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Landau Level Mixing in the $\nu = 0$ Quantum Hall State of Graphene[1] BRADEN FESHAMI, HERBERT FERTIG, Department of Physics, Indiana University — The $\nu = 0$ quantum Hall state in graphene has been the focus of many studies over the last several years. Recent experimental developments have allowed for the possibility of tuning the strength of the Zeeman interaction by tilting a graphene sample in the presence of an external magnetic field. Many of the theoretical frameworks for these systems involve projecting into the zeroth Landau level (LL) and specifying effective interaction parameters to simplify the calculation. We explore the effects of keeping a larger number of LLs, allowing for the possibility of Landau level mixing, within a self-consistent Hartree-Fock theory of the system. We include a SU(4) symmectric, Coulombic-like, interaction, and introduce microscopic on-site and nearest-neighbor interactions. Phase diagrams are constructed over a range of these two microscopic interaction strengths for different magnetic field strengths and Zeeman couplings.

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