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Magnetic flux amplification via the Hall effect high-β plasmas[1]
KEN FLANAGAN, JASON MILHONE, CARY FOREST, University of Wisconsin-Madison — A global flow drive scheme implemented in the Plasma Couette Experiment (PCX) under Hall conditions is shown to increase or decrease the magnetic flux in the plasma volume based on electrode placement. The flow scheme relies on electrodes driving current radially outward (increase in flux) or inward (decrease in flux) across a weak (1G) externally applied magnetic field. Under PCX plasma conditions, $n \sim 10^{17} - 10^{18}$ m^{-3}; $T_e \sim 5$ eV and $T_i \sim 0.2 - 0.6$ eV, argon ions are unmagnetized ($\Omega_{ci} \ll \nu_i$) while the electrons are magnetized. The electrons undergo a $V \times B$ drift, while the ions do not, resulting in an azimuthal current that can act to increase or decrease the magnetic flux. Previous experiments run on the Big Red Ball (BRB) show a similar mechanism as well as NIMROD simulations performed with the BRB geometry.

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