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Controlling topological phases of matter with quantum light

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Controlling the topological properties of quantum matter is a major goal of condensed matter physics. A major effort in this direction has been devoted to using classical light in the form of Floquet drives to manipulate and induce states with non-trivial topology. A different route can be achieved with cavity photons. In this talk, I will discuss a prototypical model for topological phase transition, the one-dimensional Su-Schrieffer-Heeger (SSH) model, coupled to a single mode cavity. I will demonstrate that quantum light can affect the topological properties of the system, including the finite-length energy spectrum hosting edge modes and the topological phase diagram. In particular, I will show that depending on the lattice geometry and the strength of light-matter coupling one can either turn a trivial phase into a topological one or vice versa using quantum cavity fields. Furthermore, the polariton spectrum of the coupled electron-photon system contains signatures of the topological phase transition in the SSH model.

Abstract category

Other

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