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**All-electrical universal control of two electron spin qubits in Si/SiGe** THOMAS WATSON, E. KAWAKAMI, Delft University of Technology, D. R. WARD, University of Wisconsin-Madison, Z. RAMLAKHAN, P. SCARLINO, M. VELDHORST, Delft University of Technology, D. E. SAVAGE, M. G. LAGALLY, MARK FRIESEN, S. N. COPPERSMITH, M. A. ERIKSSON, University of Wisconsin-Madison, L. M. K. VANDERSYPEN, Delft University of Technology — Electron spins confined to quantum dots in silicon are promising qubits for quantum information as they have long coherence times due to the low abundance of nuclear spins in the silicon substrate which cause decoherence. Here, we demonstrate the initialisation, readout, and universal control of two coupled single electron spin qubits confined to a Si/SiGe double quantum dot. In contrast to previous work on Si-MOS double dots [1], single qubit gates are achieved by performing electric dipole spin resonance (EDSR) in the presence of a magnetic field gradient produced by micromagnets [2]. This allows for faster qubit manipulation and facilitates selective addressing of individual qubits. Here the resonance frequencies of the two qubits are separated by ∼1GHz due to the magnetic field gradient. In addition, we demonstrate two-qubit gates by controlling the exchange interaction between the two electron spins achieving both a controlled-rotation gate and a controlled-phase gate, both of which are locally equivalent to the CNOT gate. [1] M. Veldhorst et al., Nature 526, 410 (2015) [2] E. Kawakami et al., Nature Nanotechnology 9, 666 (2014)

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