Seminar

Institute for Plasma Research

Title : Experimental studies on collective phenomena in dusty plasmas

Speaker : Mr. Mangilal Choudhary
Institute for Plasma Research, Gandhinagar

Date : 8th February 2017 (Wednesday)

Time : 11.00 AM

Venue : Committee Room 4, (New Building), IPR

Abstract :

The presence of sub-micron to micron sized dust particles in two component plasma either modifies the collective modes of the plasma or shows entirely new collective modes such as linear and nonlinear waves and vortices. In the plasma, these particles get negatively charge of the order of 103- 105e due to the collection of highly mobile electrons than slower ions on their surface. Because of higher charge on the dust particles, the dust-dust interaction as well as dust-plasma species (electrons and ions) interaction get stronger and cause the increase in complexity of the ambient plasma. The dynamics of the dusty plasma is self-consistently linked with the background plasma; therefore, self-oscillatory motion of dust grains gets modified when an external perturbation is applied. In this thesis, we experimentally investigated the collective phenomena of a dusty plasma in the background of argon gas using different plasma sources. Excitation of dust acoustic waves (DAWs) and its propagation characteristics in the presence of an external potential perturbation, using a floating object, is investigated in DC glow discharge plasma. For getting the large volume equilibrium dusty plasma, inductively coupled diffused plasma is used to overcome the limitations in DC discharge configuration. Transport and trapping of negatively charged dust particles in the potential well created by this diffused plasma are studied. Dynamics of the large volume dusty plasma is explored at a wide range of discharge parameters. At a particular discharge condition, multiple co-rotating vortices in the extended dust cloud are observed. Origin of vortex flow and its characteristics are experimentally examined.