Seminar

Institute for Plasma Research

Title : Secondary Instabilities In The Dynamics Of Farley Buneman Fluctuations

Speaker : Dr. J. K. Atul
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Date : 14th June 2016 (Tuesday)

Time : 03:30 PM

Venue : Seminar Hall, IPR

Abstract:

Simultaneous existence of multi instabilities have been reported in various linear plasma devices [1][2][3] as well as in astrophysical plasma systems [4][5].The competition between the participating modes depends on the dominant drivers which drive the instability. The interplay between these modes and the associated wave particle interactions significantly alter the classical transport properties of plasma by modulating its parameters. The hierarchy of these instabilities needs to be investigated with respect to plasma confinement scenario. In context with it, a parametric coupling model is developed in terms of complex coupling coefficient for the interaction of Farley Buneman (FB) and Gradient Drift (GD) modes in slab geometry. Using kinetic wave equation, a quasiparticle approach is adopted for the description of FB modes under stationary turbulence. Further, nonlinear influences due to background plasmon quasiparticles on the dynamics of GD mode, is explored. Electron dynamics reveals the modification in electron collision frequency and inhomogeneity scale length. Also, a new quasimode gets excited through the dispersion relation. Moreover, the dynamics of the participating modes in turn gets coupled through a dimensionless parameter which is estimated using Gaussian and Delta profiles separately.

References-

[1] Chattopadhyay, P. K., Bose, S., Ghosh, J., & Saxena, Y. C. (2015). Simultaneous existence of Kelvin Helmholtz and Drift wave Instabilities in IMPED. Bulletin of the American Physical Society, 60.

[2] Chakraborty Thakur, S., Cui, L., Gosselin, J., Vaezi, P., Holland, C., & Tynan, G. (2014, October). Global transition from drift wave dominated regimes to multi-instability plasma dynamics and simultaneous formation of a radial transport barrier in helicon plasma. In APS Meeting Abstracts (Vol. 1, p. 8058P).

[3] Thakur, S. C., Brandt, C., Cui, L., Gosselin, J. J., Light, A. D., & Tynan, G. R. (2014). Multi-instability plasma dynamics during the route to fully developed turbulence in a helicon plasma. Plasma Sources Science and Technology, 23(4), 044006.

[4] Atul, J. K., Sarkar, S., & Singh, S. K. (2016). Nonlinearly coupled dynamics of irregularities in the equatorial electrojet. Physics Letters A, 380(16), 1446-1449.

[5]Gondarenko, N. A., & Guzdar, P. N. (2006). Nonlinear three-dimensional simulations of mesoscale structuring by multiple drives in high-latitude plasma patches. Journal of Geophysical Research: Space Physics, 111(A8).