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Numerical study of laminar plasma dynamo in cylindrical and spherical geometries[1] IVAN KHALZOV, ADAM BAYLISS, FATIMA EBRAHIMI, CARY FOREST, DALTON SCHNACK, Center for Magnetic Self-Organization, University of Wisconsin, Madison — We have performed the numerical investigation of possibility of laminar dynamo in two new experiments, Plasma Couette and Plasma Dynamo, which have been designed at the University of Wisconsin-Madison. The plasma is confined by a strong multipole magnetic field localized at the boundary of cylindrical (Plasma Couette) or spherical (Plasma Dynamo) chamber. Electrodes positioned between the magnet rings can be biased with arbitrary potentials so that Lorenz force $\mathbf{E} \times \mathbf{B}$ drives any given toroidal velocity profile at the surface. Using the extended MHD code, NIMROD, we have modeled several types of plasma flows appropriate for dynamo excitation. It is found that for high magnetic Reynolds numbers the counter-rotating von Karman flow (in cylinder) and Dudley-James flow (in sphere) can lead to self-generation of non-axisymmetric magnetic field. This field saturates at certain amplitude corresponding to a new stable equilibrium. The structure of this equilibrium is considered.

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