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Generalized Landau-level representation: effect of static screening in quantum Hall effect in graphene LIFANG XIA, Arizona State University, IGOR SHOVKOVY, Arizona State Unviersity — By making use of the generalized Landau-level representation (GLLR) for the quasiparticle propagator, we study the effect of screening on the properties of the quantum Hall states with integer filling factors in graphene. The analysis is performed in the low-energy Dirac model in the improved rainbow approximation, in which the long-range Coulomb interaction is modified by the one-loop static screening effects in the presence of a background magnetic field. By utilizing a rather general ansatz for the propagator, in which all dynamical parameters are running functions of the Landau-level index n, we derive a self-consistent set of the Schwinger-Dyson (gap) equations and solve them numerically. The explicit solutions demonstrate that static screening leads to a substantial suppression of the gap parameters in the quantum Hall states with a broken $U(4)$ flavor symmetry. The temperature dependence of the energy gaps is also studied. The corresponding results mimic well the temperature dependence of the activation energies measured in experiment. It is also argued that, in principle, the Landau-level running of the quasiparticle dynamical parameters could be measured via optical studies of the integer quantum Hall states.

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