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On the Existence of Phonon Coherent States in Nanomaterials

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Abstract. In our work we describe the energy transfer by thermal excitations with accounting a coherence in nanosized systems during heat removal. A general formalism of thermal conductivity by second quantization method is proposed with an account of both the usual phonon model of heat transfer and the formation of coherent Schrödinger states of the oscillator system. An exact general form of solution for a time-dependent problem with arbitrary initial conditions is analytically developed. It is shown that at certain ratios of constants characterizing the interaction of phonons with the electronic subsystem a heat flow does not decay with time in the crystal.

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