Brief introduction to emerging phononics

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Reduction of the size of electronic devices, in the quest of the improving their speed, below the acoustic (AC) phonon mean free path creates a new situation for phonon propagation and interaction, especially in piezoelectric semiconductors. The possibility of generating strong acoustic phonon waves further led to the emerging field of nanophononics; it opens up an exciting opportunity for engineering phonon spectra and for imaging nanoscale motions in a non-invasive manner.

Recently, impulsive generation of coherent AC phonons by utilizing the equal confinement of photonic and phononic modes and acoustic analog to optical parametric effects in three-level scheme ensued from the early works on phonon laser. We briefly summarize the concept of phonon lasers and our electrical scheme of controlling the acoustic phonons.