Photonic Devices Having Degenerate or Split Spectral Band Edges

Tech ID: 18736 / UC Case 2007-705-0

BACKGROUND

The manipulation of electromagnetic energy can be advantageous to numerous applications within many industries. For instance, much effort has been focused on reducing the velocity of electromagnetic energy, such as light and microwave pulses. The reduced velocity of electromagnetic energy can facilitate manipulation of electromagnetic waves. It can also enhance the light-matter interaction essential in numerous optical and microwave applications.

One common photonic device exploiting spatial inhomogeneity is a photonic crystal. This device is typically composed of multiple repeating segments (unit cells) arranged in a periodic manner. The electromagnetic frequency spectrum of a typical photonic crystal develops frequency bands separated by forbidden frequency gaps. The frequency separating a photonic band from adjacent photonic gap is referred to as a (photonic) band edge, or simply a band edge.

One common drawback of current photonic devices employing spatial inhomogeneity is that only a small fraction of the incident electromagnetic radiation is converted into the slow electromagnetic mode, resulting in low efficiency of the device. Another common drawback of current photonic devices is the necessity to employ a large number of the said segments (unit cells) in order to achieve a desirable slowdown of electromagnetic energy. Accordingly, improved photonic devices are needed having smaller dimensions and allowing for more efficient manipulation of the incident electromagnetic radiation.

TECHNOLOGY DESCRIPTION

University researchers have developed a photonic device configured to display photonic band gap structure with a degenerate or a split band edge. Electromagnetic radiation incident upon these photonic devices can be converted into a frozen mode characterized by a significantly increased amplitude, as compared to that of the incident wave. The device can also be configured as a resonance cavity with a giant transmission band edge resonance.

APPLICATIONS

This invention allows one to drastically enhance the performance of existing active electromagnetic elements, such as nonlinear and active materials, as well as creating much more efficient resonance cavities.

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	8,655,134	02/18/2014	2007-705

CONTACT

Ben Chu
ben.chu@uci.edu
tel: .

OTHER INFORMATION

CATEGORIZED AS

- **Communications**
  - Other
- **Materials & Chemicals**
  - Other
- **Sensors & Instrumentation**
  - Analytical
- **Transportation**
  - Aerospace

RELATED CASES

2007-705-0

UCI Beall
Applied Innovation

5270 California Avenue / Irvine,CA
92697-7700 / Tel: 949.824.2683