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Metallic Line Defects in three-dimensional topological band insulators YI ZHANG, YING RAN, ASHVIN VISHWANATH, University of California Berkeley — Dislocations in topological insulators can host a one-dimensional metallic state that is topologically protected. We discuss experimental consequences for $Bi_{0.9}Sb_{0.1}$ alloys, including an unusual strain-induced conductivity effect. With a view to studying interaction effects, microscopic parameters for the one-dimensional metallic modes are derived, starting from a Liu-Allen tight-binding model. The Luttinger parameter for the one-dimensional metal in $Bi_{0.9}Sb_{0.1}$ is estimated. A different route to a metallic defect line is found in model systems where SU(2) spin rotation symmetry is spontaneously broken, leading to a topological insulator. Line defects of the order parameter are found to be metallic, if a strong topological insulator is realized. We study models exhibiting this phase on the diamond and ideal wurtzite lattices. Prospects for experimental realizations are discussed.

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