Abstract Submitted
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Progress Towards High-Speed Operation of the Magnetorotational Instability Experiment and Diagnostic Development E. P. GILSON, K. CASPARY, D. CHOI, F. EBRAHIMI, PPPL, J. GOODMAN, Princeton U., H. JI, PPPL, Princeton U., M. LYSANDROU, U. Chicago, P. SLOBODA, PPPL, M. TABBUTT, U. Wisconsin, Madison — Estimates and simulations both suggest that the Princeton MRI experiment must operate with inner cylinder rotation rates $>$ 1,500 rpm, corresponding to magnetic Reynolds numbers $Rm > 3$, in order for the flow to be unstable to the MRI. Results will be presented demonstrating progress towards high-speed operation while avoiding adverse effects from large dynamic pressure and heat. Recent studies show that conductive end caps increase the magnitude of the saturated MRI signal, enabling easier detection [1]. However, motor control feedback and pneumatically-driven brakes must be used to maintain control when forces arise from the interaction between induced currents in the rotating end caps and the 3,000 G applied magnetic field. The use of Hall probes and strain gauges to measure the azimuthal magnetic field and the torque at the inner cylinder will be discussed. Results from the Spectral Finite Element and Navier Stokes code have been used to better understand the expected shape of the MRI threshold curve with conducting end caps, the nature of the forces on the end caps, and to predict the magnetic fields and torques at the inner cylinder that result from the onset of the MRI.

[1] X. Wei, et al., Phys. Rev. E **94**, 063107 (2016).

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