Preparation of Nuclear Spin States in Double Quantum Dots[1] JA-COB J. KRICH, MICHAEL GULLANS, Harvard University, JACOB M. TAYLOR, MIT, MICHAEL STOPA, BERTRAND I. HALPERIN, MIKHAIL D. LUKIN, AMIR YACOBY, Harvard University — Recent experiments on double quantum dot systems with two electrons have shown rich dynamics associated with the hyperfine coupling to nuclear spins. We examine how the cycles used to produce dynamic nuclear polarization in such double quantum dots can lead to interesting non-equilibrium configurations of the nuclear spins. We develop a master equation for the nuclear spins, which we solve using time-dependent mean field theory. We find a rich set of phenomena in the system, including tendencies of the system to approach two very different configurations, one with equal effective magnetic fields produced by the nuclei in the two dots and the other with a large difference between the magnetic fields produced by the nuclei in the two dots, both of which are seen in experiments.

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