International Journal on Emerging Technologies **5**(1): 131-134(2014)

ISSN No. (Online) : 2249-3255

Design of H Shaped Slotted Rectangular Microstrip Patch Antenna for C-band Wireless Communication

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(Received 05 March, 2014 Accepted 24 May, 2014)

ABSTRACT: **The explosive growth in the demand for wireless communication and information transfer using handsets and personal communication (PCS) devices has created the need for major advancements of antenna design as a fundamental part of any wireless systems. This paper presents the designs of two antenna for C-band communication at 4-8Ghz.One of the antenna is Rectangular Microstrip Patch Antenna(RMPA) and Second one is H-Shaped Slotted Rectangular Microstrip Patch Antenna (HSSRMPA). Basic property of both the antenna like simulated design, Returnloss, directivity, Radiation Pattern and bandwidth are discussed. This work shows that Return Loss of Antenna in Slotted Patch is decreased and Total Efficiency of slotted RMPA is increased. Slit-Slot Rectangular Microstrip Patch Antenna also reduces the size of antenna which is always a basic need of Patch antenna design system.**

Keywords: Rectangular Microstrip Patch Antenna (RMPA), H-Shaped Slotted Rectangular Microstrip Patch Antenna (HSSRMPA), return loss, directivity.

I. INTRODUCTION

Most of the rapid advances in microstrip antennas took place in the 1980s.Firstly; these were driven by defence and space applications. Then this technology is growing rapidly in the commercial sector. Specifications for defence and space applications antennas typically emphasize maximum performance with little constraint on cost. On the other hand, commercial applications demand low cost components, often at the expense of reduced electrical performance. Thus, microstrip antennas for commercial systems require low-cost materials, simple and inexpensive fabrication techniques. Antennas are the essential communication link for aircrafts and ships. Antennas for cellular phones and all types of wireless devices link us to everyone and everything. With mankind's activities expanding into space the need for antennas will grow to an unprecedented degree. Antennas will provide the vital links to and from everything out there [1].

A compact, lightweight, low-cost antenna for GSM/PCS/UMTS cellular telephone system applications is designed. Measured and simulated results of different parameters are presented. A prototype of this antenna was fabricated; the good agreement with the simulation provides validation of the design procedure [2].

In the area of remote sensing, the Synthetic Aperture Radar (SAR) technique has been used to determine ground soil grades, vegetation type, ocean wave speed and direction, etc., and has significant commercial impact on the general population in terms of agriculture and weather prediction. For example, a C-band interferometric SAR1341, recently developed by NASA/JpL, has successfully measured the characteristics of the ocean waves, which contributed to the prediction of weatherThe purpose of this paper is to design a Different microstrip patch antenna with Defect Ground Structure . It is also used to remove the harmonics [4].

This work presents RMPA for mobile communication and two design of Patch antenna has been Compared and observed [5], all paper shows the effects of SAR distribution with mobile communication and gives the ideal value of SAR distribution with not effecting the human health from mobile communication [6-9].

II. ANTENNA DESIGNS

Here designing of antenna is done using CST-Microwave Studio simulation software and the parameters are displayed by the figures. Designing of the patch has to be taken into consideration, the space available on the fuselage where the antenna has to be installed. The antenna physical sizes are an important factor in the design process [9] owing to the miniaturization of the modern mobile terminals. Any technique to miniaturize the size of the MPA has received much attention. Designing requires selection of suitable dielectric constant and substrate height of an antenna as these are basics to design an antenna; these are chosen according to the design frequency our designed frequency band is 8Ghz(4-8GHz).Here the chosen material is FR4 lossy .

1. Substrate Height =1.6mm
2. Dielectric Constant = 4.3
3. Loss Tangent =.02

Designing of two antennas RMPA and HSSRMPA(H-Shaped Slotted RMPA) is done and their respective results are shown by Graph or figure. The Length and Width of Microstrip Patch Antenna has been calculated by the formula [10].

All other parameter like cut width, cut depth, continue straight path length and width are calculated by iteration on simulation software and dimensions are stored for best simulation results. Antenna Designed by simulation Software, its return loss graph, Directivity Graph, Electric field Distribution, Radiation pattern is shown for two antenna design RMPA and HSSRMPA by CST-MWS simulation Software [11].

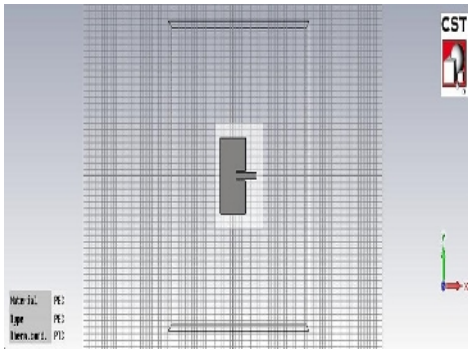

Fig. 1. Simple RMPA for C-band Communication.

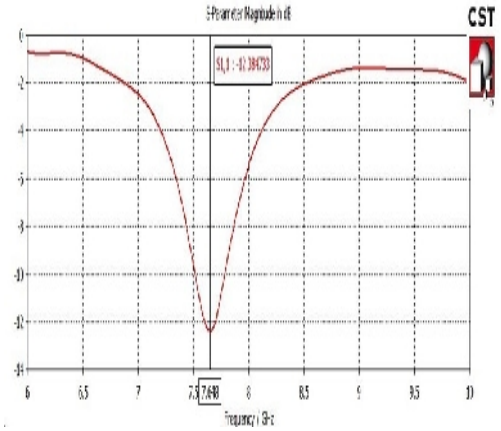

Fig. 2. Simulated Return Loss vs. Frequency of Simple RMPA is 12.384dB.

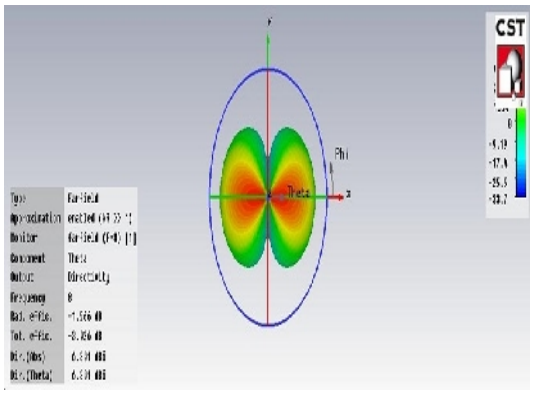

Fig. 3. Radiation Pattern of Simple RMPA is 6.301dBi.

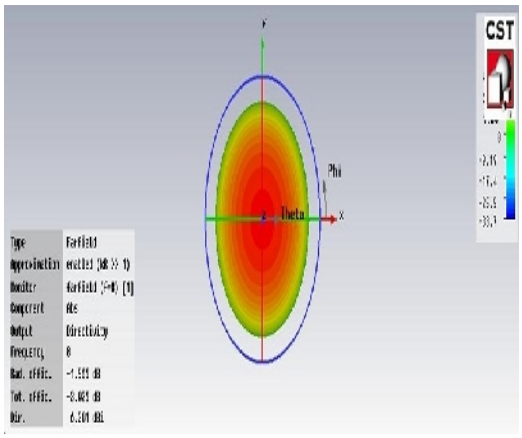

Fig. 4. Total Efficiency of Simple RMPA is 3.026Db.

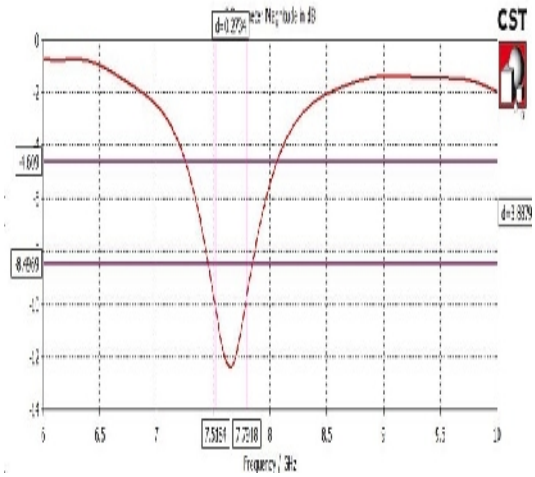

Fig. 5. Bandwidth of Simple RMPA 270.34MHz.

Table 1: Communication.Parameter of Simple Rmpa for C-band.

Frequency (8GHz)	Return loss (dB)	Directivity (dBi)	Bandwidth(MHz)	Total Efficiency (dB)
7.648	12.384	6.301	270.34	3.026

As it is very clear from the Fig. 1, Fig. 2, Fig. 3, Fig. 4, Fig. 5 and Table I that, antenna is working on 7.648GHz and giving return loss 12.384dB, Directivity 6.301dbi, bandwidth of 270.34MHz which is very good enough for working of an antenna. Now H Shaped slot has been introduced into the simple microstrip patch antenna in the lower and upper part of simple RMPA as shown in Fig. 6. Slot is lowering the losses continuously, which is very important aspect to design this antenna system.

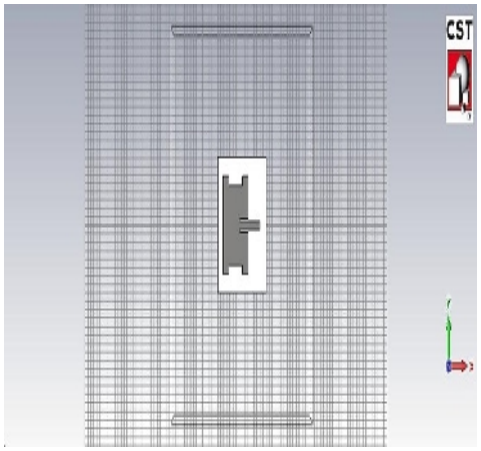

Fig. 6. H Shaped-Slotted RMPA for Improve responses in Radar Communication.

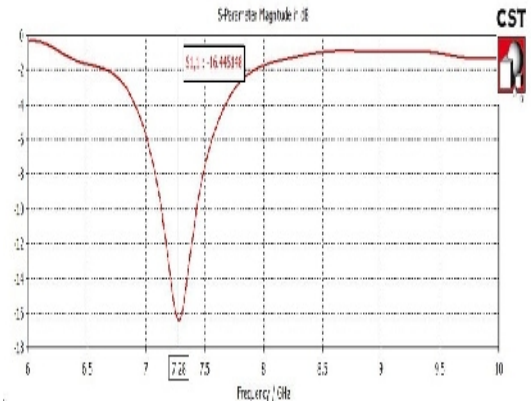

Fig. 7. Simulated Return-loss of H-Shaped Slotted RMPA is 16.445dB at 7.28GHz.

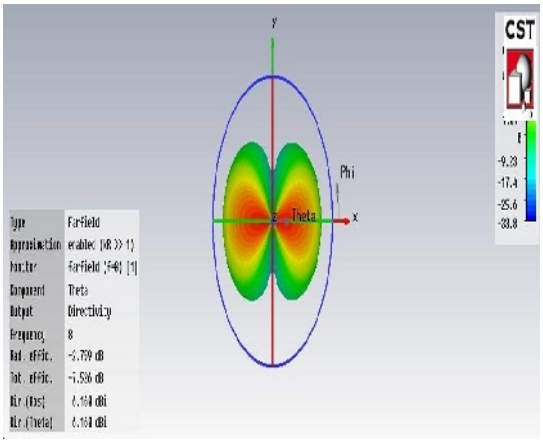

Fig. 8. Directivity of H-Shaped Slotted RMPA is 6.168dBi.

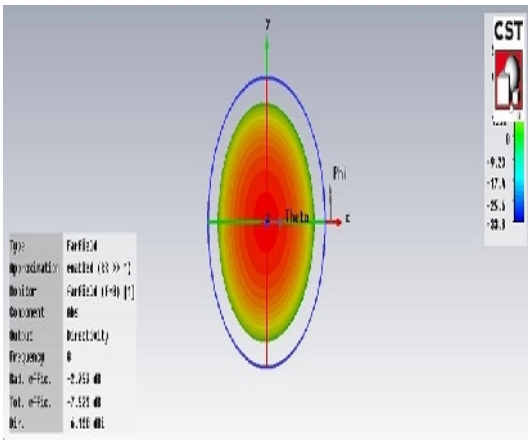

Fig. 9. Total efficiency of H Shaped Slotted RMPA is 7.526Db.

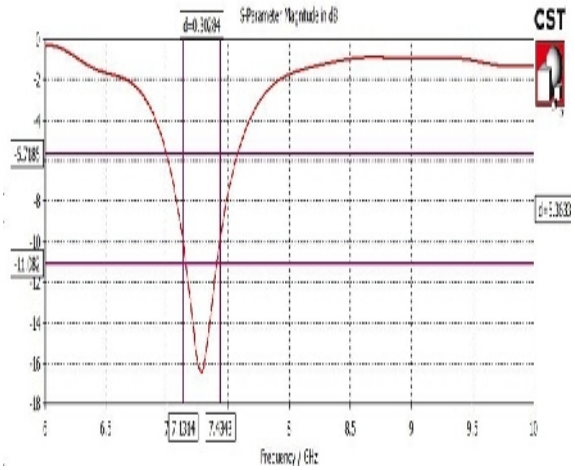

Fig. 10. Bandwidth of Slit-Slotted RMPA 300.284MHz.

Table 2. Parameter of H Shaped -Slot Rmpa for C-band Communication.

Frequency(8GHz)	Returnloss(dB)	Directivity(dBi)	Bandwidth(MHz)	Total Efficiency(dB)
7.28	16.445	6.168	300.284	2.258

III. RESULT

Comparative study of both the antenna is done as shown, in Fig. 6 and Fig. 1 the size is reduced. From Fig. 2 and Fig. 7 the Return-loss of antenna is decreased about 32.79%.Antenna directivity is almost same clear from Fig. 3 and Fig. 8.Antenna total efficiency is increased from 3.026dB to 7.526 dB as shown in figure 4 and 9, bandwidth is increased from 270.34MHz to 300.284MHz as shown in Fig. 5 and Fig. 10 and all these results can be justified from Table 1 and 2.

IV. CONCLUSION

This paper concludes from above figures and tables that the H-Shaped slotted structure of Antenna has improved characteristics like efficiency, bandwidth and return loss. And due to these improved parameters maximum output is achieved.

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