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Incompressible Even Denominator Fractional Quantum Hall States in the Zeroth Landau Level of Monolayer Graphene

Thursday 6 June 2019 11:30 (15 minutes)

Incompressible fractional quantum Hall states at even denominator fractions ($\nu = 1/2, 1/4$) have recently been observed in experiments in monolayer graphene. We use a Chern-Simons description of multicomponent fractional quantum Hall states in graphene to study these incompressible fractional quantum hall states in the zeroth Landau level and suggest variational wavefunctions that may describe them. We find that the experimentally observed even denominator fractions and standard odd fractions (such as $\nu = 1/3, 2/5$, etc.) can be accommodated within the same flux attachment scheme and argue that they may arise from sublattice or chiral symmetry breaking orders (such as charge-density-wave and antiferromagnetism) of composite Dirac fermions. We also discuss possible experimental probes that can narrow down the candidate broken symmetry phases for the fractional quantum Hall states in the zeroth Landau level of monolayer graphene.

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