Topologically protected dynamical quantum phase transitions[1]
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ATSKY, Los Alamos National Laboratory, NORDITA — A sudden quantum quench
of a Bloch band from one topological phase toward another has been shown to exhibit
an intimate connection with the notion of a dynamical quantum phase transition
(DQPT), where the returning probability of the quenched state to the initial statei.e.
the Loschmidt echovanishes at critical times $\{t^*\}$. Analytical results to date are lim-
ited to two-band models, leaving the exact relation between topology and DQPT
unclear. In this work, we show that for a general multi-band system, a robust DQPT
relies on the existence of nodes (i.e. zeros) in the wavefunction overlap between the
initial band and the post-quench energy eigenstates. These nodes are topologically
protected if the two participating wavefunctions have distinctive topological indices.
We demonstrate these ideas in detail for both one and two spatial dimensions using
a three-band generalized Hofstadter model. We also discuss possible experimental
observations.

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