

Absorption-Dispersion Properties in a Four-Level Atomic System with Vacuum-Induced Coherence

WEI Hua,¹ LI Jia-Hua,¹ ZHAN Zhi-Ming,² and PENG Ju-Cun³

¹ Department of Physics, Huazhong University of Science and Technology, Wuhan 430074, China

² State Key Laboratory of Laser Technology, Huazhong University of Science and Technology, Wuhan 430074, China

³ Department of Physics, Xiaogan Normal University, Xiaogan 432100, China

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Abstract: We discuss and analyze absorption-dispersion response for the probe field in a typical four-level atomic system with vacuum-induced coherence (VIC) arising from the cross coupling pathways associated with a pair of upper excited hyperfine levels. We find that VIC effect can preserve electromagnetically induced transparency (EIT) by using the detailed numerical simulations based on the density-matrix equations and analytical calculations in the dressed-state picture. We also show that the atomic hyperfine structure cannot be a hindrance to obtaining EIT.

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Key words: vacuum-induced coherence, probe absorption, frequency dispersion

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