



**UNIVERSITI TEKNOLOGI MARA**

**PERFORMANCE CHARACTERISATION OF FIBER  
BRAGG GRATING IN COMMUNICATION  
SYSTEM**

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## ABSTRACT

This thesis presents the performance characterizations of fiber Bragg Grating for single and two channels optical communication system. Transmission system operating at 10Gbit/s data speed are used with the signal wavelengths of ITU#34 (1550.12nm) and ITU#35(1549.32nm) as the preference of channel designation in this project. The channel spacing of 100GHz (approximately 0.8nm) is chosen by ITU standard for the distance between channel wavelengths. The channel wavelengths are equally spaced in optical frequency base on the International Telecommunication Union (ITU) standard. Individual components are characterized by varying its main parameters to investigate experimentally their individual performances using ED-WDM system. The systems set up are analyzed using fiber optic equipments which involve OPTOSCI ED-WDM, signal generator and oscilloscope. Fiber Bragg Grating represents one of the key elements as an optical device used for channel filtering in the emerging of optical communications. The various types of applications are mostly applied for measurement parameters such as power, temperature and losses which provides excellent filter spectral shapes. It have been confirmed experimentally that results are compatible with the performance characteristics of FBG such as sharp and flat-top amplitude responses, flat delay responses and high isolation. From this analysis, it is confirmed that the application of FBG principle where transmission and reflection path influences the FBG characteristics. Therefore, FBG is applicable with the advantages of low cost, high optical filtering and easy matching with other fiber devices.

# TABLE OF CONTENTS

|  | <b>PAGE</b> |
|--|-------------|
| <b>DECLARATION</b>                           | ii          |
| <b>ACKNOWLEDGEMENT</b>                       | iv          |
| <b>ABSTRACT</b>                              | v           |
| <b>TABLE OF CONTENTS</b>                     | vi          |
| <b>LIST OF FIGURES</b>                       | viii        |
| <b>LIST OF TABLES</b>                        | x           |
| <b>ABBREVIATION</b>                          | xi          |
| <br>   |             |
| <b>CHAPTER 1: INTRODUCTION</b>               |             |
| <br>   |             |
| 1.1. Optical fiber communication system      | 1           |
| 1.2. Scope of Project                        | 3           |
| 1.3. Objectives                              | 3           |
| 1.4. Outline of thesis                       | 4           |
| <br>   |             |
| <b>CHAPTER 2: OPTICAL FILTER</b>             |             |
| <br>   |             |
| 2.1 Basic background                         | 5           |
| 2.2 Wavelength Division Multiplexing (WDM)   | 8           |
| 2.3 Literature Review on Fiber Bragg Grating | 10          |
| <br>   |             |
| <b>CHAPTER 3: FIBER BRAGG GRATING</b>        |             |
| <br>   |             |
| 3.1 Overview                                 | 11          |
| 3.2 Background Theory                        | 13          |

# **CHAPTER 1**

## **INTRODUCTION**

### **1.1 OPTICAL FIBER COMMUNICATION SYSTEM**

Optical fiber plays an important role in communication system. They have been used in variety of applications such as for voice channel transmission, high speed internet and also for cable television signals. Today, global communication has increased the demand for the transmission with higher speed for long haul transmission. As the transmission losses decreased, it enables for long distance communication efficiently.

The basic idea of optics in fiber communication system relates with electronic signal. An optical transmitter represents the light source in transmission. It consists of electronic circuits to enable the signal process drives the light source properly. Throughout the fiber transmission, the light source was carried in an optical fiber to a receiver. At receiver, the light source was converting back to electronic form to drive device on the other end.

In communication systems, fiber optic is used with multiple types of in-line components such as attenuators, modulators, amplifiers and filter. Those components are produced by coupling the light from the optical fiber into integrated optical waveguide device and then back into the optical fiber. The aim is to provide the optical fiber domain entirely with the fiber optic devices.