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Manifestations of electron interactions in photogalvanic effect in chiral nanotubes

Abstract:

Carbon nanotubes provide one of the most accessible experimental realizations of one dimensional electron systems. In the experimentally relevant regime of low doping the Luttinger liquid formed by electrons may be approximated by a Wigner crystal. The crystal-like electronic order suggests that nanotubes exhibit effects similar to the Mossbauer effect where the momentum of an emitted photon is absorbed by the whole crystal. We show that the circular photovoltaic effect in chiral nanotubes is of the same nature. We obtain the frequency dependence of the photovoltage and characterize its singularities in a broad frequency range where the electron correlations are essential. Our predictions provide a basis for using the photogalvanic effect as a new experimental probe of electron correlations in nanotubes.