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Generation and control of rotation in the flowing magnetized plasma (FMP) experiment[1] ZHEHUI WANG, JIAHE SI, Los Alamos National Lab., FESPT TEAM — The Flowing Magnetized Plasma (FMP) experiment at Los Alamos examines the physics of rotating plasmas inside magnetic field when the plasma thermal energy density is comparable to or exceeds vacuum magnetic energy density. Several types of instabilities, including Magneto- rotational instability (MRI), are expected based on theory. The growth rate of each instability is a function of temperature and density gradient, magnetic field and its gradient, rotation and rotation shear. Therefore, a key experimental issue is to drive plasma rotation and tailor rotation profile. A multi-MW coaxial gun, powered by a unique sub-kV electrolytic capacitor bank, produces a meter-size rotating plasma with $n_e > 1.0$ x 10^{19} m^{-3} and $T_e \sim$ 1-20 eV. Rotation and profile are further controlled by floating or biasing conducting boundaries at different electrical potentials, and by inserting an electrode along the symmetry axis of cylindrical plasmas. Plasma rotation is measured directly by probes, Doppler spectroscopy, and indirectly by fast camera imaging, and phase- shift of magnetic probes. Rotation frequency at the boundary, linearly increasing with axial vacuum magnetic field, is found at a few percent of ion gyrofrequency. Results of the rotation and profile as a function of bias electrical potential of different electrodes will be presented. Relevant rotation mechanisms, ExB and diamagnetic flows in particular, and implications to MRI, will be discussed.

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