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**A Luttinger Hamiltonian is not enough** M.C. CHANG, C.P. CHUU, Q. NIU, University of Texas at Austin — In the study of spintronics, it is important to understand carrier transport in multiple energy bands, such as in the conduction or valence bands in semiconductors. Such bands are often described by effective Luttinger Hamiltonians, derived from k.p perturbation and symmetry considerations. A closely related case is the Pauli Hamiltonian, which suppose to give an effective description for the upper Dirac bands in the non-relativistic limits. Here we show that such an effective Hamiltonian alone is not really sufficient. Various Berry phase type corrections must be supplemented to give proper description of electron charge and spin dynamics.

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