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Brillouin light scattering as a probe for low frequency quasiparticles in solids[1] NIKITA KLIMOVICH, KEVIN OLSSON, KYONGMO AN, SEAN SULLIVAN, ANNIE WEATHERS, LI SHI, XIAOQIN LI, Univ of Texas, Austin —
In increasingly small electronic and spintronic devices, electrons, optical phonons, acoustic phonons, and magnons are often driven out of local thermal equilibrium. Thermal transport based on equilibrium dynamics does not adequately describe these systems necessitating a better understanding of non-equilibrium transport processes. Measuring the specific temperatures of the different energy carriers is therefore crucial in understanding the thermal transport. Brillouin light scattering (BLS) has recently been explored as a temperature sensor for low frequency acoustic phonons in glass, and also magnons in metallic and insulating ferromagnetic materials. We report the measured BLS spectra of acoustic phonons in Silicon at different temperatures. The temperature dependence of the BLS peak frequency, linewidth, and integrated intensity are examined to evaluate their potential uses as temperature sensors of acoustic phonons. We also observe a large nonequilibrium in phonon-magnon temperature in YIG under the effects of laser heating and thereby extract a value for the phonon-magnon coupling coefficient.

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