MODELING OF SINGLE MODE OPTICAL WAVEGUIDE USING FINITE DIFFERENT METHOD (FDM)

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ABSTRACT

This project is about numerical analysis of optical waveguide to analyze the propagation constant of the waveguides and obtain the TE field distributions. Numerical technique is essential in optical waveguide because they are easier to use and more transparent. To model the single mode optical waveguide structure, we have used Finite Different approach as one of the waveguide to simulate the electric field distribution. The waveguide allows guided wave propagation only if the thickness is greater than a critical cutoff thickness for each waveguide mode. From that, electric field distribution of 1550nm and 1310nm can be acquired and analysed. The waveguide structure of 1550nm shows better electric field distribution compared to 1310nm wavelength since the 1550nm waveguide can maximize the bandwidth system with low attenuating loss.

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CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

A waveguide is a structure that guides waves, such as electromagnetic waves or sound waves. There are different types of waveguides for each type of wave. The original and most common meaning is a hollow conductive metal pipe used to carry high frequency radio waves, particularly microwaves.

The geometry of a waveguide reflects its function. Slab waveguides confine energy to travel only in one dimension, fiber or channel waveguides for two dimensions. The frequency of the transmitted wave also dictates the shape of a waveguide, an optical fiber guiding high-frequency light will not guide microwaves of a much lower frequency. As a rule of thumb, the width of a waveguide needs to be of the same order of magnitude as the wavelength of the guided wave [1].