Seminar

Institute for Plasma Research

Title: Poloidal Dust Rotation in Toroidally Symmetric Structure in DC Glow Discharge

Speaker: Manjit Kaur

Date: 29th May, 2015 (Friday)

Time: 2:00 pm

Venue: Committee Room 3 (New Building), IPR

Abstract:

Dusty plasmas are low temperature plasmas comprising of micron or sub-micron sized particles in addition to electrons, ions and neutrals. The dust particles inside plasma acquire large negative charges due to the higher mobility of electrons than ions, which enables them to interact with their neighbours very strongly and result into many new and interesting phenomena. Self-organised rotation of dust particles is one such interesting phenomenon that has been investigated in parallel plate dc glow discharge and will be presented. Self–organized poloidally rotating mono-dispersed micro-particles in toroidal geometry are observed at high pressures (p >100 Pa) with a concentric metallic ring placed above the cathode surface. Probe measurements reveal that a radial density gradient is localized near the poloidally rotating structure, above the metallic ring. An estimation of the different forces indicates a gradient in the ion drag force arising due to a radial density gradient as the cause of rotation. Analysis using Navier-Stoke's equation also shows that a radial gradient in the ion drag force due to the density gradient is the principal cause of dust rotation. This is further confirmed by experimentally introducing an additional density gradient in the system by placing a concentric circular disc along with the metallic ring on the cathode surface. Poloidally rotating structures are formed both above the disc and the metallic ring at the location of the radial density gradient, strengthening the importance of role played by density gradients in the formation of rotating dust clouds. In this presentation, these results will be discussed in details.