Abstract Submitted
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Topological Insulators in Three Dimensions[1] LIANG FU, CHARLES KANE, EUGENE MELE, University of Pennsylvania — We study three dimensional generalizations of the quantum spin Hall (QSH) effect. Unlike two dimensions, where the QSH effect is distinguished by a single Z_2 topological invariant, in three dimensions there are 4 invariants distinguishing 16 "topological insulator" phases. There are two general classes: weak (WTI) and strong (STI) topological insulators. The WTI states are equivalent to layered 2D QSH states, but are fragile because disorder continuously connects them to band insulators. The STI states are robust and have surface states that realize the 2+1 dimensional parity anomaly without fermion doubling, giving rise to a novel "topological metal" surface phase. We show that the Z_2 invariants can be easily determined for systems with inversion symmetry. This allows us to predict specific materials are STI's, including semiconducting alloy Bi_{1-x} Sb_x as well as $\alpha-$Sn and HgTe under uniaxial strain.

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2. Liang Fu, C.L. Kane, cond- mat/0611341.

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