

Rate of phonon excitation and conditions for phonon generation in rectangular quantum wires

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Abstract: Phonon generation via the Cerenkov effect in rectangular quantum wires is theoretically studied based on the quantum kinetic equation for the phonon population operator. Analytical expressions for the rate of change of the phonon population and conditions for phonon generation are obtained. Numerical results for the specific rectangular quantum wires show that the amplitude of the laser field must satisfy additional conditions that are different in comparison with those of the other works. The differences between the generation of acoustic phonon and optical phonon are considered.

Author Keywords: Electron-phonon interaction; Phonon amplification; Quantum kinetic equation; Quantum wire

Year: 2006

Source title: Journal of the Korean Physical Society

Volume: 49

Issue: 6

Page : 2367-2372

Cited by: 3

Link: [Scopus Link](#)

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ISSN: 3744884

Language of Original Document: English

Abbreviated Source Title: Journal of the Korean Physical Society

Document Type: Article

Source: Scopus

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