

Abstract Submitted  
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**Nonlocal screening, electron-phonon coupling, and phonon renormalization in metals**<sup>1</sup> PEIHONG ZHANG, Department of Physics, UC Berkeley, STEVEN G. LOUIE, MARVIN L. COHEN — A new method for calculating the phonon self-energy in metals arising from the coupling between phonons and electrons near the Fermi surface is developed. The essence of this scheme is the separation of the inter- and intra-band parts of the electron polarizability. The intra-band contribution provides extra screening and is closely related to the electron-phonon coupling and phonon softening in metals. Applications of this scheme to phonons in MgB<sub>2</sub> give excellent results when compared with experiments and previous theoretical work. In addition, both electron and hole dopings are found to reduce the renormalization effect of the  $E_{2g}$  phonon mode. This indicates weakened electron-phonon couplings in the doped systems. This is consistent with the experimental observations that the superconducting transition temperature of MgB<sub>2</sub> drops upon substituting Mg with either Al or Li.

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