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MHD Modeling of a Plasma Dynamo Experiment CARY FOREST, ADAM BAYLISS, DALTON SCHNACK, ERIK SPENCE, ETH-Zurich, KLAUS REUTER, IPP, Garching — A new plasma experiment to investigate the magnetorotational instability, dynamos, and other fundamental plasma processes for astrophysics is described and numerically modeled using MHD computation. Use of a plasma for such an experiment may allow the magnetic Reynolds number (the dimensionless parameter governing self- excitation of magnetic fields) to be approximately a factor of 10 larger than in liquid metal experiments The experiment uses an axisymmetric ring cusp geometry (poles facing inward with alternating polarity along the vessel wall) to confine a plasma in a large, magnetic field free region in the center of the device. To stir the plasma, cathodes positioned between the magnet rings are biased such that the resulting electric field induces plasma rotation through the ExB drift. This poster describes numerical simulations using NIMROD and the incompressible MHD code DYNAMO of the experiment that (1) establish the viability of driving the flows using the proposed electrode scheme in the multicusp geometry, and (2) that edge driven differential rotation can provide flows that can lead to bulk flows suitable for a broad range of turbulence and dynamo studies in astrophysically relevant parameters.

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