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Seminar

Institute for Plasma Research

Title : The rotating Rayleigh-Taylor instability in a strongly coupled dusty plasma

Speaker: Dr. Bivash Dolai

Guru Ghasidas Vishwavidyalaya, Bilaspur

Date : 09th April 2021 (Friday)

Time : 03:30 PM

Venue : Online - Join the talk:

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Abstract :

The linear Rayleigh-Taylor instability (RTI) in a strongly coupled dusty plasma (SCDP) in the presence of dust cloud rotation is investigated analytically and also numerically using finite difference method (FDM). The magnetized ions exert a rotational force on the unmagnetized dust particles due to the collisional momentum transfer to the dust particles [1, 2]. Based upon the equivalence of the magnetic Lorentz force and Coriolis force on the plasma, we find the nature of this force similar to the Coriolis force [3, 4]. The dispersion relation is analytically derived using appropriate boundary conditions and velocity profile. The dispersion characteristics are analyzed in the strongly coupled limit, and it is observed that the criterion of linear RTI is modified due to the presence of rotation and shear velocity comprising strong correlation effects. It is found that in the presence of intermediate magnetic field in SCDP, dust cloud rotation and strong correlation effects altogether stabilize the growth rate of linear RTI. The analytical growth rate of RTI shows a good agreement with the growth rate calculated using FDM.

References:

- [1] M. Mondal, S. Sarkar, S. Mukherjee, and M. Bose, *Contrib. Plasma Phys.* 58, 56 (2018).
 - [2] P. K. Kaw, K. Nishikawa, and N. Sato, *Phys. Plasmas* 9, 387 (2002).
 - [3] P. Hartmann, Z. Donko, T. Ott, H. Kahlert, and M. Bonitz, *Phys. Rev. Lett.* 111, 155002 (2013).
 - [4] H. Kahlert, J. Carstensen, M. Bonitz, H. Lowen, F. Greiner, and A. Piel, *Phys. Rev. Lett.* 109, 155003 (2012).
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