

Abstract Submitted  
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**Charge polarization and phonon renormalization at the K point of graphene** JOSE GONZALEZ, Instituto de Estructura de la Materia, CSIC, 28006-Madrid, Spain, ENRICO PERFETTO, University of Milano-Bicocca, 20126-Milano, Italy — We study the renormalization of the dispersion of different phonon branches by low-energy electronic excitations at the K point of graphene. Among all the in-plane phonons, only the transverse optical modes have a nonvanishing coupling to electron-hole excitations, with a mild Kohn anomaly at the K point. We show, however, that the total charge polarization has a singular behavior and that the dispersion of the out-of-plane phonons undergoes therefore a strong renormalization, with a significant decrease of the phonon frequencies. This leads to an enhancement of the coupling between the two Dirac valleys in graphene, with the potential to open an instability in the spectrum of Dirac quasiparticles.

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