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قَســم

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها
علي هذه الأفلام قد اعدت دون آية تغيرات

يجب أن

تحفظ هذه الأفلام بعيداً عن الغبار

في درجة حرارة من 15 – 20 مئوية ورطوبة نسبية من 20-40 %

To be kept away from dust in dry cool place of
15 – 25c and relative humidity 20-40 %

بعض الوثـــائق

الأصلية تالفـــة

بالرسالة صفحات

لم ترد بالأصـــــل

Ain Shams University
Faculty of Engineering
Electronics & Electrical
Communication Dept.

Modeling of Photonic Band Gap Structures for Optical Communication Systems

A Thesis
Submitted in Partial Fulfillment for the Requirements
Of the Degree of Master of Science in Electrical Engineering
(Electronics and Electrical Communications Engineering)

Submitted By

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Degree: Master of Science in Electrical Engineering
(Electronics and Communication Engineering)

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Statement

This dissertation is submitted to Ain Shams University for the degree of Master of Science in Electrical Engineering (Electronics and Communication Engineering).

The work included in this thesis was carried out by the author at the Electronics and Communication Engineering Department, Faculty of Engineering, Ain Shams University.

No part of this thesis has been submitted for a degree or qualification at other university or institution.

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ABSTRACT

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In this work we study and model the light propagation in photonic crystal structures. The plane wave expansion method is developed with a more rigorous technique for the calculation of the photonic band gaps and the off-plane propagation angles in a two dimensional photonic crystal.

The comparison with existing techniques shows that the new model enables to estimate the effective angles over the entire range of longitudinal propagation constant, and allows for an accurate determination of the off-plane propagation angle of different bands. It thus enables to calculate more precisely the percentage of spontaneous emission, from an embedded point source, suppressed at a certain frequency.

Several methods of controlling the position of guided modes inside the photonic band gap have been presented and analyzed using the super cell approximation. The appearance of acceptor-type and donor-type modes is observed and explained. The importance of the relative position of holes versus the absolute amount of added high dielectric constant material is emphasized. Finally, the finite different time domain (FDTD) method is used to verify the results by simulating light propagation through a sharp bend photonic crystal wave-guide with varying air hole radii.

Keywords: Photonic band gaps, Plane wave expansion method, spontaneous emission control, PBG waveguides