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Temperature Dependence of Brillouin Light Scattering Spectra of Acoustic Phonons in Silicon[1] KEVIN SOMERVILLE, NIKITA KLIMOVICH, KYONGMO AN, SEAN SULLIVAN, ANNIE WEATHERS, LI SHI, XIAOQIN LI, Univ of Texas, Austin — Thermal management represents an outstanding challenge in many areas of technology. Electrons, optical phonons, and acoustic phonons are often driven out of local equilibrium in electronic devices or during laser-material interaction processes. Interest in non-equilibrium transport processes has motivated the development of Raman spectroscopy as a local temperature sensor of optical phonons and intermediate frequency acoustic phonons, whereas Brillouin light scattering (BLS) has recently been explored as a temperature sensor of low-frequency acoustic phonons. Here, we report temperature dependent BLS spectra of silicon, with Raman spectra taken simultaneously for comparison. The origins of the observed temperature dependence of the BLS peak position, linewidth, and intensity are examined in order to evaluate their potential use as temperature sensors for acoustic phonons. We determine that the integrated BLS intensity can be used measure the temperature of specific acoustic phonon modes.

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