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Model for emissive cathode operation in a large magnetized plasma and controlled generation of plasma flows[1]

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This talk reports on a new model that describes the effects produced by thermionic electron injection into a magnetized plasma in which the separation between cathode and anode is much larger than the mean free-path [2]. 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. Formulas for the threshold conditions leading to virtual cathode operation are obtained. 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) [3]. 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-Alfvn instabilities. Experimental measurements and comparisons to model predictions are presented.

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[2]M. J. Poulos, **Phys. Plasmas** 26, 022104 (2019)

[3]S. Jin, M. J. Poulos, B. Van Compernolle, and G. J. Morales, **Phys. Plasmas** 26, 022105 (2019)