Abstract Submitted
for the MAR09 Meeting of
The American Physical Society

**Quantifying Spin Hall Effects in Gold Hall Bars**[1] GORAN MIHAJLOVIC, JOHN E. PEARSON, SAMUEL D. BADER, AXEL HOFFMANN, Materials Science Division and Center for Nanoscale Materials, Argonne National Laboratory, Argonne, IL 60439 USA, MIGUEL ANGEL GARCIA, Universidad Complutense, Madrid, Spain — Spin Hall effects manifest the fundamental interdependence between charge and spin transport. We studied these effects experimentally by measuring the non-local resistance,$R_{nl}$, in mesoscopic Au Hall bars where spin current generation and detection are spatially separated in two side arms, while a bridging arm acts as the spin conduit. The measured $R_{nl}$ decreases monotonically with decreasing temperature, changing sign from positive to negative. This can be understood by modeling $R_{nl}$ as a sum of two components; a positive, ohmic component, arising from the charge current, and a negative component, due to spin Hall effects and spin diffusion. By varying the spacing between the side arms, the components can be separated. We determined the spin diffusion length, thespin Hall angle and the spin Hall conductivity. We found spin Hall angles of order 0.1, with a temperature dependence proportional to the resistivity, while the spin Hall conductivity was almost temperature independent.

[1]Work at Argonne is supported by the U.S. Department of Energy Office of Science under Contract No. DE-AC02-06CH11357.

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Date submitted: 10 Dec 2008 Electronic form version 1.4