Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Large non-inverted and inverted spin signals in break-junction-based nonlocal spin valves[1] SHUHAN CHEN, HAN ZOU, SIU-TAT CHUI, YI JI, University of Delaware — A nonlocal spin valve (NLSV) is a lateral structure with a ferromagnetic (F) spin injector, an F spin detector and a nonmagnetic (N) channel. A pure spin current can be generated in the N channel by electrical injection through the injector, and can be detected as a spin signal between the spin detector and the N channel. For a typical metallic NLSV, one expects a regular spin signal meaning that the nonlocal resistance is high for the parallel (P) states of the injector and the detector and low for the antiparallel (AP) states. We investigate spin signals of NLSV's with a break junction formed between the detector and the copper N channel by electrostatic discharge. We observed both non-inverted and inverted spin signals with large magnitudes. An inverted spin signal has low nonlocal resistance values for the P states and high values for the AP states. The magnitude is up to 90 milliohms at 4 K and up to 30 milliohms at 300 K, larger than the typical metallic NLSV with similar dimensions. The large magnitude can be explained by the spin-charge coupling across the highly resistive break-junction. The signs of the spin signals (non-inverted vs. inverted) are determined by the local spin-dependent density of states near the break-junction.

[1]This work was supported by US DOE grant No. DE-FG02-07ER46374

Shuhan Chen
University of Delaware

Date submitted: 11 Nov 2011 Electronic form version 1.4