

Abstract Submitted  
for the MAR12 Meeting of  
The American Physical Society

**Chiral Topological Phases and Fractional Domain Wall  
Excitations in One-Dimensional Chains and Wires<sup>1</sup>** JUKKA

VAYRYNEN, Yale University, TEEMU OJANEN, Harvard University  
— According to the general classification of topological insulators, there exist one-dimensional chirally (sublattice) symmetric systems that can support any number of topological phases. We introduce a zigzag fermion chain with spin-orbit coupling in magnetic field and identify three distinct topological phases. Zero-mode excitations, localized at the phase boundaries, are fractionalized: two of the phase boundaries support  $\pm e/2$  charge states while one of the boundaries support  $\pm e$  and neutral excitations. In addition, a finite chain exhibits  $\pm e/2$  edge states for two of the three phases. We explain how the studied system generalizes the Peierls-distorted polyacetylene model and discuss possible realizations in atomic chains and quantum spin Hall wires.

<sup>1</sup>Academy of Finland (T.O), KAUTE, Emil Aaltonen Foundation, ERC Grant No. 240362-Heatronics (J. I. V)

Jukka Vayrynen  
Yale University

Date submitted: 03 Nov 2011

Electronic form version 1.4