PATNA WOMEN'S COLLEGE AUTONOMOUS 1940

Physics
Explore–Journal of Research
ISSN 2278 – 0297 **(Print)**
ISSN 2278 – 6414 **(Online)**
UGC Approved List of Journals No. - 64404

http://www.patnawomenscollege.in/journal

FDTD Simulation of One-Dimensional Photonic Band Structure

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Received : November 2018
Accepted : March 2019
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Abstract : *The behavior of a Photonic crystal relies upon Photonic Band Gap (PBG). In the present work, band gap has been computed for a 1D Photonic Crystal. Both PWE and FDTD methods are widely used for band gap computation of Photonic Crystals. FDTD method is used for the simulation of band gap and PWE method as a band solver.*

Keywords: *1-D Photonic Crystals, FDTD, PWE, Photonic Band Gap (PBG).*

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Introduction :

The principle of Photonic Crystals (PhCs) is similar to how the properties of semiconductor enable the creation of electronic devices. A photonic crystal is called a crystal, because of its periodicity, and photonic because it acts on light. A Photonic Crystal is known as the special class of optical media with periodic modulation of the refractive index and permittivity. The defining feature of a photonic crystal is the periodicity of dielectric material along one or more directions. Based on its periodicity it can be classified into three major groups–One-Dimensional, Two-Dimensional and Three-Dimensional Photonic Crystals (Yablonovitch E., 1987 and Joannopoulos John D. et. al., 2008). If this periodic arrangement is of the order of the wavelength of light, then for some range of wavelengths light can not go through the crystal. This range of wavelength is called the Photonic Bandgap (John S., 1987).

This paper is subdivided into three major sections: Section-I gives a brief introduction about the work, Section-II gives a brief theoretical background of the computational methods which are used for simulation and analysis. Section-III gives the Results and outcomes of this study, including the corresponding tables and graphs. Section-IV is for the conclusions of the research work.