

Abstract Submitted
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Landau Theory of Helical Fermi Liquids REX LUNDGREN, University of Texas at Austin, JOSEPH MACIEJKO, University of Alberta — We construct a phenomenological Landau theory for the two-dimensional helical Fermi liquid found on the surface of a three-dimensional time-reversal invariant topological insulator. In the presence of rotation symmetry, interactions between quasiparticles are described by ten independent Landau parameters per angular momentum channel, by contrast with the two (symmetric and antisymmetric) Landau parameters for a conventional spin-degenerate Fermi liquid. We project quasiparticle states onto the Fermi surface and obtain an effectively spinless, projected Landau theory with a single projected Landau parameter per angular momentum channel that captures the spin-momentum locking or nontrivial Berry phase of the Fermi surface. As a result of this nontrivial Berry phase, projection to the Fermi surface can increase or lower the angular momentum of the quasiparticle interactions. We derive equilibrium properties, criteria for Fermi surface instabilities, and collective mode dispersions in terms of the projected Landau parameters. We briefly discuss experimental means of measuring projected Landau parameters.

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