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Electron interaction effects in graphene

DANIEL SHEEHY, Louisiana State University

Graphene, a one-atom thick sheet of graphite, has received a large amount of attention following its recent experimental isolation. At low energies, graphene possesses an emergent relativistic symmetry, and can be described in terms of linearly-dispersing massless "Dirac" fermions, with a velocity that is determined by band structure and experimentally measured to be 300 times smaller than the speed of light. This approximate relativistic behavior is, however, broken by the presence of the long-ranged Coulomb interaction, although many experiments can be explained in terms of a non-interacting picture. I will discuss how the Coulomb interaction will be manifested in various experimentally observable quantities, including the heat capacity, diamagnetic response, and optical conductivity. I will also discuss the implications of recent experiments on the optical transparency of graphene.