Communication With Triangular Microstrip Patch Antenna Array

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ABSTRACT

Mainly the requirements of modern communication system are high gain, large bandwidth and less size antennas which gives excellent performance over a wide range of frequency spectrum. The greater the number of elements an array, more is its directivity consequently will have a greater gain. To achieve maximum radiation substrate with low dielectric constant is mostly selected . Thus proposed system uses FR4 as a dielectric substrate(€r=4.4). Desired Triangular patch antenna is designed & simulated by using high frequency simulation software HFSS .Various Antenna parameters like Return Loss, Gain and VSWR etc. are calculated using HFSS. The antenna has been designed to operate on the range of 5.5GHz.Therefore the proposed antenna is highly suitable for communication system.

Keyword: - *Microstrip Patch Antenna, Array, Radiation, Directivity, Gain, T-Junction ,RMSA&TMSA etc*

1. INTRODUCTION

Communication initiated among human by sound through voice. One of human kinds greatest natural resources is the electromagnetic spectrum and the antenna has been instrumental in harnessing these resource. It has been only very recent in human history that the electromagnetic spectrum, through the use of radio.

Now days communication plays an important role in the worldwide society and the communication systems are rapidly switching from "wired to wireless". Wireless technology gives a flexible way for communication and less expensive alternative compared to wired . 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 is a Radiating element which Radiate Electromagnetic Energy uniformly in Omni direction or finally in some systems for point to point communication purpose in which increased gain and reduced wave interference is required. Antenna is a transducer designed to transmit or receive electromagnetic waves. Microstrip antennas have several advantages over conventional microwave antenna and therefore are widely used in many practical applications. It consists of a radiating patch on one side of dielectric substrate ,ground plane on other side.[4]

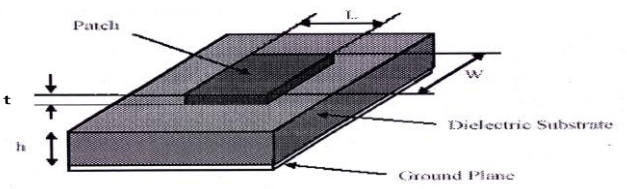


Fig -1: Microstrip Rectangular Patch Antenna Structure

The patch antenna plays a very important role in today's world of wireless communication systems. There is always a large demand for high performance, small size and low cost wireless communication systems. In order to get these

requirements, planar patch antenna is preferred because of their various advantages such as light weight ,low volume, low cost and ease for fabrication. Although the microstrip patch antenna has various disadvantages such as low gain, narrow bandwidth and low efficiency .These disadvantages can be overcome by constructing many patch antennas in array configuration.[2]

1.1 Motivation Of Project

In 1950s the microstrip patch antenna was first introduced.It has been considered as the most common and significant types of antennas due to their significant advantages of light weight, low cost, low profile, planar configuration, high reliability, suitable for arrays, easy fabrication techniques, and easy integration with microwave monolithic integrate circuits (MMICs).Microstrip patch antennas have extensively used in commercial and military applications also. However, the traditional microstrip antennas using Rectangular Patch with T -Junction does not meet the requirements of various wireless applications because antenna has only few percent of impedance bandwidth and radiation pattern with omni direction.So the proposed system introduces better modification into antennas with the help of triangular shape & insertion of T shape .

1.2 Scope Of The Project

Patch antenna can be designed by using antenna simulation software such as HFSS Software ,Computer Simulation Tool microwave environment software or any other software. 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, global positioning system (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 Traingular antenna But the Bandwidth can be enhanced by use of Triangular Microstrip antenna. By adding more array elements gain can be improved easily.

2. DESIGN FLOW

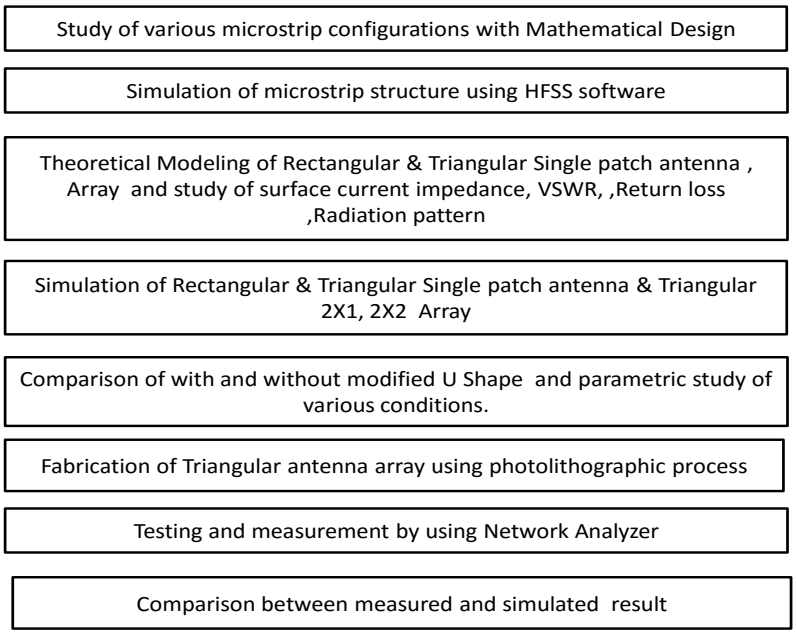


Fig -2: Design Flowgraph of RMSA & TMSA

2.1 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

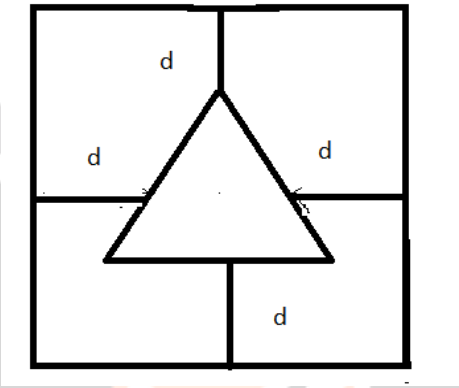


Fig -3: Design geometry of TMSA

3. PATCH GEOMETRY

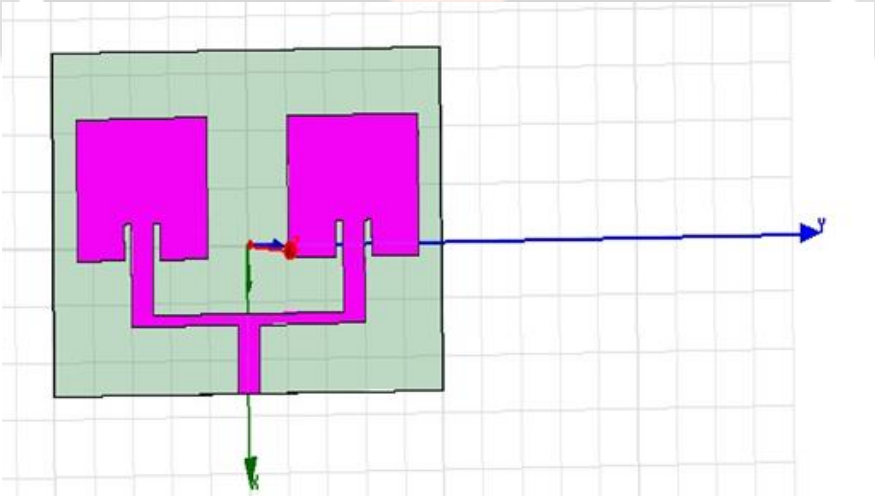


Fig -4: 2X1 RMSA Array (Simulated)

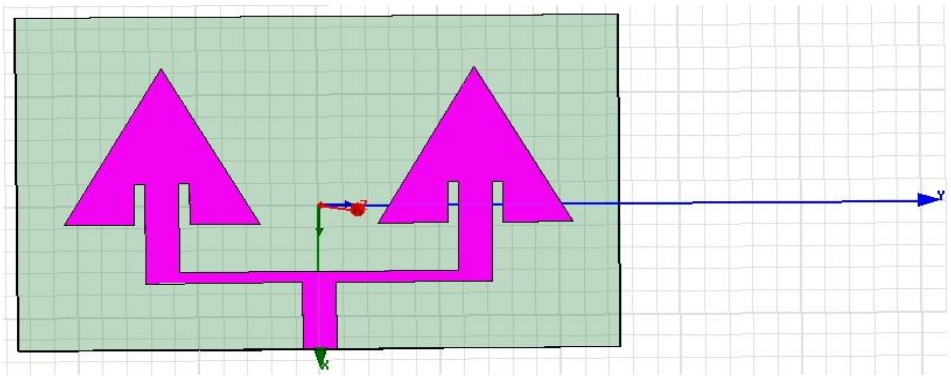
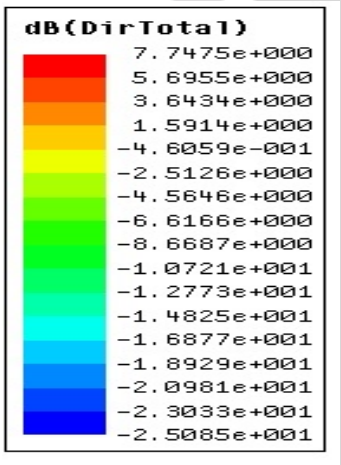


Fig -5: 2X1 TMSA Array (Simulated)

4. SIMULATION RESULTS

1. Directivity



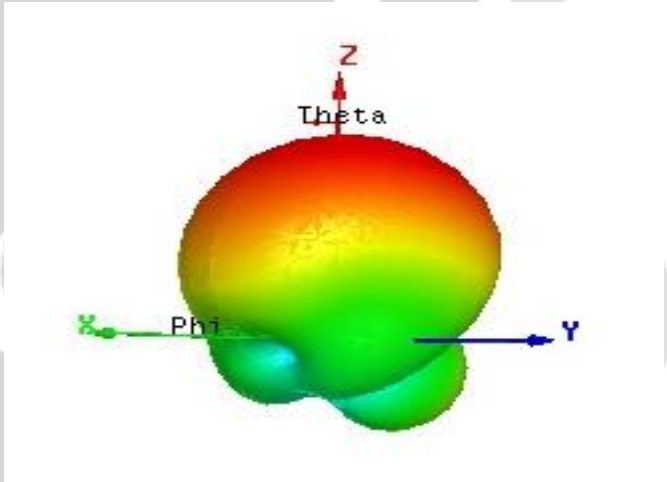


Fig -6: Directivity for 2X1 TMSA Array (Simulated)

2. Radiation Pattern

Name	Theta	Ang	Mag
m1	360.0000	-0.0000	7.3591

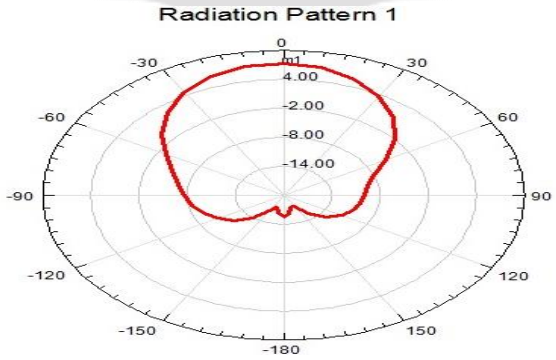


Fig -7: Radiation for 2X1 TMSA Array (Simulated)

3. Return Loss.

Fig -8: Radiation for 2X1 TMSA Array

4. VSWR

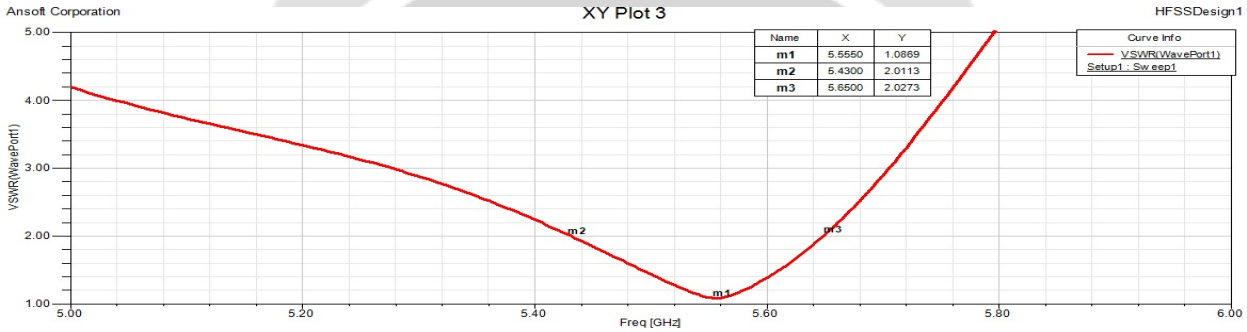


Fig -9: VSWR for 2X1 TMSA Array

5. COMPARISON OF TMSA & RMSA

Table -1

Sr.no.	Type of MSA	Freq (GHz)	Return loss(dB)	VSWR	Bandwidth (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)

Table -2

Sr. no.	Type of MSA	Freq (GHz)	Return loss(dB)	VSWR	Gain (dB)
1.	2x1Rectangular Patch Array	5.5	-45.42	1.08	4.62
2.	2x1 Triangular Patch Array	5.5	-27.61	1.12	7.80

Table -2: Comparison of 2x1 RMSA & TMSA (Simulated)

6. CONCLUSION

This study compared Rectangular & Triangular Microstrip antenna array of 2X1 elements at freq. of 5.5 Ghz using HFSS software. The size of array reduced because of utilization of Triangular patch . So fabrication cost of antenna will be less. By insertion of Triangular patch gain will be improved for 2X1 TMSA to 7.8 db & VSWR value is of 1.12 . Earlier the gain value was of 4.62db & VSWR - 1.08 for 2X1 RMSA .

REFERENCES

[1] Diego R. Minervino ,Joao B. Dolvim Dantas,"*Arrays of Rectangular Patch Microstrip Antennas For Aerospace Applications*", IEEE,2013

[2] Sai HoYeung,Alejandro Garcia-Lamparez,Tapan Kumar Sarkar&Magdalena Salazar Palma,*"Commumnications*", IEEE Transactions on antennas & Propagation , Vol .62 ,No. 5, May2014

[3] K.Shrikar, L. Sai vinodh, B.Ramesh, K.P.Vinay, "*Design of 1X2 Triangular Shaped Microstrip Patch Antenna Array for WLAN Applications with DGS Structures* ", International Journal of Innovative Research in Computer and Communication Engineering, Vol. 3, Issue 3, March 2015

[4] Anamika Srivastava,Priya Upadhyay, Richa Sharma , "*Design And Implementation Of Series Micro Strip Patch Antenna Array For Wireless Communication* ", Int.JComputer Technology & Applications,Vol 3 (5), 1769-1774,Sept 2012.

[5] B.Sandhya Reddy ,V. Senthil Kumar, V. V.Srinivasan, "Design & Development Of a Light Weight Microstrip Patch Antenna Array For Solar Power Satellite application ",IEEE, 2012