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Detecting monopole charge via quantum interference transport XIN DAI, Tsinghua Univ, HAIZHOU LU, South University of Science and Technology China, HONG YAO, Tsinghua Univ — Topological Weyl and double-Weyl semimetals host different monopole charges in momentum space. How to detect the signature of the monopole charges in quantum transport remains a challenging topic. Here, we reveal the connection between the parity of monopole charge in topological semimetals and the quantum-interference correction to the conductivity. We demonstrate that the parity of monopole charge determines the sign of quantum-interfere correction, with odd and even parity yielding the weak anti-localization and weak localization effect, respectively. This is attributed to the Berry phase difference between time-reversed trajectories circulating the great circle of the Fermi sphere that encloses the monopole charges. From standard Feynman diagram calculations, we further show that the weak-field magnetoconductivity is proportional to $\pm\sqrt{B}$ for double-Weyl semimetals and Weyl semimetals, respectively, which could be verified experimentally.

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