

Acknowledgements.....	ii
Abstract.....	iv
Table of contents.....	ix
List of Figures.....	xii
List of Tables.....	xv
List of abbreviations.....	xvi
<b>1. Introduction .....</b>	<b>1</b>
1.1.Motivation.....	2
1.1.1. The current needs of telecommunications.....	2
1.1.2. Visible light communications.....	4
1.1.3. Broadband sources in fiber communications.....	8
1.2.Objectives.....	9
1.3.Organization of the thesis.....	10
<b>2. Optoelectronic for optical wireless communications.....</b>	<b>12</b>
2.1.Introduction.....	13
2.2.Optoelectronic properties of semiconductors.....	13
2.2.1. Semiconductors.....	14
2.2.2. Semiconductor alloys.....	15
2.2.3. Properties of II-VI semiconductors.....	15
2.2.3.1.Electronic properties.....	15
2.2.3.2.Optical properties.....	16
2.3.Design of Optoelectronics Materials.....	17
2.3.1. WIEN2K software description.....	17
2.3.1.1.The Theory of the Functional Density.....	17
2.3.1.2.The Local Density Approximation (LDA).....	18
2.3.1.3.The Generalized Gradient Approximation (GGA).....	19
2.3.2. The FP-LAPW method.....	19
2.3.3. The flowchart of WIEN2K.....	20
2.4.Study of the ZnSeO material for optoelectronic devices in wireless communication...21	21
2.4.1. Computational details.....	22
2.4.2. The properties of the ZnSe <sub>1-x</sub> O <sub>x</sub> material.....	23
2.4.2.1.Physical properties.....	23
2.4.2.2.Electronic properties.....	25
2.4.2.3.Optical properties.....	25
2.5.Conclusion .....	28
<b>3. Optical Wireless Communications.....</b>	<b>29</b>
3.1. Introduction.....	30
3.2.Optical Wireless Communication (OWC) systems.....	32
3.2.1. OWC systems design.....	33
3.2.2. Configuration of OWC links.....	34

3.2.3. Types of OWC systems.....	36
3.2.3.1.Visible Light Communication (VLC).....	36
3.2.3.2.Free Space Optical Communication (FSO).....	37
3.2.4. Optical modulation for OWC systems.....	38
3.2.4.1.Factors affecting modulation techniques for OWC systems.....	38
3.2.4.2.Types of modulation techniques used in OWC systems.....	39
3.3. Design of Experimental prototypes.....	43
3.3.1. Analog wireless transmission using visible light.....	43
3.3.2. System description.....	44
3.4. Experimentation and results.....	45
3.4.1. Analog wireless transmission using visible light.....	45
3.4.2. Digital wireless transmission using visible light.....	50
3.4.2.1.Description of the transmitted data.....	50
3.4.2.2.Experimental results.....	51
3.5.Conclusion.....	59
<b>4. Optical OFDM signal transmission using a broadband source over SSMF...60</b>	
4.1. Introduction.....	61
4.2. Broadband sources based optical networks.....	62
4.2.1. Different broadband sources.....	62
4.2.2. Fundamentals of signal transmission based on BBSs.....	63
4.2.3. Tolerant dispersion systems for BBS based optical links.....	66
4.3.Experimental setup.....	70
4.3.1. Generation and reception of OFDM signal.....	70
4.3.1.1.OFDM signal parameters.....	72
4.3.1.2.Symbol generation.....	73
4.3.1.3.Location and assignment of carriers.....	73
4.3.1.4.Hermitian symmetry.....	74
4.3.1.5.The cyclic prefix.....	74
4.3.1.6.Pre-emphasis filter.....	76
4.3.1.7.Signal clipping.....	76
4.3.1.8.Data rate of transmitted signal.....	77
4.3.1.9.Reception of the OFDM signal.....	78
4.3.1.10. Quality of the OFDM signal.....	79
4.3.2. Optical components.....	81
4.3.2.1.The Broadband source (BBS).....	81
4.3.2.2.Multiport Tunable Optical Filter (MTOF).....	81
4.3.2.3.Electro-Optic Modulator (EOM).....	82
4.3.2.4.Polarization controller.....	82
4.3.2.5.Receiver.....	82
4.3.3. OOFDM-WDM experimental network.....	83
4.4.Experimental results and applications.....	86
4.4.1. Carrier reuse for bidirectional transmission.....	86

4.4.2. Dynamic bandwidth allocation.....	88
4.4.3. Multiple users in reconfigurable networks.....	90
4.4.4. Multiple band selection.....	92
4.5.Conclusion.....	93
<b>5. Conclusions and future prospects.....</b>	<b>94</b>
5.1.Conclusions.....	95
5.1.1. Optoelectronic devices for optical telecommunications.....	95
5.1.2. Optical wireless communications systems.....	96
5.1.3. Bidirectional WDM-OOFDM access networks based on broadband sources...	97
5.2.Future research lines.....	97
<b>Bibliography</b>	
<b>Appendixes</b>	