Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Optical conductivity of nodal metals[1] C.C. HOMES, G.D. GU, Condensed Matter Physics and Materials Science Dept., Brookhaven National Laboratory, Upton, New York, J.J. TU, J. LI, Department of Physics, The City College of New York, New York, A. AKRAP, École de Physique, Université de Genève, CH-1211 Genève 4, Switzerland — Fermi liquid theory is remarkably successful in describing the transport and optical properties of metals; at frequencies higher than the scattering rate, the optical conductivity adopts the well-known power law behavior $\sigma_1(\omega) \propto \omega^{-2}$. We have observed an unusual non-Fermi liquid response $\sigma_1(\omega) \propto \omega^{-1\pm0.2}$ in the ground states of several quasi two-dimensional cuprate (optimally doped $Bi_2Sr_2CaCu_2O_{8+\delta}$, optimally and underdoped $YBa_2Cu_3O_{7-\delta}$) and iron-based materials ($A$$Fe_2As_2$, A =Ba, Ca) which undergo electronic or magnetic phase transitions resulting in dramatically reduced or nodal Fermi surfaces. The identification of an inverse (or fractional) power-law behavior in the residual optical conductivity now permits the removal of this contribution, revealing the direct transitions across the gap and allowing the nature of the electron-boson coupling to be probed. The non-Fermi liquid behavior in these systems may be the result of a common Fermi surface topology of Dirac cone-like features in the electronic dispersion.

[1]Supported by the DOE under Contract No. DE-AC02-98CH10886.

Christopher Homes
Brookhaven National Laboratory

Date submitted: 15 Nov 2013 Electronic form version 1.4