Abstract Submitted
for the MAR08 Meeting of
The American Physical Society

Bias dependence of magnetic exchange coupling. PAUL HANEY, MARK STILES, Center for Nanoscale Science and Technology, National Institute of Standards and Technology, CHRISTIAN HEILIGER, Center for Nanoscale Science and Technology, National Institute of Standards and Technology, Maryland NanoCenter, University of Maryland, ALLAN MACDONALD, The University of Texas at Austin — An applied electrical bias can change the interlayer coupling in magnetic multilayers and magnetic tunnel junctions. The bias dependence of these changes is controversial; it is not clear whether the changes depend linearly or quadratically on the applied voltage. Motivated by this controversy, as well as proposals to exploit bias-dependent exchange coupling to accomplish current induced magnetic switching, we compute the bias-dependence of interlayer exchange coupling in magnetic multilayers and tunnel junctions. For simple tight-binding models, we derive expressions for this dependence, describe the special cases in which this dependence is particularly large, and derive the extent to which zero-bias expressions for interlayer coupling remain valid for biased systems. We also examine the related question of the bias-dependence of intralayer exchange interactions in a single ferromagnetic layer, and discuss experimental consequences of bias-modulated exchange stiffness, including induced changes in the Curie temperature and spin wave dispersion. This work has been supported in part by the NIST-CNST/UMD-NanoCenter Cooperative Agreement.

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Date submitted: 19 Dec 2007 Electronic form version 1.4