TABLE OF CONTENT

APPROVAL LETTER i

STATEMENT OF ORIGINALITY LETTER ii

ABSTRACT iii

ABSTRAK iv

PREFACE v

ACKNOWLEDGEMENTS vi

TABLE OF CONTENT viii

LIST OF FIGURES x

LIST OF TABLES xii

LIST OF ACRONYMS xiii

CHAPTER 1: Introduction 1

1.1 Motivation 1

1.2 Problem Formulation 2

1.3 Objectives 2

1.4 Scope of Work 2

1.5 Methodology 2

1.6 Outline of the Report 3

CHAPTER 2: LITERATURE OF REVIEW 4

2.1 Transmission Modes (TM) in LTE Downlink 4

2.1.1 TM 1 6

2.1.2 TM 2 6

2.1.3 TM 3 6

2.1.4 TM 4 7

2.1.5 TM 5 7

2.1.6 TM 6 7

2.1.7 TM 7 7

2.1.8 TM 8 8

2.2 MIMO 9

2.2.1 Spatial Multiplexing..... 13

2.2.2 Transmit Diversity 13

2.2.3 Beamforming 14
2.3 Quadrature Amplitude Modulation 16
2.4 Precoding 17
2.5 FPGA 19
CHAPTER 3: DESIGN OF SYSTEM 21
3.1 Introduction 21
3.2 The Flow Chart of the Design of the System 21
3.3 Modelling of Linear Precoding LTE 22
3.3.1 64-QAM Mapper 23
3.3.2 Precoding Block 26
3.3.3 OFDM Block 28
3.4 Bit Representation 28
3.5 Precoding System Design in Xilinx 29
3.5.1 64 QAM Mapper in Xilinx 30
3.5.2 Precoding Block in Xilinx 31
3.5.3 OFDM Block in Xilinx 32
3.6 Precoding System Simulation and Verification 33
3.6.1 64-QAM Mapper Simulation 33
3.6.2 Precoding Block Simulation 34
3.6.3 Precoding-OFDM block Simulation 36
CHAPTER 4: IMPLEMENTATION AND ANALYSIS 37
4.1 Introduction 37
4.2 Implementation of Precoding System on FPGA 37
4.2.1 Implementation Steps 39
4.2.2 System Implementation 41
4.3 System Analysis 44
CHAPTER 5: CONCLUSIONS AND RECOMMENDATION 46
5.1 Conclusions 46
5.2 Recommendation 46
BIBLIOGRAPHY xiv
APPENDIX A
APPENDIX B