Literature Survey On TMSA & RMSA For Communication

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ABSTRACT

*Now a day's communication is fast emerging field**.** High speed, low cost, light weight are the certain requirements of such field. Antenna is an device which helps to send &receive signals over a long distance easily .Variety types of antennas are available like wired ,aperture, microstrip , reflector etc. The proposed survey considered microstrip patch antenna for ready reference. Microstrip antenna can be fabricated for various sizes & shapes such as Rectangular, Triangular, Circular, Helical etc. In this proposed survey comparative study on microstrip antenna is done for Triangular & Rectangular patch at a specific freq of 5.5 GHz. This range of freq is mostly suitable for Wi-max applications. Result analysis is done with the help of HFSS simulation software. With the help of vector network analyzer antenna performance parameters can be tested.*

Keyword: - *Array, RMSA &TMSA etc*

1. INTRODUCTION

Microstrip antenna has received increasing attention because of its attractive features such as small size, flexible excitation techniques, wider impedance bandwidth, high temperature tolerance, etc. [1-3].The microstrip antenna is also called as Dielectric Resonator Antenna (DRA). Antenna can be excited by different feeding mechanisms like direct microstrip-line feed, coaxial probe, aperture-coupled by microstrip line or coplanar waveguide, conformal strip feed, etc. Recently, DRA arrays have attracted extensive attention due to high gain in various communication systems.

The communication systems are rapidly switching from "wired to wireless". For communication Wireless technology is a flexible way and an alternative as compared to wired in terms of cost. Antenna is one of the important elements of the wireless communications systems. Thus, antenna design has become one of the most active fields in the communication studies. One of the types of antenna is the Micro strip patch antenna. Antenna radiates Electromagnetic energy uniformly in Omni direction which increases gain and reduces interference is required. Antenna is a transducer designed to transmit or receive electromagnetic waves. Microstrip antennas have several practical applications. Microstrip antenna comprises of a radiating patch in which upper side is of dielectric substrate & lower side is of ground plane [6]

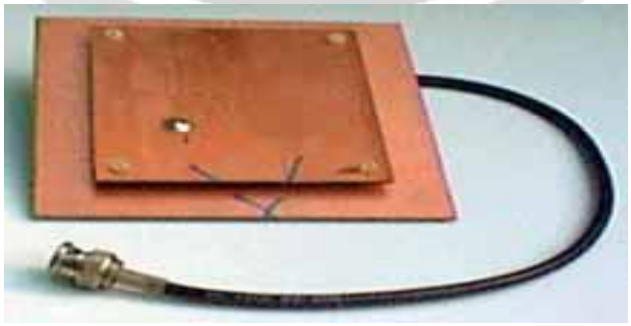


Fig -1: Microstrip Rectangular Patch Antenna Structure

1.1 Scope Of The Project

There are number of antenna designing & simulation software available such as IE3D, HFSS, CAD Feco.etc .By using HFSS software the proposed Triangular & Rectangular patch antenna can be designed. For substrate different materials can be chosen (for proposed work FR4 substrate having dielectric constant as 4.4 s selected) .They have been widely used for commercial and military applications such as television, broadcast radio, mobile systems, GPS, radio-frequency identification (RFID), multiple-input multiple-output (MIMO) systems, vehicle collision avoidance system, satellite communications, surveillance systems, direction founding, radar systems, remote sensing, biological imaging, missile guidance, radar and so on .As the gain of the Rectangular microstrip antenna is more as compared to Triangular antenna, But the Bandwidth can be enhanced by use of Equi-lateral Triangular microstrip antenna. Also adding more array elements gain can be improved easily.

2. DESIGN FLOW

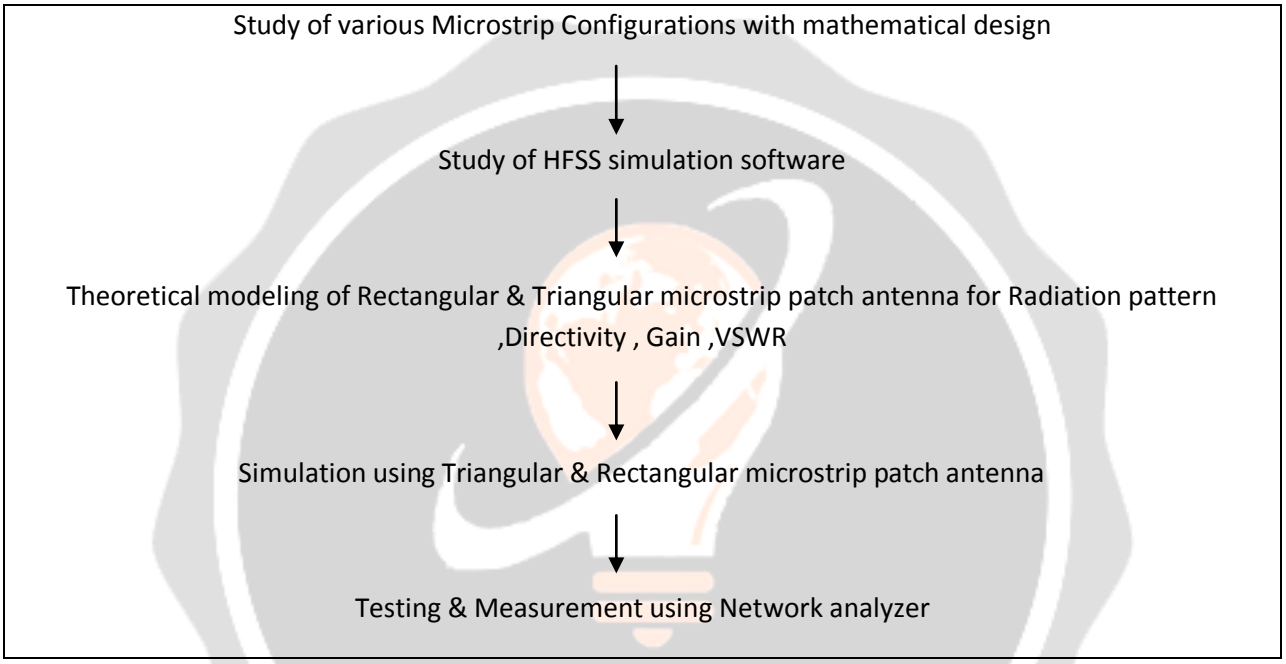


Fig -2: Design Flowgraph of RMSA & TMSA

2.1 Design Methodology for Rectangular MSA

a. Mathematical Equations

A. In a dielectric substrate, the effective dielectric constant is calculated by,

$$€reff = \frac{€r+1}{2} + \frac{€r-1}{2}\left(\frac{1+12\,h}{w}\right) 1/2$$

Where,

€r = dielectric constant of the substrate

h =thickness of the substrate

w = width of the patch

B. The real length for the patch can be calculate by

$$L = Leff - 2\Delta L$$

$$\Delta L = \frac{0.412\ h\ (\epsilon reff + 0.3)\ (W/h + 0.264)}{(\epsilon reff - 0.258)\ (W/h + 0.8)}$$

C. Calculate effective length

$$L\ eff = C / 2\ fo \sqrt{\epsilon eff}$$

Where,

f_0= center frequency of the antenna.

D. The width for the patch can be calculate by ,

$$W = C / 2fo\ (\sqrt{(\epsilon r + 1)} / 2)$$

E. For the transmission line, the length is approximately 0.75 λ,

$$\lambda = C / fo \sqrt{\epsilon reff}$$

Where ,

λ = wavelength of the antenna.

2.2 Design Methodology for Triangular MSA

Fundamental Resonant Freq Calculation
fr = 2C/3W √εr

Substatate Caculations for Triangular MSA

Lambda=c/f=54mm ,Where c –velocity of light=3x10^8m/s^2 ,F=5.5Ghz ,Er=4.4

D=lambada/4*sqrt(er)=6.7mm

Or gnd plane should be Lambda/2

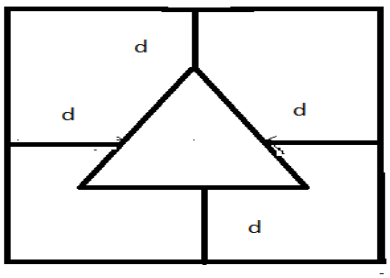


Fig -3: Design geometry of TMSA

3. PATCH GEOMETRY

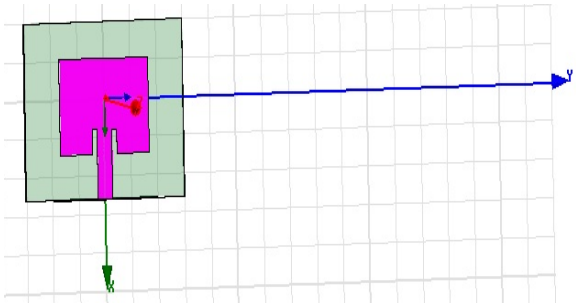


Fig -4: Single patch RMSA (Simulated)

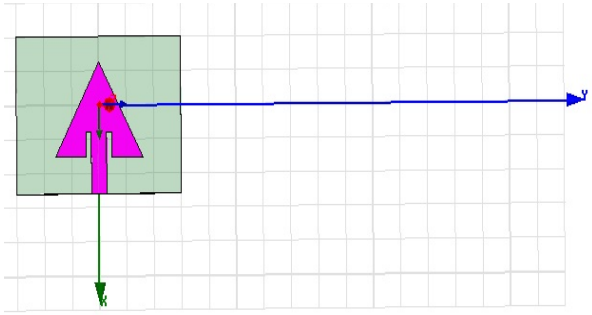


Fig -5: Single patch TMSA (Simulated)

4. SIMULATION RESULTS

1. Directivity

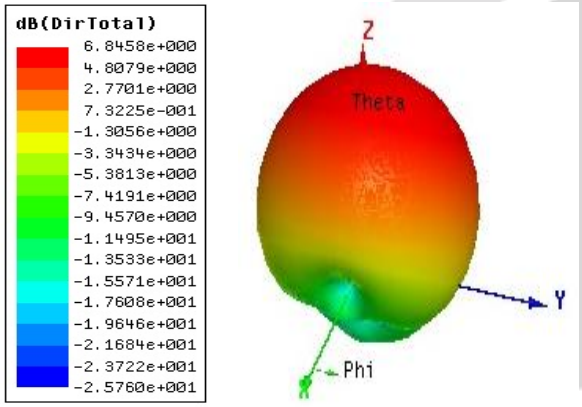


Fig -6: Directivity for Single patch RMSA (Simulated)

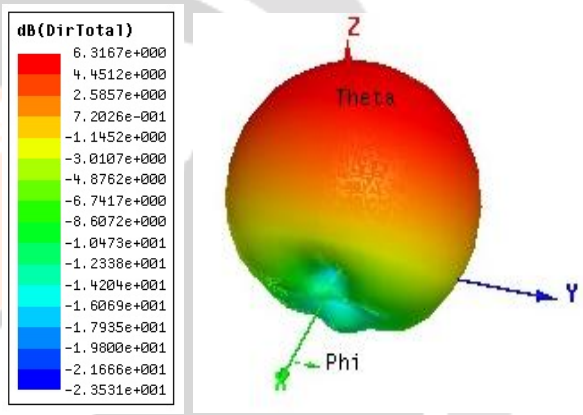
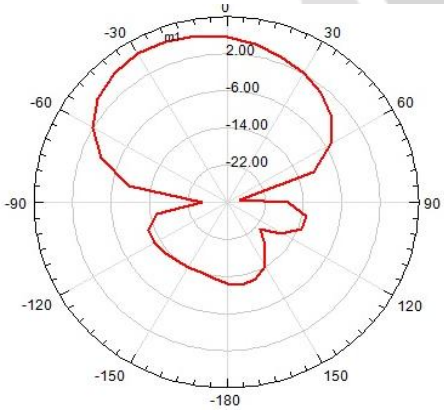


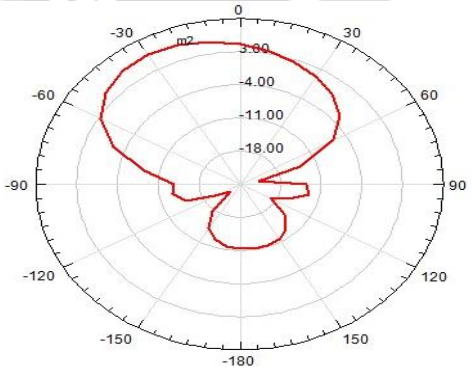
Fig -7: Directivity for Single patch TMSA(Simulated)

2. Radiation Pattern



Name	Theta	Ang	Mag
m1	340.0000	-20.0000	6.8876

Fig -8: Radiation for Single patch RMSA (Simulated)



Name	Theta	Ang	Mag
m2	340.0000	-20.0000	6.3074

Fig -9: Radiation for Single patch TMSA (Simulated)

3. Return Loss.

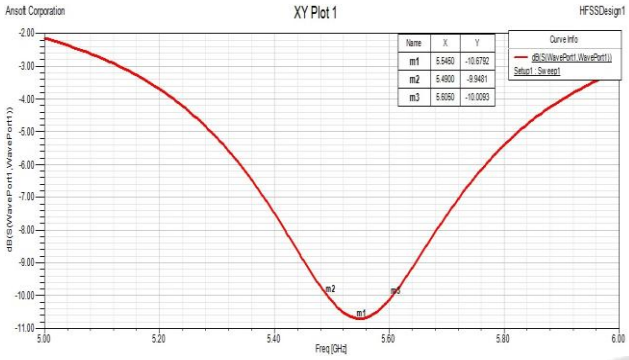


Fig -10: Return loss for Single patch RMSA (Simulated)

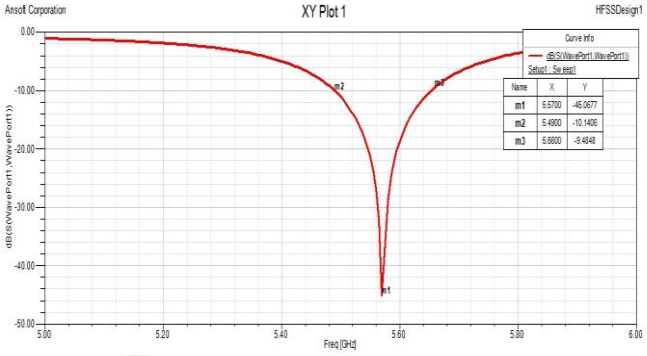


Fig -11: Return loss for Single patch TMSA (Simulated)

4. VSWR

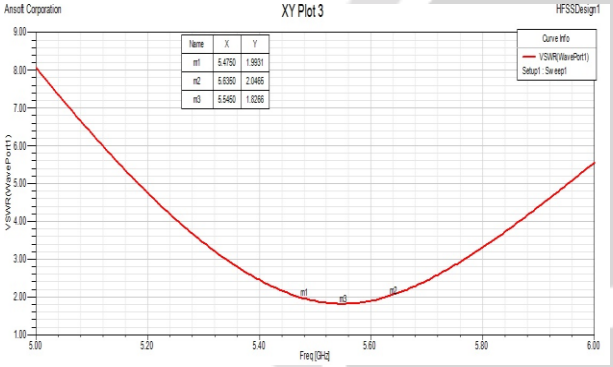


Fig -12: VSWR for Single patch RMSA (Simulated)

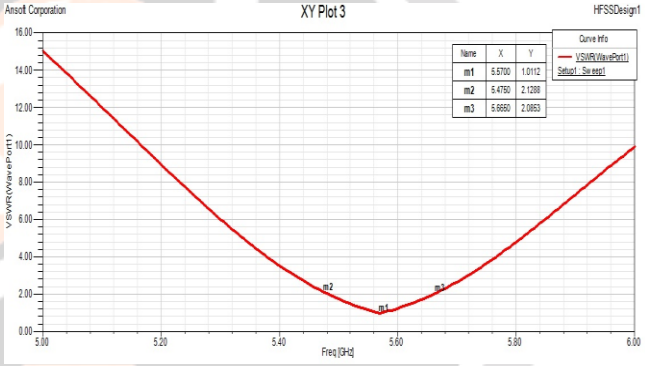


Fig -13: VSWR for Single patch TMSA (Simulated)

5. COMPARISON OF TMSA & RMSA

Table -1

Sr. No.	Type of MSA	Freq (GHz)	Return loss(dB)	VSWR	BW (MHz)	BW (%)	Gain(dB)
1.	Single RMSA	5.57	-11.00	1.81	160	2.90	6.80
2.	Single TMSA	5.57	-45.07	1.01	190	3.45	6.31

Table -1: Comparison of Single RMSA & TMSA (Simulated)

6. CONCLUSION

With the help of HFSS software this study compared single patch RMSA &TMSA at freq. of 5.5 GHz. It is observed that by utilization of Triangular patch not only antenna size but also fabrication cost of antenna can be easily reduced. Rectangular patch provides the gain equals to 6.80 db,while Triangular patch reduces the gain equals to 6.31 db . VSWR value is of 1.81 for RMSA & 1.01 for TMSA. Return loss value is decreased to -45.07 dB from -11.00 dB for TMSA. Also BW is improved from 160 MHz to 190 MHz for TMSA .Only the drawback for Triangular patch is that gain is slightly reduced, which can be overcome by adding Array elements.

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