Design of a Low-loss Y-Splitter for Optical Telecommunication using a 2D Photonics Crystal

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Abstract

In this study a wide bend, low loss (>2. 0dB) Y-splitter has been designed for TE-polarized light. The structure consists of hexagonal lattice where circular Si-dielectric rods in air background have been organized. For optimal design of photonic band gap, inter-cell distance and cell radius have been varied to find the largest photonic band gap which should corresponds to the optical communication wavelength ranging from 1. 3µm to 1. 6µm. From the study, cell radius of 0. 3µm and lattice constant of 0. 98µm were the optimum values which provided the wavelength range of 1. 34µm to 1. 58 µm. Using this structure, waveguide properties have been studied varying the cell radius of the adjacent cell of the propagating path. With the optimized waveguide design, a Y-splitter has been designed. Less than 2dB loss has been realized for wavelength ranging from 1. 38µm to 1. 56µm using the designed Y-splitter. And a minimum loss of 0. 46 dB has been realized at wavelength 1. 56µm. By using plane wave expansion (PWE) method band gap of the structure have been evaluated. Finite difference time domain (FDTD) method has also been used to compute the transmission power, electric field distribution and magnetic field distribution properties of the system.
References

- See for example, C. Yeh, Applied Photonics (Academic, New York, 1990), Chap. 11.
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Index Terms

Computer Science Communication Systems

Keywords

- Plane Wave Expansion(PWE)
- Plane Wave Expansion Method(PWEM)
- Finite Difference Time Domain(FDTD)
- Photonic Carystals(PhCs)
- Photonic Band gap(PBG)
- Transverse Electric(TE)
- Transverse Magnetic(TM)
- Line Defect Waveguide(LDW)