Seminar

Institute for Plasma Research

Title :   Modulational instability of dust acoustic waves in a strongly coupled Yukawa system within the Quasi-localized charged approximation (QLCA) framework

Speaker: Dr. Sandip Dalui
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Date :   25th July 2022 (Monday)

Time :   03.30 PM

Venue :   Online - Join the talk:
               https://lobby.ipr.res.in/Sandip_Dalui_PDF_ExtensionTalk

Abstract:

The quasi-localized charge approximation (QLCA) approach is used to study the collective mode dispersion in the strongly coupled Yukawa systems. This QLCA approach is incorporated to study the nonlinear excitations of dust acoustic waves in a quasi-crystalline phase of a strongly coupled Yukawa system. Using the reductive perturbation method a nonlinear Schrödinger equation is derived within the QLCA framework to see the nonlinear behaviour of a strongly coupled Yukawa system. The negative signature of the linear dispersion relation is predicted in quasi-crystalline phase for the strongly coupled limit of the dusty plasma. We have derived the nonlinear dispersion relation which contains the term with dynamical tensor responsible for the strongly coupled limit of the Yukawa system and consequently the growth rate of instability and maximum modulational growth rate of instability have derived analytically. For weakly and strongly coupled limit of the dusty plasma, we have investigated the modulational instability which identifies the modes of maximum modulational growth rate of instability for different parameters viz., the dust temperature and the screening parameter $\kappa = \frac{a}{\lambda_D}$ where a is the inter dust separation and λ_D is the Debye length. The instability is characterized in full parametric space of the strongly coupled system, showing newer domains of stability and strong modifications of the results with respect to the stability analysis of a weakly coupled Yukawa system.

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