Abstract Submitted
for the DPP16 Meeting of
The American Physical Society

A Quick Method to Determine the Charge on Dust Particles in a Complex Plasma.[1] ZHIYUE DING, KE QIAO, LORIN MATTHEWS, TRUELL HYDE, CASPER, Baylor University — The individual levitation height for two, paired dust particles (each having a diameter of 8.89 μm and mass of 5.55e-13 kg as stated by the manufacturer) was measured inside both 1.0-inch and a 0.5-inch glass boxes, placed on the lower powered electrode within a GEC RF reference cell. These heights were compared to that of a single particle levitated under identical conditions, with the equilibrium position of the upper particle within the pair found to be slightly higher than that of the single particle. The measured difference between the two is small (and assumed to be caused by the repulsive interaction between the dust particles), so although the top particle deviates slightly from its equilibrium position (i.e., the equilibrium position acquired by a single particle under the same conditions) it may still be assumed to be influenced by the normal set of restoring forces. Assuming a simplified Coulomb interparticle interaction, applying a standard force balance calculation provides the charge for each dust particle. In this manner, the particle charge was measured for rf powers between 250 mV and 700 mV at a constant gas pressure of 40 mTorr. The resulting data shows the particle dust charge to remain relatively stable, varying less than 10% from an average charge of 14,000 e-, for powers between 450 mV and 700 mV. However, below 450mV the measured particle charge fluctuates dramatically. The implications of these results will be examined and discussed.

[1]NSF / DOE funding is gratefully acknowledged - PHY1414523 PHY1262031

Truell Hyde
CASPER, Baylor University

Date submitted: 12 Jul 2016 Electronic form version 1.4