Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Fermionic Symmetry Protected Topological Phase Induced by Interaction SHANGQIANG NING, Institute for Advanced Study, Tsinghua Univ, HONGCHEN JIANG, Stanford Institute for Materials and Energy Sciences, SLAC National Accelerator Laboratory, ZHENGXIN LIU, Institute for Advanced Study, Tsinghua Univ — It is known that interaction can reduce the classification of topological phases in free femion systems, for instance, the Z classes of 1D Kitaev Majorana chains with time reversal symmetry reduce to Z_8 under interaction. However, strong interactions can give rise to new SPT phases which have no counterparts in free fermion systems. In this talk, I illustrate this result through an concrete example. The symmetry group we consider is $U(1)Z_2^T$. There are no topological phases for non-interacting fermions with this symmetry. When interactions are turned on, a nontrivial topological phase appears owning to the existence of nontrivial projective representation. We illustrate this result by studying a three-legged ladder of spineless fermions with strong interactions. We show that there are two gapped SPT phases, the trivial one is adiabatically connected to the band insulator, while the states in the nontrivial phase cannot be adiabatically evolved into the trivial phase without breaking symmetry.

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Date submitted: 14 Nov 2014 Electronic form version 1.4