

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

قال الله تعالى:

قُلْ لَوْ كَانَ الْبَحْرُ مِدَادًا لَكَلِمَاتِ رَبِّي لَنَفَذَ الْبَحْرُ قَبْلَ أَنْ تَنْفَدَ كَلِمَاتُ رَبِّي وَلَوْ جِئْنَا بِمِثْلِهِ مَدَدًا
(١٠٩) قُلْ إِنَّمَا أَنَا بَشَرٌ مِثْلُكُمْ يُوحَىٰ إِلَيَّ أَنَّمَا إِلَهُكُمُ إِلَهٌ وَاحِدٌ فَمَنْ كَانَ يَرْجُوا لِقَاءَ رَبِّهِ
فَلْيَعْمَلْ عَمَلًا صَالِحًا وَلَا يُشْرِكْ بِعِبَادَةِ رَبِّهِ أَحَدًا (١١٠)

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ABSTRAC

In *communication* Technology the signal needs to travel long distances, through communication media, during this transmission the signal faces many factors which effect it. The chromatic dispersion of fiber is a major factor causing distortion of the light signal, and if not being addressed using accurate compensators it will lead to a significant deterioration in the performance of optical system.

By sending signal of 1mw for 10km distance, the result shows that the receive signal without ideal compensation Fiber Bragg is 0.263mw& with ideal compensation Fiber Bragg is 0.98mw also in 50km distance, the result shows that the receive signal without ideal compensation Fiber Bragg is 0.058mw& with ideal compensation Fiber Bragg is 0.92mw,so more in distance 100km, the result shows that the receive signal without ideal compensation Fiber Bragg is 0.018mw& with ideal compensation Fiber Bragg is 0.78mw,In 200km length and when comparing the signal without ideal compensation fiber bragg is 0.015mw & with ideal compensation Fiber Bragg is 0.52mw.

This Thesis proposed the ideal compensation Fiber Bragg Grating device with different lengths in optisystem program to enhance the effect of dispersion and losses. The obtained results show good enhancement in transmitted signal characteristics that concerning the dispersion and losses. Also, the advantage of this technique to provide the compensation of dispersion .the results show the extent of the improvement made in network performance. Optisystem program was used to simulate the technique proposed.

المستخلص

في عالم الاتصالات تتعرض الاشارة المرسله الي عوامل تؤدي الي اضعاف واضمحلال الاشارة مما يؤدي الي ضعف كفاءة خدمات الاتصالات وتختلف هذه العوامل باختلاف اوساط الاتصال. يعتبر التشتت اللوني لليف البصري احد اهم العوامل المسببة لتشوية شكل الاشارات الضوئية المرسله , واذا لم تجري معالجته بشكل صحيح ودقيق باستخدام المعوضات فان ذلك سيؤدي الي تدهور كبير في اداء نظام الاتصال الضوئي. عند ارسال اشارة ذات قدرة 1ملي وات لمسافة 10 كيلو متر فنجد ان الاشارة عند الاستقبال وقبل استخدام المعوض ان القدرة تناقصت الي 263 مايكرو وات وعند استخدام المعوض لنفس الاشارة نجد ان القدرة تحسنت الي 890 مايكرو وات .وعند زيادة مسافة الارسال الي 50 كيلو متر نلاحظ ان الاشارة تناقصت الي 58 مايكرو وات قبل استخدام المعوض وبعد استخدام المعوض عند الاستقبال نجد ان الاشارة تحسنت الي 920 مايكرو وات .وعند زيادة مسافة الارسال الي 100 كيلو متر نلاحظ ان الاشارة عند الاستقبال من غير استخدام المعوض كان هنالك تدهور في القدرة يصل الي 18 مايكرو وات وبعد استخدام المعوض عند الاستقبال نجد ان قدرة الاشارة وصلت الي 780 مايكرو وات . وعند الارسال للاشارة ذات قيمة القدرة 1ملي وات لمسافة ال 200 كيلو متر نلاحظ ان الاشارة عند الاستقبال من غير استخدام معوض حدث لها تدهور وتارجح في قيمة القدرة يصل الي 15 مايكرو وات اما عند ادخالها لجهاز المعوض عند الاستقبال حدث تحسين للاشارة وتحسنت قدرتها الي 520 مايكرو وات وبالتالي تمكنا من الحصول الي اشارة المعلومات عند وحدة الاستقبال .لاياخذ التشتت اللوني قيمة ثابتة او معروفة علي طول وصلة الليف .وهذا مايستدعي استخدام معوضات تشتت قابلة للتوليف والتي تتطلب معلومات مستمرة عن قيمة التشتت الفعلية تقدم عن طريق وحدة مراقبة التشتت.

وعليه فان هذه الاطروحة نقترح استخدام جهاز التعويض مع اطوال مختلفه ببرنامج ال**optisystem** لتحسين تأثير التعويض والفقد .والنتيجة المتحصلة توضح التحسين الجيد في خصائص الاشارة المرسله بالنسبة للتشتت والفقد .تم الاستفادة من هذه التقنية لمعوض التشتت , وتم التوصل لنتائج تبين مدي التحسن الحاصل في اداء الشبكة مقارنة مع شبكات اخري لا يجري فيها تعويض التشتت بشكل دقيق. تم استخدام برنامج **optisystem** لمحاكاة التقنية المدروسة حيث تم التوصل من خلاله الي نتائج مشجعة في مجال تحسين اداء الشبكات الضوئية.

List of Figures

Figure		Page
2-1	Basic fiber optic communication system	8
2.2	Optical Transmission – Schematic	9
2.3	Principle of Light Transmission on Optical Fiber	10
2.4	Optical fiber windows	13
2.5	Simple (Sparse) WDM	14
2.6	Effect of Dispersion	15
2.7	Pulse Dispersion	16
2.8	Broadening of Light Pulses	18
2.9	Single-Mode Fiber	21
2.10	chromatic dispersion	24
2.11	Step-Index Single-Mode Dispersion	25
2.12	Dispersion-Shifted Single-Mode	25
2.13	Dispersion of “Standard” Single-Mode Fiber	27
2.14	Dispersion Compensation	32
2.15	Dispersion Compensation Using a Mid-Span DCF	33
2.16	Dispersion Compensation of a New Link with DCF	34
2.17	Spectral Inverter – Schematic Dispersion	35
2.18	Spectral Inversion - Wavelength Domain	36
2.19	Compensation with a Fiber Bragg Grating	37
2.20	Limiting Bit Rate of Single-Mode Fibers	38
2.21	Dispersion-Limited Transmission Distance	42
2.22	Schematic and Dispersion of a DCF	47
2.23	Dispersion Management in a Long-Haul Fiber Link	48
2.24	Dispersion Values	51
3.1	GVD block diagram	59
3.2	GVD Project Bill of Materials	59
3.3	Optical Fiber Properties	60
3.4	Compensation with Ideal Dispersion Component	61
3.5	Bill of material and simulation for Compensation	62
3.6	Compensation of Dispersion Ideal Compensation	62
3.7	Ideal Dispersion Compensation FBG configuration	63
4.1	Input Pulse and Output Pulse of Effect GVD	67

4.2	Pulse Chirp Plotted with Intensity Pulse.	69
4.3	Spectra Corresponding to Figure 4.1 and 4.2	70
4.4	Setting Chirp Parameter to Pulse Compression	72
4.5	Optical fiber lengths	73
4.6	Pulse shape and chirp at $z=0$ and $z=z_{\min}$	73
4.7	Gaussian pulse after 10 km propagation in SMF	76
4.8	Dispersion Compensation with Ideal Component	78
4.9	Gaussian Pulse after 50 km Propagation in SMF	79
4.10	Result of Compensation with Ideal Component	80
4.11	Gaussian Pulse after 100 km Propagation in SMF	82
4.12	Result Dispersion Compensation FBG Component	83
4.13	Gaussian Pulse after 200 km Propagation in SMF	85
4.14	Dispersion Compensation with Ideal Component	86

List of table

Table		Page
2.1	Fiber Optic Transmission Windows	12
3.1	Optical Design components	64

List of Abbreviations

ASE	Amplified Spontaneous Emission
BER	Bit Error Rate
CD	Chromatic Dispersion
DAF	Dispersion-Altered Fibers
DCF	Dispersion Compensation Fiber
DCS	Dispersion Compensation Schemes
DFB	Distributed Feedback Lasers
DFF	Dispersion-Flattened Fibers
DSF	Dispersion-Shifted Fibers
EDFAs	Erbium Doped Fiber Amplifiers
FBG	Fiber Bragg Grating
FDM	Frequency Division Multiplexing
FOC	Fiber Optic Communication
FSK	Frequency shift keying
FWM	Four -Wave Mixing
Gbps	Giga bit per second
GVD	Group Velocity Dispersion
ISI	Inter Symbol Interference
ITU	International Telecommunications Union
LED	Light Emitting Diode
LPGs	Long Period's Gratings
MM	Multi Mode
MMF	Multi Mode Fiber
OPC	Optical Phase Conjugation
PMD	Polarization-Mode Dispersion
RMS	Root-Mean-Square
RI	Refractive Index
SM	Single Mode
SMF	Single Mode Fiber
SPM	Shift Phase Modulation
WDM	Wavelength Division Multiplexing

List of symbols

A	Pulse-envelope amplitude
B	Bit rate
β_2	Second-order dispersion
β_3	Third-order dispersion
D	Dispersion parameter
Gb/s	Giga bit per second
L	Fiber length
μm	micro meter
Tb/s	Tera bit per second
V	V number
Vg	group Velocity
H(ω)	transfer function
\bar{n}	average mode index
Λ	grating period
σ_λ	rms spectral width
$\tilde{A}(0, \omega)$	Is the Fourier transform of A (0, t)
τ_g	Group delay
ω_{IF}	Intermediate frequency
XP	Mcrossphase modulation
λ_B	Bragg wavelength
λ_{ZD}	Zero-dispersion wavelength

Table of contents

Figure الاية	Page I
Acknowledgement	II
Abstract	III
المستخلص	IV
List of Figures	V
List of Table	VII
List of Abbreviations	VIII
List of symbols	IX
Table of contents	X
Chapter One: Introduction	1
1.1 Background	2
1.2 Problem Statement	4
1.3 Proposed solution	5
1.4 Aim and Objective	5
1.5 Methodology	5
1.6 Thesis Outline	6
Chapter Two: Literature Review	7
2.1 Introduction Fiber Optic Communication System	8
2.2 Basic Concepts of Fiber Optics	8
2.3 Optical Transmission System Concepts	9
2.4 Transmitting Light on a Fiber	10
2.4.1 Advantages of optical fiber Communication	11
2.4.2 Disadvantages of optical fiber Communication	11
2.5 Transmission Windows	12
2.5.1 Wavelength Division Multiplexing	13
2.6 Chirp Definition	14
2.7 Dispersion	15
2.7.1 Dispersion Concept	15
2.7.2 Pulse Dispersion	16
2.7.3 Dispersion Mechanism	17
2.8 Effect of Dispersion	17

2.9	Single-Mode Fiber	20
2.9.1	Features of Single-Mode Fiber	20
2.9.2	Types of Single-Mode Fiber	22
2.10	Dispersion in Single-Mode Fiber	23
2.10.1	Chromatic Dispersion	23
2.10.2	Material Dispersion	24
2.10.3	Waveguide Dispersion	24
2.11	Group Velocity Dispersion	26
2.12	Control of Dispersion in Single-Mode Fiber Links	28
2.13	Dispersion Management	37
2.14	Related work	51
Chapter Three: Design and Implementation		54
3.1	Over view	55
3.2	Modeling	55
3.2.1	Group Velocity	55
3.2.2	Wave Velocities	56
3.2.3	Modal wave phase velocity	56
3.2.4	Effects of Group Velocity Dispersion	57
3.3	Design	59
3.4	Simulation	63
3.4.1	Compensation of Ideal Dispersion Components	64
3.5	Verification	65
Chapter Four: Results and Discussion		66
4.1	Demonstration the Effects of Group Velocity Dispersion	67
4.2	Compensation with Ideal Dispersion Components	75
4.2.1	case 1 Optical fiber is 10km dispersion -160ps/nm	75
4.2.2	case 2 Optical fiber is 50km dispersion -800ps/nm	79
4.2.3	case 3 Optical fiber is 100km dispersion -1600ps/nm	82
4.2.4	case 4 Optical fiber is 200km dispersion -3200ps/nm	85
Chapter Five: Conclusion and recommendation		88
5.1	Conclusion	89
5.2	Recommendation	90
References		91