Coherent manipulation and readout of a single electron spin

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Abstract

Optically detected magnetic resonance has been used to readout and manipulate spin states of single nitrogen-vacancy (NV) defect in diamond. For the triplet ground state of the defect center, the coherent control of the spin states of the defect at room temperature has been demonstrated. The coupling to C^{13} nuclear spin has been observed. Detailed analysis of different decoherence factors will be presented. Under continuous optical excitation, fast electron spin jumps lead to decoupling of the nuclear spin, as well as to a significant decrease of the electron T_2 and T_1 times. Dark state preparation experiments demonstrate the strong spread of the dephasing rates over different NV defects. The observed T_2 times, as long as 2 μs allow an 8-π coherent nutation of the single electron spin.