UNIVERSITI TEKNOLOGI MARA

IMPROVING ENERGY EFFICIENCY OF MASSIVE MIMO USING SMALL CELL NETWORK

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ABSTRACT

Nowadays, the compaction of the cellular network resulted in increased demand in wireless data services. However, the cellular energy efficiency (EE) can be improved by densification the network topology, without bothering quality-of-service (QoS) constraint at the users. In this paper, small cell network (SCN) is applied in massive MIMO (MM) and analyze the power consumption of these two densification approaches for different QoS constraints. For this paper, three beamforming (BF) algorithms are compared which are optimal BF is using only the base station (BS), multiflow regularized zero forcing (RZF) BF and optimal spatial soft-cell coordination BF. Numerical result compared with BF algorithm proposed in different simulation parameters and show that by increasing the number of small-cell access points (SCAs), the antennas per SCAs could enhance the total system energy efficiency

Keywords— beamforming, massive MIMO, energy efficiency, power consumption

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TABLE OF CONTENTS

CHAPTER 1

INTRODUCTION

1.1 BACKGROUND

The demand for data service is increasing dramatically and wireless systems with high throughput and the capability to serve a large number of user equipment are desired [1]. This problem can be overcome by providing an effective and simple solution for improving the Energy Efficiency (EE) of Massive MIMO (MM) in current cellular network [2]. One of the methods is by applying Small Cell Networks (SCN) in MM. This combined approaches provides the highest energy efficiency; small cells contributes to reducing the propagation losses while MM enables multiplexing of users with controlled interference [3]. SCN is a cellular network where the sizes of the cells employed are very small. In MM, transmitting antenna at each Base Station (BS) consists of huge number of antenna. For the fifth generation of mobile communication technology, the MM system is considered one of the most promising systems. The spectrum efficiency of MM can be increased by an order of magnitude as tens of user equipment can be served on the same time-frequency resource by exploring spatial multiplexing [1].

Network coverage can be extended by using small cells and higher spatial frequency reuse can be done by reducing cell size and at the same time, the network capacity also can be increased [4]. It is developed with self-organizing, low-power and low-cost BS in each cell. In addition, the system capacity can be increased through the simplest and most effective way according to their benefits that explored