

Abstract Submitted
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Strained and inhomogeneous Weyl and Dirac semimetals: Transport in axial magnetic fields and Fermi arc surface states from pseudo Landau levels ADOLFO GRUSHIN, Univ of California - Berkeley, JORN W. F. VENDERBOS, MIT, ASHVIN VISHWANATH, Harvard, RONI ILAN, Tel Aviv University — Dirac and Weyl semimetals host topologically stable Weyl nodes appearing in pairs of opposite chirality. In this work we allow a space-time dependent Weyl node separation, which acts as a background axial vector potential on the electromagnetic response and the energy spectrum of these materials. This situation arises either from inhomogeneous strain, non-uniform magnetization and also in cold-atomic systems. The resulting axial magnetic field \mathbf{B}_5 is observable through an enhancement of the conductivity as $\sigma \sim \mathbf{B}_5^2$ due to an underlying chiral pseudo magnetic effect. Using two lattice models, we analyze the effect of \mathbf{B}_5 on the spectral properties of topological semimetals, revealing that (i) the surface Fermi arcs, can be reinterpreted as $n = 0$ pseudo-Landau levels resulting from a \mathbf{B}_5 confined to the surface (ii) position-momentum locking a bulk \mathbf{B}_5 creates pseudo-Landau levels interpolating in real space between Fermi arcs at opposite surfaces and (iii) there are equilibrium bound currents proportional to \mathbf{B}_5 that average to zero over the sample, analogs of bound currents in magnetic materials. We conclude by discussing how our findings can be probed experimentally.

Adolfo Grushin
UC Berkeley

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