



## ICTS Fluid Dynamics Seminar

**Title** : Investigation of Subcritical Turbulence Through First-Principle Methods

**Speaker** : Suruj Jyoti Kalita (Institute for Plasma Research, HBNI, Gandhinagar)

**Date** : Wednesday, 11 September 2024

**Time** : 2:30 PM (IST)

**Abstract** : A Yukawa liquid, often realizable in Complex plasmas, provides a perfect test bed to study fluid instability and turbulence related studies. Due to the stretched length-scale and slow time-scale, macroscale fluid phenomena can be studied accurately at the kinetic level, with the possibility of experimental verification of the obtained results. A screened Coulomb potential, also called a Yukawa potential is often used in theory and simulations to model Complex plasmas. In my presentation, using classical “first principles” 3D MD simulations, I shall try to explain the possibility of subcritical transition to turbulence in PCF in a 3D Yukawa liquid, using a few millions of particles. By perturbing a PCF with finite-amplitude disturbance, subcritical transition to turbulence is demonstrated [1]. The characteristics of turbulence and its sustenance is shown to depend on the nature of the perturbation and its amplitude. Unlike supercritical turbulence, here the turbulence is shown to be spatially localized and interspersed with laminar regions, which are typical characteristics of subcritical turbulence. The effect of system size or aspect ratio [2] and the effect of stable stratification [3] on subcritical turbulence in PCF is investigated. The interaction of Yukawa liquid with coherent vortex structure [4] is studied, and important insights regarding the overall turbulence process are obtained. All the above mentioned points will be presented briefly during the presentation.

[1] S Kalita, R Ganesh, “Spot formation in three-dimensional Yukawa liquid,” *Physics of Fluids*, 33, 095118, 2021.

[2] S Kalita, R Ganesh, “Turbulent spot formation in three-dimensional Yukawa liquids using large-scale molecular dynamics simulation - effect of system size,” *Physica Scripta*, 99, 055246, 2024.

[3] S Kalita, R Ganesh, “Turbulent spot formation in stably stratified three-dimensional Yukawa liquids,” *Physical Review Research*, 6, 01319, 2024.

[4] S Kalita, R Ganesh, Manuscript Under Preparations, 2024

**Venue** : Online

Zoom Link: <https://icts-res-in.zoom.us/j/99603149815?pwd=gbFpgWhKAYWlIOMcTwDchpicuKrkn8.1>

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