

Abstract Submitted
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Hofstadter's Butterfly in One-dimensional Driven Quantum Systems PENGFEI LIANG, MICHAEL MARTHALER, LINGZHEN GUO, Institut für Theoretische Festkörperphysik, Karlsruhe Institute of Technology (KIT), 76131 Karlsruhe, Germany — A novel way to produce Hofstadter's butterfly is proposed in one-dimensional driven quantum systems. The system, which is modeled as a periodically kicked harmonic oscillator, creates various lattice structures in phase space. We develop the band theory of the square lattice and show that the Hofstadter's butterfly appears in the fractal quasienergy spectrum as a consequence of both the periodic lattice structure and the noncommutative geometry of phase space. We further introduce the concept pseudospin to distinguish degenerate states. Our proposal opens up the possibility to observe fractal structure in one-dimensional quantum systems and may bring a new way for quantum simulation.

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