Single Particle Reconstruction in Dust Density Waves

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In this contribution, recent reconstructions of dust density waves at a single particle level are presented. With a three-camera stereoscopy system [1], dynamics of three dimensional dust clouds under microgravity and in a laboratory plasma chamber have been investigated. The particles are confined in a symmetric parallel-plate rf-discharge and form complex structures that often feature dust density waves driven by the ion stream. While the dust cloud accumulates naturally under microgravity, in the laboratory a temperature gradient must be applied to compensate the gravitational force and levitate the particles inside the plasma bulk.

The dust clouds feature a central particle free domain, called "void", over a wide parameter range. Single particle reconstruction inside the void has already been accomplished [2]. The next step is the investigation of particles moving inside the particle bulk and take part in the density wave movement. The reconstruction of trajectories from a sufficient amount of individual particles allows to analyze all properties of these non-linear waves.

The high dust density in the wave domains require complex analysis processes to obtain particle trajectories. In addition to the reconstruction results, main steps of the reconstruction algorithms are illustrated.

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