Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Topological Edge States with Zero Hall Conductivity in a Dimerized Hofstadter Model ALEXANDER LAU, CARMINE ORTIX, JEROEN VAN DEN BRINK, Institute for Theoretical Solid State Physics, IFW Dresden — The Hofstadter model is one of the most celebrated models for the study of topological properties of matter and allows the study of the quantum Hall effect in a lattice system. Indeed, the Hofstadter Hamiltonian harbors the topological chiral edge states that are responsible for the quantized Hall conductivity. Here, we show that a lattice dimerization in the Hofstadter model opens an energy gap at half-filling. What is more, we demonstrate that even if the ensuing insulator has a Chern number equal to *zero*, concomitantly a doublet of edge states appear that are pinned to specific momenta. We show that the presence of these states can be understood from the topological properties of lower dimensional cuts of the system, using a mapping of the Hofstadter Hamiltonian to a collection of one-dimensional Aubry-André-Harper (AAH) models. A sub-set of AAH chains in this collection preserve inversion symmetry. This guarantees the presence of topologically protected doublets of end modes to which the edge states are pinned. To explicitly prove the robustness of the emerging edge states, we define and calculate the topological invariant that protects them, which turns out to be an integer invariant for inversion-symmetric AAH models.

Alexander Lau
Institute for Theoretical Solid State Physics, IFW Dresden

Date submitted: 29 Oct 2015 Electronic form version 1.4