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Tomography of a polariton topological insulator

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In the field of topological photonics, exciton-polariton cavities have emerged as a promising platform, thanks to the complementary nature of their matter and light components. Indeed, the excitonic part provides large non-linearities and susceptibility to magnetic fields, allowing time-reversal symmetry breaking, whereas the photonic part allows the engineering of gain, losses or the equivalent of spin-orbit coupling for photons. Thanks to all of this, exciton-polariton systems allow the study of a wide variety of phenomena, such as Chern insulators, quantum spin Hall effect, non-Hermitian skin effect, topological lasing or topological gap solitons. Moreover, the open nature of exciton-polariton cavities makes them ideally suited to the measurement of geometrical and topological properties underlying these phenomena.

Here, we report the experimental signature of the opening of a topological gap in a specially designed polariton honeycomb lattice, showing large TE-TM and Zeeman splitting. We follow the transition from a trivial phase to a Chern number C = ±2 topological phase through the polarization and sub-lattice localization properties of the eigenmodes of the system. Furthermore, our measurement gives us access to the Berry curvature and quantum metric of the system.

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