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Optical Measurements of Thermal Diffusivity in Strange Metals
JIECHENG ZHANG, E. M. LEVENSON-FALK, AHARON KAPITULNIK, Stanford Univ — Thermal transport measurements of strongly correlated electronic systems provide key insight into their emerging collective behavior. For example, high-$T_c$superconductors exhibit different regimes of unusual transport with bad metallicity at high temperatures, a pseudogap-dominated transport at intermediate temperatures, and the interplay with superconductivity at low temperatures. We present optical non-contact measurements of local thermal diffusivity in such materials. In our apparatus we focus a laser spot onto the surface of the investigated sample; the laser power is then modulated to create a periodic, point-like heat source. Another laser is focused nearby on the surface where the local reflectivity is measured. Since the reflectivity is temperature-dependent, it serves as a contactless probe of temperature oscillations due to the heat source. By measuring the temperature profile on the surface of the sample as a function of modulation frequency, we extract the thermal diffusivity of the material. We will present measurements of the temperature dependence and anisotropy of diffusivity in various strange metals, and discuss further applications of the apparatus.

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