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Optical control of spin coherence in singly charged quantum dots[1]

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The most promising candidate for implementation of quantum information technologies in semiconductors is the spin of an electron confined in a quantum dot because of its good coherence properties. Our approach is based on using an electron spin ensemble for defining a robust macroscopic quantum bit. Typically such an ensemble suffers from inhomogeneities. Using tailored pulsed laser excitation protocols this ensemble can be homogenized, such that the involved electrons appear to be identical when precessing about an external magnetic field. In this contribution problems and perspectives related to this approach will be discussed. In particular collective initialization and manipulation of the electron spin ensemble will be addressed. The use of all-optical techniques ensures that the manipulation can be performed on picosecond time scales.

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