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Coherent Excitation of the Optic Phonon in Si Measured with Femtosecond Spectroscopy D.M. RIFFE, A.J. SABBAH[1], Utah State University
— Using 28 fs, 800 nm laser pulses from a Ti:sapphire oscillator we have coherently excited, and subsequently probed with time dependent reflectivity, the Si zone-center optic phonon. The reflectivity modulations are well described by an underdamped oscillator $(\Delta R/R)\exp(-t/\tau)\cos(2\pi t/T+\phi)$ with amplitude $\Delta R/R \approx 5\times10^{-6}$, phase $\phi = 86 \pm 14$ degrees, period $T = 64.07 \pm 0.07$ fs, and decay time $\tau = 2.75 \pm 0.15$ ps. The phase indicates that transiently stimulated Raman scattering (TSRS) is responsible for the coherent-phonon generation: our result are in good agreement with a recent theory of TSRS for opaque materials [T. E. Stevens *et al.*, Phys. Rev. B **65**, 144304 (2002)] when we extend the theory to include the finite lifetime of the excited charge density that drives the oscillation. Additionally, the period and decay time of the coherent oscillations are consistent with carrier-density dependent Raman-scattering measurements.

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