Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

**Quantum limit for nuclear spin polarization in semiconductor quantum dots** JULIA HILDMANN, University of Konstanz, ELEFTHERIA KAVOUSANAKI, Graduate University Okinawa, GUIDO BURKARD, University of Konstanz, HUGO RIBEIRO, University of Basel — One of main sources of decoherence for spin qubits confined in semiconductor quantum dots comes from hyperfine interaction of the electron spin with the nuclear spins. By polarizing the nuclear spins to 100% it is possible to extend coherence times. A recent experiment [E. A. Chekhovich *et al.*, Phys. Rev. Lett. **104**, 066804 (2010)] has demonstrated that high nuclear spin polarization can be achieved in self-assembled quantum dots by exploiting an optically forbidden transition between a heavy hole and a trion state. However, a fully polarized state is not obtained as expected from a classical rate equation. We theoretically investigate this problem with the help of a quantum master equation and we demonstrate that a fully polarized state cannot be reached due to formation of a nuclear dark state. We also show that the maximal degree of polarization depends on the form of the electron envelope wave function inside of the quantum dot.

Julia Hildmann
Universitaet Konstanz

Date submitted: 14 Nov 2013 Electronic form version 1.4