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Distinguishing the Magnetorotational Instability (MRI) from Magnetized Ekman Flows in the PPPL MRI Experiment ERIK GILSON, KYLE CASPARY, Princeton Plasma Physics Laboratory, JEREMY GOODMAN, Princeton University, HANTAO JI, Princeton Plasma Physics Laboratory, Princeton University, ETHAN SCHARTMAN, Nova Photonics, XING WEI, Princeton University — Results are presented from initial experiments on the upgraded Magnetorotational Instability (MRI) experiment that uses GaInSn as the working fluid and now operates with conductive end caps to improve the coupling of angular momentum to the fluid to increase the saturation amplitude of the MRI signal. Measurements of the fluid velocity field and perturbed magnetic field over a range of magnetic Reynolds numbers, Rm, and Lundquist numbers, S, are compared with results from the SFEMaNS code in order to separate the effects of MRI on the system from effects such as Ekman flows and Shercliff layer instabilities. The MRI can be identified by observing its growth rate, noting the relative magnitudes and spatial distributions of the perturbed radial flow velocity u_r and radial magnetic field B_r, and measuring the scaling of u_r and B_r with Rm. The clear identification of the onset of MRI in the apparatus is complicated by the geometry and boundary conditions creating an imperfect supercritical pitchfork bifurcation. Nevertheless, a stability diagram can be created that shows that MRI is a weak-field instability that occurs only below a certain value of the normalized magnetic field S/Rm but above a threshold where viscous effects damps the growth of the instability.

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