Proc. Annual Symposium on Research & Industrial Training, 03(2016) 399-404
Department of Electronics – Wayamba University of Sri Lanka

DESIGNING A FREQUENCY PLAN FOR 4G MIMO IMPLEMENTATION IN KANDY CLUSTER

R.A.P. De Zoysa*, L.D.R.D Perera

Department of Electronics, Wayamba University of Sri Lanka, Kuliyapitiya, Sri Lanka

*amithaprasanna90@gmail.com**

ABSTRACT

Recent technologies have made real-time high data rate communication a reality. Long Term Evolution (LTE) is one of them. This paper, discusses the performance of Multiple Input Multiple Output (MIMO) communication in comparison with Single Input Single Output (SISO) communication to achieve high data rates in LTE communication. To achieve this target, frequencies of the network need to be re-planed since there exist technical barriers. Objectives of this research are frequency plan designing, applying in to the 4G network in Kandy cluster and implement the MIMO.Finaly, data throughput improvement is expected as the result.

Keywords: MIMO implementation, LTE data throughput, Frequency planning.

1 INTRODUCTION

Mobitel Private Limited is indeed a well-recognized mobile telephony operator in the country. As the fastest growing mobile network in the South Asia, the Mobitel has earned a great pride to the country. Mobitel which established in 1993 is the second mobile service provider in Sri Lanka. Mobitel is expanding their capacity and the coverage of the network through projects called stages. Latest stage, stage seven is going to be commencing immediately. Each stage has a main target to cover, to improve the capacity, increase coverage through the country and so on. [1]

The main aims of stage seven are to improve the coverage through the country and implement several LTE sites focusing Colombo and major universities. After the stage seven expansion,

the total Base Transfer Station (BTS) are increased by 38% and NodeBs (3G site) are increased by 66%. As well as SISO (Signal Input Signal Output) network throughput is not enough when increased network traffic. So MIMO implementation is a solution for this case. MIMO implementation also faced above technical barrier because Mobitel has a problems when frequency bands allocating because mobitel currently used 1800MHz band through 15MHz frequency range. From this frequency range, 5MHz range (778MHz to 798MHz) is used for 2G deployment and 10MHz range (512MHz to 584MHz) is used for 2G and LTE deployment. [2] Since Receiving Radio Unit (RRU) has limited capacity, 2G and LTE cannot allocating in same RRU without frequency reusing. Hence need to re-farm existing 1800 band to accommodate LTE MIMO deployment without changing 2G Quality and using hopping bands. So requirement occurred to develop a new frequency plan which has more capacity, higher throughput, easily expansion able and which is well organized.

2 EXPERIMENTAL

2.1 Methodology

Pre-throughput data of existing SISO 4G network in Kandy cluster (40 signaling towers) were collected using Tems pocket software and Samsung S3 phone. After that design a well-organized frequency plan with non-hoping bands and maintaining 2G network quality using Mapinfo Software. This frequency plan was applied in to the system with MIMO implementation. After MIMO implementation, post-throughput data in Kandy cluster were collected using Tems pocket software and Samsung S3 phone. After analyzing pre and post throughput data, success of the frequency plan was determined.

2.2 Description of Software and Tools.

- Tems Pocket Software

  TEMS Pocket is a phone-based test tool developed for measuring the performance and quality parameters of wireless networks. The tool collects measurement and event data for immediate monitoring. [3]

- Mapinfo Software

Mapinfo can perform geographic operations such as frequency planning, combining and splitting, creating thematic diagrams...etc. Frequency data can be displayed as points using Mapinfo software.

3 RESULTS & DISCUSSION

Main target of this research is existing LTE data throughput improving. When compared pre throughput data that network in SISO transmitting mode and post throughput data the network in MIMO transmitting mode, it was identified that there exist throughput increment after implementing MIMO. Three sites in Kandy was considered for testing this improvement. Those results can be tabulated as follows;

Table 1: Throughput results in MIMO and SISO

Sites	Data throughputs in SISO transmitting mode(Mbps)	Data throughputs in MIMO transmitting mode(Mbps)	Improvement of the data throughputs(Mbps)
Kandy 01	7.63	11.97	6.02
Kandy 02	5.45	13.65	8.20
Kandy 03	2.96	12.26	9.3

Theoretically, this throughput should double as the improvement since MIMO implementation. But practically, there exist different situation. When considered the research problems, it can be predict that frequency plan is worked successfully.

4 CONCLUSIONS

According to above results, expected practical improvement of the network is achieved after MIMO implementation since frequency plan was applied into 4G network in Kandy cluster. But there exist difference between theoretical expected throughputs (15Mbps) and practical throughputs. However, these throughput gains depend on three factors: maximizing rich scattering conditions within a cell, configuring the eNodeB to properly match MIMO settings to real-world

conditions, and ensuring that UEs can take full advantage of the multipath conditions that are present. Scanning receivers that can provide accurate real-world measurements of multipath conditions and potential throughput are essential tools for evaluating the performance of all three of these factors. With these measurements, mobile operators can maximize the data rates and reliability of LTE networks, resulting in a premium return on their LTE equipment investments while improving customer satisfaction. [4]

ACKNOWLEDGEMENTS

The first author would like to owe his special thanks to External supervisor Mr. D.W.N.Weerasekara and Industrial Training program coordinator, Dr. U.S.Liyanaarachici to giving their guidance, advices, and directions all over the training period which helps to complete a reasonable and valuable research.

REFERENCES

[1] Aniket Thor,Satish Kakade,Shahrukh Shaikh, "Counting Conveyor For Engineering Applications," *IPASJ International Journal of Mechanical Engineering (IIJME),* vol. 3, no. 5, p. 4, 2015.

[2] Amruta Pandit,Jyoti Rangole, "Literature Review on Object Counting using Image Processing Techniques," *International Journal of Advanced Research in Electrical,Electronics and Instrumentation Engineering,* vol. 3, no. 4, p. 4, 2014.

[3] Pankaj Agarwal, Ratnesh Kumar tiwari, Samardeep Banyal,, "COLOR/METAL SENSING SORTING SYSTEM," *International Journal Of Engineering Research & Management Technology,* vol. 1, no. 2, p. 11, 2014.

[4] L. K. Nordell, "," *Conveyor Belt Speed and Pulley Diameter,* p. 1, 17 September 2003.

[5] "Mobitel Overview," Mobitel (pvt) Ltd, 1993. [Online]. Available: http://mobitel.lk/about-us. [Accessed 10 September 2015].

[6] "Spectrum Management," Telecommunications Regulatory Commission of Sri Lanka , [Online]. Available: http://spectrum.trc.gov.lk/Cellular/CELLULAR1.html. [Accessed 25 September 2015].

[7] "Ultraportable Network Testing Solutions for Indoor/Anywhere," Ascom Holding AG, [Online]. Available: http://www.ascom.com/nt/en/index-nt/tems-products-3/tems-pocket-5.htm#overview. [Accessed 01 10 2015].

[8] P. R. Solutions, "Maximizing LTE Performance Through MIMO Optimization," PCTEL, Inc., Germantown, 2011.