

Abstract Submitted
for the DPP13 Meeting of
The American Physical Society

Effects of Electron Emission on Plasma-Surface Interaction¹

MICHAEL CAMPANELL, HONGYUE WANG, ALEXANDER KHRABROV, IGOR KAGANOVICH, Princeton Plasma Physics Laboratory — Most models of sheaths facing emitting surfaces invoke assumptions that the sheath is time-independent, the wall potential is negative, ions enter the sheath at Bohm velocity, the presheath is weakly affected, and one wall is considered [1]. We present theory and PIC simulations showing that these assumptions can break down in practice. When emission is strong, the sheath potential can become positive, repelling ions from the wall [2,3]. Emitted electrons entering the plasma can drastically affect the presheath structure too. If their mean-free-path is large, emitted electrons can transit the plasma and impact the opposite wall; hence wall charging becomes a complex global problem [4]. Secondary emission can trigger sheath instabilities preventing plasma-wall systems from reaching steady state [5,6]. Implications are discussed for tokamaks, Hall thrusters, dusty plasmas, hot cathodes, RF discharges and spacecraft. [1] G.D. Hobbs and J.A. Wesson, *Plasma Phys.* 9, 85 (1967). [2] M.D. Campanell, A.V. Khrabrov and I. D. Kaganovich, *Phys. Rev. Lett.* 108, 255001 (2012). [3] M.D. Campanell, submitted to *Phys. Rev. E* (2013). [4] M.D. Campanell and H. Wang, submitted to *Appl. Phys. Lett.* (2013). [5] M.D. Campanell, A.V. Khrabrov and I. D. Kaganovich, *Phys. Rev. Lett.* 108, 235001 (2012). [6] M.D. Campanell et al., *Phys. Plasmas* 19, 123513 (2012).

¹This work was supported by the U.S. DOE under contract no. DE-AC02-09CH11466, and by AFOSR.

Michael Campanell
Princeton Plasma Physics Laboratory

Date submitted: 12 Jul 2013

Electronic form version 1.4