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Numerical simulations of plasma dynamo in cylindrical and spherical von Karman flows IVAN KHALZOV, BEN BROWN, CARY FOREST, DALTON SCHNACK, University of Wisconsin-Madison, FATIMA EBRAHIMI, University of New Hampshire — We present the results of dynamo simulations in cylindrical and spherical von Karman plasma flows with parameters relevant to the Madison Plasma Couette Experiment (MPCX) and Madison Plasma Dynamo Experiment (MPDX). Simulations are done using the extended magnetohydrodynamic (MHD) code NIMROD for an isothermal compressible plasma model including two-fluid effects (Hall term in Ohm's law), which is beyond the standard incompressible MHD picture. It is found that the counter-rotating von Karman flows result in sustained dynamo action and self-generation of magnetic field when the magnetic Reynolds number exceeds a critical value. Depending on geometry and plasma parameters the dynamo field can either saturate at certain amplitude corresponding to a new stable equilibrium (laminar dynamo) or lead to turbulent dynamo. It is shown that plasma compressibility results in increase of the critical magnetic Reynolds number while inclusion of the Hall term in Ohm's law changes the level of saturated dynamo field but not the critical value for the onset of dynamo action. The work is supported by NSF.

Ivan Khalzov
University of Wisconsin-Madison

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