Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Classifying Topological Defects in Insulators and Superconductors[1] JEFFREY C.Y. TEO, C.L. KANE, University of Pennsylvania — We develop a unified framework to classify topological defects in insulators and superconductors described by spatially modulated Bloch and Bogoliubov de Gennes Hamiltonians. We consider a Hamiltonian $\mathcal{H}(\mathbf{k}, \mathbf{r})$ that varies slowly with adiabatic parameters $\mathbf{r}$ away from the defect. Band theories are grouped into ten classes according to the presence or absence of anti-unitary symmetries, time reversal $\Theta^2 = \pm 1$ and/or particle-hole $\Xi^2 = \pm 1$. Both send $\mathbf{k} \mapsto -\mathbf{k}$ and $\mathbf{r} \mapsto \mathbf{r}$. Stable classification of topological band theories are characterized by a unified set of integral formulae for all the symmetry classes in any dimensions. Examples that fall into this framework include edge and surface states along an interface, 1D chiral, helical and Majorana modes along a line defect, bound charge and Majorana zero mode at a point defect. This approach also applies to time dependent phenomena, such as the Thouless charge pumb, the Z_2 spin pumb and the exchange statistics of Majorana bound states in three dimensions.

[1]NSF grant 0906175

Chi Yan Jeffrey Teo
University of Pennsylvania

Date submitted: 22 Nov 2009 Electronic form version 1.4