Seminar

Institute for Plasma Research

Title : External control of the synchronization dynamics of two inductively coupled glow discharge plasma sources

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Date : 16th February 2018 (Friday)

Time : 10.30 AM

Venue : Seminar Hall, IPR

Abstract :

The phenomenon of synchronization is a common occurrence in many natural systems, in which individual members of an ensemble of oscillating units adjust their rhythms to oscillate in unison. Many of these natural systems are also subject to external periodic forcing that can influence their collective behaviour in significant ways. A plasma is a complex nonlinear system that supports a variety of waves and instabilities, and the influence of an external driver on the behaviour of such excitations can have many interesting effects. In this talk, an experimental investigation of the influence of an external periodic forcing on the synchronization dynamics of two inductively coupled plasma sources will be presented. The driven response of the coupled system is found to have a rich structure in the parameter space of the frequency and the amplitude of the external driver. In particular, there is a strong impact on the nature of the phaseflip transitions between anti-phase and in-phase synchronized states of the system and the frequency bifurcation structure of the collective states. The external driver provides a convenient tool for accessing various collective states of the system and controlling the collective dynamics of the two coupled systems through a proper choice of its frequency and amplitude. Our experimental results are qualitatively supported by numerical simulation results from a theoretical model of two environmentally coupled van der Pol equations, one of which is driven externally. Also, some basic nonlinear dynamics experiments are performed in non-thermal plasma jet for synchronization studies.