Ground state phase diagram of interacting Dirac electrons in graphene under magnetic field

Tatsuya Higashi
Dept. of Physics, Tohoku U.

Previous theoretical works

- Hubbard-Fisk theory (Z. H. Zheng et al., PRB 76, 245414 (2007))
- Charge-density waves (CDW) in Dirac Dirac states in the band structure of graphene
- Exact diagonalization (ED) (H. Wang et al., PRB 130, 110101 (2018))

Motivation (N-2 Landau level in graphene)

Fractional quantum Hall effects in standard 2D electron systems in the N=0 and 1 Landau levels

CDW ground states of standard 2D electron systems in high Landau levels

Effective inter-electron interaction of the Mth Landau level

Model

DMRG method for quantum 2D electron systems under high magnetic field

Summary

- By the use of DMRG method, we determined the ground state of Dirac electrons in the N=2 Landau level of graphene at various filling factors.
- By analyzing the guiding center pair correlation function, we obtained the reliable ground state phase diagram.