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Non-linear DC response to an AC electric field for a two-band model[1] SERGEY PERSHOGUBA, Nordita, Center for Quantum Materials, KTH Royal Institute of Technology, and Stockholm University, Stockholm, Sweden — Recently there has been rise of interest in various non-linear electromagnetic effects in solids. We calculate a second-order DC current response to an AC electric field for a generic two-band model with valence and conduction bands. The current is composed of two contributions: the intra- and interband terms. The intraband current occurs due to a resonant injection of the carriers to the conduction band. The current grows linearly with time as more carriers are excited into the conduction band until it is saturated by the relaxation processes. In contrast, the interband current is constant in time and occurs because of the interband hybridization of the valence and conduction bands. The interband current has both resonant and non-resonant components. The former component was previously referred to as the "shift-current". All expressions for the currents are composed of gauge-invariant combinations of Berry connections. We apply the results to specific tight-binding models.

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