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Ion flow and sheath structure near positively biased electrodes[1]
RYAN HOOD, BRETT SCHEINER, SCOTT BAALRUD, University of Iowa, MATTHEW HOPKINS, ED BARNAT, BENJAMIN YEE, Sandia National Laboratories, ROBERT MERLINO, FRED SKIFF, University of Iowa — Measurements of the ion velocity distribution function and plasma potential were made near small positively biased electrodes using laser-induced fluorescence and an emissive probe [1]. The effect of dielectric material surrounding the electrode was tested and compared with a 2D particle-in-cell simulation. Both measurements and simulation reveal that if the electrode is embedded within a dielectric ring, ions are accelerated toward the electrode to approximately 0.5 times the ion sound speed before being deflected radially by the electron sheath potential barrier. The axial potential profile in this case contains a virtual cathode. In comparison, when the surrounding dielectric is removed, both the ion flow and virtual cathode are almost completely absent. These measurements suggest that the ion presheath from the negatively charged dielectric encapsulates the electron sheath of the positively biased electrode, resulting in a virtual cathode that substantially influences the local ion flow profile. [1] R. Hood, B. Scheiner, S. D. Baalrud, M. M. Hopkins, E. V. Barnat, B. T. Yee, R. L. Merlino, and F. Skiff, Phys. Plasmas 23, 113503 (2016).

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