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Hyperfine tolerant triplet-singlet qubit in rotating double quantum dots DAVID DRUMMOND, LEONID P. PRYADKO, KIRILL SHTENGEL, Univ. California, Riverside — We examine the triplet-singlet state of pairs of GaAs single electron quantum dots, in which the singlet and m=0 triplet represent the logical 0 and 1. Each electron's spin feels a different magnetic field from the hyperfine coupling to the local nuclei of the GaAs, leading to a relative phase difference between the two electrons, and thus decoherence. Previous methods have delayed decoherence using complicated electrical pulse schemes or nuclear polarization with Overhauser fields, which can only be maintained for short times and require great energy. Instead we propose to eliminate hyperfine decoherence by repeatedly rotating the dots adiabatically, exposing the electrons to the same average magnetic field. In addition, we show that if these rotations are performed repeatedly in a symmetric fashion, the Dresselhaus and Rashba spin-orbit couplings are significantly suppressed. The construction of such a device might also be of interest to topological quantum computers, which depend on similar rotations.

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