



华侨大学系统科学研究所

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学术报告

Ultracold Atoms in Stroboscopic 1D Lattice: Topology and many-body physics in phase space lattices

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报告摘要:

Hamiltonians which are inaccessible in static systems can be engineered in periodically driven many-body systems, i.e., Floquet many-body systems. We propose to use interacting particles in a one-dimensional (1D) harmonic potential with periodic kicking to investigate two-dimensional topological and many-body physics. Depending on the driving parameters, the Floquet Hamiltonian of single kicked harmonic oscillator has various lattice structures in phase space. The noncommutative geometry of phase space gives rise to the topology of the system.

We investigate the effective interactions of particles in phase space and find that the point-like contact interaction in quasi-1D real space becomes a long-rang Coulomb-like interaction in phase space, while the hardcore interaction in pure-1D real space becomes a confinement quark-like potential in phase space. We also find that the Floquet exchange interaction does not disappear even in the classical limit, and can be viewed as an effective long-range spin-spin interaction induced by collision. Our proposal may provide platforms to explore new physics and exotic phases by Floquet many-body engineering.

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