MAR14-2013-008893

Abstract for an Invited Paper
for the MAR14 Meeting of
the American Physical Society

Probing the chiral anomaly and transport in Weyl semimetals[1]

SIDDHARTH PARAMESWARAN[2], UC Berkeley and UC Irvine

The topological nature of Weyl semimetals is reflected in the Adler-Bell-Jackiw anomaly, an unusual bulk response where applying parallel electric ($\mathbf{E}$) and magnetic ($\mathbf{B}$) fields pumps electrons between nodes of opposite chirality at a rate proportional to $\mathbf{E} \cdot \mathbf{B}$. We argue that this pumping is measurable via nonlocal transport experiments, in the limit of weak internode scattering. Such nonlocal transport vanishes when the injected current and magnetic field are orthogonal, and therefore serves as a test of the chiral anomaly. I will also comment on the possibility of observing similar physics in the three-dimensional Dirac semimetallic phase proposed to exist in Na_3Bi and Cd_3As_2, which have been the subject of recent photoemission and transport experiments. Reference: arXiv preprint 1306.1234 (2013).

[1]We acknowledge support from the Simons Foundation, NSF Grant PHYS-1066293 (Aspen Center for Physics), DOE Contract No. DEAC02- 05CH11231, and the Gordon and Betty Moore Foundation Grant GBMF1250 (IQIM at Caltech).

[2]Joint work with T. Grover (Kavli Institute for Theoretical Physics), D. A. Pesin (University of Utah), D. A. Abanin (Perimeter Institute), and A. Vishwanath (UC Berkeley)