Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Smooth gauge for topological insulators ALEXEY SOLUYANOV, DAVID VANDERBILT, Rutgers University — We develop a technique for constructing Bloch functions for Z_2 quantum spin-Hall insulators that are smooth functions of $\mathbf{k}$ on the whole Brillouin-zone torus. As the initial step, the occupied subspace of the insulator is decomposed into a direct sum of two "Chern bands," i.e., topologically non-trivial subspaces with opposite Chern numbers. This decomposition remains robust independently of underlying symmetries or specific model features. Starting with the Chern bands obtained in this way, we construct a topologically non-trivial unitary transformation that rotates the occupied subspace into a direct sum of topologically trivial subspaces. The possibility of using such a transformation is validated, and the entire procedure is illustrated, by applying it to the Kane-Mele model.

Alexey Soluyanov
Rutgers University

Date submitted: 08 Nov 2011 Electronic form version 1.4