Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Two Exponentials Associated with Temperature in Spin-Seebeck Effect Geometry[1] WAYNE SASLOW, MATTHEW SEARS, Texas A&M University — Recent experiments report the observation of a Spin-Seebeck effect, where an applied thermal gradient along (x) a very thin (z), narrow (y) ferromagnetic sample F is associated with a spin current.[2] In present geometries this spin current is measured indirectly via a Pt bar above (z) the sample; a voltage difference V along y is measured and interpreted as being due to a spin current j_s into (z) the Pt, which then causes an inverse Spin Hall effect (j_s causes transverse V). Measured voltages often show a $\sinh(x/s)$ dependence, where s is long compared to any relevant spin-diffusion length.[3] The spin current has been interpreted as accompanying a temperature disequilibrium between the phonons and magnons in F.[4] The present work uses irreversible thermodynamics to include magnon-phonon equilibration in F and the thermal properties of the (non-magnetic) substrate S. We find two exponentials describing the overall thermal response along x, the second one associated with equilibration between F and S. If the thermal coupling between F and S is poor, then the second length can be rather long.

[1]Supported by Department of Energy grant DE-FG02-06ER46278.
[2]K. Uchida et al, Nature 455, 778 (2008).
[3]C. M. Jaworski et al, Nature Materials 9, 898 (2010).
[4]J. Xiao et al, Phys. Rev. B 81, 214418 (2010).

Wayne Saslow
Texas A&M University

Date submitted: 22 Dec 2010 Electronic form version 1.4