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Singlet-triplet splitting in double dots due to spin orbit and hyperfine interactions DIMITRIJE STEPANENKO, University of Basel, MARK RUDNER, BERTRAND I. HALPERIN, Harvard University, DANIEL LOSS, University of Basel — We analyze the low-energy spectrum of a detuned double quantum dot in the presence of magnetic fields, spin orbit interaction, and nuclear spins, and focus on the regime of spin blockade. Starting from a realistic model for two interacting electrons in a double dot, we derive perturbatively an effective two-level Hamiltonian in the vicinity of an avoided crossing between singlet and triplet levels, which are coupled by the spin-orbit and hyperfine interactions. We evaluate the level splitting at the anticrossing in various parameter regimes, and show that it depends on two controllable parameters: the angle between the external magnetic field and the internal spin orbit field, and on the detuning, as well as on the difference between nuclear fields in the two dots. We identify a parameter regime where spin orbit and hyperfine terms can become of equal strength and propose a protocol for tuning their relative sizes.

[X] Prefer Oral Session
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