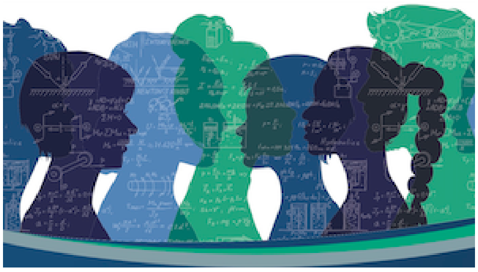

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Finite SSH chains coupled to a two-level emitter: Transition from weak perturbation to new edge state

Sunday, January 22, 2023 9:18 AM (12 minutes)

The Hamiltonian for the one-dimensional SSH chain is one of the simplest Hamiltonian that supports topological states. This work considers between one and three finite SSH chains that are coupled in two distinct ways. In set-up 1 (cavity-shared case), the three chains share a lattice site (or cavity), which, in turn, is coupled to a two-level emitter. In set-up 2 (emitter-shared case), each chain is coupled to the same two-level emitter. For both scenarios, we investigate the emitter dynamics as functions of the emitter-cavity coupling strength g and the detuning between the emitter energy and the center of the band gap. For small g, the emitter acts as a perturbation. For moderately large g, in contrast, the emitter acts as a new edge. This transition is related to the finiteness of the SSH chains considered in this work, i.e., such a transition is absent in the corresponding infinite chain systems. To quantify the robustness of the topological system characteristics, onsite disorder is introduced. The inverse participation ratio for the cavity-shared and emitter-shared systems consisting of j chains (j>1) are found to display differences as a function of the disorder strength.

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