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Engineering Double Quantum Dots in Si/SiGe using Shottky Top Gates NAKUL SHAJI, Electrical and Computer Engineering, University of Wisconsin-Madison, LEVENTE KLIEN, Department of Physics, University of Wisconsin-Madison, DON SAVAGE, Material Science and Engineering, University of Wisconsin-Madison, MARK ERIKSSON, Department of Physics, University of Wisconsin-Madison, ROBERT BLICK, Electrical and Computer Engineering, University of Wisconsin-Madison — Quantum information processing in silicon based semiconductors have gained importance lately due to its inherent advantages like low spin orbit coupling and thus very large spin coherence times, as compared to competing III-V devices. Previous work done on silicon based low dimensional devices include successful fabrication of etch defined quantum dots in Si/SiGe quantum wells, whose potentials are modulated by lateral side gates. Another way of forming quantum dots is by using shottky top gates to deplete the underlying two dimensional electron gas (2DEG) in selected areas. Quantum dots formed by shottky top gates are preferred over etched ones to achieve better control over the tuning of tunnel barriers and to minimize etch induced depletion of the 2DEG. Unlike III-V materials, shottky gates formed in SiGe/Si quantum wells have been found to be very leaky. In this talk we discuss the issues of gate leakage, formation of tunnel junctions and engineering double quantum dots (Qubits) in SiGe/Si quantum wells with the help of an additional back-gate.

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