Abstract Submitted
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Theory of coherent phonons in carbon nanotubes[1] GARY SANDERS, CHRIS STANTON, University of Florida — We develop a general theory for the generation of coherent phonons in single wall carbon nanotubes or arbitrary chirality. Coherent phonons are generated in the nanotube via the deformation potential electron-phonon interaction with photogenerated carriers. In our theory the electronic states are treated in a third nearest neighbor tight binding formalism which gives a good description of the states over the entire nanotube Brillouin zone while the nanotube phonon states are treated in a valence force field model that includes bond-stretching, in-plane and out-of-plane bond-bending, and bond-twisting interactions. In the tight-binding electron-phonon interaction, all two center integrals out to fourth nearest neighbors are retained. The equations of motion for the coherent phonon amplitudes are obtained in a density matrix formalism and we find that the coherent phonon amplitudes satisfy driven oscillator equations for each value of the phonon wavevector. We will discuss excitation strengths for different coherent phonon modes and compare to recent experiments.

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