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Relaxation hotspots and fast reset of a single electron spin in a double quantum dot[1] KATJA NOWACK[2], MOHAMMAD SHAFIEI, Delft University of Technology, CHRISTIAN REICHL, WERNER WEGSCHEIDER, ETH Zurich, LIEVEN VANDERSYPEN, Delft University of Technology — We measure the relaxation time of a single electron spin in a double quantum dot as a function of the energy detuning between the two dots for Zeeman splitting larger than the tunnel coupling. Close to the charge degeneracy point at which the electron delocalizes over both dots we observe two "hot spots" at which relaxation times are enhanced by almost four orders of magnitude. We identify these hot spots to occur at degeneracies of orbital and spin excitations. The spin-orbit and hyperfine interaction in the GaAs host lattice efficiently mix degenerate spin states and in combination with fast orbital relaxation this can lead to a fast pumping of the electron spin to its ground state. The enhanced spin relaxation can be exploited to achieve a fast reset of the electron spin, which might prove useful in the context of spin based quantum information processing.

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