

CHAPTER 1

INTRODUCTION

1.1 General

Wireless communication technology has developed and more reliable in order to communicate with other people around the world. In transferring the data from one end to the other end, especially in wireless and mobile data transmission, the expected data at the receiver should be the same as from the transmitter. Otherwise, the data will not be classified as a reliable data.

However, the development of this technology is still unable to preserve their reliability from several natural phenomena such as rain drops, storm and lightning effects. In telecommunication, the sequence of rain on the microwave system at a particular frequency is more critical especially for the countries located in tropical and equatorial region (Din J. et. al, 2003) and so as lightning.

Lightning is a natural prodigy that is of great attention to human being because it annihilating deformities to the equipment and installations. It integrated the formation of high flashing of light and thunder sounds. In the early year, some primitive people

lightning were assigned to myths and superstitious. The first person endeavoured that lightning is an electrical phenomenon was Sir Benjamin Franklin (Golam Sorwar, 1997).

Lightning plays a role as a major natural force of electromagnetic radiation and the ability of transmitting data to the receiver become unreliable. A lot of amendments, improvements, adjustments and alterations are to be made over the affected data in order to make it become reliable and as the same as has been transmitted. A lot of research and experiment has been done to conserve the data during the transmission after it being influenced by this kind of natural prodigy. Therefore, a reliable and dependable data can be accumulated at the receiver.

1.2 Objectives of Research

The objectives of this research are as follows;

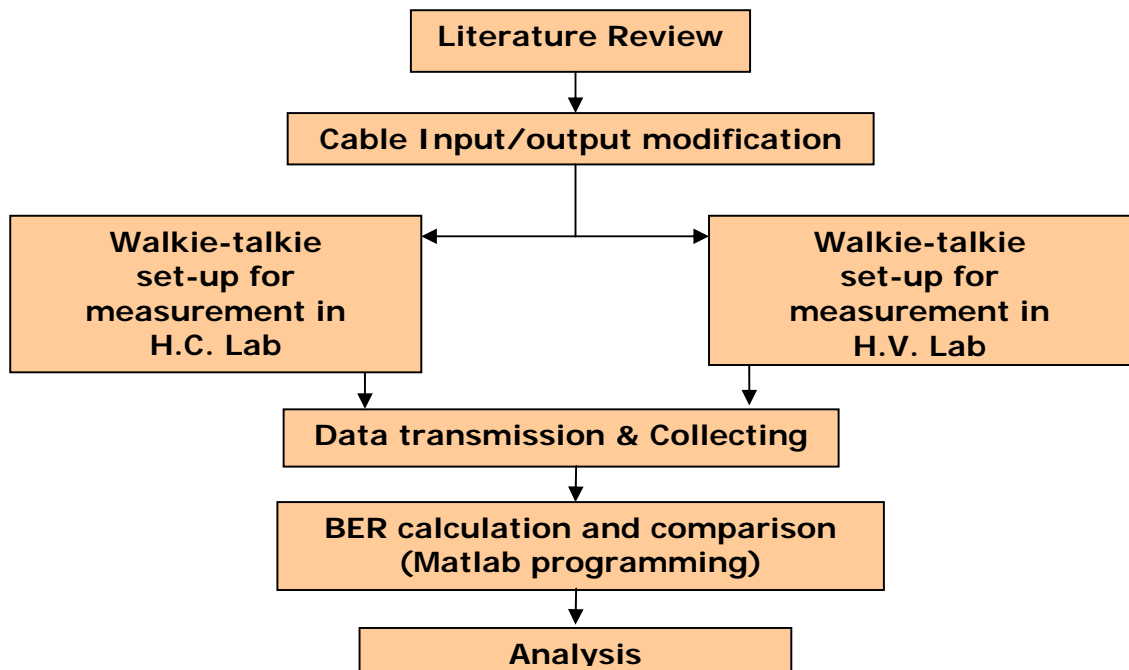
1. To ascertain and prove whether lightning can contribute to BER in digital communication.
2. To determine which of the lightning electromagnetic field components cause maximum data corruption and deterioration.
3. To model the lightning interaction model with the data transmission using electromagnetic theory.

1.3 Research Scopes

In order to ensure an accurate and reliable transmitted data, persistency and consistency of data detector or receiver need to be clearly studied. The measurement of bit error rate (BER) is a step towards the development of a reliable and error-free data receiver. This research is to study the interaction between the electromagnetic field produced by the lightning and the electromagnet field existed when transmitting signal to the other end. Therefore, it is important to know which type of lightning is extremely hazardous to the signal or data during the transmission. For that reason, it is required to develop an electromagnetic modelling regarding the lightning interaction with the data transmission. Besides, bit error rate (BER) during lightning strike activities for private mobile radio will be measured. Two experiments has been conducted which involved the use of a high voltage low current equipment and a high current low voltage equipment. The first experiment, using impulse voltage generator (IVG) and the second experiment using recloser test set. A pair of walkie-talkie at frequency from 925.130MHz to 935.430MHz Motorola T5420 was used in this experiment.

1.4 Research Methodology

1.4.1 Flow chart



1.4.2 Methodology

From the chart above, it can be described in detail as below:

1. Literature study related to this topic. The topic is divided into two diverse topics which are bit error rate and lightning electromagnetic field fundamentals.

2. A sequence of binary data is generated using Matlab software and been transform into frequency shift keying (fsk) signal before it can be transmitted into the air interface.
3. A pair of walkie-talkie will be used in order to transmit and receive data; therefore a pair of cable is going to be utilized in the experiment. The cable is modified from the walkie-talkie handsfree that it possible to be connected into the input and output port of the computer.
4. Experimental Setup - Two types of experiment will be conducted that are using two main different equipments:
 - a. High voltage equipment – Impulse Voltage Generator (IVG) in High Voltage Laboratory
 - b. High current equipment – Recloser Test Set (RTS) RCL19 in High Current Laboratory
5. Signal is ready to be transmitted. Layout of both experiments can be referred in chapter 5. The position of radios must be in line of sight (LOS) in order to ensure there is no obstacle along the transmission path. Data is collected at the end of the transmission path, receiver.
6. Several data starting with no lightning condition, high voltage values and high current values. Received data or signal than be stored in the base station (computer) and analysis will be done at the end of measurement.
7. All signals in the base station will actuate several simulation processes in order to identify bit error rate. Bit error of the received signal will be calculated using Matlab software. Other analysis will also be executed to determine the effect of lightning strike to the transmitted signal through air interface.