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Spin Manipulation in InAs Nanowire Double Quantum Dots[1]

M.D. SCHROER, M. JUNG, K.D. PETERSSON, C.M. QUINTANA, J.R. PETTA, Princeton University — Recently, much effort has been devoted to the development of physical qubits for integration into quantum computers. Qubits allowing control with electric fields are attractive, as ac magnetic fields are more difficult to generate and localize on the nanoscale. The material properties of InAs allow efficient driving of electron spin resonance via the spin–orbit interaction. Our work has focused on developing quantum dots in InAs nanowires as fully characterized and controllable qubits. We have optimized our nanowire growth to eliminate the presence of planar defects, which impede the predictable formation of quantum dots. Using a bottom–gated architecture [1], we demonstrate tunable InAs nanowire double quantum dots, with the occupation controllable to the last electron. Pauli blockade is observed in the two-electron regime, demonstrating spin-dependent transport. We are able to drive single spin rotations by applying microwaves to one of the local metallic gates; from the electron spin resonance condition we extract a g–factor of $\sim$9. Finally, we demonstrate full electrical control of the two-electron system and characterize gate fidelities.

[1] S. Nadj-Perge *et al.*, arXiv:1011.0064v1

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