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Optimizing g-factor tuning with electric fields in self-assembled InAs/GaAs quantum dots JOSEPH PINGENOT, CRAIG E. PRYOR, MICHAEL E. FLATTÉ, Dept. of Physics and Astronomy, The University of Iowa — Single-spin manipulation in quantum dots can be achieved without a time-dependent magnetic field by modulating the electron g tensor in the dots with an electric field. Using a recently-developed envelope-function formalism for quantum dot g factor calculations[1], we have studied the dependence of the electron g tensor tuning range on quantum dot size and shape. The electric field is applied in the growth direction of the dot, assumed to be along [001]. We find that larger percentage changes in the g factors along the principal axes can be achieved in taller dots (more extended along the growth direction) and also, surprisingly, in more elliptical dots. The [110] and [1$\bar{1}$0] g factors change sign as a function of dot height and lateral extent. Tuning ranges are of the order of Δ g 0.02 for electric fields changing from 0 to $\pm$100 kV/cm. By choosing a dot with a g factor near 0 we identify dots whose g factors should change sign along one principal axis as a function of electric field. This should generate very rapid spin manipulation using g tensor modulation resonance[2]. This work supported by DARPA/ARO DAAD19-01-1-0490. [1] C. E. Pryor and M. E. Flatté, *Phys. Rev. Lett.* in press. [2] Y. Kato *et al.*, *Science* **299**, 1201 (2003).

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