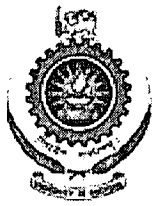

EFFECT OF POLARIZATION DEVIATION IN OTDM DE-MULTIPLEXING USING NONLINEAR OPTICAL LOOP MIRROR

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DECLARATION

I do hereby declare that the work reported in this research project was exclusively carried out by me under the supervision of Dr. R. P. Thilakumara and to best of my knowledge; the work included in the thesis has not been submitted for any other academic qualification at any institution.

Signature: ***UOM Verified Signature*** Date: 07/08/2009

Certified by:

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Signature: ***UOM Verified Signature*** Date: 07/08/2009

For my father, late Mr. R. A. Kovinthapillai

TABLE OF CONTENTS

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LIST OF FIGURES

LIST OF TABLES

ACRONYMS

FDM	:	Frequency Division Multiplexing
FWM	:	Four Wave Mixing
GVD	:	Group Velocity Dispersion
MMF	:	Multi Mode Fiber
NOLM	:	Nonlinear Optical Loop Mirror
NRZ	:	Non-Return-to-Zero
NSE	:	Nonlinear Schrodinger Equation
OCDM	:	Optical Code Division Multiplexing
OTDM	:	Optical Time Division Multiplexing
RZ	:	Return-to-Zero
SBS	:	Stimulated Brillouin Scattering
SMF	:	Single Mode Fiber
SPM	:	Self Phase Modulation
SRS	:	Stimulated Raman Scattering
SOA	:	Semiconductor Optical Amplifier
SOP	:	State of Polarization
TDM	:	Time Division Multiplexing
WDM	:	Wavelength Division Multiplexing
XPM	:	Cross Phase Modulation

ABSTRACT

Today, the optical communication is of great interest in developing extensive, high-speed networking infrastructures in all optical domains. High speed data rates are achieved in optical domain using different multiplexing techniques, mainly WDM and OTDM. WDM systems are somewhat matured today and are commercially deployed. OTDM systems are still in the research level and a promising technology for the future. Multiplexing and demultiplexing in optical domain is still a challenge mainly due to immaturity of all optical devices.

All optical switching devices, which can potentially operate at very high speeds and much faster than electronic devices, are expected to play important role in the future optical communication systems. The large nonlinearity offered by the optical fibers demonstrates the potential for all optical switching.

In this thesis, Demultiplexing of OTDM signal using NOLM is studied. The NOLM, whose operation principle is based on the fiber nonlinear effects, has been identified as the suitable best candidate for the demultiplexing of OTDM signal due to its simple configuration, low switching power operation and over Tb/s switching potentiality.

This thesis investigates theoretically a dominant issue on NOLM demultiplexer. The impact of polarization deviation between the signal and control pulses and the switching efficiency of the NOLM demultiplexer for various power levels are studied. A complete set of equations concerning the different states of polarization and considering the SPM and XPM as the nonlinear effect of the fiber are established and simulated using MATLAB software.