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Seminar

Institute for Plasma Research

Title : Sticky islands in stochastic webs and anomalous chaotic cross-field particle transport by $E \times B$ electron drift instability

Speaker: Dr. Debraj Mandal
Institute for Plasma Research, Gandhinagar

Date : 16th September 2020 (Wednesday)

Time : 03:30 PM

Venue : Online - Join the talk:

https://meet.ipr.res.in/Debraj_PDF_Extension_Talk

Abstract :

The $E \times B$ electron drift instability or electron cyclotron drift instability is observed in many magnetized plasma devices. This small frequency instability is an important agent in crossfield particle transport. In this work first we analyse the collisionless transport mechanism of electrons due to presence of a single electrostatic mode generated by this $E \times B$ electron drift instability by considering a reduced two-degrees-of-freedom Hamiltonian. It helps to simplify the original dynamics complexity. In the presence of the electrostatic wave and the magnetic field the dynamics of a charged particle becomes chaotic, and for different parameter values it generates Halloweenmask like and other different stochastic webs in the phase-space. We define a scaling exponent to characterise transport in such phase space having a mixture of chaotic and regular trajectory domain, and we show that the transport is anomalous, of super-diffusive type. The trajectories stick to different kinds of islands in phase space, and their different sticking time power-law statistics generate successive regimes of the super-diffusive transport.
