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Using Adiabatic Pulses for the Control of Nitrogen Impurities in Diamond ZHI-HUI WANG, Ames Laboratory, USDOE, G. DE LANGE, R. HANSON, Kavli Institute of Nanoscience Delft, Delft University of Technology, Delft, The Netherlands, V.V. DOBROVITSKI, Ames Laboratory, USDOE — High-fidelity quantum control and dynamical decoupling of the NV center in diamond has been recently demonstrated [1]. Efficiently manipulating the spin bath of nitrogen atoms (P1 centers) can add new freedom to the control of NV centers, and can map out the properties of the bath. However, the electron spins of P1 centers have a broad spectrum, and it is difficult to implement accurate rotations uniformly over the whole spectrum. We show that the adiabatic pulses (AP) provide an efficient tool for the bath control. The internal bath dynamics imposes very moderate limitations on the AP parameters so that P1 centers can be controlled with good ($> 90\%$) fidelities. The shape of AP can be tailored to the spectral density of the bath for optimized performance. We show how, by manipulating P1 centers, spin echo and dynamical decoupling of the NV center can be achieved in efficient manner.

[1] G. de Lange et al., Science **330**, 60 (2010); B. Naydenov et al., arXiv:1008.1953 (2010); C. A. Ryan et al., arXiv:1008.2197 (2010).

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