MAR15-2014-020134

Abstract for an Invited Paper
for the MAR15 Meeting of
the American Physical Society

An Exchange-Only Qubit in Isotopically Enriched ^{28}Si

MARK GYURE, HRL Laboratories, LLC

We demonstrate coherent manipulation and universal control of a qubit composed of a triple quantum dot implemented in an isotopically enhanced Si/SiGe heterostructure, which requires no local AC or DC magnetic fields for operation. Strong control over tunnel rates is enabled by a dopantless, accumulation-only device design, and an integrated measurement dot enables single-shot measurement. Reduction of magnetic noise is achieved via isotopic purification of the silicon quantum well. We demonstrate universal control using composite pulses and employ these pulses for spin-echo-type sequences to measure both magnetic noise and charge noise. The noise measured is sufficiently low to enable the long pulse sequences required for exchange-only quantum information processing. Sponsored by United States Department of Defense. The views and conclusions contained in this document are those of the authors and should not be interpreted as representing the official policies, either expressly or implied, of the United States Department of Defense or the U.S. Government. Approved for public release, distribution unlimited.