Abstract Submitted
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Screening of the electron-phonon interaction in STO ALEXANDER EDELMAN, PETER LITTLEWOOD, Univ of Chicago — Strontium titanate is a bulk insulator that becomes superconducting at remarkably low carrier densities. Even more enigmatic properties become apparent at the strontium titanate/lanthanum aluminate (STO/LAO) interface and it is important to disentangle the effects of reduced dimensionality from the poorly-understood pairing mechanism. Recent experiments[1] measuring the electronic structure of the analogous strontium titanate surface have found a cross-over as a function of carrier density from a series well-resolved phonon replica bands to a single quasiparticle dispersion, with the crossover occuring at densities that correspond to the disappearance of superconductivity in the STO/LAO system. We interpret these results in a simple analytical model that extends an Engelsberg-Schrieffer theory of electrons coupled to a single longitudinal optic phonon mode to include the effects of electronic screening. As the carrier density increases, the effective dielectric function cuts off the long-range phonon interaction beyond the Thomas-Fermi screening length, eventually leaving only a uniform short-range coupling to the phonon bath. We additionally incorporate the effects of carrier density on the static dielectric properties of the interface.

[1]Z. Wang et al, arXiv:1506.01191

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