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Landau-level mixing in the fractional quantum Hall effect in graphene[1] MICHAEL PETERSON, California State University Long Beach, CHETAN NAYAK, Microsoft Research, University of California Santa Barbara — We study the effects of Landau level mixing on the fractional quantum Hall effect in graphene. Landau level mixing in graphene is especially important since the ratio of the Coulomb energy to the cyclotron energy is independent of magnetic field and of order one. In particular, we derive an effective Hamiltonian that fully incorporates Landau level mixing by renormalizing the two-body Coulomb potential (renormalizing the Haldane pseudopotentials) and inducing particle-hole symmetry breaking three-body terms, cf. Bishara and Nayak, Phys. Rev. B 80, 121302(R) (2009). As opposed to the FQHE in GaAs semiconductor devices, graphene has no finite-thickness corrections since the two-dimensional graphene sheet is atomically thin and the Dirac nature of the electrons in graphene forces the particle-hole symmetry breaking three-body terms to exactly vanish in the lowest Landau level.

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