Abstract Submitted
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Experiments and simulations of the expansion of three dimensional dusty plasmas[1] JOHN K. MEYER, ROBERT L. MERLINO, University of Iowa, VIKRANT SAXENA, Center for Free Electron Laser Science, DESY, Hamburg, Germany, AVINASH KHARE, University of Delhi, ABHIJIT SEN, Institute for Plasma Research, Bhat, Gandhinagar, India — The expansion of a three-dimensional dust cloud was studied experimentally, and using molecular dynamics simulations. The dust clouds are composed of spherical glass particles of one micron diameter formed in a DC glow discharge in argon. The dust clouds are confined by an electrostatic potential structure formed by a biased mesh electrode. The cloud expansion is initiated either by turning off the bias on the mesh or by turning off the anode voltage, or both. The cloud expansion is studied by imaging the particles with a thin sheet of 532 nm laser light and a fast video camera. Cloud expansions were studied for various neutral gas pressures. The simulation model is zero dimensional, which solves the equation of motion of screened dust particles along with temporal evolution equations for plasma density and electron temperature which determine the Debye length and the dust charge. The effect of background neutral gas enters through loss terms in the plasma density and electrons temperature evolution equations. In the high pressure regime the electron temperature decays faster than the plasma density while in the low pressure regime opposite is true. Results from the simulations at different background pressure are obtained and compared with the experimental observations.

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