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**Type-II Weyl semimetals** ALEXEY SOLUYANOV, DOMINIK GRESCH, ETH Zurich, ZHIJUN WANG, Princeton University, QUANSHENG WU, MATTHIAS TROYER, ETH Zurich, XI DAI, IOP, Chinese Academy of Sciences, ANDREI BERNEVIG, Princeton University — The Dirac equation of quantum field theory gives rise to massless Weyl fermions that respect Lorentz invariance. In condensed matter these fermions are realized as low energy excitations in Weyl semimetals. In these materials a topologically protected linear crossing of two bands, called a Weyl point, occurs at the Fermi level resulting in a point-like Fermi surface. Lorentz invariance, however, can be violated in condensed matter, and here we generalize the Dirac equation accordingly to obtain a fundamentally new kind of Weyl fermions. In particular, we report on a novel type of Weyl semimetal, with a new type of Weyl point that emerges at the boundary between electron and hole pockets. This node, although still a protected crossing, has an open, not point-like, Fermi surface, resulting in physical properties very different from that of standard Weyl points. We show that an established material, $WTe_2$, is an example of this novel type of topological semimetals.

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