MODELLING OF ALL OPTICAL SWITCH BASED ON SYMMETRIC MACH-ZEHNDER (SMZ) USING SYMMETRIC AND ASYMMETRIC COUPLER

This project is presented as fulfillment of the award of the Bachelor in Electrical Engineering (Honours) of UNIVERSITI TEKNOLOGI MARA MALAYSIA.

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ACKNOWLEDGEMENT

Firstly, I would like to thank to Allah because with his blessing, I was affordable to complete for this project. I want to wish more thanks to my supervisor, Miss Nani Fadzlina Binti Naim for her invaluable comment, support advice, guidance, friendship and effort to ensure this project finished. I also want to wish thanks to my friends who always shared the idea and support to me. Lastly, thank you again to all who help me to finish this project. I am really appreciating your support.

ABSTRACT

As increasing capacity demand in telecommunication system, the ultrahigh-speed optical network was developing rapidly. In these networks, it is important to the switching, routing and processing in optical domain to prevent bottlenecks of optoelectronic conversions. Using all optical switches based on Symmetric Mach-Zehnder (SMZ), characteristics and switching window profile was investigated in this paper. As compared to the various interferometer based switch configurations, the SMZ structure provides the most flexibility, compact size, low power operation, shortest switching window and thermal stability. This paper presents the modelling based on SMZ switch. The analysis of conventional and proposed SMZ switch by using symmetric coupler (50:50 couplers) and asymmetric coupler (60:40 couplers) placed at the end of this switch was shown and compared. The performance and advantages of these proposed SMZ switch coupler are also analyzed.

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INTRODUCTION

1.1   Introduction

Optical Time Division Multiplexing (OTDM) technology is an alternative technique for future ultra-speed photonic networks that has attracted much attention [1]. At ultra-high speed, it is desirable to carry out the entire signal routing, processing and demultiplexing in the optical domain in order to avoid bottleneck due to the optical to electronic conversion. One of the key components in all-optical OTDM system is the all-optical switch, which is the main building block in all above optical functions.

All optical switches with the interferometric arrangement such as the Terahertz Optical Asymmetric Demultiplexers (TOADs) [2], the Ultrafast Non-linear Interferometers (UNIs) [3], Mach-Zehnder Interferometers (MZIs) [4], and Non-linear Optical Loop Mirrors (NOLMs) [5], which are generally studied. Among these switching schemes, MZI switches are the most capable due to their compact size, thermal stability and low–power operation. Considering various MZI configurations, the Symmetric Mach-Zehnder (SMZ) structure provides the high flexibility and relatively symmetrical and shortest switching window profile [6].