

Abstract Submitted
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Randomized Benchmarking
in a Si/SiGe Triple-Dot Decoherence-Free Subsystem REED ANDREWS,
HRL Laboratories, LLC — We demonstrate single-qubit randomized benchmarking of an exchange-only quantum-dot qubit. The qubit is implemented using an array of three electron spins in three undoped accumulation-mode quantum dots fabricated from an isotopically enhanced Si/SiGe heterostructure [1]. The three spins form a decoherence-free subsystem with encoded universal control using the exchange interaction [2], for which Clifford operators are composed of 1 to 4 sequential, voltage-controlled exchange evolutions of calibrated strength. Symmetric pulsing using an inter-dot exchange gate reduces sensitivity to charge noise [3]. We find that at zero magnetic field, charge noise nevertheless contributes significantly to gate errors, with additional errors due to pulse imperfections and spurious magnetic field gradients. Errors as low as 1% have been obtained for single qubit randomized benchmarking using only the exchange interaction for qubit rotations.

[1] M.G. Borselli et al., *Nanotechnology* 26, 375202 (2015)

[2] K. Eng et al., *Sci. Adv.* 1, e1500214 (2015)

[3] M.D. Reed et al., *Phys. Rev. Lett.* 116B, 110402 (2016)

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