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Phonon scattering in a strongly-driven 1D electron system[1]
KATHLEEN E. HAMILTON, LEONID P. PRYADKO, ALEXEY A. KOVALEV, UCR — We consider phonon relaxation kinetics of a non-equilibrium, one-dimensional electron system driven by a strong, high frequency electric field. For a single-band system, and assuming that the phonon scattering rate is small on the scale of the driving frequency ω, we derive and solve the coupled equations for the Keldysh Green's functions and self energies. In the presence of the periodic driving field, the electrons' energy is replaced by the Floquet quasienergy; in the single-band case it just equals the energy averaged over the period (modulo $\hbar\omega$). The energies of the phonons emitted or absorbed by the system correspond to transitions between the Floquet energy bands, and are strongly dependent on both the amplitude and the frequency of the driving field. Of note is a system in the regime of dynamical localization, where the average electron kinetic energy vanishes. Here, the phonon energies must be in resonance with harmonics of the driving frequency, and the stationary electron distribution function reduces to a constant, with infinite effective temperature.

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