

Abstract Submitted  
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**Strong Coulomb interactions and weak disorder in graphene**

MATTHEW FOSTER, IGOR ALEINER, Columbia University — We analyze the instabilities and compute the transport properties of the low-temperature conducting phase of graphene, using a model that incorporates both Coulomb electron-electron interaction and weak quenched disorder effects. Strong Coulomb interactions are treated within the large- $N$  expansion. Using a perturbative renormalization group (RG) approach to study the effects of virtual processes, we find that at successively lower energy scales, for moderate to strong Coulomb interaction strengths, a type of non-Abelian vector potential disorder always asserts itself as the dominant *elastic* scattering mechanism for generic short-ranged microscopic defect distributions. Vector potential disorder appears in graphene due to, e.g., elastic lattice deformations (“ripples”). We combine the RG results with a quantum kinetic equation analysis of real processes, i.e. inelastic electron-electron scattering, which allows us to compute the temperature- and chemical potential-dependence of electric and thermal transport coefficients due to elastic and inelastic scattering processes in various coupling regimes.

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