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High-field magnetoconductivity of topological semimetals HAI-ZHOU LU, South University of Science and Technology of China, SONG-BO ZHANG, SHUN-QING SHEN, The University of Hong Kong — The chiral anomaly has been widely believed to give a positive magnetoconductivity or negative magnetoresistivity in strong and parallel fields in topological semimetals. However, several recent experiments on both Weyl and Dirac topological semimetals show a negative magnetoconductivity in high fields. Here, we study the magnetoconductivity of Weyl and Dirac semimetals in a strong magnetic field applied along the direction that connects the Weyl nodes, we find that the conductivity along the field direction is not only determined by the Landau degeneracy, but also depends on the Fermi velocity and scattering potentials. We identify several scenarios in which the high-field magnetoconductivity is negative. It shows that the high-field positive magnetoconductivity may not be a compelling signature of the chiral anomaly. The quantum linear magnetoresistance will also be discussed.

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