

Abstract Submitted  
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**Many-body effects in doped graphene on a piezoelectric substrate.**<sup>1</sup> F. SOLS, D. G. GONZALEZ, I. ZAPATA, Universidad Complutense de Madrid (Spain), J. SCHIEFELE, IMDEA Nanociencia (Madrid, Spain) , F. GUINEA, IMDEA Nanociencia (Madrid, Spain) and University of Manchester (UK) — We study theoretically the role of piezoelectric acoustic phonons in the context of piezoelectric substrates covered by graphene. They are responsible for effective, substrate dependent electron-electron interactions which can be strong and give rise to novel many-body effects. We present a new derivation of the electron-phonon interaction matrix element which generalizes previous calculations made within the simpler and not always justified isotropic approximation. We study several many-body effects, including the temperature-dependent phonon renormalization due to the electron cloud surrounding the lattice vibration, as well as the electron self-energies arising from the effective electron-electron interactions in the perturbative  $G_0W$  approximation. We also perform calculations of the graphene electron mobility on substrates with various levels of piezoelectricity. Finally, we discuss how these piezoelectric phonons can influence the superconducting instability. For completeness, we compare our results with the situation found for the two-dimensional electron gas and for conventional three-dimensional BCS superconductors.

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