

Off-resonant Raman quantum memory in impurity crystals: signal-to-noise ratio analysis

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Abstract

© 2017 Kvantovaya Elektronika and Turpion Ltd. The possibility of implementing an off-resonant Raman scheme of optical quantum memory on the basis of an ensemble of three-level atoms is investigated under the condition of equal polarisations of resonant transitions forming the L-scheme. The developed model is used to analyse the signal-to-noise ratio at the output of an optical quantum memory device in $^{143}\text{Nd}^{3+}:\text{YLiF}_4$. It is shown that this ratio can significantly exceed unity for single-photon input pulses. The required values of the parameters can be obtained by using an impurity crystal in the form of a whispering-gallery mode ring resonator.

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Keywords

Impurity crystal, Quantum memory, Resonator, Signal-to-noise ratio

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