

Seminar

Institute for Plasma Research

Title : An Experimental Investigation of Oscillating Plasma bubbles and its Nonlinear Structure (evolution and effects) in a Magnetized Plasma System

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Date : 24th July 2020 (Friday)

Time : 03:30 PM

Venue : Online - Join the talk:

https://meet.ipr.res.in/Dr.MariammalM_PDFtalk

Abstract :

Plasma bubbles are large scale structures of depleted plasma density in our earth's ionosphere that affect communication signals propagating through atmosphere, to include global navigation satellite systems. Plasma bubbles have been studied for decades using different techniques such as incoherent backscatter radar, ionogram analysis, insitu satellite measurements etc. An attempt has been made through experiments to understand the occurrence of plasma bubbles along with its instabilities and its complete non linear structure in a glow discharge and filamentary discharge magnetized plasma system. Oscillating plasma bubbles have been created around a 75% optical transparency cylindrical and spherical mesh grid in a DC and filamentary discharge plasma system with low magnetic field. Plasma bubbles are created by developing ion density gradient around cylindrical grid of 20 cm in diameter and 25 cm in height and spherical grid of 12 cm in diameter inserted into the plasma. Relaxation and contraction of the plasma bubbles in presence of external conditions such as various discharge voltages, magnetic field, grid biasing voltage, pressure etc. have been studied. The diagnostics viz., electrical Langmuir probe and hot emissive probe have been used to detect the plasma floating potential fluctuations and plasma potential at different imposed experimental conditions. The investigation of experimental results have been characterized by adopting nonlinear techniques such as Phase space plot, Recurrence plot, Recurrence quantification analysis, Multi fractal detrended fractal analysis (MF-DFA), wavelet analysis etc. Moreover, observations are extended further to study instability viz., Rayleigh Taylor instability, Sheath induced instability etc associated with the plasma bubbles. The intension of the present work is to correlate the findings about plasma bubbles with the one existing in equatorial F- region of our ionosphere.

Keywords: Plasma bubble, Floating potential fluctuations, Instability, Chaos, Virtual anode, Potential well.
