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Fermions on the Bloch bands of shaken square optical lattice[1]
AHMET KELES, George Mason University and University of Pittsburgh, ERHAI ZHAO, George Mason University, VINCENT LIU, University of Pittsburgh — We study the interplay between multiple Bloch bands and interactions facilitated by a time-periodic drive in a system of ultracold Fermions in two dimensional square optical lattice. The periodic drive is chosen to be in circular orbit and its frequency is tuned to the gap between ground state s-band and two fold degenerate p-bands. Using the numerical Floquet formalism, we obtain the single particle quasi-energy spectrum by including all higher bands. We analytically derive an effective time independent Hamiltonian fully consistent with the numerical Floquet solution by considering the lowest four orbitals and show that s-band mixed with higher bands via shaking displays a set of non-trivial Fermi surfaces. We obtain the effective interactions of the particles in the mixed s-band and show that a simple onsite interaction gives rise to momentum dependent interaction on the Fermi surface. Considering attractive interactions tuned via Feshbach resonance in the weak coupling limit, we obtain the phase diagram and the pairing symmetries as a function of lattice filling.

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