Abstract Submitted
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Anomalous Thermal Diffusivity in Bad Metals[1] JIECHENG ZHANG, ELI M. LEVENSON-FALK, Stanford University, BRAD J. RAMSHAW, Los Alamos National Labs, DOUGLAS A. BONN, RUIXING LIANG, WALTER N. HARDY, University of British Columbia, SEAN A. HARTNOLL, AHARON KAPITULNIK, Stanford University — Local measurements of thermal diffusivity are used to analyze the transport of heat in the bad metallic regime of several strongly correlated materials. In underdoped YBCO systems, we use the in-plane anisotropy to analyze transport in this system. Specifically, we find that the diffusivity anisotropy is comparable to reported values of the electrical resistivity anisotropy and drops sharply below the charge order transition, suggesting that both anisotropies have the same origin. We interpret our results through a strong electron-phonon scattering picture and find that both electronic and phononic contributions to the diffusivity exhibit a saturated scattering time of $\sim \hbar/k_B T$. Our results suggest that neither well-defined electron nor phonon quasiparticles are present in underdoped YBCO systems, and thermal transport exhibits a collective behavior of a "soup" of strongly coupled electrons and phonons which moves at a velocity that is smaller than the Fermi velocity, but larger than the speed of sound. We generalize this treatment to measurements of other bad metals and discuss its implications.

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