On the optical properties of graphenes

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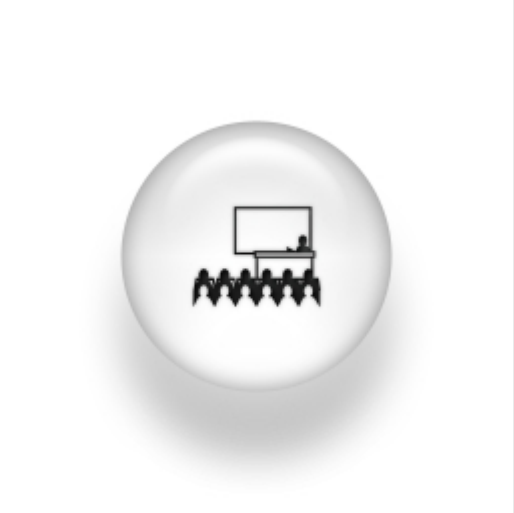
Tobias Stauber



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ABSTRACT:
One of the hallmarks of the optical properties of (suspended) graphene is that a simply-observable quantity as the optical transparency is defined solely by the fine structure constant [1]. In the first part of this talk, I will give the theoretical explanation to this experiment, i.e., show that even in the visible-optics regime the corrections to the Dirac cone approximation are small (a few percent) and the effect of next-nearest neighbor hopping is negligible [2]. I will also discuss the infrared conductivity of graphene on a substrate where electron-phonon and impurity scattering become important [3].
In the second part, I will look at the optical properties of double layer graphene with respect to their plasmonic excitations, near-field amplification and extraordinary (perfect) transmission [4]. Also graphene's fluorescence quenching including transverse decay channels and full retardation will be discussed [5]. Finally, the current-current correlation function of the full hexagonal tight-binding model will be derived [6] and I will show that lattice effects lead to a paramagnetic response for graphene with intrinsic doping at low temperatures [7].

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[3] T. Stauber, N. M. R. Peres, and A. H. Castro Neto, Phys. Rev. B 78, 085418 (2008).
[4] T. Stauber and G. Gómez-Santos, Phys. Rev. B 85, (2012).
[5] G. Gómez-Santos and T. Stauber, Phys. Rev. B 84, 165438 (2011).
[6] T. Stauber and G. Gómez-Santos, Phys. Rev. B 82, 155412 (2010).
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