

Table of Contents

Title Page	<i>i</i>
Abstract	<i>ii</i>
Acknowledgments	<i>iv</i>
Table of Contents	<i>v</i>
List of Figures	<i>vii</i>
Chapter 1: Introduction	1
1.1 Optical Fiber Communications Systems	2
1.2 Wavelength Division Multiplexing	3
1.3 Spectrum-Sliced WDM Systems	4
1.4 Motivation for this Dissertation	5
1.5 Dissertation Outline	6
Chapter 2: Receiver Performance Analysis	11
2.1 Use of Saddlepoint Approximation for Receiver Performance Analysis	12
2.1.1 ON-Case	12
2.1.2 OFF-Case	16
2.1.3. Results	17
2.2 The Gaussian Approximation	18
Chapter 3: Effect of Non-Rectangular Spectra on Receiver Sensitivity	35
3.1 Butterworth Filter Approximation	35
3.2 Mathematical Formulation	36
3.3 Transmission Analysis	39
3.3.1 Signal Transmission	39
3.3.2 Noise Transmission	40
3.3.3 Evaluation of Filter Influence	41

Chapter 4: Effect of Interchannel Interference on Receiver Performance	48
4.1 Mathematical Formulation	48
4.1.1 Single-Sided Interference	48
4.1.2 Double-Sided Interference	52
4.2 Evaluation of Interchannel Interference	52
4.2.1 Saddlepoint Approximation	53
4.2.2 Gaussian Approximation	56
4.2.3 Chi-Square Approximation	58
4.3 Transmission Capacity	60
Chapter 5: Conclusions	84
Appendix A: The Saddlepoint Approximation	87
A.1 Error Probability	90
Appendix B: The Chi-Square Distribution	92
B.1 The Gamma Function	92
B.2 Derivation of the Chi-Square Distribution	93
B.3 Moment Generating Function (MGF)	95
References	101