UNIVERSITI TEKNOLOGI MARA

5-BEAM RF ANTENNA SOLUTION FOR INDOOR COVERAGE IN STADIUM PERAK

TUAN NUR NAJIHAH AYUNI BINTI JAAFAR

Thesis submitted in fulfilment of the requirements
for the degree of
Bachelor of Engineering (Hons) Electronic Engineering

Faculty of Electrical Engineering

January 2019

ACKNOWLEDGEMENT

Alhamdulillah Thanks to Allah for the strength and blessing me throughout the entire research and completion of this thesis. Peace upon our prophet Muhammad S.A.W. who has given light to mankind.

The author would like to express highest gratitude to the members of Faculty of Electrical Engineering, Universiti Teknologi MARA Shah Alam, Malaysia. Special thanks to the engineers of Edotco Malaysia Sdn.Bhd. for the continuous tips and guidelines throughout the accomplishment of this project. This paper was supported by "Fundamental Research Grants Scheme", file No. 600-IRMI/FRGS 5/3 (099/2017).

Lastly, I would like to express my special gratitude and thanks to all persons for giving me such attention and time.

ABSTRACT

This paper will simulate the coverage prediction upon deployment of the Multi-beam RF Antenna Solution. The initial project is to address the high demand on data transaction over the services provided by telecommunication industries during major events held in Malaysia such as in stadiums or Open Square. For instance, when there is a big event, subscribers tend to go live and this lead to bad connectivity. This has come out to a solution in which the Multi-beam RF Antenna is applied. So this research paper will provide data analysis information for example formula, calculation and significant values involved during the creation of the project. To obtain all the information, a software called Planning Tools is used. This planning tool will identify the best position of the antenna to be placed at its best position based on coverage strength. As subscribers' demand for better coverage as well as fast throughput during major events especially in open area, most telecommunication operators realize of the initiative and had open their steps to attain the customers desire. Concerning the request, a 5-beams antenna is proposed to serve high crowd also provide best coverage with faster data transaction. A simulation of 3G and 4G coverage prediction need to be conducted before the deployment of the proposed antenna type. The solution is chosen as it is sustainable maintenance, cost-effective and fast in deployment. Few steps taken right before the deployment is done such as the simulation of coverage prediction. The simulation is carried out using the planning tools namely iBwave software where the performance in terms of Return Loss (dB), frequency band, technology (3G and 4G), Equivalent Isotropic Radiated Power (EIRP), Utilizing Rate (%), Reference Signal Received Power (RSRP) and Received Signal Code Power (RSCP) are observed to obtain the best coverage in the proposed area. It is expected that the antenna will serve the user subscribers with excellent in term of network quality and performance to the targeted area with minimum interference and delay.

TABLE OF CONTENT

CHAPTER 1

INTRODUCTION

1.1 BACKGROUND OF STUDY

A multi-beam antenna (MBA) is defined as an antenna with the ability to generate multiple independent beams simultaneously from a single aperture. It plays an increasingly important role by adding more functions to the systems that they are a part of, especially in mobile communication. A multiband antenna is a single antenna that could operate in more than one frequency bands, which it can cover various wireless applications. It increases the capacity per transaction, maintain the available frequency band and lessen interference. Each antenna has its own frequency band based on the design, if a certain frequency is out of the range, it rejects the signal[9]. Nowadays, mobile users have a prodigious appetite for data. The demand for higher throughput continues shooting up. Based on a statistic, internet user population in Malaysia recorded a staggering growth by a whopping 88 percent since 2006 until last year.

The usage of Internet-based communications is constantly evolving all over the world and demands super fast speed. People being extravagant in communicating with families and friends through Facebook, Instagram as well as live streaming update such as FB live, Insta live and video call especially during big events. Normally, there are fewer subscribers in a stadium but due to popular event nowadays, people tend to update more such as favorite team,