Artificial magnetism for photons in polaritons lattices

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Inducing artificial magnetism for photons is one of the main challenges for the implementation of photonic lattices with topological properties. In this presentation we will describe two strategies to engineer artificial magnetic fields in polariton micropillars. The first one consists in the engineering a spatial gradient in the hopping of photons in a honeycomb lattice of coupled micropillars. This artificial strain gives rise to a gauge field that results in the appearance of Landau levels at the Dirac cones [1]. In this configuration, time-reversal symmetry is preserved and the artificial magnetic fields have opposite signs at the two nonequivalent Dirac cones. The second strategy takes advantage of the light-matter interaction present in polaritons and their spin-dependent interactions: it is possible to break time-reversal symmetry by pumping the system with light of a given circular polarization. We show this effect and how it can give rise to photonic chiral currents.

References

[1] O. Jamadi, E. Rozas, G. Salerno, M. Milićević, T. Ozawa, I. Sagnes, A. Lemaître, L. Le Gratiet, A. Harouri, I. Carusotto, J. Bloch, and A. Amo, Direct Observation of Photonic Landau Levels and Helical Edge States in Strained Honeycomb Lattices, *Light: Science & Applications* **9**, 144 (2020).Authors, *Journal*, **Volume**, page (Year) (Arial 10).