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Charge-Tunable Electron-Phonon Coupling in Single Layer Graphene JUN YAN, YUANBO ZHANG[1], PHILIP KIM, ARON PINCZUK, Columbia University — We report the observation of electron-phonon coupling in single layer graphene via gate-modulated Raman spectroscopy. The doubly-degenerate long-wavelength optical phonon of graphene (the G-band) is found to be very sensitive to charging of the single atomic layer by the electric-field-effect. The functional dependences of frequency and line-width on gate voltage are explained in terms of charge-tunable interactions of G-band phonons with particle-hole transitions across a vanishing band gap. The phonon dynamics uncovers, from a unique perspective, the intriguing physics of Dirac fermions residing in this two dimensional hexagonal lattice of carbon atoms. The striking symmetry manifested in the spectra offers an optical venue for the determination of the charge-neutral Dirac-point.

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