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Spin current swapping and spin hall effect in disordered metals HAMED SAIDAOUI, CHRISTIAN PAUYAC, AURELIEN MANCHON, King Abdullah University of Science and Technology — The conversion of charge currents into spin currents via the spin Hall effect has attracted intense experimental and theoretical efforts lately, providing an efficient means to generate electric signals [1] and manipulate the magnetization of single layers. More recently, it was proposed that spin-dependent scattering induced by spin-orbit coupled impurities also produces a so-called spin swapping, i.e. an exchange between the spin angular momentum and linear momentum of itinerant electrons [2,3]. In this work, we investigate the nature of spin swapping and its interplay with extrinsic spin Hall effect and spin relaxation in finite size normal metals. We use two complementary methods based on non-equilibrium Green's function technique. The first method consists in rigorously deriving the drift-diffusion equation of the spin accumulation in the presence of spin-orbit coupled impurities from quantum kinetics using Wigner expansion. The second method is the real-space tight binding modeling of a finite system in the presence of spin-orbit coupled disorder. [1] A. Hoffman, Spin Hall Effects in Metals, IEEE Trans. Magn. 49, 5172 (2013). [2] M. B. Lifshits and M. I. Dyakonov, Phys. Rev. Lett. 103 , 186601 (2009) [3] S. Sadjina et al, Phys. Rev. B 85 , 115306 (2012)

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