ΠΑΝΕΠΙΣΤΗΜΙΟ ΚΡΗΤΗΣ

ΤΜΗΜΑ ΦΥΣΙΚΗΣ

ΓΕΝΙΚΟ ΣΕΜΙΝΑΡΙΟ ΤΜΗΜΑΤΟΣ ΦΥΣΙΚΗΣ

PHYSICS COLLOQUIUM

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17:00 -18:00

3rd Floor Seminar Room

Optical graphene: diffraction-free edge states and strain-induced photonic Landau levels

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Abstract

Optical graphene is an array of micron-scale waveguides in arranged in a honeycomb lattice. Just like ordinary graphene, optical graphene has Dirac points in its spectrum; therefore, the striking physics of graphene can be brought into optics, and completely new phenomena can be experimentally observed. Examples of this include conical diffraction [1,2]; gap solitons [1], and tachyonic PT-symmetry breaking [3]. In this colloquium I will present experimental results on two new such phenomena: (1) diffraction-free edge states; and (2) strain-induced magnetic fields and Landau levels (as well as band gaps between them).
In a photonic crystal setting, the latter presents the possibility of achieving extremely high photonic densities of states (due to high Landau level degeneracy) for the improved efficiency of nonlinear optical logic components, terahertz generation, and single-photon sources. My aim in this talk is to demonstrate that graphene physics in the optical domain provides a template to understand and explore new phenomena that would be unobservable conventionally, as well as to demonstrate its potential for enhancing desirable device properties.

[1] Peleg et. al., Phys. Rev. Lett. 98, 103901 (2007).
[2] Ablowitz et. al., Phys. Rev. A 79, 053830 (2009).
[3] Szameit et. al., Phys. Rev. A (Rapid Comm) 84, 021806(R) (2011).