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**Exotic Effects of Spin-Flip Scattering on Massive Dirac Fermions<sup>1</sup>**

SHENGYUAN YANG, ZHENHUA QIAO, The University of Texas at Austin, YUGUI YAO, JUNREN SHI, Institute of Physics, Chinese Academy of Sciences, QIAN NIU, The University of Texas at Austin — We investigate the effects of spin-flip scattering on the Hall transport and spectral properties of massive Dirac fermions. We find that in the weak scattering regime, the Berry curvature distribution is dramatically compressed in the electronic energy spectrum, becoming singular at band edges. As a result the Hall conductivity suffers a sudden jump (or drop) of  $e^2/2h$  when the Fermi energy sweeps across the band edges, and otherwise is a constant quantized in units of  $e^2/2h$ . In parallel, spectral properties such as the density of states and spin polarization are also greatly enhanced at band edges. Possible experimental methods to detect these effects are discussed.

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Shengyuan Yang  
The University of Texas at Austin

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