MAR17-2016-020188

Abstract for an Invited Paper
for the MAR17 Meeting of
the American Physical Society

Thermal transport in Weyl, double-Weyl, Dirac, and magnetically ordered systems with strong spin-orbit coupling[1]

GREGORY A. FIETE, University of Texas at Austin

In this talk I will discuss some of our recent work on the thermal transport properties of Weyl and Dirac semimetals, double-Weyl semimetals, and magnetically ordered insulators with strong spin-orbit coupling. The thermal properties will be described primarily within the context of a Boltzmann transport theory. For the Weyl/Dirac systems we study the temperature, disorder, carrier density, and field (both magnetic and electric) dependent response. The double-Weyl system is predicted to exhibit a spatially anisotropic response that would allow one to distinguish it from the single Weyl system in transport measurements. In addition, I will touch on some of our work related to electronic cooling by phonons in Dirac and Weyl semimetals. For the magnetically ordered insulators with strong spin-orbit coupling, we study the Kitaev-Heisenberg model which exhibits 4 different ordered phases depending on the relative importance of the spin-orbit coupling, and a model with Dzyaloshinskii-Moriya interactions motivated by thin film pyrochlore iridates. We compute the thermal conductivity tensor and conclude that some properties of the magnetic order and its excitations, including topological magnon bands, can be inferred from the anisotropies and temperature dependence of the thermal conductivity. P. Laurell and G. A. Fiete, arxiv:1609.03612 Q. Chen and G. A. Fiete, Phys. Rev. B **93**, 155125 (2016), R. Lundgren and G. A. Fiete, Phys. Rev. B **92**, 125139 (2015), R. Lundgren, P. Laurell, and G. A. Fiete, Phys. Rev. B **90**, 165115 (2014).

[1]We gratefully acknowledge financial support from the ARO, DARPA, and NSF.