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Investigation of Langmuir-probe-characteristic behavior at high bias frequency[1] SARAH NEWBURY, Harvard University, SAMUEL COHEN, JACK MATTEUCCI, Princeton Plasma Physics Laboratory — Langmuir probe characteristics recorded for magnetized DC hollow-cathode neon plasmas yield increasing values for electron temperature, plasma potential, and ion saturation current with increasing frequency of the applied probe bias voltage. The extent to which stray capacitance to the probe plays a role was investigated. Langmuir probe characteristics were recorded at frequencies ranging from 10 Hz to 8 kHz while the applied voltage to the probe was sawtooth modulated – thus the rate of change of the bias voltage is constant. From these characteristics, the plasma temperature and density, as well as estimates for the capacitance in the wires, were calculated. The consistency and accuracy of these calculations were analyzed and found to indicate that the stray capacitance is the major factor contributing to the effects observed at higher bias frequencies. Similar experiments were performed with the PFRC-2 Langmuir probe apparatus, and the results of these experiments confirm the significant role of the stray capacitance. Contributions from electron thermalization, ion transit time, Debye length/probe radius, gyroradius, and displacement current at high bias frequencies have also been considered, but were found to be unlikely to produce the observed effects.

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