UNIVERSITI TEKNOLOGI MARA

MINIATURE STUB-LOADED MONOPOLE ANTENNA AT 800 MHz FOR FSR SENSOR

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ABSTRACT

In this research, it presents a design simulation and analysis of miniature stub-loaded omni-directional monopole antenna at 800 MHz for Forward Scattering Radar (FSR) sensor. A miniature technique and a robust genetic algorithm optimizer have been introduced to minimize the total length of the antenna compares to a standard monopole antenna at same frequency. A target to achieve desired design goals or performance of the miniature stub-loaded monopole antenna has been set in this project. The desired design goals arise from comparing to commercial off-the-shelf (COTS) antenna that is currently exists in the market at the same frequency. A significant difference in performance between one and two stub-loaded monopole antenna have been observed. The proposed design also shows a 12% smaller in length compared to a standard monopole antenna. A better performance also has been observed but with gain less than 2 dBi. No significant change in gain performance was observed when parameter sweeps analysis was applied to each segments two stub-loaded monopole antenna structure. By simulating on a larger ground plane, an improvement of almost 27% smaller in total length has been achieved with gain improved to 5.24 dBi by the proposed design.

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CHAPTER I

INTRODUCTION

1.0 Overview

Past few decades have shown a vast grow of wireless sensor network applications. It is an active research area in telecommunication and computer science with numerous workshops and conference arrange every each year. This wireless sensor network can be found in environmental and earth monitoring such as air quality and pollution monitoring, forest fire detection, landslide detection and natural disaster prevention. In industrial application, the wireless sensor network is used for machine health monitoring, data logging, industrial sense and control application and also waste water monitoring. The wireless sensor network also being used in agricultural, passive localization and control application and also smart home monitoring to safe guard our house and family. In defense applications, the wireless sensor network application is widely used especially border security, situational awareness, force and perimeter protection. Example of forward scattering radar (FSR) sensor is shown on Fig 1.0.
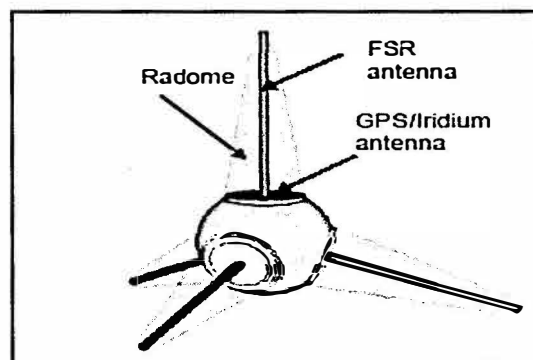

Fig 1.0 - FSR Sensor Prototype [2].

Wireless network of FSR sensors is designed for situational awareness in ground operation [1, 2]. These sensors will communicate with the receiver and the whole network will create an invisible net that can detect and recognize ground target such as personnel and vehicles when entering the network coverage area with