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g tensor modulation resonance and single-spin manipulation in semiconductor quantum dots JOSEPH PINGENOT, CRAIG E. PRYOR, MICHAEL E. FLATTÉ, Department of Physics and Astronomy and Optical Science and Technology Center, University of Iowa, Iowa City, IA 52242 — We explore how electric fields can be used to drive single spin resonance in quantum dots without AC magnetic fields. We calculate the g tensor for a single electron in a semiconductor quantum dot as a function of electric field along the growth direction of the dot. The calculations are based on an eight-band envelope-function formalism[1]. The growth-direction g factor is relatively insensitive to this electric field, but for InAs/GaAs dots with transition energies around 1.2 eV the in-plane g factor changes by 20% for an electric field of 150kV/cm. For a DC magnetic field oriented at 45 degrees to the growth direction the spin precession axis for an electron changes by 6 degrees from zero electric field to 150 kV/cm. Thus an AC pseudo-magnetic field almost 10% the size of the DC magnetic field can be generated. This is sufficient to drive g-tensor modulation resonance[2] in the dot and perform single-spin manipulation. 1. C. E. Pryor and M. E. Flatté, cond-mat/0410678. 2. Y. Kato, et al., Science 299, 1201 (2003).

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