Abstract Submitted
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Search for emergent superlattice dispersion in a topological insulator heterostructure[1] ILYA BELOPOLSKI, Princeton Univ, NIKESH KOIRALA, Rutgers University, SUYANG XU, MADHAB NEUPANE, GUANG BIAN, NASSER ALIDOUST, Princeton University, SEONGSHIK OH, Rutgers University, ZAHID HASAN, Princeton University — Crystals are typically offered to us by nature and we must search among them to find ones with useful properties. Here, we consider a more aggressive approach to materials engineering where we build a nanometer-scale periodic array of different crystal lattices. Such a lattice of lattices may allow us to directly engineer desired electronic properties in an emergent superlattice band structure. To our knowledge, no such superlattice dispersion has yet been observed. However, the discovery of topological insulators offers a natural route to engineering a superlattice band structure. Moreover, a topological insulator superlattice has immediate relevance as a way to engineer a Weyl semimetal. Other superlattices which give rise to other unusual phases may also exist. Here, we use photoemission spectroscopy to study a one-dimensional superlattice of alternating layers of a topological insulator, Bi_2Se_3, and a conventional insulator, $In_xBi_{2-x}Se_3$. This system has a phase transition to a topological phase, which we search for by changing the thickness of the topological and trivial layers, as well as the In doping x in the trivial layer. Despite evidence in favor of a superlattice dispersion, we cannot yet conclude that we have achieved a superlattice band structure.

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