

Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Topological states in one dimensional solids and photonic crystals

TIMOTHY ATHERTON, HARSH MATHUR, Case Western Reserve University —
We show that the band structure of a one-dimensional solid with particle-hole symmetry may be characterized by a topological index that owes its existence to the non-trivial homotopy of the space of non-degenerate real symmetric matrices. Moreover we explicitly demonstrate a theorem linking the topological index to the existence of bound states on the surface of a semi-infinite one dimensional solid. Our analysis is a one-dimensional analogue of the analysis of topological insulators in two and three dimensions by Balents and Moore; our results may be relevant to long molecules that are the one dimensional analogue of topological insulators. We propose the realization of this physics in a one-dimensional photonic crystal. In this case the topology of the bandstructure reveals itself not as a bound surface state but as a Lorentzian feature in the time delay of light that is otherwise perfectly reflected by the photonic crystal.

Timothy Atherton
Case Western Reserve University

Date submitted: 02 Dec 2010

Electronic form version 1.4