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【12】Hyperbolic lattices: from table-top simulators to non-Abelian band theory

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Negatively curved spaces arise in fields ranging from cosmology to condensed-matter physics, but are hard to probe experimentally. However, their discrete counterparts, hyperbolic lattices, can be realized, e.g., in electric-circuit networks, where we measured signatures of negative curvature. This might allow probing fundamental relationships between curved spaces and quantum theories in table-top experiments.
Additionally, the interplay between lattice effects and curvature results in noncommutative translation symmetry with exotic non-Abelian Bloch states that have remained inaccessible to analytical treatments. We introduce an efficient method to construct those states by generalizing Brillouin-zone folding to hyperbolic lattices, paving the way to a complete hyperbolic band theory.

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