CHPTER ONE

INTRODUCTION

1 .1 Preface

Existing base station antenna in cellular communication are normally Omni-directional .Omni-directional antenna radiates its energy in all directions, which result in a waste of frequency band because majority of transmitted signal power radiates in other directions instead of the desired user. Signal power radiated throughout the cell area will increase the interference and reduce Signal-to-Noise Ratio(SNR) due to desired users. Although sector antenna will increase capacity of the system by dividing the entire cell into sectors but it have the same problem ofinterference .Smart antennas provides a relief by transmitting/receiving the power only to/from the desired directions and suppressing the undesired users [1].

When two or more signals overlap in each other this process is called interference .Interference can effect in the operation of the receiving wireless communications, causing reception problems and observably effect in the signal performance metrics (data rate, capacity, Signal-to-Interference and Noise Ratio (SINR), and throughput) because when the interference increases consequently the system gain will decreases and when the interference decreases system gain will increases. It’s important to realize that interference mitigation is essential to enhance the quality of the service provided to the user. Smart antenna investigates interference mitigation and improves the previous performance metrics [2].

1.2 Problem Statement

Interference problem greatly affects thequality of the service provided tothe user. The high interference in wireless systems such as LTE-Advanced degrades the Signal to Interference and Noise Rate (SINR) which leads to limited number of users and reduction in the capacity.

1.3 Proposed Solution

The solution of the above mentioned problem is to use the smart antenna technique. Smart antenna can be used very effectively to reduce the interference through beam-forming and improve the system capacity by using transmit diversity.

1.4 Research Aims and Objectives

The aim of this research is to improve the performance of LTE -advanced by using smart antenna systems.

The detailed objectives of this research areincluding:

- To simulate the operation of the smart antenna.
- To enhance the SINR.
- To reduce interference.
- To increase capacity (number of users).
- To increase data rate.

1.5 Methodology

To accomplish this project the work has been divided in to four phases, their details are as follow:

Phase one: Having knowledge of the smart antenna systems and how its work is the major step to achieve the objectives of this research. In phase two a mathematical coordination of the system equations for algorithms and the system performance metrics get covered.In phase three the operation of the smart antenna systems including beam-forming process, Direction-of-Arrival (DOA) and Least Mean Square error (LMS) algorithms then simulated. Then in phase four the improvement of the system performance metrics are evaluated through a simulation written in MATLAB.Finally the results are obtained and the thesis is documented.

1.6 Thesis Outlines

This thesis is organized as follows: Chapter Two content the literature review which consists of: Background of the development for generation of the mobile communication with focusing for 4Generation. Chapter Three consists of the research methodology in which the beam-forming techniques, smart antenna performance metrics and their mathematical representations. Chapter Four include result and discussion for simulation of DOA and LMS algorithms and the smart antennaperformance metricsusing MATLAB program.Chapter Five summarizes the results obtained in this thesis.