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Influence of electron-magnon scattering on spin transfer torque in magnetic tunnel junctions[1] AURELIEN MANCHON, SHUFENG ZHANG, University of Arizona — Manipulating the magnetization direction using spin transfer torque in magnetic tunnel junctions (MTJs) has been one of the most important challenges in spin electronics for the past five years. Elastic tunneling theories show that the torque possesses two components, one being mainly linear in bias voltage whereas the other shows a quadratic bias dependence. These theoretical results have been recently confirmed by "spin-diode" experiments [1]. However, the validity of the elastic tunneling has been questioned by two experimental studies [2]. These studies show that the bias dependence of the out-of-plane torque can be dramatically different from the elastic quadratic dependence. Using the Transfer Hamiltonian formalism, we study the influence of interfacial electron-magnon scattering on the bias dependence of the spin transfer torque. We show that this mechanism can strongly affect the bias dependence of the spin transfer torque, in agreement with the recent experimental studies [2]. [1] J. C. Sankey et al., Nature Physics 4, 67 (2008); H. Kubota et al., Nature Physics 4, 37 (2008). [2] S. Petit, et al., Phys. Rev. Lett. 98, 077203 (2007); Z. Li, et al., Phys. Rev. Lett. 100, 246602 (2008).

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