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Extreme Harmonic Generation in an InAs Spin-Orbit Qubit[1] J. STEHLIK, M.D. SCHROER, Department of Physics, Princeton University, Princeton, NJ 08544, USA, M.Z. MAIALLE, M.H. DEGANI, Faculdade de Ciências Aplicadas, Universidade Estadual de Campinas - UNICAMP, R. Pedro Zaccaria, 1300, 13484-350 Limeira, SP, Brazil, J.R. PETTA, Department of Physics, Princeton University, Princeton, NJ 08544, USA — Strong spin-orbit materials have shown great promise in the field of quantum computation. Unlike conventional semiconductor materials, fast all-electrical control is achieved through electric dipole spin resonance (EDSR). In this work we explore EDSR in an InAs nanowire spin-orbit qubit. We observe signs of harmonic generation where spin flips occur at the resonance condition $nhf = g\mu_{\mathrm{B}}B$, where f is the applied frequency, B is the magnetic field, g is the g-factor and n is an integer. Near the interdot charge transition we observe harmonics up to $n = 8$, indicating extreme harmonic generation. At far detuning we only observe the $n = 1$ resonance. Further, we find odd/even structure in the harmonic response: odd harmonics result in an increase in the leakage current while even harmonics result in its suppression. Finally we observe oscillations in the resonant current as a function of detuning. The striking detuning dependence suggests that the harmonics may be caused by Landau-Zener transitions occurring due to the anti-crossing between the differing charge states. Numerical simulations of the system are qualitatively consistent with this picture.

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Jiri Stehlik
Department of Physics, Princeton University, Princeton, NJ 08544, USA

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