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**Motional Narrowing of Optically Detected Single Nuclear Spin Qubit** LIANG JIANG, M.V. GURUDEV DUTT, LILY CHILDRESS, EMRE TOGAN, MIKHAIL LUKIN, Department of Physics, Harvard University — We study quantum dynamics of individual nuclear spin qubit coupled to optically excited, proximal single electron spin. We show that nuclear spin dephasing can be very slow, even under conditions of fast optical excitation. We present a detailed theoretical model for this process, which is related to motional narrowing in NMR as well as quantum Zeno effect. These results are compared with detailed experimental study of single nuclear spins associated with nitrogen-vacancy centers in diamond. Finally, we discuss the relevance of these results to realization of quantum information processing.

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