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Linear plasmon dispersion in graphene and single-wall carbon nanotubes and the influence of interlayer interactions

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— Using first principles calculations [1], we studied momentum resolved electron energy loss spectra (EELS) for isolated graphene in RPA. In particular, we investigated the influence of interlayer interactions on the plasmon dispersion and the importance of local field effects (or depolarization effects). The latter cause a mixing of electronic transitions resulting in a nearly linear dispersion of the π-plasmon in graphene for in-plane momentum transfer. Corresponding EELS measurements on isolated, vertically aligned single-wall carbon nanotubes (SWCNT) show a very similar dispersion relation along the tube axis. This validates the use of graphene to understand electronic excitations of carbon nanotubes and vice versa. [1] www.dp-code.org

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