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Transport in a One-Dimensional Hyperconductor EUGENIU PLAMADEALA, Univ of California - Santa Barbara , MICHAEL MULLIGAN, Stanford University, CHETAN NAYAK, Univ of California - Santa Barbara, Microsoft Station Q — We define a 'hyperconductor' to be a material whose electrical and thermal DC conductivities are infinite at zero temperature. The low-temperature behavior of a hyperconductor is controlled by a quantum critical phase of interacting electrons that is stable to all potentially-gap-generating interactions and arbitrary potentially-localizing disorder. We compute the low-temperature DC and AC electrical and thermal conductivities in a one-dimensional hyperconductor, studied previously by the present authors, in the presence of both disorder and umklapp scattering. We identify the conditions under which the transport coefficients are finite, and exhibit examples of violations of the Wiedemann-Franz law. We show that the temperature dependence of the electrical conductivity is a power law, $\sigma \propto 1/T^{1-2(2-\Delta_X)}$ for $\Delta_X \geq 2$, down to zero temperature when the Fermi surface is commensurate with the lattice. In the incommensurate case with weak disorder, such scaling is seen at high-temperatures, followed by an exponential increase of the conductivity $\ln \sigma \sim 1/T$ at intermediate temperatures and, finally, $\sigma \propto 1/T^{2-2(2-\Delta_X)}$ at the lowest temperatures. In both cases, the thermal conductivity diverges at low temperatures.

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