360

Accession number:20114414466492

Title:Interaction of phonons and Dirac fermions on the surface of Bi 2Se3: A strong Kohn anomaly

Authors:Zhu, Xuetao (1); Santos, L. (2); Sankar, R. (3); Chikara, S. (1); Howard, C. (1); Chou, F.C. (3); Chamon, C. (1); El-Batanouny, M. (1)

Author affiliation:(1) Department of Physics, Boston University, Boston, MA 02215, United States; (2) Department of Physics, Harvard University, Cambridge, MA 02138, United States; (3) Center of Condensed Matter Sciences, National Taiwan University, Taipei 10617, Taiwan

Corresponding author: Zhu, X.

Source title: Physical Review Letters

Abbreviated source title: Phys Rev Lett

Volume:107

Issue:18

Issue date:October 26, 2011

Publication year:2011

Article number:186102

Language:English

ISSN:00319007

E-ISSN:10797114

CODEN:PRLTAO

Document type: Journal article (JA)

Publisher: American Physical Society, One Physics Ellipse, College Park, MD 20740-3844, United States

Abstract:We report the first measurements of phonon dispersion curves on the (001) surface of the strong three-dimensional topological insulator Bi 2Se3. The surface phonon measurements were carried out with the aid of coherent helium beam surface scattering techniques. The results reveal a prominent signature of the exotic metallic Dirac fermion quasiparticles, including a strong Kohn anomaly. The signature is manifest in a low energy isotropic convex dispersive surface phonon branch with a frequency maximum of 1.8 THz and having a V-shaped minimum at approximately 2kF that defines the Kohn anomaly. Theoretical analysis attributes this dispersive profile to the renormalization of the surface phonon excitations by the surface Dirac fermions. The contribution of the Dirac fermions to this renormalization is derived in terms of a Coulomb-type perturbation model.

Number of references:32