Seminar

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Institute for Plasma Research

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Title: Excitation of Terahertz Surface Magnetoplasmons by Laser on Graphene–n-InSb Semiconductor Surface

Speaker: Dr. Rohit Kumar Srivastav
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Date: 06th June 2025 (Friday)

Time: 10:30 AM

Venue: Seminar Hall, IPR

Abstract

A mechanism is proposed for the resonant excitation of terahertz (THz) surface magnetoplasmons (SMPs) via the oblique incidence of a p-polarized laser beam on a graphene sheet deposited over a rippled surface of an n-type InSb semiconductor, under the influence of an external magnetic field. The magnetic field, applied parallel to the semiconductor surface, modifies the SMPs dispersion [1]. The graphene layer, which can be fabricated using chemical vapor deposition (CVD) or plasma-enhanced chemical vapor deposition (PECVD), introduces enhanced surface conductivity (σ_g), supporting the propagation of strong surface plasmons [2-3]. The resonant excitation of THz SMPs, periodic ripple surface provides the extra momentum for the phase-matching conditions. The incident laser imparts a linear oscillatory velocity to free electrons, which, when coupled with a modulated electron density, generates a linear current density that acts as a source for THz SMPs generation. It is shown that the amplitude of the THz SMP wave can be tuned by adjusting the external magnetic field (B_0), the graphene's Fermi energy (E_F), the semiconductor's temperature (T), and the incident angle (θ) of the laser. This mechanism holds promise for the development of actively tunable plasmonic devices. [4-5].

References:

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[3] M. Saeed, et. al., Molecules 25, 3856 (2020).
[4] I. F. Akyildiz, et. al., IEEE Transactions on Communications 70, 4250 (2022).
[5] K. Liu, et. al., Nature Communications 15, 8037 (2024).
[6] R. K. Srivastav and M. Kundu, Physical Review E (2025), Submitted.