Abstract Submitted
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Electric-field-driven spin resonance of a Mn dopant in GaAs V.R. POVILUS, Department of Physics and Astronomy University of Iowa , J.-M. TANG, Department of Physics University of New Hampshire, M.E. FLATTÉ, Department of Physics and Astronomy University of Iowa — All-electric manipulation of the ground-state spin system of a Mn dopant in GaAs using a static electric field in combination with a transverse dynamic electric field requires careful positioning of two gates on the nanoscale[1]. Here we propose a method of efficiently controlling the spin of a Mn dopant using parallel static and dynamic electric fields, but adding a small static magnetic field. In a scalable geometry this would permit full control of the ground-state J=1 spin of a Mn dopant using a single electric gate. The energy states and eigenfunctions of the Mn dopant system under the influence of both an electric and magnetic field cannot be simply described using an effective electric-field-dependent g tensor, as would be done in g tensor modulation resonance[2]. However, the dynamical equations for the spin can be numerically solved and exhibits high-visibility Rabi oscillations. For example, with a static electric field of 500 V/cm, a dynamic electric field of 300 V/cm with frequency 9.1 GHz, and a magnetic field of 0.1 Tesla, all oriented in the [113] direction, the Rabi oscillation period is 2.7 ns.
[1] J.-M Tang, Jeremy Levy, and M. E. Flatté, Phys. Rev. Lett. 97, 106803 (2006).
[2] Y. Kato, et al., Science 299, 1201 (2003).

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