Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Hyperthermal epitaxy of enriched ^{28}Si KEVIN DWYER, University of Maryland, College Park, JOSHUA POMEROY, National Institute of Standards and Technology — In the effort to produce devices suitable for quantum computation, it is necessary to increase as much as possible the T_2 coherence time of the electron or nuclear spin being used as a qubit. For silicon devices this means using isotopically enriched ^{28}Si. This is because ^{28}Si has no net nuclear spin while the spin of ^{29}Si present in natural Si (4.67%) interacts with the qubit spin and reduces the T_2 time greatly. Sufficiently long T_2 times are necessary for successful operation of quantum computers and we will demonstrate a method for producing epitaxial layers of ^{28}Si on a Si substrate. Ideally, the silicon layers produced must not only be isotopically enriched, but chemically pure and defect free for best performance. These qualities are produced by deposition from a hyperthermal energy beam line using a mass selecting magnet. Depositing silicon epilayers at hyperthermal energies allows for greater manipulation of layer quality. This process is tested and calibrated initially using carbon dioxide. As a preliminary test, isotopically enriched ^{13}C is implanted into semiconductor grade silicon and analyzed by secondary ion mass spectroscopy as an independent check on estimated levels of isotopic and chemical purity.

Kevin Dwyer
University of Maryland, College Park

Date submitted: 19 Nov 2010 Electronic form version 1.4