Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Ohmic spin injection from a half-metal at finite temperatures: Is the conductivity mismatch problem relevant? JAMES GLASBRENNER, ALEKSANDER WYSOCKI, KIRILL BELASHCHENKO, University of Nebraska - Lincoln — Spin injection from a normal ferromagnet into a semiconductor requires a highly-resistive tunnel or Schottky barrier at the interface to overcome the conductivity mismatch problem. This barrier limits the current that can be achieved in a device. A half-metallic ferromagnet used as a spin injector obviously overcomes this problem at zero temperature, but the situation at finite temperatures is nontrivial. We argue that the two-current model is inapplicable to half-metals, and that Ohmic (barrierless) spin injection from a half-metal is possible even at finite temperatures. This conclusion is reached using an intuitive model which sums up multiple scatterings at the interface. To complement this model, we calculate the spin injection efficiency for a half-metallic electrode using a single-band tight-binding model with explicit statistical averaging over thermal spin fluctuations. The results are contrasted with the case of a normal ferromagnet. We also consider a practically interesting case of a CrAs electrode within the tight-binding LMTO method.

James Glasbrenner
University of Nebraska - Lincoln

Date submitted: 19 Nov 2010 Electronic form version 1.4