Anomalous edge states in scattering networks: stronger than Chern

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Abstract

Originally discovered in the quantum Hall effect, chiral edge states are, in fact, a remarkable manifestation of a Chern topological phase, whose experimental realizations extend beyond the realm of quantum matter. The robustness of these unidirectional modes against defects and imperfections makes them ideal candidates for the robust transport of information or energy. However, this robustness has its limits, set by the energy gap, which must remain large compared to the amplitude of perturbations. The situation is different for networks of circulators. These nonreciprocal media can develop not only a Chern topological phase but also another topological phase formally analogous to the so-called anomalous Floquet topological phases. Remarkably, these edge states persist under certain types of disorder, particularly structural disorder, beyond the threshold at which those of the Chern phase are destroyed.

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