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Chern-Simons theory of an anomalous metallic state in half-filled monolayer graphene[1] PALLAB GOSWAMI, BITAN ROY, KUN YANG, National High Magnetic Field Laboratory and Florida State University — The ground state of half-filled monolayer graphene undergoes a novel metal-insulator transition with increasing strength of applied magnetic field. In a weak magnetic field the ground state at half-filling corresponds to a critical metallic state, that governs the $\nu = -2$ to $\nu = 2$ quantum Hall plateau transition. In the strong magnetic field regime this critical state gives way to an interaction driven quantum Hall insulator state. Currently there is no satisfactory theoretical explanation of the insulating phase and the phase transition. Motivated by this issue, we investigate the nature of the ground state in clean half-filled monolayer graphene, using a lattice Chern-Simons theory. In contrast to the results obtained previously by mean-field calculations in the Landau level basis, our analysis in the unpolarized regime shows the existence of an anomalous semimetallic state up to a critical strength of magnetic field, and the critical strength is determined by non-universal details of interaction strength. In the polarized regime the dynamics of the relevant metallic state changes dramatically, and new insulating phases do emerge.

[1]NSF

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