

Abstract Submitted  
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**Wannier representation of  $Z_2$  topological insulators** ALEXEY SOLUYANOV, Rutgers University, DAVID VANDERBILT — We consider the problem of constructing Wannier functions for  $Z_2$  topological insulators. For Chern insulators it is well known that there is a topological obstruction to the construction of Wannier functions, and one may wonder whether this is also true in the  $Z_2$  case. We consider a model system for the  $Z_2$  problem in 2D. In the  $Z_2$ -even phase the system is an ordinary insulator, and the usual projection-based scheme can be used to build the Wannier representation. In the  $Z_2$ -odd phase we do find a topological obstruction, but only if one insists on choosing a gauge that respects the time-reversal symmetry, corresponding to Wannier functions that come in time-reversal pairs. If instead we are willing to violate this gauge condition, a Wannier representation becomes possible. We present a scheme for constructing Wannier functions for the  $Z_2$ -odd phase, showing explicitly that the Wannier functions do not come in Kramers pairs despite the presence of time-reversal symmetry.

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