Design of Very Low Return Loss, Rectangular Microstrip Patch Antenna for Cellular and Mobile Communication

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***Abstract*—Cellular Mobile Communication is need of world. In this era life cannot imagine without cell phone. In this paper it has been designed a two antenna for GSM communication at 1800MHz. First antenna is Rectangular Microstrip Patch Antenna(RMPA), and second one is Slit Slotted Rectangular Microstrip Patch Antenna(SSRMPA). Basic property of both the antenna like simulated design, Returnloss, Electric field Distribution, Radiation Pattern are discussed. Finally it is shown that Return Loss of Antenna in Slit-Slot Patch is decreased about 92.52%, and antenna Directivity is also increased a bit, and Total Efficiency of slit-slot RMPA is increased about 12.48% Slit-Slot Rectangular Microstrip Patch Antenna also Reduces the size of antenna which is always a basic need of cell phone antenna design system. Slit Slotted RMPA also improving the result by lowering the return loss at 92.52% almost all losses removed.**

***Index Terms*—Rectangular Microstrip Patch Antenna (RMPA), Slit-Slot Rectangular Microstrip Patch Antenna (SSRMPA), returnloss, directivity**

I Introduction

Microstrip Patch Antennas are always famous due to their easy fabrication, small size, and low cost, light weight in cellular mobile phone industry. Mobile phone system need a small size antenna which can easily be fit inside the body of cellular phone, allthough attempt is always continuing increasing the gain, bandwidth, and directivity of antennas by making it truncated, slotted or even Ground plane of the antennas are modified. It has been designed a truncated RMPA to improve the performance of RMPA for GSM application in this paper. [1], [2], [3], [4], [5]

It has been shown a new design of a compact, lightweight, low-cost, multistandard antenna for GSM/PCS/UMTS cellular telephone system and Hiprelan applications. .Measured and simulated results of the resonant frequency, return loss, radiation patterns and SAR distribution are presented Simulation analysis was performed using the HFSS software. A prototype of this antenna was fabricated; the good agreement with the simulation provides validation of the design procedure. [6].

It has been designed CMPA with 2slit slot, 3slit-slot, and 6slit-slot and observed results for different designs, and finally it is shown that as slit-slot increases to six slit-slot Return-loss and Bandwidth of CMPA are reduced. The multiband antenna use for wireless communication in different applications. Bandwidth improvement is about 63.3%, 72.10% and 37.5% respectively in two, three and six slit-slotted patch when compared to their basic design bandwidth band. Antenna is changed to multiband by slit-slot Circular Microstrip Patch Antenna (CMPA). [7]

The purpose of this paper is to design a Different microstrip patch antenna with Defect Ground Structure (DGS) for efficient rectenna design. This antenna having the property of high harmonics rejection at unwanted frequencies at 2.0131GHz, and 2.457GHz, 2.565GHz as the designed frequency is 1.3 GHz and return loss is decreased about 43.17%by the DGS structure. It is also used to remove the harmonics and reduce the size of antenna. [8]

II Antenna Designs

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In this section antenna has been designed using a CST-Microwave Studio simulation software and display the parameter by the figures.

First of all there is a need to choose a dielectric constant and substrate height to design an antenna as these are basic to design an antenna, these are choose according to the design frequency our designed frequency is 1800MHz.the chooses material is rogers R03006 lossy

1. Substrate Height =1.6mm
2. Dielectric Constant=6.15
3. Loss Tangent=.02

It has been designed a both antenna RMPA and SSRMPA in this section and show the Results by Graph or figure. The length and width of Microstrip Patch Antenna has been calculated by the formula given in References books [9], and 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 all Graph are Given below for both the antenna design RMPA and SSRMPA by CST-MWS simulation Software [10].

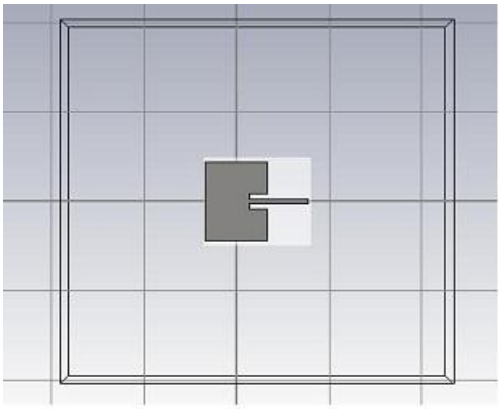

Figure 1. Simple RMPA for GSM Communication

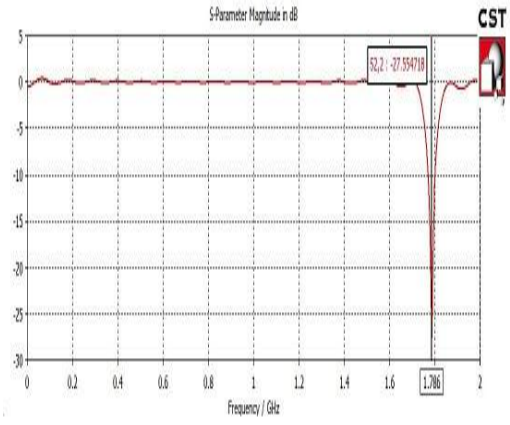

Figure 2. Simulated Return Loss vs. Frequency of Simple RMPA is 27.554dB at 1.786GHz

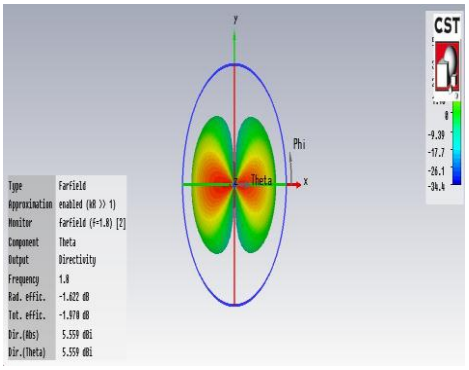

Figure 3. Radiation Pattern of Simple RMPA is 5.559dBi

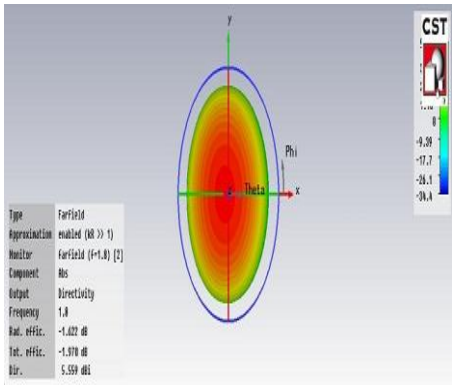

Figure 4. Total Efficiency of Simple RMPA is 1.970dB

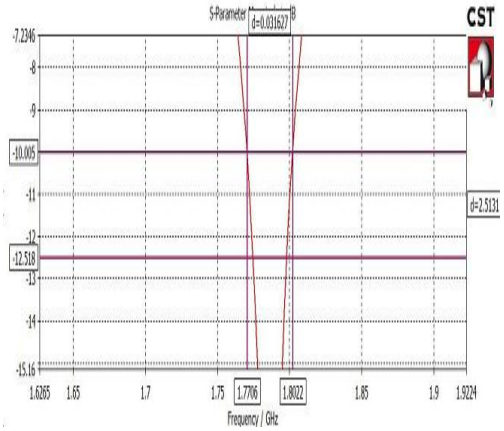

Figure 5. Bandwidth of Simple RMPA 31.627MHz

TABLE I. PARAMETER OF SIMPLE RMPA FOR GSM COMMUNICATION

Frequency(1.8 GHz)	Return loss(dB)	Directivity(dBi)	Bandwidth (MHz)	Total Efficiency(dB)
1.786GHz	27.554	5.559	31.627	1.970

As it is very clear from the Fig. 1, Fig. 2, Fig. 3, Fig. 4, Fig. 5 and Table I that, antenna is working to the 1.786GHz and giving return loss 27.554dB and Directivity is 5.559dbi,and giving bandwidth of 31.627MHz which is very good enough to work properly of working an antenna Now slit-slot has been introduced

into the simple microstrip patch antenna in the direction opposite to the feed line as shown into the Fig. 6 having a dimension of 18mm*2mm.slit is lowering the losses continuously, which is very important aspect to design this antenna system.

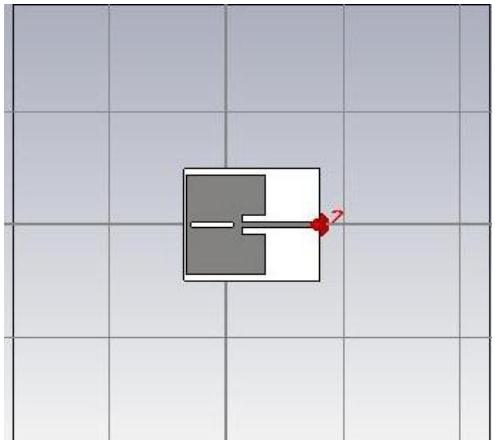

Figure 6. Slit-Slotted RMPA for Improve responses in GSM Communication

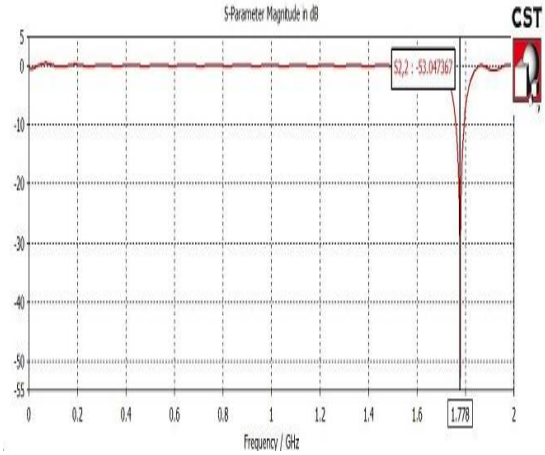

Figure 7. Simulated Return-loss of Slit-Slotted RMPA is 53.04dB at 1.778dBi

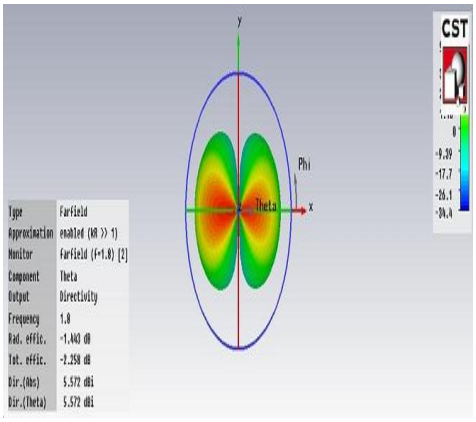

Figure 8. Directivity of Slit-Slot RMPA is 5.572dBi

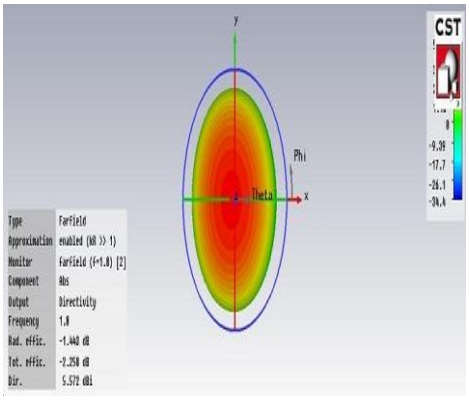

Figure 9. Total efficiency of Slit-Slot RMPA is 2.258dB

TABLE II. PARAMETER OF SLIT-SLOT RMPA FOR GSM COMMUNICATION

Frequency(GHz)	Returnloss (dB)	Directivity(dBi)	Bandwidth(MHz)	Total Efficiency(dB)
1.778	53.04	5.572	33.56	2.258

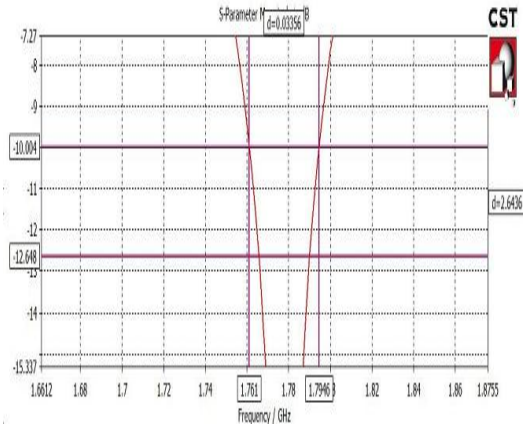

Figure 10. Bandwidth of Slit-Slotted RMPA 33.56MHz

III CONCLUSION

As it easily can be concluded from above figures and tables that Responses of Antenna improves as it slit-slotted. Antenna size is reduces due to the slit-slotted structure. Antenna directivity, bandwidth increases. Antenna Return-loss got highly decreased and maximum output achieved.

IV RESULT

Finally it has been designed an antenna shown in Fig. 6 as compared from Fig. 1 size is reduced. It is very obvious from Fig. 2 and Fig. 7 that Return-loss of antenna get highly decreased about 92.52%.Antenna directivity is increased from 5.559dBi to 5.572dBi clear from Fig. 3 and Fig. 8, antenna total efficiency is also got increased from 1.970dB to 2.258dB as very clear from figure 4 and 9,bandwidth of designed antenna is also got improved from 31.627MHz to 33.56MHz as it is very

clear from Fig. 5 and Fig. 10 all these results can also be justified from Table I and Table II.

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