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Thermal Instability of Edge States in a 1D Topological Insulator[1]
OSCAR VIYUELA, ANGEL RIVAS, MIGUEL ANGEL MARTIN-DELGADO, Universidad Complutense de Madrid — The stability of topological phases of matter, also known as topological orders, against thermal noise has provided several surprising results in the context of topological codes used in topological quantum information. However, very little is known about the behavior of a topological insulator (TI) subjected to the disturbing thermal effect of its surrounding environment. This is of great relevance if we want to address key questions such as the robustness of TIs to thermal noise, existence of thermalization processes, use of TIs as platforms for quantum computation, etc. In this work, we have studied the dynamical thermal effects on the protected edge states of a TI when it is considered as an open quantum system in interaction with a noisy environment at a certain temperature T. Let us recall that stable edge states are a defining signature of topological insulators. Outstandingly, we find that the usual protection of edge states against quantum perturbations and randomness is lost in the case of thermal effects, despite the fermion-boson interaction with the thermal environment respects chiral symmetry, which is the symmetry responsible for the protection (robustness) of the edge states in this TI. We are able to compute decay rates for practical implementations. PRB (2012)

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