

2.0 OBJECTIVES AND METHODOLOGY

2.1 Objective

Eighteen Telecommunication towers in Sri Lanka have been investigated during 3 and half year period from 2008 May to Dec 2011. As per the experience throughout the period the telecom operator has faced lot of damages to RBS equipment, neighborhoods and lot of complaints received from neighborhoods and Government authorities. At the moment two court cases are being heard with regards to the lightning cases. The objective of this research is to identify the lightning incidents case by case or as a general and propose suitable precautions and strengthen the proposal using geographical arrangement of tower surround, Earth resistance values measured, tower grounding arrangement, power line lightning protection system and the commercial power distribution to the area by measurements, technical theories and simulation software.

2.2 Methodology

In this investigation



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Check the nature of Tower and the surrounding

- Geographical nature of the tower location

- Lightning density of the area

- Soil condition of the tower location

- Tower height above the sea level

- Nature of other towers located in same area

- Check the neighborhood residence around the tower

Check the nature of damages reported

- Direct lightning strikes

- In Direct lightning strikes

- Power line surges

- Earth potential rise

Check the nature of the lightning protection system

Air termination system
Power line surge protection system
Grounding system arrangement

Taken quantitative measurements of
Earth resistance system

Check the severity of ground potential rise on the power line voltage rises with
Earth resistance
Secondary diverters

Data collection has done through the site surveys to check the nature of the tower locations, lightning protection system and the damages.

The data for the geographical nature of the tower locations and height from the sea level taken by using Google contour maps as shown in Figure 2.1.



Figure 2.1: Contour map

(Source: Author)

The grounding measurements has been done using Digital Earth Tester – KYORITSU 4105A. The Fall-of-Potential method (sometimes called the Three-Terminal method)

is the most common way to measure earth electrode system resistance, but it requires special procedures when used to measure large electrode systems. This is the method to accurately measure earth resistance in telecommunication towers, where we can find large no of electrodes, wires, plates etc. The arrangement for the earth resistance measurement by using KYORITSU 4105A is shown in Figure 2.2.

This method eliminates many tedious measurements but may not yield good accuracy unless the current and potential probes are outside the electrical influence of the electrode system. But main problem in telecommunication tower measurements is the lack of space to place current and potential electrode outside the electrical influence of the electrode system.

The ground resistance was taken for every possible direction from each tower leg twice (in same direction, with two different potential and current electrode locations where ever possible), where a conductor intended for grounding, enters the earth. The standard distance for the earth to potential electrode has taken as 61.8 % of the earth to current electrode distance [11].

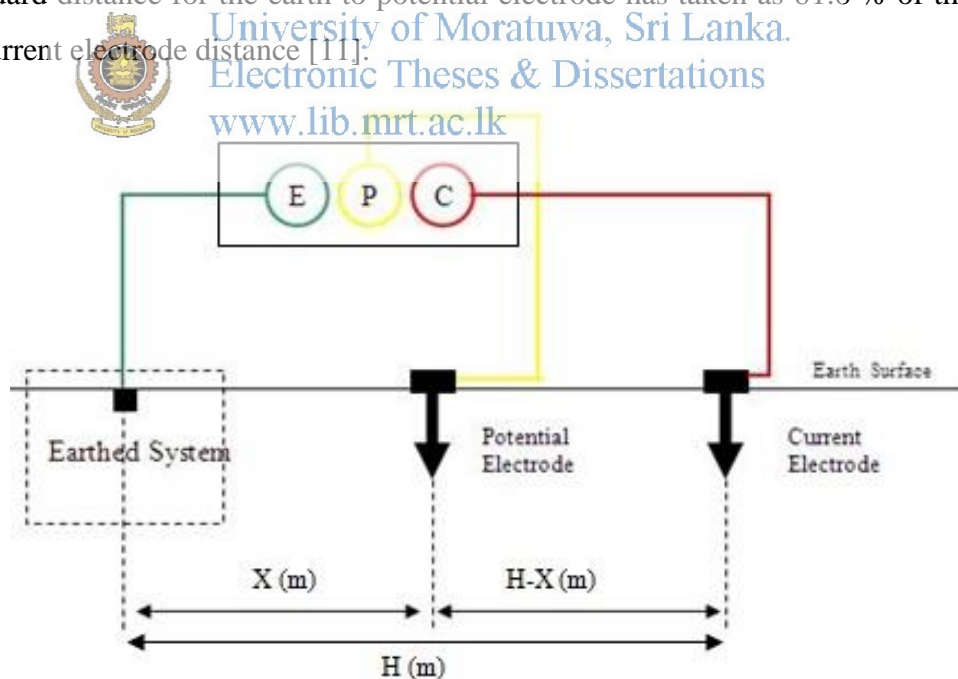


Figure 2.2: Earth resistance measurement arrangement using KYORITSU 4105A.

(Source: Author)

The potential and effects of power line damages are quantified and simulated using PSCAD Ver. 4.20 Professional. Models for surge reduction filter, Power line arrangement and surge wave developed using PSCAD.