Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Surface Theory of Topological Insulators PAK ON CHAN, TAYLOR HUGHES, SHINSEI RYU, EDUARDO FRADKIN, University of Illinois at Urbana-Champaign — We discuss a hydrodynamic effective field theory description of 3+1 dimensional topological insulators. The effective field theory is a BF type topological field theory augmented with an axion (theta) term, which is obtained from the functional bosonization technique that introduces one form as well as two form gauge fields, the latter of which describes the conserved U(1) charge. We construct various kinds of non-local operators describing topological excitations in the bulk and study their algebraic properties thereof. Furthermore, we derive a hydrodynamic effective field theory for the gapless surface of 3+1 dimensional topological insulators. Such theory, which is essentially a BF-CS theory with a non-local Maxwell term, reproduces all the physical properties appeared in the bulk and is hence compatible to the bulk theory. Current-current correlation function is calculated and its transformation under modular transform is also discussed.

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Date submitted: 15 Nov 2013 Electronic form version 1.4