GSM DOWNLINK POWER DENSITY SURVEY IN MERLIMAU AREA

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UNIVERSITI TEKNIKAL MALAYSIA MELAKA

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GSM DOWNLINK POWER DENSITY SURVEY IN MERLIMAU AREA

This report is submitted in accordance with the requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor of Electronic Engineering Technology (Telecommunication) with Honours.

by

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FACULTY OF ELECTRICAL AND ELECTRONIC ENGINEERING

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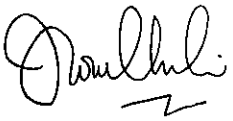

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DECLARATION

I hereby, declared this report entitled GSM DOWNLINK POWER DENSITY SURVEY IN MERLIMAU AREA is the results of my own research except as cited in references.

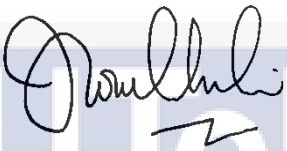
Signature: 

Author : Mohd Sofhan Afif Bin Abdull Majid

Date: 15.02.2021

APPROVAL

This report is submitted to the Faculty of Electrical and Electronic Engineering Technology of Universiti Teknikal Malaysia Melaka (UTeM) as a partial fulfilment of the requirements for the degree of Bachelor of Electronic Engineering Technology (Telecommunication) with Honours. The member of the supervisory is as follow:

Signature: 

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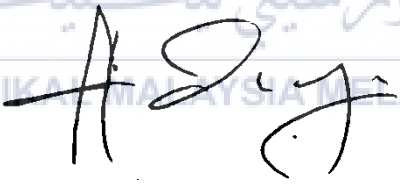
Signature: 

Co-supervisor: Win Adiyansyah Indra

ABSTRAK

Projek ini adalah mengenai Kajian Ketumpatan Kuasa Laluan Menurun di kawasan Merlimau. Tujuan utama projek ini adalah untuk meninjau ketumpatan kuasa laluan menurun GSM dengan menggunakan alat uji yang sesuai seperti penganalisis spektrum dan penggunaan aplikasi pemantauan telekomunikasi pada telefon pintar. Seterusnya, projek ini juga adalah untuk meninjau lokasi yang terbaik dan sesuai untuk menempatkan sistem pengambilan tenaga dengan melakukan pengujian dengan kaedah memandu pada kawasan tersebut. Akhir sekali, tujuan projek ini juga menghasilkan peta ketumpatan kuasa downlink GSM daripada data yang telah dikumpulkan untuk setiap 1-meter pada kawasan yang disasarkan.

ABSTRACT

This project is about GSM Downlink Power Density Survey in the Merlimau area. The aim of this project is to survey the GSM downlink power density by using a test gear which is a spectrum analyzer and telecommunication monitoring software on the smartphone. Next, this project is also to survey the best and suitable location to place the energy harvesting system after doing a drive test. Lastly, the aim of this project is also to produce the map of GSM downlink power density using the collected data for every 1 meter for the targeted area.

DEDICATION

This project is dedicated to my beloved family members, my supervisor and co – supervisor and to all my friends who have given me the motivation and never-ending moral and physical support from the start until the end.

ACKNOWLEDGEMENTS

I would like to give my gratitude and thank you to my supervisor, Encik Nurulhalim Bin Hassim and to my co – supervisor Encik Win Adiyansyah Indra for their bright ideas and exceptional guidance for the completion of my project. I would also like to thank my friends for always guiding and tutoring me by suggesting solutions and knowledge to complete this survey. I also wish to take this opportunity to express my deepest gratitude to my family members for their unwavering support and encouragement. They are my source of strength and motivation. Finally, my appreciation goes to everyone who were involved in my completing this project.

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LIST OF SYMBOLS

D, d	-	Diameter
F	-	Force
g	-	Gravity = 9.81 m/s
I	-	Moment of inertia
1	-	Length
m	-	Mass
N	-	Rotational velocity
P	-	Pressure
Q	-	Volumetric flow-rate
r	-	Radius
T	-	Torque
Re	-	Reynold number
V	-	Velocity
w	-	Angular velocity
x	-	Displacement
z	-	Height
q	-	Angle

CHAPTER 1

INTRODUCTION

1.1 Introduction

This chapter is an overview of the energy harvesting system. The problem statement is defined. Next, followed by an appropriate procedure to implement the objectives of this survey with a specific scope.

1.2 Background study

The purpose of this project is to complete a survey and observe the highest power density measurement for the GSM downlink power. Then, this survey can identify the most suitable location to install an innovative system for energy harvesting. The data collection for this survey will be obtained by using the Agilent Keysight spectrum analyser. This equipment is very useful for this research because it can scan, measure, and analyse the power density for every radio frequency identified per the frequency allocation provided by Malaysian Communications Multimedia Commission (MCMC).

1.3 Problem Statement

Nowadays, the use of wireless devices has grown significantly in different applications, such as mobile phone, especially the smartphone. Every telecommunication company of these modern devices will provide their technology with the ability to connect the internet.

The problem statements for this survey are as follows., The RF power density from the cell tower is sometimes wasted. This excess power actually can be harnessed by converting it into DC power to be used by low power devices. In addition, It was discovered that no GSM Downlink RF power mapping been done in Merlimau area especially for energy harvesting purpose.

1.4 Objectives

The main objectives of this study are:

i. To survey the GSM downlink power density.

ii. To produce the map of GSM power downlink.

iii. To identify the best or suitable locations to place an energy harvesting system.

1.5 Scope of work

The scope of this project are the functional limitations that will make sure that project is goes the correct way to achieve the end goal. The monitoring and surveying of the GSM downlink power density of the base station will be done by using portable test gear device which is the Keysight FieldFox Microwave Spectrum Analyzer with 9GHz capability. The drive test will be done within area surrounding Merlimau in the district of Jasin, Melaka.

The purposes of this survey is to record the highest power downlink at various cell towers around Merlimau area. The identified locations can then be used to assemble an energy harvesting devices with the suitable antenna and rectifier. In order to achive this, the data needed to be collected by doing the drive test. Data will be collected at every 1-meter interval with the specific area to obtain exact location of highest power density for GSM downlink signal wave. Preparation of GSM setup for drive test and the GPS antenna is also a must for this drive test survey. Getting accurate GPS coordinates will identify the ideal location for energy harvesting devices placement which will be done by a later project.

1.6 Project contribution

This survey will be very useful for both the industry and the state because it can identify possible replacement for the current conventional power. It is indeed a source of green energy. There is no wastage of energy. When connected to a rechargeable battery, this system will helps to lengthen the operating life for devices since the storage battery can be recharged during sleep mode. Furthermore by using this harvesting system, there is no need to get the battery checked and replaced regularly.

1.7 Thesis structure

This thesis consists of 5 chapters in total. The content is show below:

Chapter 1 was about the Introduction that consist of 7 main subjects which are introduction, objective, problem statement, scope of work, project contribution and thesis structure.

Chapter 2 was about the literature review. In this chapter was a summarization and explanation about the similar and past research from the journal that shown almost the same result and usage of the equipment and tools.

Chapter 3 was about the Methodology, this chapter will explain the equipment that is used in this survey which consist of both hardware and software. These applications also relate this survey with the theoretical capability of the equipment and software. More than that, this chapter also show the report flow chart, project flow chart, Gantt chart and expected result of this survey.

Chapter 4 was the result; this chapter will explain all about the output from data collected for this survey. Basically, this chapter will show the graph diagram which are histogram graph and scattering graph.

Chapter 5, in this chapter was about the Conclusion and possible future work, this explained whether the objective had been successfully completed and provide the recommendations for improvement of this survey.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

In this chapter, there are some of the articles from the Scopus site and IEEE Xplore that had been investigated based on the scope of this project. This research focuses on the RF energy harvesting or energy scavenging for GSM downlink power density and the application of other equipment which is a high-efficiency antenna to capture the signal wave and suitable rectifier to convert the AC signal into DC supply. The suitable articles about the RF energy harvesting, had been found to assist in the process to complete and finish this project. There are 10 journals identified about the RF energy harvesting.