Resonant photovoltaic effect in doped magnetic semiconductors

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The non-linear optical response of clean undoped semiconductors contains a static intrinsic term – the shift current. We show that when Kramers degeneracy is lifted, the second order DC response of doped semiconductors or semimetals to an AC electric field becomes large at the interband absorption threshold in clean nearly isotropic materials. We refer to this effect, which results from an interesting interplay between inter-band coherence and intra-band occupation number response, as the resonant photovoltaic effect (RPE). We evaluate the RPE for a model of the surface states of a Bi_2Te_3 coupled to in-plane magnetic order due to either bulk doping or proximity coupling.

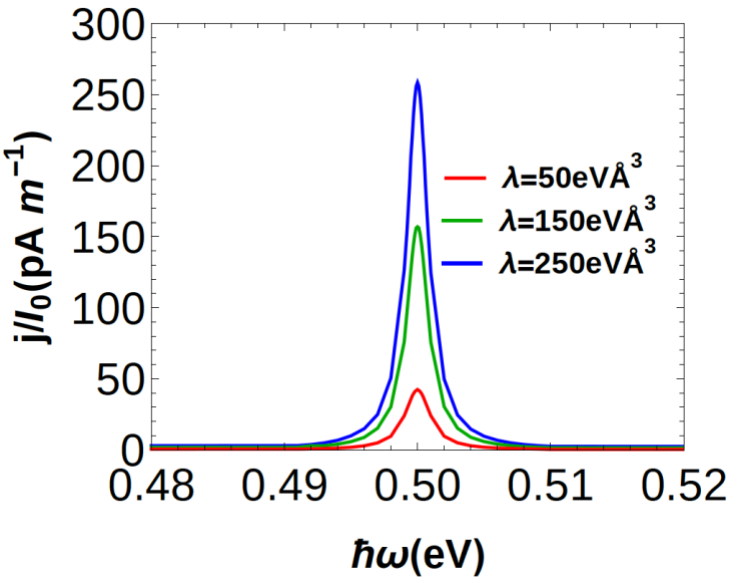

Fig. 1. RPE resonance for a topological insulator with warping coefficient λ, with I_0 the intensity in W/m^2. The blue curve corresponds to known values for Bi_2Te_3.