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Spin Lasers: From Microscopic Description to Rate Equations IGOR ZUTIC, GAOFENG XU, University at Buffalo, PAULO FARIA JUNIOR, University of Regensburg/University of Sao Paulo, VELIMIR LABINAC, University of Rijeka, GUILHERME SIPAHI, University of Sao Paulo — Commercial spintronic devices usually rely on magnetoresistive effects. Injecting spin-polarized carriers into semiconductor lasers enables devices that use different operating principles and can overcome limitations of conventional (spin-unpolarized) lasers [1]. The conservation of angular momentum and spin-orbit coupling leads to the transfer of angular momentum from spin-polarized carriers to emitted circularly-polarized light. Using microscopic optical gain calculations [2] based on accurate electronic structure and phenomenological rate equations [3], we show, considering wurzite GaN quantum wells, how these complementary methods can elucidate the operation of such spin lasers and their advantages [4]. [1] M. Holub et al., PRL 98, 146603 (2007); M. Lindemann et al., APL 108, 042404 (2016); J. Rudolph et al., APL 82, 4516 (2003); J. Frougier et al., APL 103, 252402 (2013); J.-Y. Cheng et al., Nat. Nanotech. 9, 845 (2014). [2] P. Faria Junior, G. Xu, J. Lee, N. Gerhardt, G. Sipahi, I. Zutic, PRB 92, 075311 (2015). [3] J. Lee, S. Bearden, E. Wasner, I. Zutic, APL 105, 042411 (2014). [4] P. Faria Junior, G. Xu, Y.-F. Chen, G. Sipahi, I. Zutic, preprint.

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