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Size dependent transitions induced by an electron collecting electrode near the plasma potential[1] EDWARD BARNAT, GEORGE LAITY, MATT HOPKINS, Sandia National Laboratories, SCOTT BAALRUD, Department of Physics and Astronomy, University of Iowa — As the size of a positively biased electrode increases, the nature of the interface formed between the electrode and the host plasma undergoes a transition from an electron-rich structure (electron sheath) to an intermediate structure containing both ion and electron rich regions (double layer) and ultimately forms an electron-depleted structure (ion sheath). In this study, measurements are performed to further test how the key scaling relationship relating the area of the electrode to that of the area of the vessel containing the plasma discharge impacts this transition. This was accomplished using a segmented disk electrode in which individual segments were individually biased to change the effective surface area of the anode. Measurements on bulk plasma parameters such as the collected current density, plasma potential, electron density, electron temperature and optical emission are made as both the size and the bias placed on the electrode are varied. Size dependent transitions in the voltage dependence of the plasma parameters are identified in both argon and helium discharges and are compared to the interface transitions predicted by global current balance [1].

[1] S. D. Baalrud, N. Hershkowitz, and B. Longmier, Phys. Plasmas 14, 042109 (2007).

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