

Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Spin Transistor Action from Hidden Onsager Reciprocity¹ I.

ADAGIDELI, Sabanci University, V. LUTSKER, M. SCHEID, Regensburg University, PH. JACQUOD, University of Arizona, K. RICHTER, Regensburg University — We investigate generic Hamiltonians for confined electrons with weak inhomogeneous spin-orbit coupling [1]. Using a local gauge transformation we show how the $SU(2)$ Hamiltonian structure reduces to a $U(1) \times U(1)$ structure for spinless fermions in a fictitious orbital magnetic field, to leading order in the spin-orbit strength. Using an Onsager relation, we further show how the resulting spin conductance vanishes in a two-terminal setup, and how it is turned on by either weakly breaking time-reversal symmetry or opening additional transport terminals, thus allowing one to switch the generated spin current on or off. We numerically check our theory for mesoscopic cavities as well as Aharonov-Bohm rings.

[1] Adagideli et al., Phys. Rev. Lett. 108, 236601 (2012)

¹This work was supported by TUBITAK, TUBA-GEBIP, funds of the Erdal Inonu chair, NSF, MANEP and DFG

Inanc Adagideli
Sabanci University

Date submitted: 10 Dec 2012

Electronic form version 1.4