Abstract Submitted
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Langmuir probes don't measure plasma potentials correctly in presheaths near boundaries[1] GREGORY SEVERN, Dept. of Physics Biophysics, University of San Diego, EUGENE WACKERBARTH, Leidos, PEIXUAN LI, NOAH HERSHKOWITZ, Dept. of Engineering-Physics, University of Wisconsin-Madison — It is shown that emissive probes (EPs) measure plasma potential profiles correctly in plasma presheaths, and that Langmuir probes (LPs) do not, in low temperature, low pressure plasma. It is conventional wisdom that LPs do not work in the sheath near material boundaries, but do work in quasineutral plasma. Experiments were performed in unmagnetized argon discharges, $0.1 \leq P_n \leq 1 mTorr$, with $1 \leq T_e \leq 5eV$, and $1 \times 10^9 \leq n_e \leq 1 \times 10^{10} cm^{-3}$, that compared plasma potential measurements made by partially coated and uncoated LPs, and cylindrical LPs, with measurements made by emissive probes. Presheaths were set up in the plasma using negatively biased electrodes. Results indicated that the EP potential measurements (in the limit of zero emission) were more negative than LP measurements in the presheath. In the sheath, most LP measurements did not go negative but rather became increasingly positive. Only the EP measurements worked in the sheath and presheath. These differences are thought to be caused by inherent, diffuse, ion flow in the presheath region toward the negatively biased electrode, characteristic of sheath formation.

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