

UNIVERSITI TEKNOLOGI MARA

**A NEW HYBRID MATHEMATICAL
MODEL FOR INTERFERENCE
MANAGEMENT BY COMBINING OF
FRACTIONAL FREQUENCY REUSE
AND DYNAMIC POWER CONTROL
METHODS IN FEMTOCELL
NETWORKS**

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ABSTRACT

The increase in capacity and system data rate may lead to capacity problems and hence become one of the crucial issues in any Mobile Communication Networks. Although the Long Term Evolution (LTE) is called the 4th Generation of the Mobile Cellular Communication Network, it can no longer solve the problem regarding the capacity of the cell. In order to cope with the increase in demand for stable and high data rates among mobile users, femtocell or Home Evolve Node B (HeNB) has been developed to improve indoor capacity and coverage. Deploying femtocells in macrocell are one of the efficient ways to improve the performance of mobile services in high traffic congested areas. Femtocell is a small and lightweight base station that aims for indoor usage such as at home or in an enterprise and provide better user experiences to users. However, femtocell deployments caused interference between femtocells itself and also to the existing macrocells. This thesis studied the two combining interference methods in LTE Heterogeneous Networks (HetNets) in order to reduce interference in HetNets which are the Fractional Frequency Reuse (FFR) and Dynamic Power Control (DPC) methods. The FFR method highlights the significance of two parameters which are the fraction of radius in center region (r_{th}) as well as the fraction of the system bandwidth (β) allocated for the center area while the DPC method highlights the importance of the parameter Path Loss (PL) compensation factor (α). This thesis proposed a new hybrid mathematical model for interference management by identifying the effect of r_{th} , β and α on the improvements value of capacity, throughput as well as the Signal to Interference plus Noise ratio (SINR). The proposed r_{th} , β and α value were then used in simulation model by using the MATLAB software to analyze the number of handovers occurred for the proposed method and comparing its performance improvement with the conventional method. The simulation results showed that the proposed method give higher values of the macrocell and femtocell SINR by 135.71% and 50.54% respectively. It showed that there was a significant reduction the inter-cell interference in LTE HetNets by offloading the macrocells traffic to the femtocells and higher load balancing performance can be achieved and hence reducing the number of handovers.

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TABLE OF CONTENTS

	Page
CONFIRMATION BY PANEL OF EXAMINERS	ii
AUTHOR'S DECLARATIONS	iii
ABSTRACT	iv
ACKNOWLEDGEMENT	v
TABLE OF CONTENTS	vi
LIST OF TABLES	x
LIST OF FIGURES	xiii
LIST OF SYMBOLS	xxiv
LIST OF NOMENCLATURES	xxvi
CHAPTER ONE: INTRODUCTION	
1.1 Background of Study	1
1.2 Problem Statement	5
1.3 Research Objectives	7
1.4 Scope and Limitation of Study	8
1.5 Research Methodology	9
1.6 Thesis Contributions	12
1.7 Organization of Thesis	13
CHAPTER TWO: LITERATURE REVIEW	
2.1 Introduction	14
2.2 Long Term Evolution (LTE)	14
2.2.1 LTE System Architecture	15
2.2.1.1 The Access Network	18
2.3 Differentiation between 4G and Traditional Cellular Network	19
2.3.1 Low Power Nodes (LPNs)	23
2.4 Femtocell Architecture Standardization	23
2.4.1 3GPP Femtocell	27

2.5 Challenges and Technical Issues of Heterogeneous Networks (HetNets) Deployment	28
2.5.1 Interference Scenario with Femtocell Deployment	29
2.6 Handover	32
2.6.1 Handover Procedure in Femtocell Network	34
2.7 Interference Management Methods in LTE Network	35
2.7.1 Fractional Frequency Reuse (FFR)	36
2.7.2 Power Control	44
2.7.3 Almost Blank Subframe (ABS)	48
2.7.4 Coordinated Multi-Point (CoMP)	49
2.7.5 Devices to Devices (D2D)	50
2.8 Comparison of Interference Management Methods	51
2.9 Summary	52

CHAPTER THREE: MATHEMATICAL MODELING

3.1 Introduction	54
3.2 The Enhancement of Fractional Frequency Reuse (FFR) Method	56
3.2.1 Macrocell Capacity	59
3.2.2 Femtocell Capacity	65
3.2.3 Macrocell and Femtocell Throughput	68
3.2.4 Macrocell SINR	68
3.2.5 Femtocell SINR	73
3.3 Numerical Results of Enhanced FFR Method	74
3.3.1 The Effect of Radius Fraction on Macrocell Capacity	74
3.3.2 The Effect of Radius Fraction on Total Macrocell Capacity	78
3.3.3 The Effect of Radius Fraction on Femtocell Capacity	80
3.3.4 The Effect of Radius Fraction on Macrocell Throughput	81
3.3.5 The Comparison of Femtocell Throughput between FFR 6 and FFR 3 for Varies Radius Fraction	82
3.3.6 The Effect of Number Femtocells on Macro and Femto Edge Users Throughput	83