EuroSciCon

EuroSciCon Joint Event on
Laser Optics & Photonics and Atomic & Plasma Science

July 16-17, 2018
Prague, Czech Republic

Am J Compt Sci Inform Technol 2018, Volume 6
DOI: 10.21767/2349-3917-C1-003

EFFECT OF GEOMETRICAL PARAMETERS ON THE LIGHT PROPAGATION CHARACTERISTICS OF HEXAGONAL PHOTONIC CRYSTAL FIBERS

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Photonic crystal fibers (PCFs) have a structure of wavelength-scale morphological microstructures running along its length. In recent years, photonic crystal fiber (PCF) has attracted significant interest because of its unusual properties and extended applications in telecommunications as well as in novel photonic devices such as sensors, medical instrumentation, and many kinds of optical components. All these applications depend on the structure and geometrical parameters like lattice pitch, air hole shape and diameter and type of lattice. By manipulating these parameters, we can design fibers for different desired applications. In this paper, we analyses the effect of doubling the air hole diameter and pitch of hexagonal PCF (H-PCF) structures. Here, we have performed numerical analysis using finite element method to calculate the dependence of the PCF parameters towards the propagation characteristics like effective mode area, confinement loss, nonlinear coefficient, numerical aperture, spot size and zero dispersion shifting over 800–2000 nm wavelength range. We found that by doubling the value of air hole diameter of an H-PCF, we can increase the nonlinearity by an amount of 80-90% and reduce the confinement loss by 100%. These structures can be used for highly nonlinear applications like super continuum generation in their zero dispersion wavelengths. By doubling the value of pitch of a given symmetric H-PCF structure, large mode area H-PCF of effective area around 600 times more than its original value with an increase in confinement loss by a factor of 800 can be designed. But, doubling both the air hole diameter and pitch of the given symmetric H-PCF structure keeping the AFF constant, results in an increase in the effective mode area of the structure with the decrease of the confinement loss. This consideration can be used for the construction of low loss LMA PCF.

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