Abstract Submitted
for the MAR09 Meeting of
The American Physical Society

Theory of Semiconductor Spin Lasers CHRISTIAN GOTHGEN, SUNY Buffalo, RAFAL OSZWALDOWSKI, SUNY Buffalo and N. Copernicus University, Torun, Poland, IGOR ZUTIC, SUNY Buffalo — Semiconductor lasers with spin-polarized carriers' injection have important advantages as compared to the conventional lasers in which the carriers are unpolarized. While such spin lasers have been successfully realized and shown to provide spin-polarization modulation and threshold current reduction [1-4], there remain important theoretical challenges in understanding their operation. We demonstrate that the maximum threshold reduction is larger than previously thought possible and, surprisingly, can be enhanced by ultrafast spin relaxation of holes [5]. By combining our analytical model [5] and numerical studies of spin lasers we explore the effects of quantum confinement in the gain region and identify different modes of operation. We thank A. Petrou for valuable discussions. This work is supported by US ONR and NSF-ECCS CARRER. [1] J. Rudolph et al., Appl. Phys. Lett. 82, 4516 (2003). [2] M. Holub et al., Phys. Rev. Lett. 98, 146603 (2007). [3] S. Hovel et al., Appl. Phys. Lett. 92, 041118 (2008). [4] D. Basu et al., Appl. Phys. Lett. 92, 09119 (2008). [5] C. Gothgen et al., Appl. Phys. Lett. 93, 042513 (2008).

Rafal Oszwaldowski
SUNY Buffalo

Date submitted: 20 Nov 2008 Electronic form version 1.4