

Abstract Submitted
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Tuning the phonon self-energy of a graphene bilayer¹ JUN YAN, ERIK HENRIKSEN, PHILIP KIM, ARON PINCZUK, Columbia University — We use low temperature Raman spectroscopy and the electric field effect to investigate the coupling of long wavelength optical phonons (the G-band) with charge carriers in bilayer graphene. The charge tunable phonon spectra exhibit a remarkable symmetry which reflects the underlying particle-hole symmetry of the electron band structure. The change of phonon line-width is interpreted as a Landau damping of the phonon into resonant electron-hole pair transitions. The phonon energy exhibits an intriguing non-monotonic evolution with charge density. We found that the electron-hole pair excitation stiffens (softens) the lattice vibration when its energy is smaller (larger) than the phonon energy, in agreement with theoretical predictions for deformation electron-phonon coupling.

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