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Increasing Quantum Dot Electron Spin Coherence with Persistent Spin Narrowing[1] BO SUN, University of Michigan, COLIN CHOW, Univeristy of Michigan, ALLAN BRACKER, DANIEL GAMMON, Naval Research Laboratory, LU SHAM, University of California San Diego, DUNCAN STEEL, University of Michigan — We demonstrate reproducible initialization of the Overhauser field in a single InAs self-assembled quantum dot using the hole assisted nuclear feedback mechanism. This fixes the mean the Overhauser field to a value determined by two pump lasers and dramatically reduces the statistical broadening of the electron spin resonance arising from averaging over the nuclear spin ensemble, (1/T2*). By initializing for tens of milliseconds, the prepared Overhauser field distribution lasts for well over a second even in the presence of a fluctuating electron spin. Furthermore, we find a mechanism which will initialize the nuclear spins using only a single laser, and that this mechanism involves the evolution of the nuclear spins "in the dark", that is, absent any optical field. This new method is directly compatible with the CW readout technique used in recent time-domain spin manipulation experiments.

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