Abstract Submitted for the MAR09 Meeting of The American Physical Society

Coherent Acoustic Spectroscopy of Nanorod Arrays MASASHI YA-MAGUCHI, JIANXUN LIU, DEXIAN YE, Department of Physics, Rensselaer Polytechnic Institute, TOH-MING LU, Department of Physics, Rensselaer Polytechnic Institute — Coherent acoustic transport through vertically grown nanorod array on substrate and coherent acoustic vibration of nanorod arrays are experimentally studied by using femtosecond laser based acoustic spectroscopy in GHz-THz frequency range. In nanorod materials, acoustic phonon dispersion and life time are altered by the spatial confinement, and many of nanoscale materials have mechanical resonance in GHz-THz frequency range. Si and Ni nanorod arrays are grown vertical on top of a thin Al transducer layer deposited on substrate. Longitudinal acoustic phonons are excited coherently in the transducer layer. We have observed the transport of the coherent acoustic pulses through the nanorod arrays. The center frequency of the acoustic pulse was comparable to the diameter of the nanorods. Also, we have observed the transfer of the acoustic energy to the nanorod vibration mode while the coherent acoustic pulse propagates through. Mean-Free-Path and time of flight of the coherent acoustic phonons is determined by comparing the results of the samples with different thicknesses.

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Date submitted: 18 Dec 2008

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