Slowing Down and Stopping Light

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Abstract

Slowing down and storing light has many applications. It can be used for Communications to reduce noise. Using in computers for optical switches can cut power requirement, faster computations and increase memory. In all types of networks (power, communications and computers) Orderly traffic flow in networks. Increase the efficiency Solar Light System. Although highly Theoretical at this point and there has been some success at calculating and modify the group velocities of light in a medium and more research needs to be done.

• Slowing Down and Stopping Light
• Maxwell's equations
  Transmission and the Index of Refraction use some of your Lecture notes Dr. Andres La Rosa
• Phase velocity of light
• The phase velocity of light is the velocity with which phase fronts propagate in a medium

•the speed of light (speed of light in vacuum) is a physical constant value is 299,792,458 meters per second
•Using the old numerator and a denominator Trick

•X-ray in glass Light waves can move faster then light
•Using the relation of

•Group velocity $v_g$ defined as the inverse of the derivative of the wave-number with respect to angular frequency
•phase velocity does not equal group velocity
•is a reduction in the group velocity of light
•“Phase velocity and group velocity greater than $c$ does not contradict the special theory of relativity, because phase velocity and group velocity is not a signal velocity” *

* FAST LIGHT, SLOW LIGHT
Optics & Photonics News June 2002
Raymond Y. Chiao and Peter W. Milonni
•Ignoring
•Group velocity dispersion where The frequency in the field is too broad.
•Anomalous dispersion $w$ is close to an absorption frequency of the medium and $n$ is uneven medium
•There are Two or more Methods Slowing Down light
•1) material and waveguide dispersion
•2) Reflection
• Material dispersion
• Electromagnetically Induced Transparency (EIT) to the coherent transfer of photons in and out of a quantum system
• Electromagnetically Induced Transparency (EIT)
• EIT is a quantum-mechanical effect in which two possible absorption processes can, in effect, interfere destructively with one another in such a way that absorption at a particular frequency does not occur. In Associated with EIT is a very large \( \frac{dn}{d} \), and consequently a very small group velocity, and furthermore \( n \) is unity and the group velocity dispersion is zero
• Coherent Population Oscillation (CPO)
• Using quantum dots to electrically and optically controllable slow light devices
• forward-bias injection current and reverse-bias voltage can change the group index in a semiconductor quantum-dot waveguide.

• Four-wave mixing
Waveguide dispersion
• structures to modify the spatial component (k-vector) of a propagating wave
• photonic crystals affect the motion of photons
• Coupled Resonator Optical Waveguides (CROW) impedance discontinuity, and the related back-reflection
• References
• FAST LIGHT, SLOW LIGHT
Optics & Photonics News June 2002
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• Controlling the Speed of Light
Optics & Photonics News December 2004
D. R. Solli and J. M. Hickmann
• Slow light:
• lecture notes
Dr. Andres La Rosa
• Encyclopedia for Photonics and Laser Technology:
http://www.rp-photonics.com/encyclopedia.html
• IEEE Journal of Quantum Electronics:
http://photonicsociety.org/
• University of California at Berkley Ca.