

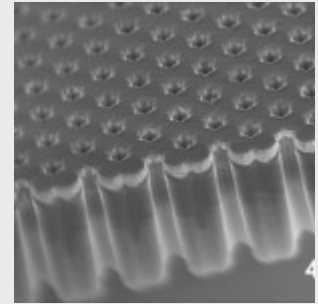
Polaritons in Lattices: A Nonlinear Photonic Emulator of Graphene

Title: Polaritons in Lattices: A Nonlinear Photonic Emulator of Graphene.

When: Thursday, 07 July (2016), 16.00-17.00 h.

Place: Departamento de Física Teórica de la Materia Condensada, Facultad Ciencias, Module 5, Seminar Room (5th Floor).

Speaker: Alberto Amo, Centre de Nanosciences et de Nanotechnologies, CNRS, Univ. Paris-Sud, Université Paris-Saclay, France.



Exciton polaritons are quasi-particles arising from the strong coupling of quantum well excitons and cavity photons in semiconductor microcavities.

Thanks to their mixed light-matter nature, polaritons present unique nonlinear properties while, simultaneously, allowing the design of the photonic potential landscape. The direct visualisation of polariton eigenfunctions in luminescence experiments, makes microcavities an extraordinary photonic platform to emulate 1D and 2D nonlinear Hamiltonians.

In this way, polaritons allow transposing to the photonic world some of the properties of electrons in solid state systems, and to engineer Hamiltonians with novel transport and nonlinear properties.

In this presentation we will show striking nonlinear effects in two coupled micropillars which can be described by the nonlinear Bose-Hubbard dimer. We will then address the physics of a honeycomb lattice of coupled micropillars [1]. Its band structure emulates for photons the π and π^* bands of graphene [2, 3]. In addition, our system permits exploring orbital degrees of freedom, inaccessible in actual graphene, which give rise to flat bands and novel kind of edge states.

Our system presents interesting perspectives in view of studying nonlinear excitations in engineered photonic Hamiltonians owing to polariton-polariton interactions [4].

References

- S. R. K. Rodriguez et al., Interaction-induced hopping phase in driven-dissipative coupled photonic microcavities. *Nat. Commun.* 7, 11887 (2016).
- T. Jacqmin et al., Direct Observation of Dirac Cones and a Flatband in a Honeycomb Lattice for Polaritons. *Phys. Rev. Lett.* 112, 116402 (2014).
- M. Milićević et al., Edge states in polariton honeycomb lattices. *2D Mater.* 2, 034012 (2015).
- F. Baboux et al., Bosonic Condensation and Disorder-Induced Localization in a Flat Band. *Phys. Rev. Lett.* 116, 066402 (2016).

[More information on IFIMAC Website](#)