Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Carrier density dependence of the spin lifetime in the persistent photoconductor Si:$Al_{0.3}Ga_{0.7}As$[1] JOON-IL KIM, J. MISURACA, K. KOUNTOURIOTIS, S. VON MOLNAR, P. XIONG, Florida State University, Florida, USA, K. MENG, J. LU, L. CHEN, X. YU, J. ZHAO, Institute of Semiconductors, CAS, Beijing, China — Electrical spin injection/detection experiments have been performed on Si:$Al_{0.3}Ga_{0.7}As$, a persistent photoconductor. The carrier density of this material can be tuned in situ via photo excitation across the insulator-metal transition (IMT) [1], which enables spin accumulation and transport measurements in one and the same sample over orders of magnitude variation in carrier density, thus circumventing the difficulties of making many replicas to realize different doping levels. Fe/AlGaAs heterostructures were grown by MBE, in which AlGaAs and GaAs graded Schottky junctions were tested for optimum spin injection. Spin transport devices, suitable for 3-terminal and non-local 4-terminal Hanle-type measurements and on-chip determination of the carrier density, were fabricated from the wafers. The spin lifetimes, determined from fits of the Hanle curves to a Lorentzian or the spin drift-diffusion model, range from 0.5 ns to 2.8 ns and exhibit a nonmonotonic carrier density dependence possibly peaked at the IMT.

[1] J. Misuraca et al., Phys. Rev. B82, 125202 (2010).

[1]Work supported by NSF grant #DMR-09008625 and NSFC grant #10920101071.

Joon-Il Kim
Florida State University

Date submitted: 16 Nov 2012 Electronic form version 1.4