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Emissive cathode operation in a large magnetized plasma and its role in a basic heat transport experiment MATTHEW POULOS, Princeton Plasma Physics Laboratory — A model is derived to describe the effects produced by thermionic electron injection into a magnetized plasma column in which the separation between cathode and anode is much larger than the mean free-path of the electrons. Analytic expressions are found for the spatial pattern of the global current system, the partition of potential across the plasma sheath, and the effective plasma resistance. The associated radial electric field produces global sheared ExB flows while particle injection and Ohmic heating lead to rearrangements in density and temperature. The linear stability of the radial gradients in the self-consistent profiles to drift-Alfvén fluctuations is assessed and the nonlinear evolution of the fluctuating profiles is simulated numerically. Predictions of the model are found to be in excellent quantitative agreement with measurements performed in the Large Plasma Device (LAPD) at the University of California, Los Angeles (UCLA). It is demonstrated experimentally by selective biasing of the cathode structure that flow-shear generated by thermionic emission, under externally controlled conditions, can suppress the growth of drift-Alfvén instabilities.

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