Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Symmetry protected topological phases from decorated domain walls XIE CHEN, YUAN-MING LU, ASHVIN VISHWANATH, University of California, Berkeley — Symmetry protected topological phases are gapped quantum phases with gapless edge excitations protected by certain symmetries of the system. While SPT phases in lower dimensions (especially 1D) are relatively well understood, less is known about higher dimensional (2D and 3D) SPT phases including what their edge excitations are like and how to detect them. In this work, we present a construciton of d dimensional SPT phases with $Z_2 \times G$ symmetry by decorating the Z_2 domain walls in the d dimensional bulk with $d-1$ dimensional SPT phases with G symmetry. Such a construction not only provides a simple understanding of higher dimensional SPT phases starting from lower dimensional ones, but also reveals a special topological feature of such SPT phases. That is, on the boundary of the system, the domain wall end points/loops carry gapless edge states of the $d-1$ dimensional SPT phase with G symmetry. We discuss in detail a 2D SPT phase with $Z_2 \times Z_2^T$ symmetry and a 3D SPT phase with $Z_2 \times Z_2$ symmetry, which illustrate a more general hierarchical structure of SPT phases related to the cup product of group cohomology.

Xie Chen
University of California, Berkeley

Date submitted: 08 Nov 2012 Electronic form version 1.4