Abstract Submitted
for the DAMOP13 Meeting of
The American Physical Society

EIT quantum memory in the presence of four-wave mixing CHRISTOPHER O'BRIEN, NIKOLAI LAUK, MICHAEL FLEISCHHAUER, Department of Physics and Research Center OPTIMAS, TU Kaiserslautern, Germany — We investigate the effects of four-wave mixing (FWM) in a quantum memory which exploits electromagnetically induced transparency (EIT) to map a signal field, e.g. a single photon, onto a long-lived collective atomic excitation by adiabatically switching off and on a strong control field. At high optical depths a four-wave mixing process can occur in this scheme, since the control field starts to act on both possible transitions producing a new idler field, which in turn affects the propagation of the signal field. FWM amplifies the signal field but also introduces noise to the signal channel. We use a full quantum mechanical approach to solve the coupled Maxwell-Bloch equations in order to determine when FWM is beneficial and when it is detrimental to light storage, in order to estimate FWM's effect on the QM fidelity.

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Date submitted: 31 Jan 2013 Electronic form version 1.4