Abstract Submitted
for the DAMOP17 Meeting of
The American Physical Society

Electromagnetically Induced Transparency in a Double-Lambda System[1] SAESUN KIM, ALBERTO MARINO, University of Oklahoma — Electromagnetically induced transparency (EIT) is a well-known phenomenon due in part to its application to quantum devices such as quantum memory and quantum gates. Commonly, EIT is modeled with a three-level lambda configurations due to the simplicity of the calculation; however, all of the D1 transitions in Alkali atoms have four hyperfine levels. As a result, it is necessary to consider the effect of two excited states whose frequency separation is smaller or of the order of the Doppler broadening when working with atomic vapors. We model the atomic system as a double-lambda system and analytically calculate its response using the density matrix formalism under the assumption of a weak probe field and taking Doppler broadening into account. We show that the presence of the fourth level leads to an additional term in the susceptibility compared to two independent three-level lambda systems. This extra interference term leads to an enhancement of EIT and electromagnetically induced absorption (EIA) and under certain conditions to an additional absorption in-between the two upper levels. Finally, we measure the transmission spectrum through a ^{85}Rb vapor cell and show that it agrees with the theoretical calculations.

[1]Work supported by a grant from the AFOSR (FA9550-15-1-0402)

Saesun Kim
University of Oklahoma

Date submitted: 27 Jan 2017 Electronic form version 1.4