A Family of Aperiodic Tilings with Tunable Quantum Geometric Tensor

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Abstract

Aperiodic systems host unique spectral and transport properties which are at the same time limited by the strict geometric rules that define them. In this work, we explore the first continuously tunable family of two-dimensional aperiodic tilings in which the underlying real-space geometry becomes a control knob of the wave-function's quantum geometric tensor. The real-space geometry can be used to tune into topological phases occupying an expanded phase space compared to crystals, or into a disorder-driven topological Anderson insulators. The quantum metric can also be tuned continuously, opening new routes towards tunable single- and many-body physics in aperiodic solid-state and synthetic systems.

References

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Figures

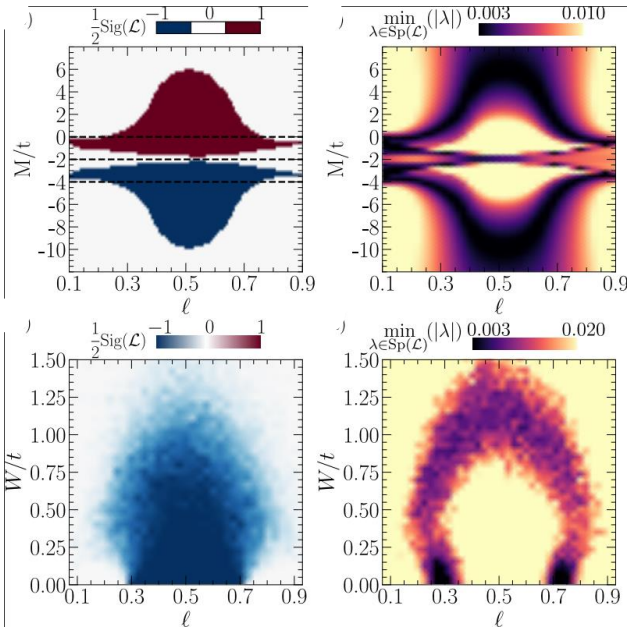

Figure 1: Topological phase diagrams for undisordered and disordered members of the Hat family. Given by the spectral localizer and its local gap.

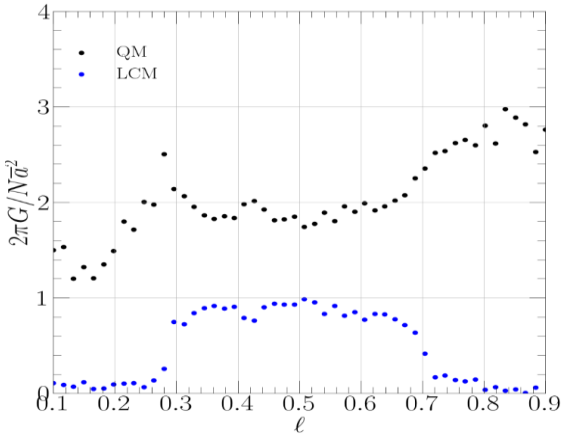

Figure 2: Quantum metric as a function of the parameter that interpolates between the different members of the Hat family