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Polarization and Spectral Properties of Massive Graphene VALERI KOTOV, VITOR PEREIRA, Boston University, BRUNO UCHOA, Boston University and UIUC, ANTONIO CASTRO NETO, Boston University — We discuss the situation when a finite gap exists in the Dirac fermion spectrum, due to either external factors (substrate-induced), or the mesoscopic (finite size) nature of the sample. The gap could also be generated dynamically via chiral symmetry breaking. We will overview: (1.) The behavior of the polarization charge, induced by an external Coulomb source. The charge density exhibits an unconventional distribution in space, which we present in detail. The density variation could be observable in real experiments when an external ion is placed on the graphene sheet. (2.) The modification of the fermion self-energy; in particular, the large-N limit of the theory. We find that in this limit, which could be relevant for Graphene, the electronic dispersion is strongly renormalized at small energies. We discuss possible consequences of this behavior.

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