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Topological States and Adiabatic Pumping in Quasicrystals[1]
YAAKOV KRAUS, YOAV LAHINI, ZOHAR RINGEL, MOR VERBIN, ODED ZILBERBERG, Weizmann Institute of Science — We find a connection between quasicrystals and topological matter, namely that quasicrystals exhibit non-trivial topological phases attributed to dimensions higher than their own [1]. Quasicrystals are materials which are neither ordered nor disordered, i.e. they exhibit only long-range order [2]. This long-range order is usually expressed as a projection from a higher dimensional ordered system. Recently, the unrelated discovery of Topological Insulators [3] defined a new type of materials classified by their topology. We show theoretically and experimentally using photonic lattices, that one-dimensional quasicrystals exhibit topologically-protected boundary states equivalent to the edge states of the two-dimensional Integer Quantum Hall Effect. We harness this property to adiabatically pump light across the quasicrystal, and generalize our results to higher dimensional systems. Hence, quasicrystals offer a new platform for the study of topological phases while their topology may better explain their surface properties.

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[2] C. Janot, *Quasicrystals* (Clarendon, Oxford, 1994), 2nd ed.
[3] M. Z. Hasan and C. L. Kane, Rev. Mod. Phys. **82**, 3045 (2010).

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