Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Quantum memory and phase gate in Optical cavities based on EIT[1] HALYNE BORGES, CELSO VILLAS-BÔAS, Federal University of São Carlos — In this work we investigate theoretically the implementation of an optical quantum memory in a system composed by a single atom, trapped in a high finesse optical cavity. In order to analyse the feasibility of implementing a quantum memory in the atom-cavity system based on the EIT phenomenon, we investigated in detail which parameter configuration the memory efficiency is optimized considering the two different setups. Our results shows that for a asymmetric one-sided cavity, which is the experimental setup commonly used to observe the EIT effect, the memory efficiency value saturates at about 8.5%. Meanwhile, for an one-sided cavity, we observe for a sufficiently high value of the coupling constant g, the efficiency has its maximum value increased considerably, close to 100%. However, this experimental setup is not suitable to observe cavity-EIT in the transmission spectrum, being necessary another kind of experiment, such as measurements phase difference field that leaves the cavity induced by the control field. Considering this configuration we also showed the implementation of a quantum phase gate based on the same nonlinear effect, where the pulse probe can experience a phase shift on the order of π, due to the presence or absence of a control pulse.

[1]Supported by FAPESP (Proc. 2014/12740-1) and INCT-IQ

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Date submitted: 06 Nov 2015 Electronic form version 1.4