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Optical rectification at visible frequency in biased bilayer graphene F. HIPOLITO, NUS Graduate School for Integrative Sciences and Engineering, VITOR M. PEREIRA, Department of Physics, National University of Singapore — The second order response of the electrical current to an electromagnetic field is analyzed within the framework of non-equilibrium many-body perturbation theory for the case of a two-dimensional electronic system such as graphene and its bilayer. The absence of inversion symmetry in a biased graphene bilayer allows a finite DC response in second order to an AC electromagnetic wave. The induced DC current is evaluated for biased bilayer at finite temperature, and its tunability is analyzed as a function of electron density, which can be experimentally varied by means of a global gate voltage applied to the sample. Both intrinsic and photon drag microscopic processes are considered, as they contribute on similar footing to the photocurrent in general. However, the dependencies of these two contributions on the polarization state of the incident light are different, which allows the manipulation of the relative contribution of intrinsic versus photon drag contributions by tuning the experimental parameters. For example, the photocurrent emerging from circularly polarized light stems entirely from photon drag, as the circular photogalvanic effect is forbidden by the C_3 rotation symmetry of the honeycomb lattice.

Fábio Manuel Hipólito Vilas Boas
Natl Univ of Singapore

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