Abstract Submitted
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Theory of spin-polarized semiconductor lasers[1] RAFAL OSZWALDOWSKI, CHRISTIAN GOTHGEN, IGOR ZUTIC, SUNY Buffalo — In semiconductor systems spin-polarized electrons couple to photons with definite angular momentum. This effect is the basis for numerous existing and proposed devices [1]. Quantum-well based Vertical Cavity Surface Emitting Lasers (VCSELs) take advantage of this phenomenon to produce circularly-polarized light by using either optical or electrical pumping [2]. We describe the VCSEL system employing Semiconductor Bloch Equations. We include the influence of spin-orbit coupling and the dependence of dipole matrix elements on carrier's wavevectors. We reduce this description to an effective four-level model, incorporating such effects as different spin lifetimes for electrons/holes and laser-cavity birefringence. Applying this approach to a spin-polarized system, we calculate the threshold current, the polarization of the emitted light and other relevant quantities. [1] I. Zutic, J. Fabian, S. Das Sarma, Rev. Mod. Phys. 76, 323 (2004). [2] M. Holub et al., Phys. Rev. Lett. 98, 146603 (2007); J. Rudolph et al., Appl. Phys. Lett. 82, 4516 (2003).

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Igor Zutic
SUNY Buffalo

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