Abstract Submitted
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An experimental platform to study rotating plasma flows relevant to astrophysical disks and jets[1] V. VALENZUELA-VILLASECA, S. V. LEBEDEV, J. P. CHITTENDEN, F. SUZUKI-VIDAL, L. G. SUTTLE, E. R. TUBMAN, J. W. D. HALLIDAY, D. RUSSELL, Imperial College London — Disks are ubiquitous structures in the universe and are typically accompanied by outflows, seen in the form of highly collimated jets. We present first results of an experimental platform [1] developed on the MAGPIE pulsed-power facility (1 MA, 500 ns current pulse) which uses converging supersonic plasma flows to drive a differentially rotating disk together with an axial jet. The plasma flows are formed by ablation of 8 aluminium wires and are accelerated by the radial and azimuthal components of the JxB force. This produces an off-axis convergence that introduces rotation in the merging flows. The dynamics of the disk rotation and formation of an extended axial jet are observed by multi-frame XUV and optical imaging of the plasma self-emission. Laser interferometry and Thomson scattering allow us to map the plasma density and velocity distribution of the rotational plasma and its jet. The magnetic field in the plasma can be measured with Faraday rotation. The rotational characteristics of the flow are compared with simulations using the 3D MHD code Gorgon. Using this new platform, we expect to address questions regarding the interplay of rotation and magnetic fields frozen-in the flow and the acceleration of jets from the disk. [1] Bocchi et al., ApJ 767, 84 (2013).

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