



## Electromagnetic Wave Propagation in One-Dimensional Photonic Crystal

- Abhilasha • Monika • Shivani Kumari
- Bhrigunath Prasad

Received : November 2018

Accepted : March 2019

Corresponding Author : Bhrigunath Prasad

**Abstract :** *The photonic crystal have become a rapidly growing area of research with their vast application areas. A Photonic crystal exhibits characteristics that depends on various parameters such as crystal lattice, dielectric used, defects dimensions, propagation of light etc. In this work, we have drawn photonic band gap (PBG) Crystal Layout and these structure are simulated using OptiFDTD simulator in Optiwave software. A report on various parameters of different crystal structures which are generally used for sensor designing application are given along with their some APML parameters in different frequency values which help designers to choose a better structure depending on the application requirements. In a Photonic crystal structure, there are number of geometrical and electrical parameters which can critically affect crystals*

*characteristics. During simulation, none of the parameters were varied, which helped us in understanding the influence of each geometrical difference in a structure, with the help of simulation, we obtained best possible Photonic crystal structure.*

**Keywords:** 1D Photonic Crystals, PBG Layout, FDTD Method, opti FDTD

### Introduction:

Photonic crystals have been studied in one form or another since 1887, the term 'photonic crystal' was first used over 100 years later, after Eli Yablonovitch and Sajeev John published two milestone papers on photonic crystals in 1987. Before 1987, one-dimensional photonic crystals in the form of periodic multi layers dielectric stacks (such as the Bragg mirror) were studied extensively (Yablonovitch, 1987).

Photonic crystals are materials with a spatial periodicity in their dielectric constant. Under certain conditions, photonic crystals can create a photonic band gap i.e. a frequency window in which propagation through the crystal is inhibited (Sajeev, 1987). Light propagation in a photonic crystal is

### Abhilasha

B.Sc. III year, Physics (Hons.),  
Session : 2016-2019, Patna Women's College,  
Patna University, Patna, Bihar, India

### Monika

B.Sc. III year, Physics (Hons.),  
Session : 2016-2019, Patna Women's College,  
Patna University, Patna, Bihar, India

### Shivani Kumari

B.Sc. III year, Physics (Hons.),  
Session : 2016-2019, Patna Women's College,  
Patna University, Patna, Bihar, India

### Bhrigunath Prasad

Assistant Professor, Department of Physics  
Patna Women's College, Bailey Road,  
Patna – 800 001, Bihar, India.  
E-mail : bhrigunath.pcu@gmail.com