

Lawrence Berkeley National Laboratory

Recent Work

Title

Characteristics of silicon nanowire single electron transistor pairs as readout devices in impurity spin qubit structures

Permalink

<https://escholarship.org/uc/item/6dr7h7b6>

Author

Persaud, A.

Publication Date

2003-12-01

Characteristics of silicon nanowire single electron transistor pairs as readout devices in impurity spin qubit structures

S.-J. Park, J.A. Liddle, T. Schenkel, J. Bokor, J. Nilsson, A. Persaud

E. O. Lawrence Berkeley National Laboratory, Berkeley, CA 94720

Quantum computer schemes based on electron and nuclear spins of single dopant atoms in silicon are attractive candidates for large scale quantum information processing. Silicon based Single Electron Transistors (SET) promise to enable single spin readout through spin dependent charge measurements. We present results from our development of silicon SET structures that are designed as pairs for integration with two P atoms. Devices with undoped, 10 nm wide silicon wires are formed by electron beam lithograph without size reduction by stress limited oxidation. Device characterization at 4.2 K shows charging energies of 5-10 meV and total capacitances of ~ 10 aF. We will discuss Si-SET fabrication yields, critical performance criteria (offset charges, random telegraph signals), and the coupling of Si-SETs to radio frequency tank circuits in light of the very stringent requirements posed by qubit devices.

#This work was supported by NSA/ARDA under ARO contract #MOD707501, and by the U. S. DOE under Contract # DE-AC03-76SF00098.