Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Microscopic description of a spin laser[1] PAULO E. FARIA JUNIOR, University of Sao Paulo, GAOFENG XU, SUNY Buffalo, JEONGSU LEE, University of Regensburg, NILS C. GERHARDT, Ruhr-University Bochum, GUILHERME M. SIPAHI, University of Sao Paulo / SUNY Buffalo, IGOR ZUTIC, SUNY Buffalo
— Spin lasers provide interesting possibilities for spintronic applications at room temperature[1]. They have the same elements of a conventional laser, but the injected carriers are spin polarized which allows the output light polarization to have either positive or negative helicity. These devices are commonly implemented as VCSELs, which have the advantage of tuning the photon energy by the cavity design. We investigate a spin VCSEL with a AlGaAs/GaAs quantum well active region using band structure calculations and spin-dependent optical gain. In addition to the desirable properties for steady-state operation and cavity designs, we also show that by applying a uniaxial strain, large values of birefringence > 200 GHz can be achieved[2]. Combined with spin injected carriers, the birefringence in the device allows polarization dynamics much faster than photon intensity dynamics[3]. Our theoretical prediction for high-frequency birefringence was experimentally demonstrated in similar spin VCSELs[4]. [1] I. Zutic and P. E. Faria Junior, Nat. Nanotech. 9, 750 (2014). [2] P. E. Faria Junior et al., PRB 92, 075311 (2015). [3] N. C. Gerhardt et al., APL 99, 151107 (2011). [4] T. Pusch et al., Electron. Lett. 51, 1600 (2015).

[1]FAPESP (2011/19333-4, 2012/05618-0 and 2013/23393-8), CNPq (246549/2012-2), DFG (GE 1231/2-1), NSF-ECCS, DOE-BES and US ONR.

Paulo E. Faria Junior
University of Sao Paulo

Date submitted: 06 Nov 2015 Electronic form version 1.4