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L-Shaped Microstrip Patch Antenna with C-Band Characteristic

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Abstract

Microstrip patch antennas have a rapid growth and importance in the field of wireless communication due to ease of fabrication and versatility of possible geometries. It's still being the part of development, to design a suitable antenna of high bandwidth with compact geometry for commercial applications. The purpose of this paper is to design a compact size high bandwidth microstrip patch antenna with promising efficiency for wireless application.

A L-shaped microstrip patch antenna, operating in C-band (4-8 GHz) is proposed. The results are simulated and depicted with the help of full wave simulator HFSS.

Keywords:Microstrip Antenna, return loss, VSWR, Bandwidth..

Introduction

The basic configuration of a microstrip antenna is a metallic patch printed on thin, grounded dielectric substrate [1]. Originally, the element was fed with either a coaxial line through the bottom of the substrate, or by a coplanar microstripline. Allows feed network and other circuitry to be fabricated on the same substrate as the antenna element, as in the corporate fed microstrip array shown in microstrip antenna radiates a relatively broad beam broadside to the plane of the substrate. Thus the microstrip antenna has a very low profile, and can be fabricated using printed circuit (photolithographic) techniques. This implies the antenna can be made conformable, and potentially at low cost. Other advantage includes easy fabrication into linear and planar arrays, and easy integration into microwave integrated circuits.

Disadvantage of the original microstrip antenna configurations include narrow bandwidth,spurious feed radiation, poor polarization purity, limited power capacity, and tolerance problems. Much of the development work in microstrip antenna has thus gone into trying to overcome these problems, in order to satisfy increasingly stringent systems requirements.

This effort has involved the development of novel microstrip antenna configurations, and the development of accurate and versatile analytical models for the understanding of inherent limitations of microstrip antennas, as well as for their design and optimization [1].

Microstrip patch antenna is promising to be good candidate for wireless technologies.

Due to its advantages such as low weight, low profile planar configuration , low fabrication cost and compatibility to integrate with microwave ICs technologies., the microstrip patch antenna is very well suited for applications such as wireless communication system, cellular phones, pagers, radar systems and satellite communication systems[1,2]. The result of the development of a compact wideband radiator for use in wireless communication applications is presented in this section. Bandwidth is specified as the frequency difference in which return loss is less than -21.126dB.

Antenna Design

The proposed antenna consists of a dielectric substrate FR4 epoxy with dielectric constant 4.4.

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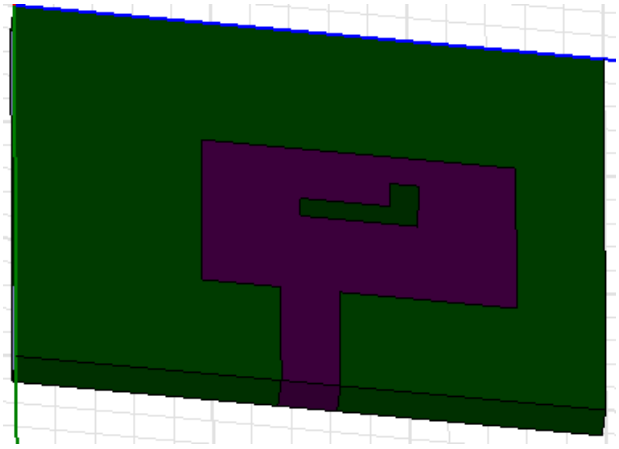

Figure 1: L-shape microstrip Patch Antenna

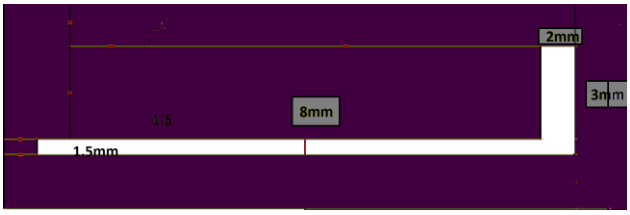

figure 2: Geometry of proposed patch.

Design Specifications

Substrate material	FR4 epoxy (4.4)
Thickness between ground and fed patch	1.6mm
Length of rectangular patch	8mm
Width of rectangular patch	3mm
Width of slot thickness	1.5mm,2mm
VSWR	1.5298
Feed location (Y , Z)	(30mm, 13.5mm)
Return loss	-21.126 dB

Table.1. Specifications of L-Shape microstrip patch antenna

I. SIMULATION RESULTS

The results are simulated and verified on HFSS.

The simulated results show a very fine bandwidth for selected frequency band (C band: 4-8 GHz)

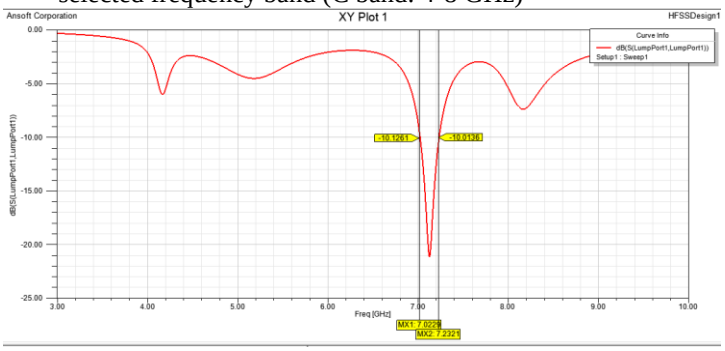

Figure.2. Return loss is -21.126291dB at resonance frequency 7.127GHz.

Frequency (MHz)	VSWR
7099	2.062
7106	1.829
7113	1.650
7127	1.529
7134	1.604
7155	2.224
7176	3.115

Frequency (MHz)	Minimum Return loss
7099	-18.549
7106	-19.582
7113	-20.468
7127	-21.126
7134	-20.714
7148	-18.943
7155	-17.901

Table.2. Return loss and VSWR value at different frequency about resonant frequency

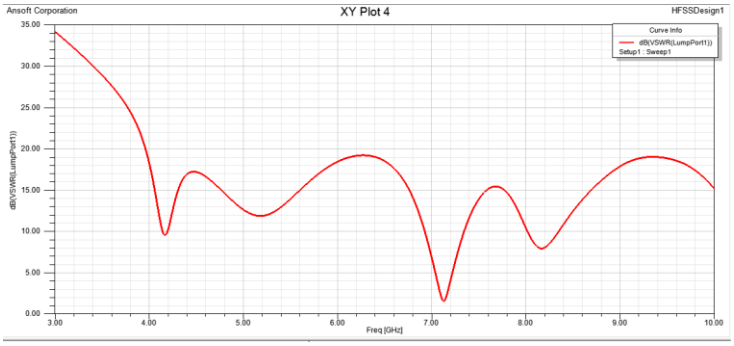

Figure.3. VSWR of microstrip antenna is 1.5298 at resonant frequency 7.127GHz

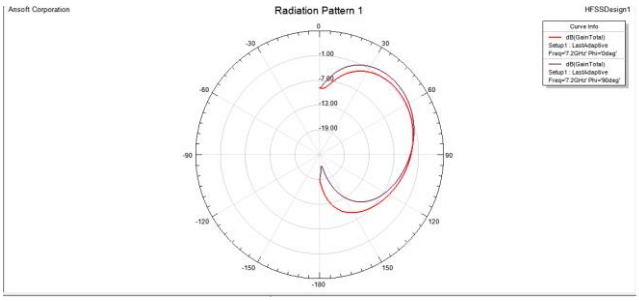

Figure 4.Radiation pattern plot.

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A Microstrip patch antenna radiates normal to its patch surface.

The elevation pattern for Φ=0 and Φ=90 degrees would be important.

Here the 2D radiation pattern of the antenna at the designed frequency for Φ=0 and Φ=90 degrees [3].

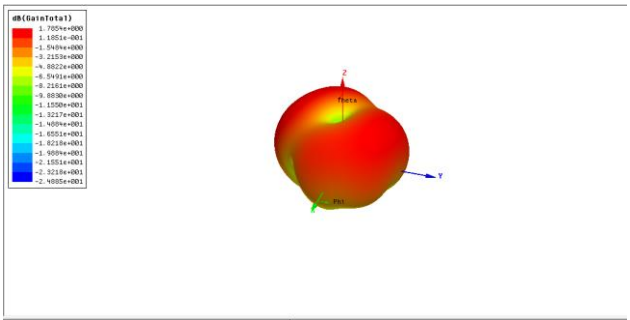

Figure.5.3-D radiation pattern view

Conclusion

The simulation results of proposed L- Shape microstrip patch antenna have provided a useful design for an antenna operating at frequency of 7127 MHz. At the time, the antenna is thin and compact with the use of low dielectric constant substrate material.

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