

Photonic Logic Gate Design Based on Frequency-Sensitive Optical Response
of an EIT Photonic Crystal

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Abstract

The frequency-sensitive optical response due to two-photon resonance of electromagnetically induced transparency (EIT) in a tunable band structure of an EIT-based layered medium is considered. The unit cells of this periodic layered structure are composed of dielectric (e.g., GaAs) and EIT atomic vapor. The frequency-sensitive behavior of controllable reflectance and transmittance depending on the external control field can be applicable to new device design (e.g., it can serve as the fundamental working mechanism for photonic switches and photonic logic gates). Some two-input logic gates (e.g., OR and NAND gates) are designed based on the present effect of sensitive switching control that results from the two-photon resonance.

Keyword : EIT photonic crystal, quantum interference, photonic logic gates