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Thermo-electric transports in double-Weyl semimetals QI CHEN, GREGORY A. FIETE, The University of Texas at Austin — Topological Weyl semimetals with linearly dispersing nodal points have received a surge of interest due to their experimental realization in real materials. Another nontrivial type of band crossing whose dispersion is not simply linear is the double Weyl point, around which the spectrum disperses linearly along one momentum direction but quadratically along the two remaining directions. In this work, we apply the semi-classical Boltzmann transport theory to study the thermo-electric conductivity of a double-Weyl fermion model. We find that the transport quantities exhibit an interesting dependence on the chemical potential and spatial anisotropic model parameters, differing from a simple quadratically or linearly dispersing electron gas. By applying a static magnetic field, we find that the double-Weyl point is only stable for a magnetic field along the linearly dispersing direction. The longitudinal and transverse electrical and thermal magneto-conductivity show a similar dependence on the in-plane cyclotron frequency to the linearly dispersing Weyl nodes. In the extreme quantum limit of chemical potential being much smaller than the cyclotron energy, we find that the lowest Landau levels are both chiral and doubly degenerate. The chiral anomaly contribution to the longitudinal magneto-conductivity is double that of a linearly dispersing Weyl node.

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