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Light-Matter interactions in synthetic magnetic fields: Landau-Photon polaritons

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We study light-matter interaction in two dimensional photonic systems in the presence of a spa- tially homogeneous synthetic magnetic field for light. Specifically, we consider one or more two-level emitters located in the bulk region of the lattice, where for increasing magnetic field the photonic modes change from extended plane waves to circulating Landau levels. This change has a drastic effect on the resulting emitter-field dynamics, which becomes intrinsically non-Markovian and chiral, leading to the formation of strongly coupled Landau-photon polaritons. The peculiar dynamical and spectral properties of these quasi-particles can be probed with state-of-the-art photonic lattices in the optical and the microwave domain and may find various applications for the quantum simulation of strongly interacting topological models.

Primary author(s) : Dr. DE BERNARDIS, Daniele (BEC-CNR-INFM and Dipartimento di Fisica, Università di Trento, I-38050 Povo, Italy and); Prof. RABL, Peter (Vienna Center for Quantum Science and Technology, Atominstitut, TU Wien, 1040 Vienna, Austria)

Co-author(s) : Dr. CHAN, Ze-Pei (Joint Quantum Institute, College Park, 20742 MD, USA); Dr. CARUSOTTO, Iacopo (BEC-CNR-INFM and Dipartimento di Fisica, Università di Trento, I-38050 Povo, Italy); Prof. HAFEZI, Mohammad (Joint Quantum Institute, College Park, 20742 MD, USA and The Institute for Research in Electronics and Applied Physics, University of Maryland, College Park, 20742 MD, USA)

Presenter(s) : Dr. DE BERNARDIS, Daniele (BEC-CNR-INFM and Dipartimento di Fisica, Università di Trento, I-38050 Povo, Italy and)

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