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Direct and Indirect Two-color Coherent Control in Bulk Silicon
JINLUO CHENG, JULIEN RIOUX[1], JOHN SIPE, Department of Physics, University of Toronto, 60 St. George Street, Toronto, Ontario, Canada M5S 1A7 — Using an empirical pseudopotential model for electron states and an adiabatic bond charge model for phonon states, we investigate the two-color direct and indirect coherent current injection with an incident optical field composed of a fundamental frequency and its second harmonic, and calculate the response tensors of the electron (hole) charge and spin currents. We show the current control for three different polarization scenarios: For co-circularly polarized beams, the direction of the charge current and the polarization direction of the spin current can be controlled by a relative-phase parameter; for the co-linearly and cross-linearly polarized beams, the current amplitude can be controlled by that parameter. For the indirect gap injection, the spectral dependence of the maximum swarm velocity shows that the direction of charge current reverses under an increase in photon energy.

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