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Interaction between Dirac fermions and phonons on the (001) surface of the strong 3D topological insulator Bi_2Te_3 COLIN HOWARD, MICHAEL EL-BATANOUNY, Boston University, FANG-CHENG CHOU, R. SHANKAR, National Taiwan University — We report on studies of the interaction of Dirac fermion quasiparticles with phonons on the (001) surface of the strong 3D topological insulator Bi_2Te_3. Studying this coupling is essential for determining the technological viability of this new class of materials. We employed inelastic helium atom scattering to determine surface phonon dispersions along the ΓM and ΓKM directions. In contrast to our previous studies on Bi_2Se_3,[1] which exhibited a strong Kohn anomaly at $2k_F \approx 0.2\text{Å}^{-1}$ in a low-lying optical phonon branch, the current results show a weaker Kohn anomaly at $2k_F \approx 0.1\text{Å}^{-1}$ in a similarly low-lying branch. The lower value of k_F is consistent with the smaller carrier concentration in Bi_2Te_3 as evidenced by Hall conductivity measurements. Our results are further substantiated by lattice dynamical calculations performed within the pseudo-charge model. We also report on a detailed analysis of the electron-phonon coupling as a function of phonon branch index and wave vector utilizing the methods we recently developed.[2]

[1]Zhu, et al. Phys. Rev. Lett. 107, 186102, 2011.
[2]Zhu, et al. Phys. Rev. Lett. 108, 185501, 2012.

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