OPTIMIZATION OF OPTICAL WAVEGUIDE STRUCTURE

By

AHMAD HAFIZI BIN ZANAL ABADIN

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This project report is approved by:

PUAN NOR AKMAR BINTI MOHD YAHYA

Project Supervisor

DATE: _____

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ABSTRACT

Optical waveguides have been known as basic structure in integrated optics. The result of waveguide analysis is very useful to apply before fabrication process begins. The normalized propagation constant b, propagation constant β and effective refractive index n_{eff} conditions have been considered for the straight waveguide for single mode propagation. In this work, a mathematical approach was applied in order to model the waveguide structure and its ability to guide the light. Through this, the behaviour of light propagation in a polymer based optical waveguide could be investigated and the characteristic of the optical waveguide can be simulated in order to obtain an optimum design.

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CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

An optical waveguide is a structure which confines and guides the light beam by the process of total internal reflection (TIR).Waveguides are the backbone of modern optoelectronics and telecommunications systems. There are two major, and very distinct, types of waveguides (metallic and dielectric) that are used in two separate regime of the electromagnetic spectrum [1,2]

One of the simplest forms of optical waveguide structures is the dielectric slab waveguide. The guided modes of the slab waveguide can easily be described because of its simple geometry. The study of slab waveguide is important for the understanding of the wave-guiding properties of more complicated dielectric waveguides. Optical waves in waveguides propagate only at a discrete set of states, which are called modes. The modes are characterized by their propagation constant, which is a measure for the speed at which the phase fronts propagate along the structure [3]. It is possible to have more than one mode of electromagnetic wave propagation within a waveguide. Each mode has a cut-off frequency at which the wave number in the direction of propagation is zero.