Abstract Submitted
for the GEC16 Meeting of
The American Physical Society

Particle charge distribution in dusty plasmas[1] MEENAKSHI MAMUNURU, Lam Research Corporation, ROMAIN LE PICARD, University of Minnesota, YUKINORI SAKIYAMA, Lam Research Corporation, STEVEN GIRSHICK, University of Minnesota, DAVID COHEN, Lam Research Corporation — Distribution of charge carried by a nano-sized particle in plasma is calculated using zero dimensional Monte Carlo simulations. In this work, several phenomena are taken into account, which place a limit on the negative charge that a nanoparticle can acquire. Electron depletion is seen in plasmas due to electronegativity or due to electron attachment to nanoparticles, and causes particle charge reduction. Secondary electron emission, photo emission place additional limitations on particle charge. Increased positive ion current to particle at higher pressures causes charge reduction [1]. Further, particle size and material dependent charge limits exist – placing a limit on the amount of charge a particle can hold [2]. The effect of all these factors is studied in the context of nanoparticle charge distributions in conditions typically seen in deposition process plasmas. Charge distributions are obtained for a wide range of conditions. The relative importance of each phenomenon in giving rise to significant fractions of non-negative nanoparticles is demonstrated. [1] Gatti, M., Kortshagen, U., "Analytical model of particle charging in plasmas over a wide range of collisionality," Physical Review E 78 (2008) 046402. [2] Le Picard, R., Girshick, S., "The effect of single-particle charge limits on charge distributions in dusty plasmas," J. Phys. D: Appl. Phys. 49 (2016) 095201 (9pp).

[1]Lam Research Grant

Meenakshi Mamunuru
Lam Research Corporation

Date submitted: 15 Aug 2016 Electronic form version 1.4