



Canadian Association  
of Physicists

Association canadienne  
des physiciens et physiciennes

Contribution ID: 536

Type: **Invited Speaker / Conférencier(ère) invité(e)**

## (I) T-linear resistivity from an isotropic Planckian scattering rate

Wednesday, 9 June 2021 11:45 (5 minutes)

Perfectly T-linear resistivity is observed in a variety of strongly correlated metals close to a quantum critical point [1] and has been attributed to a scattering rate  $1/\tau$  of charge carriers that reaches the Planckian limit [2,3], with  $\hbar/\tau = \alpha k_B T$  where  $\alpha$  is of order unity. While this relationship is often inferred from simple estimates, a T-linear scattering rate has yet to be measured.

To directly access the Planckian scattering rate, we measured the angle-dependent magnetoresistance (ADMR) of Nd-LSCO at  $p = 0.24$ : a cuprate that demonstrates T-linear resistivity over a wide temperature range at the pseudogap critical point  $p^*$  [4]. The ADMR reveals a well-defined Fermi surface that precisely agrees with ARPES [5]. In addition, we extract a T-linear scattering rate that has the Planckian value, namely  $\alpha = 1.2 \pm 0.4$ . Remarkably, this inelastic scattering rate is isotropic.

Our findings suggest that T-linear resistivity in strange metals emerges from a generic isotropic, momentum-independent inelastic scattering rate that reaches the Planckian limit.

- [1] J. Zaanen, SciPost Phys. 6, 061 (2019).
- [2] J. A. N. Bruin et al., Science 339, 804 (2013)
- [3] A. Legros et al., Nat. Phys. 15, 142 (2019)
- [4] R. Daou et al., Nat. Phys. 5, 31 (2009).
- [5] C. Matt et al., Phys. Rev. B 92, 134524 (2015)

**Primary authors:** GRISSONNANCHE, Gael (Cornell University); Ms FANG, Yawen (Cornell University); Dr LEGROS, Anaëlle (Université de Sherbrooke); Dr VERRET, Simon (Université de Sherbrooke); Dr LALIBERTÉ, Francis (Université de Sherbrooke); Dr COLLIGNON, Clément (Université de Sherbrooke); Mr ATAEI, Amirreza (Université de Sherbrooke); Prof. ZHOU, Jianshi (University of Texas); Dr GRAF, David (National High Magnetic Field Laboratory); Prof. GODDARD, Paul (University of Warwick); Prof. TAILLEFER, Louis (Université de Sherbrooke); Prof. RAMSHAW, Brad (Cornell University)

**Presenter:** GRISSONNANCHE, Gael (Cornell University)

**Session Classification:** W1-9 Superconductors and other Quantum Materials (DCMMP) / Supraconducteurs et autres matériaux quantiques (DPMCM)

**Track Classification:** Condensed Matter and Materials Physics / Physique de la matière condensée et matériaux (DCMMP-DPMCM)