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Sheath area for large planar Langmuir probes T.E. SHERIDAN, Ohio Northern University — Electrostatic (i.e., Langmuir) probes made of thin, circular disks are often used to determine plasma parameters (e.g., electron temperature and density) by analyzing the probe's current-voltage characteristic. A probe biased below the plasma potential (i.e., the ion saturation regime) attracts positive ions and repels electrons, leading to the formation of a cathodic sheath around the probe. The probe's effective collecting area is determined by the sheath area, which, for a given probe radius, depends on the probe's bias. The structure of this sheath is calculated using a particle-in-cell (PIC) code with kinetic ions and Boltzmann electrons by allowing a pulsed sheath to relax to a steady-state configuration. The Bohm criterion is used to define the sheath edge, which is taken to be the surface on which the average ion velocity equals the ion acoustic speed. The sheath area is calculated for probe radii from 50 to 200 times the electron Debye length biased from -5 to -50 times the electron temperature. The sheath area is found to have a power law dependence on both probe bias and probe radius.

Terry Sheridan
Ohio Northern University

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