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Establishing high magnetic Reynolds numbers (Rm) in MPDX for dynamo studies[1] CHRISTOPHER COOPER, MICHAEL CLARK, KEN FLANAGAN, IVAN KHALZOV, JASON MILHONE, ETHAN PETERSON, BLAIR SEIDLITZ, JOHN WALLACE, DAVID WEISBERG, CARY FOREST, University of Wisconsin, Madison — The Madison plasma dynamo experiment (MPDX) is a basic plasma research device designed to investigate flow driven MHD instabilities, such as the dynamo, in parameter regimes relevant to astrophysical systems and numerical simulations. A 3 m diameter vacuum vessel lined with an axisymmetric magnetic multipole cusp confines a nearly magnetic-field-free plasma. Thermally emissive lanthanum hexaboride cathodes biased < 400 V create the plasma and generate toroidal $J \times B$ torques in the cusp region. Plasma viscosity propagates this momentum throughout the unmagnetized core, driving poloidal and toroidal flows for studying the interactions between flows and magnetic fields in high conductivity regimes. In plasma, the viscosity and conductivity scale dramatically with T_e, n_e, and Z_{eff} which are uniquely determined by particle and energy confinement. Varying the MPDX input power and fill pressure with the achieved 10 km/s driven flows creates a scaling of the fluid Reynolds number $10 < Re < 1000$ with $Rm \sim 1000$. Numerical simulations of MPDX predict both $fast$ and $slow$ type dynamo action across this scaling. Initial measurements of plasma parameters, flow and comparisons to confinement and dynamo models will be presented.

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