LABORATORY OBSERVATION OF NATURALLY OCCURING DUST DENSITY WAVES*

Tim Flanagan and John Goree
Dept. of Physics & Astronomy, The Univ. of Iowa
Iowa City, Iowa USA

In a laboratory experiment, dust density waves are observed in a 3D void-free dusty plasma. Dust particles are levitated within the volume of a glass box that rests atop an electrode in a radio-frequency glow-discharge plasma. Confinement of dust particles is provided by an electric force. The vertical electric field is due to the electrode's sheath, while the lateral electric field is due to the walls of the glass box.

The dusty plasma consists of monodisperse polymer particles of diameter 4.8 microns. The waves are detected by illuminating the dust particles with a vertical laser sheet and imaging them with a 500 frame-per-second camera.

We observed dust density waves with planar wave fronts and a frequency of 24 Hz. They were not externally driven, but arise due to an instability. In this work, we characterize these waves and the conditions under which they appear.

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