Abstract Submitted for the MAR13 Meeting of The American Physical Society

The space group classification of topological band insulators¹ VLADIMIR JURICIC, Lorentz-Institute for Theoretical Physics, Leiden University, ROBERT-JAN SLAGER, Lorentz-Institute for Theoretical Physics, Leiden University, The Netherlands, ANDREJ MESAROS, Department of Physics, Boston College, USA, JAN ZAANEN, Lorentz-Institute for Theoretical Physics, Leiden University, The Netherlands — The existing classification of topological band insulators(TBIs) departs from time-reversal symmetry, but the role of the crystal symmetries in the physics of these topological states remained elusive. I will discuss the classification of TBIs protected not only by time-reversal, but also by space group symmetries [1]. I find three broad classes of topological states: (a) Γ -states robust against general time-reversal invariant perturbations; (b) Translationally-active states protected from elastic scattering, but susceptible to topological crystalline disorder; (c) Valley topological insulators sensitive to the effects of non-topological and crystalline disorder. These three classes give rise to 18 different two-dimensional, and, at least 70 three-dimensional TBIs. I will show how some of these topological states can be realized in two dimensions when tight-binding M-B model, originally introduced for HgTe quantum wells, is generalized to include longer-range hoppings. Finally, experimental implications of our classification scheme with an emphasis on topological states in Sn-based materials will be discussed.

[1] R.-J. Slager, A. Mesaros, V. Juricic, and J. Zaanen, arXiv:1209.2610.

¹V. J. acknowledges the support of the Netherlands Organization for Scientific Research (NWO).

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Date submitted: 11 Nov 2012

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