

Abstract Submitted  
for the GEC15 Meeting of  
The American Physical Society

**Restructure of the plasma interior (presheath) caused by electron emission from surfaces**<sup>1</sup> MICHAEL CAMPANELL, Lawrence Livermore National Laboratory — In the conventionally theorized “space-charge limited” regime of strong electron emission, the sheath potential is negative and the presheath is governed by Bohm ion acceleration towards the sheath edge. However, recent works found that sheath potentials at emitting surfaces can be positive, repelling ions. In this “inverse sheath regime,” the entire plasma interior (presheath) is also restructured [1]. Here we show at the presheath-sheath edge, due to their low velocities, the cold electrons entering the presheath have a higher spatial density than the hotter plasma electrons exiting the presheath. Therefore, assuming the emission collisionally thermalizes (reheats to the plasma temperature) in the presheath, it follows the quasineutral plasma density must increase towards the sheath edge, which is opposite from Bohm presheaths. The electron and ion force balance in the presheath becomes much different. A theoretical analysis with simulation and experimental evidence of “inverted presheaths” will be given. The results could be relevant to low temperature plasmas facing thermionically emitting surfaces and high temperature plasmas inducing strong secondary emission.

[1] M. D. Campanell, Phys. Plasmas 22, 040702 (2015).

<sup>1</sup>This work was supported by the U.S. Department of Energy.

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Date submitted: 19 Jun 2015

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