Wigner Crystallization in Chern Insulators with flat bands

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Wigner crystallization of spinless particles on flat bands with nontrivial (Chern insulators) and trivial topology is investigated. Recent theoretical works on Fractional Chern Insulators (FCI) have shown rich variety of strongly correlated phases for different filling factors on flat Chern insulator energy bands [1,2]. They were found to be stable for relatively high densities (filling factor $> 1/7$) and short-range interactions. In this work we study a transition between high and low density limits of flat bands filled by spinless particles, interacting via long-range Coulomb potential. We perform exact diagonalization for partially filled energy bands obtained on checkerboard, kagome and honeycomb lattices. An arrangement of Wigner particles in a lattice is observed after crossing critical low density limit. Creation of a periodic structure is confirmed by calculation of angular Fourier transform, proving square or hexagonal lattice formations.

References:
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