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Bulk Quantum Computation with Pulsed Electron Paramagnetic Resonance: Simulations of Single-Qubit Error Correction Schemes

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Abstract

© 2015 Springer Science+Business Media New York We investigate the possibility to restore transient nutations of electron spin centers embedded in the solid using specific composite pulse sequences developed previously for the application in nuclear magnetic resonance spectroscopy. We treat two types of systematic errors simultaneously: (i) rotation angle errors related to the spatial distribution of microwave field amplitude in the sample volume, and (ii) off-resonance errors related to the spectral distribution of Larmor precession frequencies of the electron spin centers. Our direct simulations of the transient signal in erbium- and chromium-doped CaWO(Formula presented.) crystal samples with and without error corrections show that the application of the selected composite pulse sequences can substantially increase the lifetime of Rabi oscillations. Finally, we discuss the applicability limitations of the studied pulse sequences for the use in solid-state electron paramagnetic resonance spectroscopy.

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Keywords

Calcium tungstate, Composite pulses, Electron paramagnetic resonance, Quantum computation, Rabi oscillations