EIT-based coherent control effect sensitive to probe frequency and control field intensity in a periodic layered medium

廖德超,吳俊傑,Jian Qi Shen,楊宗哲
Ph.D. Program in Engineering Science
Engineering
yangtj@chu.edu.tw

Abstract

An EIT (electromagnetically induced transparency) material can exhibit a large number of intriguing quantum optical e®ects relevant to light wave manipulation, which are expected to be bene¯cial for developing new technologies in quantum optics and photonics. A periodic layered medium with unit cells consisting of a dielectric and an EIT atomic vapor is suggested for light propagation manipulation. Such an EIT-based periodic layered medium exhibits a °exible frequency-sensitive optical response, e.g., a very small change in probe frequency can lead to a drastic variation in re°ectance and transmittance, since such an EIT atomic system interacts with both control and probe ¯elds, and destructive quantum interference caused by two-photon resonance occurs. The present EIT-based periodic layered structure can also lead to controllable optical processes depending sensitively on the external control ¯eld. The tunable and sensitive optical response induced by quantum interference of the EIT atomic system has useful applications, such as new photonic device design (e.g., optical switches, photonic transistors, logic and functional gates).

Keyword：Electromagnetically induce transparency material, periodic layered medium, flexible frequency-sensitive optical response,reflectance, transmittance, probe field, control field, photonic device.