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Exceptionally Weak Electron-Phonon Coupling on the Surface of the Topological Insulator Bi_2Se_3 - A Promise for Room Temperature Applications[1] TONICA VALLA, Z.-H. PAN, Brookhaven National Laboratory, A.V. FEDOROV, Lawrence Berkeley National Laboratory, D. GARDNER, Y.S. LEE, S. CHU, Massachusetts Institute of Technology — Gapless surface states on topological insulators are protected from elastic scattering on non-magnetic impurities which makes them promising candidates for low-power electronic applications. However, for wide-spread applications, these states should have to remain coherent at ambient temperatures. Here, we studied temperature dependence of the electronic structure and the scattering rates on the surface of a model topological insulator, Bi_2Se_3, by high resolution angle-resolved photoemission spectroscopy. We found an extremely weak broadening of the topological surface state with temperature and no anomalies in the state's dispersion, indicating exceptionally weak electron-phonon coupling. Our results demonstrate that the topological surface state is protected not only from elastic scattering on impurities, but also from scattering on low-energy phonons, suggesting that topological insulators could serve as a basis for room temperature electronic devices.

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