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Long-lived solid-state room-temperature quantum memory PETER MAURER[1], GEORG KUCSKO[2], NICK CHISHOLM[3], NORMAN YAO, Harvard University, LIANG JIANG, ALEXEY GORSHKOV, Caltech, ALEXANDER ZIBROV, ALEXANDER A ZIBROV, Harvard University, PHILIP HEMMER, A&M Texas, IGNACIO CIRAC, MPQ, MIKHAIL LUKIN, Harvard University — One of the major obstacles in quantum information technology is to prevent a quantum bit (qubit) from dephasing, while still being able to manipulate and readout the qubit state on a fast time scale. We report recent progress towards the realization of a room temperature quantum register that maintains it's quantum mechanical nature for seconds while still allowing for qubit manipulation in the MHz regime. To achieve this, we utilize a quantum register consisting of an electronic ancilla spin and a proximal nuclear memory spin; the register is associated with single nitrogen-vacancy (NV) defect centers in diamond. In order to maximize the coherence time of the nuclear spin, we employ dynamical decoupling using microwave and optical pulses. The realization of a solid state quantum memory with long coherence times at room temperature opens up new possibilities for applications of quantum information systems.

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