Seminar

Institute for Plasma Research

Title : Study of Localized Potential Structure and Heating in Expanding Helicon Plasma

Speaker : Mr. Soumen Ghosh
Institute for Plasma Research, Gandhinagar

Date : 17th March 2016 (Thursday)

Time : 11.00 AM

Venue : Seminar Hall, IPR

Abstract:

Spontaneous formation of electrostatic potential structure has important role in electric propulsion. Double layer like potential structures are very common in space plasma due to earth diverging magnetic field. These structures are also observed in laboratory experiments. Thesis highlights observations of non-uniform potentials in geometrically expanding helicon plasma in association with diverging magnetic fields. Observation of multiple ion beams indirectly indicated the formation of multiple double layer like structures in other experiments. However, there is no direct evidence for the formation of multiple double layer like structures, in an expanding helicon plasma systems. This work presents a direct evidence of multiple axial potential structures (MAPS) in expanding helicon plasma system. It is concluded from this work that the magnetic field topology dictates the physics of downstream helicon plasma which is responsible for the formation of this potential structures. It is observed that the electrons are locally heated up axially away from the antenna center which is not due to near antenna fields. Further downstream from the location of the localized electron heating density rises. These localized electron heating and downstream density rise observation is critically analyzed and find out as a cause for the formation of non-uniform potential structures. Inhomogeneous radial density distribution after the expansion may reduce the efficiency of plasma acceleration, which causes due to rotational kinetic energy conversion into axial kinetic energy in a diverging system. Independent role of magnetic and geometrical aperture on radial density inhomogeneity is studied. In this PhD thesis talk, results will be presented to explain the localized potential structure, electron heating and downstream inhomogeneity observed in expanding helicon experimental (HeX) system.