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Low-Temperature Thermal Transport at the Interface of a Topological Insulator and a d-Wave Superconductor ADAM DURST, Hofstra University — We consider the low-temperature thermal transport properties of the 2D proximity-induced superconducting state formed at the interface between a topological insulator (TI) and a d-wave superconductor (dSC). This system is a playground for studying massless Dirac fermions, as they enter both as quasiparticles of the dSC and as surface states of the TI. For TI surface states with a single Dirac point, the four nodes in the interface-state quasiparticle excitation spectrum coalesce into a single node as the chemical potential, μ, is tuned from above the impurity scattering rate ($|\mu| \gg \Gamma_0$) to below ($|\mu| \ll \Gamma_0$). We calculate, via Kubo formula, the universal limit ($T \to 0$) thermal conductivity, κ_0, as a function of μ, as it is tuned through this transition. In the large and small μ limits, we obtain disorder-independent, closed-form expressions for κ_0/T. The large-μ expression is exactly half the value expected for a dSC, a demonstration of the sense in which the TI surface topological metal is half of an ordinary 2D electron gas. Our numerical results for intermediate μ illustrate the nature of the transition between these limits, which is shown to depend on disorder in a well-defined manner.

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