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Nature of Voltage Dependence of Spin Torque in Magnetic Tunnel Junctions M. CHSHIEV, Center for Materials for Information Technology, The University of Alabama, Tuscaloosa, AL, I. THEODONIS, A. KALITSOV, N. KIOUSSIS, Califronia State University, Northridge, CA, W. H. BUTLER, Center for Materials for Information Technology, The University of Alabama, Tuscaloosa, AL — Current-induced spin torque [1] is important because it may elucidate fundamental physics and because it may have useful applications. We have recently shown [2] that in magnetic tunnel junctions, both in-plane (Slonczewski) and perpendicular-to-the-plane (field-like) components of the spin torque behave nontrivially as a function of applied bias. Recent experiments [3] are in agreement with these predictions. Here we present a systematic study of voltage-induced spin torque in magnetic tunnel junctions and provide an insight into the nature of its voltage behavior. The explanation is given in terms of the spin and charge current dependence on the interplay between evanescent states in the insulator and the Fermi surfaces of the ferromagnetic electrodes comprising the junction. Calculations are based on the Keldysh formalism with non-equilibrium Green functions technique. [1] J. C. Slonczewski, J. Magn. Magn. Mat. 159, L1 (1996); L. Berger, Phys. Rev. B 54, 9353 (1996) [2] I. Theodonis, N. Kioussis, A. Kalitsov, M. Chshiev, and W. H. Butler, Phys. Rev. Lett. 97, 237205 (2006) [3] J. C. Sankey et al, Nature Physics (2007); H. Kubota et al, Nature Physics, ibid.

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