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Intrinsic optical absorption and d.c. conductivity in Dirac metals[1]
ADAMYA GOYAL, Department of Physics, University of Florida, PRACHI SHARMA, School of Physics and Astronomy, University of Minnesota, DMITRII MASLOV, Department of Physics, University of Florida — In an ideal Dirac metal, optical absorption is absent for frequencies below the Pauli threshold (twice the Fermi energy). In real systems, however, e.g., in doped graphene, both optical absorption [1] and Raman scattering [2] find a very broad transition region around the Pauli threshold. While a number of extrinsic damping mechanisms were proposed to explain this observation in the past, we argue that the effect can be explained by an intrinsic mechanism – Auger-like recombination of optically excited minority carriers with equilibrium majority carriers. The idea goes back to a similar mechanism proposed for doped gapped semiconductors by Gavoret et al [3]. The width of the transition region in this mechanism is comparable to the Fermi energy. We also discuss certain electron-hole processes that give a scaling to the d.c. conductivity and could possibly be detected in 3-dimensional Dirac systems.

[1] Li, Z., et al. Nature Phys. 4, 532–535 (2008)
[2] E. Riccardi, et al. Phys. Rev. Lett. 116, 066805 (2016)
[3] J. Gavoret, et al. Journal de Physique, 1969, 30 (11-12), pp.987-997.

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