MAR05-2004-020123

Abstract for an Invited Paper
for the MAR05 Meeting of
the American Physical Society

Schottky contacts for quantum dots in SiGe modulation-doped heterostructures

MARK ERIKSSON, University of Wisconsin-Madison

Silicon has certain unusual properties, including a spin-0 nuclear isotope, that make quantum dots in this material excellent candidates for quantum information processing. Schottky contacts have many advantages for fabrication of such quantum dots, including large dot-gate capacitance and excellent screening of interface states. We discuss recent progress in the fabrication of silicon quantum dots using Schottky contacts to SiGe modulation-doped heterostructures. In addition to understanding the physics of electron confinement in silicon quantum dots, it is also important to understand the Hamiltonian for electrons in silicon modulation-doped quantum wells. We present measurements of the anisotropy of the spin relaxation time in silicon quantum wells, and we show results of a new spectroscopic measurement of the energy gap between the two lowest-lying valleys in silicon quantum wells. Both results have important implications for the application of Schottky-gated silicon quantum dots to quantum computation.