new effects include compressibility, multiple-fluid effects, kinetic effects, ion-neutral collisions, radiation pressure, and dust grains. In order to study some of these effects, a new, small-scale experiment using a helicon plasma has been constructed. A preliminary analysis, addressing the two-fluid or Hall effect based on a local Hall MHD formulation, shows large differences in the growth rate between the cases when magnetic field is parallel and anti-parallel to the rotation axis for the experimentally achieved parameters. This is a clear sign of Hall effects on MRI. The detailed analyses and experimental results will be presented when available.

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