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Seminar

Institute for Plasma Research

Title : Wave Propagation along Plasma and Dusty Plasma Interfaces

Speaker: Dr. Rinku Mishra
CPP, IPR

Date : 06th August 2021 (Friday)

Time : 11.30 AM

Venue : Online - Join the talk:

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

Abstract :

In past the few decades, transport properties of complex dusty plasma have been actively investigated in the laboratories and using computer simulations. The physics of waves holds a special place in such complex systems. Even though there have been several investigations on collective properties, they are mostly concerned for the bulk plasma systems. Hence, there is an excellent scope for exploring bounded or finite complex plasma systems, which is capable of providing realistic information. Moreover, if the boundary comes into the picture, apart from the electrostatic and electromagnetic plasma waves, surface waves also play an important role.

In my research work, a fundamental problem on the existence of electrostatic/electromagnetic waves near the interface/boundary region has been studied, and subsequently, kinetic modeling of the same has been performed. The surface wave[1] properties have been investigated under different situations namely the sharp interface of plasma-dusty plasma system[2] and the dust void-dusty plasma system[3]. An analytical and numerical model was developed to obtain the dispersion relation, which explains the wave properties along the interface region. An open-source code, XOOPIIC[4] has been used to develop a kinetic model of the plasma surface wave. In the model, we have used a microwave frequency as an input source to excite surface waves along the interface of a dielectric tube and plasma. The dependency of surface wave properties on the dielectric permittivity and supplied input frequency have been a central pivot of the investigation. The results are believed to provide a deep understanding on physical aspects of a surface wave sustained plasma and supposed to help in performing more thorough experimental investigations.

References:

- [1] Space charge waves in cylindrical plasma columns, A. Trivelpiece and R. Gould, Journal of Applied Physics, 30, 1784–1793 (1959)
 - [2] Propagation of high frequency electrostatic surface waves along the planar interface between plasma and dusty plasma, Rinku Mishra and M Dey, Phys. Scr., 93, 045601 (2018).
 - [3] Propagation of electrostatic surface wave along the dust void boundary, Rinku Mishra and M Dey, Phys. Scr., 93,085601 (2018).
 - [4] An Object-Oriented Electromagnetic PIC Code, J.P. Verboncoeur, A.B. Langdon and N.T. Gladd, Comp. Phys. Comm., 87, May11, 1995, pp. 199-211.
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