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Efficient suppression of Overhauser field fluctuations with DNP ROBERT MCNEIL, TIM BOTZEM, STEFANIE TENBERG, JARA Institute for Quantum Information, RWTH-Aachen University, SEBASTIAN RUBBERT, Kavli Institute of Nanoscience Delft, Delft University of Technology, HENDRIK BLUHM, JARA Institute for Quantum Information, RWTH-Aachen University — In certain spin-qubit schemes the Overhauser field is a tuned control parameter and in many spin qubits this fluctuating nuclear field is a significant factor limiting coherence. Nuclear spins can be driven via dynamic nuclear polarisation (DNP) to a chosen field and selective feedback applied narrowing the distribution of nuclear Overhauser field fluctuations[1]. The achievable narrowing of the Overhauser field is related to the maximum pump rate and previous experiments on gated GaAs quantum dots were limited by the pump rate of the pumping mechanism used. We present a method to reduce nuclear fluctuations by increasing the max achievable pump rate. Sequentially applying two ac electric fields with frequencies slightly detuned from the desired Larmor frequency results in a pump curve with a stable fixed point. In the absence of spin-orbit interaction, driving electron spin flips via electric dipole spin resonance (EDSR)[2] will also drive nuclear spin flips and this scheme is expected to result in stronger pumping and efficient suppression of the Overhauser field fluctuations. We will present experimental evidence of this driven nuclear polarization including tracking of EDSR resonances.

1. Bluhm, et al. PRL 105, 216803 ('10)

2. Laird, et al. PRL 99, 246601 ('07)

Robert McNeil JARA Institute for Quantum Information, RWTH-Aachen University

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