Condensed Matter Theory Center Seminar

Tuesday, July 19
11am-12pm
2205 Physics Building

Matthew Sears, Texas A&M

"Interpreting Spin-Seebeck Effect Measurements"

Recent experiments seem to observe the spin-Seebeck effect, which is the production of a spin-current by a thermal gradient. A thermal gradient and a uniform magnetic field are applied across the length (x) of a thin-film ferromagnet grown on top of an insulating substrate. From a voltage measurement across the width (y) of the ferromagnetic film, a spin current is inferred to occur along the thickness (z) via the Inverse Spin Hall Effect. Some experiments show that this voltage (and thus the spin current) varies as Sinh(x/\lambda), where \lambda is much greater than a spin diffusion length. With heat currents carried by both phonons and magnons in the ferromagnet, this length may be due to magnon-phonon equilibration. Using the macroscopic equations of irreversible thermodynamics, we show that, with both magnon-phonon equilibration in the sample and phonon-phonon equilibration between the sample and the substrate, thermal gradients along z vary as Sinh(x/\lambda). The thermal gradient along z yields a spin current along z (the spin-Seebeck effect), which in turn leads to a voltage gradient along y via the Spin Hall conductivity.

All are welcome to attend.

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