Chern Insulator on a Circuit Board with Broken Time-Reversal-Symmetry

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Chern Insulators are bulk insulators whose topologically non-trivial band-structure guarantees the existence of uni-directional edge modes. They have received an ever increasing amount of interest since the discovery of the Quantum Hall effect in 1980.

Recently, the concept of topology in condensed matter systems has found a wide range of applications from photonic metamaterials to phononic systems.

Here, we propose a linear RLC-network whose eigenmodes exhibit a non-trivial topology. The model is in close analogy to an electronic Chern Insulator on the Lieb lattice. It is, to the best of our knowledge, the first topological circuit with broken time-reversal symmetry.

We numerically confirm the existence of chiral edge modes and demonstrate their stability against disorder. We show that these edge modes can be experimentally observed by driving an edge-site of the circuit with a frequency within the bulk gap.

Topological circuits may present an experimentally convenient tool to simulate topological effects in lattices not restricted to spatial dimensions.