Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Hybrid Donor-Dot Devices made using Top-down Ion Implantation for Quantum Computing EDWARD BIELEJEC, NATHAN BISHOP, MALCOLM CARROLL, Sandia National Laboratories — We present progress towards fabricating hybrid donor – quantum dots (QD) for quantum computing. These devices will exploit the long coherence time of the donor system and the surface state manipulation associated with a QD. Fabrication requires detection of single ions implanted with 10's of nanometer precision. We show in this talk, 100% detection efficiency for single ions using a single ion Geiger mode avalanche (SIGMA) detector integrated into a Si MOS QD process flow. The NanoImplanter (nI) a focused ion beam system is used for precision top-down placement of the implanted ion. This machine has a 10 nm resolution combined with a mass velocity filter, allowing for the use of multi-species liquid metal ion sources (LMIS) to implant P and Sb ions, and a fast blanking and chopping system for single ion implants. The combination of the nI and integration of the SIGMA with the MOS QD process flow establishes a path to fabricate hybrid single donor-dot devices. Sandia National Laboratories is a multi-program laboratory managed and operated by Sandia Corporation, a wholly owned subsidiary of Lockheed Martin Corporation, for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-AC04-94AL85000.

Edward Bielejec
Sandia National Laboratories

Date submitted: 10 Nov 2011 Electronic form version 1.4