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Unusual Coulomb effects in graphene

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After a brief introduction into experimental possibilities at the user facility FELBE we will focus on the carrier dynamics in graphene, in particular on Coulomb scattering. In many semiconductors Coulomb scattering plays an essential role in the thermalization process of a non-equilibrium carrier distribution. Here we discuss three surprising and fascinating manifestations of Coulomb scattering in graphene. All phenomena are explored both experimentally and by manybody theory. The first observation concerns a double-bended saturation behavior of bleaching induced by near-infrared radiation [1]. The second phenomenon is the optically induced anisotropy in k-space for excitation with linearly polarized radiation and its relaxation to a Fermi-Dirac distribution [2,3]. The third set of experiments tackles the dynamics of graphene in a magnetic field perpendicular to the graphene layer. Here evidence for strong Auger scattering is found [4,5]. We discuss the possibility to apply Landau quantized graphene as a gain medium in a tunable laser [6] and as a tunable nonlinear optical material.

References

[1] T. Winzer et al, Nature Communications **8**, 15042 (2017).
[2] M. Mittendorff et al., Nano Lett. **14**, 1504 (2014).
[3] J. C.- König-Otto et al., Phys. Rev. Lett. **117**, 087401 (2016).
[4] M. Mittendorff et al., Nature Physics **11**, 75 (2015).
[5] J. C.- König-Otto et al., Nano Lett. **17**, 2184 (2017).
[6] S. Brem et al, Phys Rev. Mat. **2**, 034002 (2018).

Für diese Zeit steht eine Kinderbetreuung nach vorheriger Anmeldung zur Verfügung.

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