Abstract Submitted
for the PSF09 Meeting of
The American Physical Society

High Speed Single Dopant Spin Manipulation with a Single Electrical Gate VICTORIA POVILUS, University of Iowa Department of Physics and Astronomy, J.-M. TANG, University of New Hampshire Department of Physics, M.E. FLATTÉ, University of Iowa Department of Physics and Astronomy — Ultra-low-power computation with spin based electronics can be achieved through coherent spin manipulation. Naturally occurring Mn ions with a bound hole in GaAs provide a uniform system with the potential for fast, all electrical spin manipulation applicable to high-density scalable spin-based electronics [1] and can be probed optically [2]. In an effort to increase device scalability by utilizing a single gate we consider a configuration in which three fields, DC magnetic, DC electric and AC electric, are parallel. With a DC magnetic field of 2.5 T and total electric field strength of $200kV/cm$, we predict Rabi periods on the order of picoseconds with high visibilities. Assuming each Mn experiences a random electric field, which modifies its spin precession, we performed an ensemble calculation using this Hamiltonian to predict polarization curves from a PL measurement on low concentration Mn in GaAs. In addition we calculate how these curves are affected by a bias DC electric field.

[1] J.-M Tang, Jeremy Levy, and M. E. Flatt/'e, Phys. Rev. Lett. 97, 106803 (2006).
[2] R. C. Myers, et al. Nature Mat. 7, 203 (2008).

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Date submitted: 16 Oct 2009 Electronic form version 1.4