

Abstract Submitted
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Electric field distribution around a biased probe immersed in an electrical discharge¹ ED BARNAT, GREG HEBNER, Sandia National Laboratories — Electric field distributions are measured around a biased probe immersed in an argon discharge. The distributions are measured as functions of probe bias, argon pressure, and distance of the probe from the “boundary” placed on the plasma by a powered electrode. The electric fields are symmetrically distributed around the probe when the probe is placed sufficiently far from this boundary, but become asymmetric when the sheaths around both the probe and the powered electrode began to couple. For select cases, we discuss how the space charge is distributed around the probe. We also discuss perturbations in the excited $1s_4$ states that result due to the presence of the probe. In general, we note that while the measurable fields around the probe are contained in a region around the probe on the order of a Debye length ($\sim 1 \lambda_{Debye}$), these perturbations extend many Debye lengths ($\sim 10 \lambda_{Debye}$). We discuss the implication of these measurements both in terms of conventional Langmuir probes used to measure plasma parameters, as well as charged grains of dust that exhibit collective behavior leading to the formation of plasma crystals.

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Ed Barnat
Sandia National Laboratories

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