Topological Mott Insulator

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We investigate stability of topological Mott insulator (TMI) phase on honeycomb lattice against different perturbation. TMI state is characterized by nonzero Chern number and appears in the strongly interacting limit as long as the total band filling factor is an integer, which is not sensitive to the filling of each component. TMI displaying the quantum Hall and the quantum spin Hall effects are found for spinless and spin fermion models, because of the frustrated nature of the long-range Coulomb interaction.

In this work we employ the mean field theory to consider interacting fermions and study TMI phase transition. For honeycomb lattice, we use Hartree-Fock method and investigate the effect of perturbation terms in a form of electric and magnetic field, and random onsite potential. Stability of TMI phase is analysed. Crucial factors responsible for TMI phase destruction are determined.

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