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Conductivity of Coulomb interacting massless Dirac particles in graphene[1] VLADIMIR JURICIC, Lorentz-Instituut for Theoretical Physics, Universiteit Leiden, The Netherlands, OSKAR VAFEK, National High Magnetic Field Laboratory and Department of Physics, Florida State University, USA, IGOR HERBUT, Department of Physics, Simon Fraser University, Canada — The ac conductivity of the Coulomb interacting Dirac fermions in graphene is considered in the collisionless regime using a variant of the dimensional regularization with the spatial dimension $D = 2 - \epsilon$ for $\epsilon > 0$. We show that this regularization procedure preserves the Ward-Takahashi identity associated with the charge conservation [1], and as such it can serve as a consistent regularization of the entire interacting field theory. As a consequence of the explicitly preserved $U(1)$ gauge symmetry, the dimensional regularization yields the same result for the Coulomb correction to the conductivity when calculated using the current-current and the density-density correlators, which is, nevertheless, different than the ones previously reported in the literature. References: [1] V. Juricic, O. Vafek, and I. F. Herbut, ArXiv:1009.3269 (Phys. Rev. B, in press).

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Vladimir Juricic
Lorentz-Instituut for Theoretical Physics,
Universiteit Leiden, The Netherlands

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