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Effects of Strong Disorder in a 3-Dimensional Topological Insulators: Phase Diagram and Mapping of the Z2 Invariant BRYAN LEUNG, Rutgers University, EMIL PRODAN, Yeshiva University — We study the effect of strong disorder in a 3-dimensional topological insulators with time-reversal symmetry and broken inversion symmetry. Using level statistics analysis, we demonstrate first the persistence of delocalized bulk states even at large disorder. The delocalized spectrum displays the levitation and pair annihilation effect, indicating that the delocalized states continue to carry the Z2 invariant after the onset of disorder. The Z2 invariant is computed via twisted boundary conditions using a novel and efficient numerical algorithm. We demonstrate that the Z2 invariant remains well defined and quantized even after the spectral gap closes and becomes filled with dense localized states. In fact, our results indicate that the Z2 remains quantized until the mobility gap closes or until the Fermi level touches the mobility edge. Based on such data, we compute the phase diagram as function of disorder strength and position of the Fermi level.

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