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**Non-adiabatic spin-transfer torque independent of the spin relaxation rate** KYOUNG-WHAN KIM, NIST - Natl Inst of Stds Tech , KYUNG-JIN LEE, Korea University, HYUN-WOO LEE, POSTECH, MARK STILES, NIST - Natl Inst of Stds Tech — Non-adiabatic spin-transfer torques play an important role in magnetization dynamics. For example, they determine current-induced magnetic domain wall velocity. A well-known mechanism for non-adiabatic spin-transfer torques arises from spin relaxation and is directly proportional to the spin relaxation rate. Here we report mechanism that is independent of the spin relaxation rate. This mechanism is related to the recently reported intrinsic damping-like spin-orbit torque, which is proportional to an electric field but is independent of the conductivity, and hence the scattering rate. Likewise, the mechanism we report is independent of the scattering rate. It originates from the effective spin-orbit coupling that arises in systems with magnetic textures as we previously reported for related processes. In this work, we demonstrate the existence of such a spin-transfer torque, which is a contribution to the non-adiabatic spin-transfer torque and is independent of scattering rates. We also demonstrate that the magnitude of this torque can be much larger than other mechanisms for non-adiabatic spin-transfer torques, and may be the dominant contribution in some systems.

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