QPhysics AT QUEENS COLLEGE

Colloquium Notice

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Extreme nonlinear metamaterials

Nanophotonics holds promise for realizing compact devices that can address global challenges such as energy-efficient communication, space exploration, and clean energy sources. At the nanoscale, the electromagnetic energy of light is squeezed to dimensions much smaller than the wavelength, leading to enhanced interaction with matter. In particular, nonlinear optical interactions greatly benefit from this extreme light confinement. Several subwavelength nonlinear materials, also known as nonlinear metasurfaces, have been shown to capitalize on the enhanced near-field. The possibility of integrating these materials into devices will enable various applications, including imaging, holography, and high-speed photonic communications. Despite these promises, efficiency and tunability issues can hinder integrating nonlinear metasurfaces into compact devices. In this talk, I will discuss our recent results in developing efficient, broadband, and widely tunable nonlinear metasurfaces based on novel hybrid lightmatter states. The talk will focus on two systems: 1) hybrid states of gold and graphene plasmons and 2) hybrid states of excitons in two-dimensional semiconductors and plasmons in metals. On the one hand, hybrid states enable broadband operation and improve efficiency. On the other hand, employing two-dimensional materials as a platform provides wide tunability due to the unique properties of these materials. Pushing the limits of nonlinear light-matter interaction will lead to a new class of ultrathin electro-optical metadevices that can simultaneously generate and control light.

Monday
April 15, 2024
Starts at 12:15 PM
Coffee at 12:00 PM
Physics Conference Room, SB B326