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Velocity Renormalization of Interacting Dirac Fermions in Undoped Graphene: Functional Renormalization Group Study ANAND SHARMA, CARSTEN BAUER, PETER KOPIETZ, Univ Frankfurt, VALERI KOTOV, Univ Vermont — We present a functional renormalization group (fRG) study of the velocity renormalization due to electron-electron interactions in undoped graphene. The role of long-range Coulomb interaction has remained elusive in graphene. It is known that the electronic properties of graphene can be modeled by (2 + 1)-dimensional Dirac electrons, coupled by instantaneous Coulomb forces, and have a linear energy spectrum in the low-energy limit. Using the fRG with partial bosonization of the Coulomb interaction in the forward scattering channel, we obtain the quasi-particle Green's function of the model. We derive the fRG flow equations for the fermionic and bosonic self-energy, as well as for the triangular vertex and calculate the renormalized velocity of the interacting Dirac fermions. We also determine the anomalous dimension of the Dirac field and evaluate the critical interaction strength for chiral symmetry breaking.

Anand Sharma
Univ Frankfurt

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