Topological Spin Current DAVID SCHMELTZER, City College of NY
— We show that the $SU(2)$ transformation which diagonalizes the two dimensional
spin-orbit hamiltonian has a singularity in the momentum space at $\vec{K} = 0$ which
gives rise to non-commuting cartesian coordinates. When an external electric field is
applied, the non-commuting cartesian coordinates induce a Hall current. The presence of a random potential in an infinite system causes the single particle occupation
at $\vec{K} = 0$ and the Hall current to vanishes. For a finite system, the spin-Hall conductance is quantized in units of $\frac{eg\mu_B}{2h}$, and the charge-Hall conductivity increases
with the strength of the Zeeman magnetic field. We propose an experiment to test
our theory.

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