The pseudospin degree of freedom and dynamics in degenerate bands QIAN NIU, The University of Texas at Austin, Austin, TX 78712, DIM-ITRIE CULCER, Advanced Photon Source, Argonne National Laboratory, Argonne, IL 60439 and Department of Physics, Northern Illinois University, De Kalb, IL 60115 — Carriers in degenerate bands possess an additional degree of freedom, which may be regarded as a pseudospin. In a wave- packet picture, along with the center of mass motion in crystal momentum and real space, one must also take into account the probability amplitudes, which characterize the inter-band dynamics. The additional degree of freedom introduces nontrivial non-Abelian corrections to the carrier dynamics. These corrections include non-Abelian Berry curvature terms and a non-Abelian correction to the group velocity. For the four- band Luttinger model we will demonstrate that, under the action of an electric field, coherent wave-packet evolution leads to separation of up and down spins, discussing the role of the pseudospin in this process. We find that the helicity in the four band model can be expressed in terms of the pseudospin and is not conserved in an electric field. In addition, we will discuss the role of the pseudospin in determining the Landau levels in the Luttinger Hamiltonian by semiclassical quantization.

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