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Equivalent topological invariants of topological insulators¹

ZHONG WANG, Stanford Institute for Materials & Energy Science, SLAC Accelerator Lab, XIAO-LIANG QI, SHOU-CHENG ZHANG, Department of Physics, Stanford University — A time-reversal invariant topological insulator can be generally defined by the effective topological field theory with a quantized theta coefficient, which can only take values of 0 or π . This theory is generally valid for an arbitrarily interacting system and the quantization of the theta invariant can be directly measured experimentally. Reduced to the case of a non-interacting system, the theta invariant can be expressed as an integral over the entire three dimensional Brillouin zone. Alternatively, non-interacting insulators can be classified by topological invariants defined over discrete time-reversal invariant momenta. In this paper, we show the complete equivalence between the integral and the discrete invariants of the topological insulator.

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