

**SIMULATION AND EVALUATION OF  
CIRCULAR AND RECTANGULAR  
MICROSTRIP PATCH ANTENNA**

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## ABSTRACT

This paper discovers the performance evaluation of circular and rectangular patch microstrip antennas. The study concentrates on frequency of 2.4GHz in reference to the Nokia mobile phone characteristics. The antennas has been designed using three different materials; Perfect Electric Conductor (PEC) for ground plane, Flame Retardant 4 (FR-4) used as substrate and Copper for the patch. It has been simulated using Computer Simulation Technology (CST) Microwave Studio in CST2009 software. Return loss, input impedance, VSWR and farfield values obtained from simulations of both antennas were compared. The best performance for return loss  $S_{11}$ , input impedance  $Z_{11}$ , VSWR and farfield out of both antenna types were obtained through simulations. Circular patch antenna gave better results in comparison to rectangular patch antenna. The development of circular patch antenna is increasing and the future prospect of this antenna could expand rapidly with the adjustments of the sizes of patch and substrate permittivity selected.

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# CHAPTER 1

## INTRODUCTION

In this chapter, the background of the project is briefly discussed to provide an overview of the overall project. General information related to the design is also included, to give an insight of radio frequency design.

### 1.1 Background of Project

A microstrip patch antenna consists of a very thin metallic patch placed a small fraction of a wavelength above a conducting ground-plane. The patch and ground-plane are separated by a dielectric. The patch conductor is normally copper and can be in the form of any shape, but simple geometries generally are used, and this simplifies the analysis and performance prediction. The patches are usually photoetched on the dielectric substrate. The substrate is usually non-magnetic. The relative permittivity of the substrate is normally in the region between 1 and 4, which enhances the fringing fields that account for radiation, but higher values may be used in special circumstances.

Due to its simple geometry, the halfwave rectangular and circular patches are the most commonly used microstrip antennas. It is characterized by its length,  $L$ , width,  $w$ , radius,  $r$  and thickness  $h$ .

### 1.2 Objectives

The goals of this thesis are to design, simulate, analyze and evaluate the circular and rectangular antenna patches at frequency of 2.4G Hz. Furthermore, it is to compare the simulation results between the different antenna patches.

### 1.3 Problem Identification

Microstrip patch antenna is well-known for its low-profile, conformable to planar and non-planar surfaces, simple and inexpensive to fabricate. Nonetheless, it has narrow bandwidth, low efficiency, low gain, extraneous radiation from feeds and junctions, poor end fire radiator except