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Anisotropic photoinduced current injection in graphene JULIEN RIOUX, University of Konstanz, JOHN E. SIPE, University of Toronto, GUIDO BURKARD, University of Konstanz — Quantum-mechanical interference effects are considered in carrier and charge current excitation in gapless semiconductors using coherent optical field components at frequencies ω and 2ω. Due to the absence of a bandgap, excitation scenarios outside of the typical operation regime are considered; we calculate the polarization and spectral dependence of these all-optical effects for single- and bilayer graphene. For linearly-polarized light and with one-photon absorption at ω interfering with 2ω absorption and ω emission, the resulting current injection is five times stronger for perpendicular polarization axes compared to parallel polarization axes. This additional process results in an anisotropic current as a function of the angle between polarization axes, in stark contrast with the isotropic current resulting from the typical interference term in graphene [Rioux et al., PRB 83, 195406 (2011)]. Varying the Fermi level allows to tune the disparity parameter d closer to typical values in GaAs [$|d| \approx 0.2$, Rioux and Sipe, Physica E 45, 1 (2012)]: from -1, when the additional process is fully Pauli-blocked, to -3/7, when it is fully accessible, thus facilitating polarization sensitive applications.

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