Abstract Submitted
for the DPP19 Meeting of
The American Physical Society

Thermionic Emission Enhanced by Ion Trapping Beyond the Space-Charge Current Limitation[1] GRANT JOHNSON, MAXIM UMANSKY, MICHAEL CAMPANELL, Lawrence Livermore Natl Lab — Recent one-dimensional simulations of planar plasma sheaths revealed how surface electron emission and collisions cause transitions between classical, space-charge limited and inverse sheath regimes [1]. However, multidimensional effects of strongly emitting surfaces on plasmas with collisions remained unexplored by simulations. We developed a novel 2D-2V continuum kinetic code to study the sheath physics, current flow and potential distributions in various configurations including floating and biased emissive probes, filament discharges, and nonuniformly emitting surfaces. The simulations provide an improved understanding of the I-V traces of emissive probes and indicate that strongly emitting probes float above the plasma potential. We found that even small negatively biased cathodes such as filaments can restructure the plasma to an inverse mode where ions are globally confined. Also, we report a previously unrecognized process by which trapped ions in the virtual cathode around a small hot cathode can raise the current flow well beyond the maximum predicted by collisionless space-charge limited sheath models. [1] Johnson and Campanell, Plasma Phys. Rep. 45, 69 (2019)

[1]This work was performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under Contract no. DE-AC52-07NA27344 and supported by the DOE Office of Science, Fusion Energy Sciences.

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Date submitted: 01 Jul 2019 Electronic form version 1.4