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Nuclear State Preparation via Landau-Zener-Stückelberg transitions in Double Quantum Dots HUGO RIBEIRO, GUIDO BURKARD, University of Konstanz — We theoretically model a nuclear-state preparation scheme that increases the coherence time of a two-spin qubit in a double quantum dot. The two-electron system is tuned repeatedly across a singlet-triplet level-anticrossing with alternating slow and rapid sweeps of an external bias voltage. Using a Landau-Zener-Stückelberg model, we find that in addition to a small nuclear polarization that weakly affects the electron spin coherence, the slow sweeps are only partially adiabatic and lead to a weak nuclear spin measurement and a nuclear-state narrowing which prolongs the electron spin coherence. Based on our description of the weak measurement, we simulate a system with up to n=200 nuclear spins per dot and qualitatively explain recent experimental findings. Scaling in n indicates a stronger effect for larger n, also in qualitative agreement with experiments.

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