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Simulations of plasma dynamo in cylindrical and spherical geometries IVAN KHALZOV, CARY FOREST, DALTON SCHNACK, University of Wisconsin-Madison, FATIMA EBRAHIMI, University of New Hampshire — We have performed the numerical investigation of plasma flow and possibility of dynamo effect in Madison Plasma Couette Experiment (MPCX) and Madison Plasma Dynamo Experiment (MPDX), which are being installed at the University of Wisconsin-Madison. Using the extended MHD code, NIMROD, we have studied several types of plasma flows appropriate for dynamo excitation. Calculations are done for isothermal compressible plasma model including two-fluid effects (Hall term), which is beyond the standard incompressible MHD picture. It is found that for magnetic Reynolds numbers exceeding the critical one the counter-rotating Von Karman flow (in cylinder) and Dudley- James flow (in sphere) result in self-generation of magnetic field. Depending on geometry and plasma parameters this 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 two- fluid effects change the level of saturated dynamo field. The work is supported by NSF.

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