

Abstract Submitted
for the DPP10 Meeting of
The American Physical Society

Laboratory observation of naturally occurring dust-density waves¹ TIM FLANAGAN, JOHN GOREE, The University of Iowa, Department of Physics and Astronomy, Iowa City, Iowa 52245 — Dust-density waves are electrostatic compressional waves that propagate in dusty plasma. Compared to the more familiar ion-acoustic waves, in dust-density waves, inertia is provided by dust particles (instead of ions) while pressure is provided by the ions as well as electrons (not just electrons). In a laboratory experiment, we observed dust density waves in a 3D void-free dusty plasma. The waves occur naturally due to an ion-flow instability. Dust particles (4.8 microns) are levitated within the volume of a glass box that rests atop an electrode in a radio-frequency glow discharge plasma. Horizontal confinement of dust particles is provided by the plasma's natural electric field that is enhanced by the walls of the glass box, while vertical confinement is due to the electrode's sheath. We observed dust-density waves with planar wave fronts propagating in alignment with flowing ions. By directly imaging the dust particles with a 500 frame-per-second camera, we monitor the dust density modulations in both space and time. A typical wave propagates at 40 mm/s with a frequency of 24 Hz. In this work, we characterize these waves and their growth as they propagate.

¹This work was supported by NASA and NSF.

Tim Flanagan
The University of Iowa, Department of Physics and Astronomy,
Iowa City, Iowa 52245

Date submitted: 12 Jul 2010

Electronic form version 1.4