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Thermoelectric properties of Weyl and Dirac semimetals PONTUS LAURELL, REX LUNDGREN, GREGORY FIETE, University of Texas at Austin — We study the electronic contribution to the thermal conductivity and the thermopower of Weyl and Dirac semimetals using a semiclassical Boltzmann approach. We investigate the effect of various relaxation processes including disorder and interactions on the thermoelectric properties, and also consider doping away from the Weyl or Dirac point. We find that the thermal conductivity and thermopower have a dependence on the chemical potential that is characteristic of the linear electronic dispersion, and that electron-electron interactions modify the Lorenz number. For the interacting system, we also use the Kubo formalism to obtain the transport coefficients, finding exact agreement with the Boltzmann approach at high temperatures. We also consider the effect of electric and magnetic fields on the thermal conductivity in various orientations with respect to the temperature gradient. Notably, when the temperature gradient and magnetic field are parallel, we find a large contribution to the longitudinal thermal conductivity that is quadratic in the magnetic field strength, similar to the magnetic field dependence of the longitudinal electrical conductivity due to the presence of the chiral anomaly when no thermal gradient is present.

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