Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Mechnical tuning of ionized donors in silicon DAVID P. FRANKE, FLORIAN M. HRUBESCH, MARKUS KUENZL, Walter Schottky Institut, TU Muenchen, KOHEI M. ITOH, School of Fundamental Science and Technology, Keio University, FELIX HOEHNE, LUKAS DREHER, MARTIN S. BRANDT, Walter Schottky Institut, TU Muenchen — Ionized donors in silicon have been shown to have extraordinarily long coherence times, exceeding tens of minutes even at room temperature, which, combined with the very advanced state of silicon technology, makes them attractive candidates for the realization of solid state qubits. The corresponding near perfect isolation from their environment, however, renders the individual addressing and coupling of such qubits a major challenge on the way towards a spin quantum computer based on ionized donors. We show that the application of strain to the silicon host crystal leads to shifts of the nuclear spin resonance frequencies of $^{75}As^{+}$ due to the nuclear quadrupole interaction with crystal fields. This shift can be larger than the resonance linewidth already for modest strains, as we demonstrate by electrically detected electron nuclear double resonance (ED ENDOR) measurements on arsenic donors in strained silicon. We discuss how quadrupole interactions could allow for the individual addressing of ionized nuclear spins by mechanical tuning of their resonance frequency and, possibly, permit the elastic coupling of nuclear spin qubits to a mechanical resonator.

David Franke
Walter Schottky Institut, TU Muenchen

Date submitted: 14 Nov 2014 Electronic form version 1.4