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Dilute spin-orbit Fermi gases[1] DANIEL MALDONADO-MUNDO, Heriot-Watt University, LIANYI HE, Los Alamos National Laboratory, PATRIK ÖHBERG, MANUEL VALIENTE, Heriot-Watt University — We study repulsive Fermi gases with Rashba spin-orbit coupling in two and three dimensions when they are dilute enough that a single branch of the spectrum is occupied in the non-interacting ground state. We develop an effective renormalizable theory for fermions in the lower branch and obtain the energy of the system in three dimensions to second order in the renormalized coupling constant. We then exploit the non-Galilean-relativistic nature of spin-orbit coupled gases. We find that at finite momentum, the two-dimensional Fermi sea is deformed in a non-trivial way. Using mean-field theory to include interactions, we show that the ground-state of the system acquires a finite momentum, and is consequently deformed, when the interaction is stronger than a critical value.

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