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First-principles quantification of the non-adiabatic spin torque parameter in Fe and Ni KEITH GILMORE, National Institute of Standards and Technology, ION GARATE, University of British Columbia, ALLAN MACDONALD, University of Texas, Austin, MARK STILES, National Institute of Standards and Technology — We have used density functional methods to evaluate the non-adiabatic spin-transfer torque parameter β for Fe and Ni as a function of the electronic scattering rate. Like the damping parameter α, β contains contributions due to both intraband and interband electronic transitions. For both Fe and Ni, the intraband terms are proportional and have a ratio of approximately 1 for Fe and about 2.1 for Ni. We separate the numerically challenging interband contribution into two terms, one that we show is qualitatively and quantitatively similar to the interband contribution of α, and one that is small, but non-zero. Our calculations indicate that β is interband dominated at scattering rates consistent with room temperature for Fe and Ni, as is the case for α. From this, we expect the two dynamic parameters to be approximately equal for both metals.

Keith Gilmore
National Institute of Standards and Technology

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