

# The Peierls-Nabarro Effect in Nonlinear Topological Insulators

Justin Cole

Department of Mathematics, University of Colorado, Colorado Springs

## Abstract

The Peierls-Nabarro energy barrier is an effect that occurs in discrete nonlinear systems. In a classic system, like the Discrete Nonlinear Schrodinger (DNLS) equation, the barrier causes certain localized waves to slow and eventually stop. On the other hand, Floquet topological insulators are a type of Chern insulator where localized modes propagate unidirectionally along domain boundaries. Moreover, these so-called topologically protected modes continue their propagation in spite of material and lattice defects. For discrete Floquet topological insulators, there is a natural clash between these two forces. So, who wins? The result is a compromise. Edge states do not stop, like the DNLS system, but the modal profile does redistribute its energy to that of a slowly-varying envelope that satisfies a generalized NLS equation. As a result, relative to the discrete lattice, the mode is effectively continuous.