A Survey Report on Rectangular Micro-Strip Patch Antenna and Techniques to Improvise Bandwidth Efficiency

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Abstract— In this paper, rectangular ring microstrip patch antenna is simulated in a way to make it applicable for ultra wideband (UWB wireless). The introduction of solo patch anttena make this device unique. And thus it is easy to fabricate. Altogether if we talk about the ease of approach, then it stands far from the traditional method. The introduction of solo patch antenna is with the purpose of removing misalignment and to eradicate the matching issues. The use of rectangular strips proved to be a better contributor thus to achieve the impedance bandwidth enhancement. And here we met the purpose of designing to enhance the impedance bandwidth. The design was accomplished keeping in mind that the return Centre frequency should not exceed -10 db. It demonstrates superior radiation characteristics and reasonable gain in the whole operating band. In the designing of proposed antenna, micro-strip feeding is used for power supply purpose. CST Microwave studio suit 10 is used for the simulation purpose of the proposed antenna, which is a 3D electromagnetic field tool for simulation of electromagnetic field in all frequency bands. After simulation of proposed antenna, enhancement in impedance bandwidth of 20.60%, frequency range of 1.8533 GHz, radiation efficiency of 92.51%, and gain of 3.765dbi are obtained.

Keywords: Ultra Wideband (UWB), Ring Micro-strip Patch Antenna, Impedance Bandwidth, Radiation

I. INTRODUCTION

Ultimately we came across on a point after having ample of studies on resonators. We found that dielectric resonators are good at energy storage and work as a radiator as well. Some of its properties like small size, high radiation efficiency, and simple structure and also additional features like wideband width and low conductor loss makes it suitable for dielectric resonator antenna (DRA).

For our purpose to design antenna to improve better impedance bandwidth can be meet using different resonator shape. This is an experiment with different resonator that let us know how the shape can be helpful for better impedance bandwidth.

For excitation of antennae we can use different feeding method. Such as micro-strip feeding, disk feeding, slot line feeding, coaxial feeding etc. We have used coaxial feeding as this provides better matching .As per the basic need of this paper is to stimulate rectangular ring micro strip patch antenna. The main purpose of this stimulation is to enhance the impedance bandwidth, to minimize return loss, to increase the input impedance and more over to generate a radiation pattern in which there is minimum back radiation for UWB wireless application. Rectangular patch antenna is used to enxtend the impedance bandwidth at its maximum extent. Micro strip feeding method is used for feeding purpose. The advantage of using this design gives maximum gain relative to isotropic antenna. As per the researchers it is estimated that the rectangular patch antenna has better impedance bandwidth relatively normal patch antenna. For the high performance of antenna, thick dielectric substrate with low dielectric constant has given more importance. As this provide large bandwidth s, high radiation power and better efficiency. Along with also reduce conductor loss and Q factor. Bandwidth enhancement is main concern while designing antenna. Enhancement of bandwidth can be achieve by working on different parameter such as by varying probe height, or thickness of dielectric substrate, or by changing of dielectric constant of substrate, etc. Dielectric resonator antenna (DRA) are features with better efficiency, better wider bandwidth and thus comparatively fit for the purpose of this paper. So it is considered better antenna than microstrip patch antenna.

A. Analysis Regarding Antenna Bandwidth

A dual-band antenna can replace two single band antennas work for two frequency bands. The work on wideband stacked DRA was an implication to the design of dual-band DRAs by choosing two DRAs of having different dimensions but they are excited by a single feed. A wide band antenna has no use if it is not operating over a useful application band. This suggests the design of the band independently where the antenna is mediates only on useful bands. Three-band Behavior Antenna found with two cylindrical DRAs erect and arched by annular ring. Operation in dual frequency was achieved by incorporating an additional DRA. In a basic DRA where both DRAs are cylindrical in shape, therefore the amount of structure remains unchanged.

Dual frequency operation can also be achieved by an additional rad engine for the DRA. This theory is implemented where a cylindrical DRA and a ring slot are fed together by a DR slot allowing two complaints on related resonance. If DRA is tweeted it would be beneficial in this context. Also radiating at a particular frequency, this technique specifies where the rectangular slot is. To radiate the DRA at a particular frequency by adjusting its dimensions annular ring monopole antenna is found to resonate in the dual W-LAN bands.

II. MICROSTRIP PATCH ANTENNA

Microstrip patch antenna square measure one among the foremost wide used forms of antennas within the microwave frequency vary, and that they square measure typically utilized in the millimeter-wave frequency vary still [1], [2], [3]. Patch antennas contains a bronze patch of metal that's on high of a grounded material substrate of thickness h, with relative permittivity and porosity and .The bronze patch could also be of varied shapes rectangular, square, triangular etc. The bronze patch basically creates a resonant cavity, wherever the patch is that the high of the cavity, the bottom plane is that the bottom of the cavity, and also the edges of the patch kind the edges of the cavity. The edges of the patch act roughly as a cavity with good electrical conductor on the highest and also the bottom surfaces, and an ideal “magnetic conductor” on the edges. Once the antenna is get excited at a

particular resonance frequency, a robust field of force generates on the surface of the patch that's basically z directed and independent of the z coordinate. The patch cavity modes square measure delineated by a double index (m, n). By considering rectangular patch as shown in an exceedingly fig.1. (b), having cavity mode (m, n), the electrical field become:

$$E_Z(x,y) = A_{mn} \cos\left(\frac{m\pi x}{L}\right)\cos\left(\frac{n\pi y}{W}\right)$$

Where L is the patch length and W is the patch width.

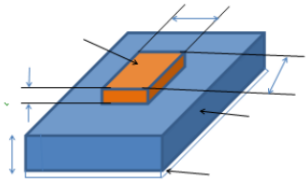

Fig. 1:

III. Variety of Feed

Brief descriptions of every of the common feed techniques ar bestowed within the following section.

A. Concentrical Feed

In this configuration the inner conductor of a concentrical connection extends through the substrate and is connected to the diverging patch whereas the outer conductor is connected to the bottom plane. The placement of the feed pin is chosen to produce the simplest resistivity match. This methodology is straightforward to fabricate however it suffers from small information measure and also the spurious radiation. Thicker substrates will increase surface wave and generate a high cross polarized field [4].

B. Edge Feed

In this configuration a conducting strip is connected on to the sting of the microstrip patch. This type of feed arrangement has the advantage of being pic print processed alongside the patch itself therefore reducing producing value.

C. Aperture Coupled

In this configuration a ground plane is sandwiched between 2 layers of the substrate material, separating the diverging patch. Coupling between the patch and also the feed line is formed through a slot or AN aperture within the ground plane that is typically cantered below the patch [5].Aperture coupled parts are incontestable with bandwidths up to 10-15% with one layer [3], [6], [7] and up to 30-50% with a stacked patch configuration [8]-[10].

D. Proximity Coupled

In this configuration the entire antenna consists of a grounded substrate wherever a microstrip feed line is located. Higher than of} this material is another material layer with a microstrip patch graven on its top surface. The power from the feed network is coupled to the patch electromagnetically, therefore making another to the shortcomings of the contacting feeding techniques. In distinction to the direct contact ways, that ar preponderantly inductive, the proximity-coupled patch's coupling mechanism is electrical phenomenon in nature. The distinction in coupling considerably affects the obtained impedance information measure, thus, information measure of a proximity-coupled patch is inherently larger than the direct contact feed patches [11].

IV. Elementary Specification of Microstrip Patch Antenna

There ar variety of parameters need to specify the performance of patch antenna.

A. Polarization

The plane whereby the electrical field varies is believed as a result of the polarization plane. Microstrip antenna basically shows a pair of kinds of polarization, specifically linear and circular.

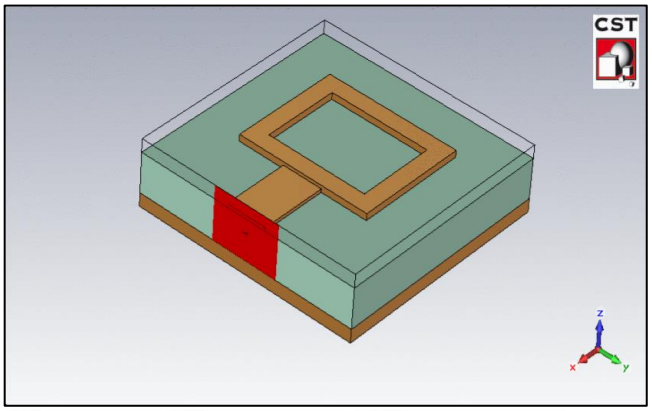

Fig. 2: Final Layout of antenna

V. Review Results

A. S- Parameter

The structure has been simulated and S-Parameter is shown in Fig.4 , it's found that resonant frequency is 9GHz with information measure one.85 gigahertz starting from three to twelve gigahertz (where S11< -10 dB). Most come loss is up to -24.126dB at the resonant frequency. The come loss, S11 (dB) is shown in Fig. 4, wherever we are able to clearly see the most dip is at 9GHz.

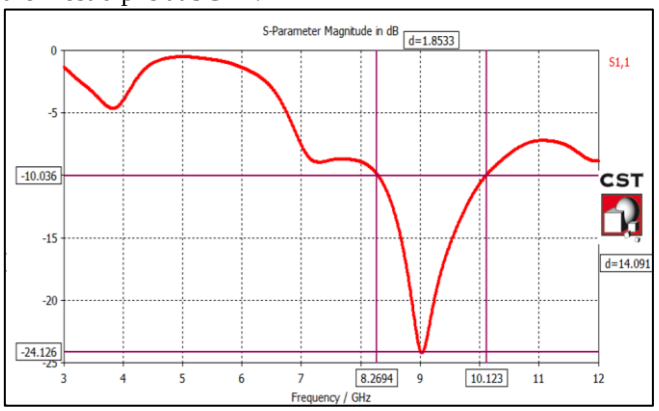

Fig. 3: S-parameter, S11 in dB

B. Far-Field Graph and its 3D Plot

At resonant frequency of nine gigahertz, Far-field graph is shown in Fig. 5, that shows most gain of antenna, is 3.765dBi. A polar plot of Gain letter of the alphabet and Gain alphabetic character, in Fig. (a), Fig. (b) Severally is additionally shown to grasp the variation with amendment in letter of the alphabet

and alphabetic character. For Gain letter of the alphabet plot, its main lobe direction is ninety deg. and its magnitude is three.4dB. For Gain alphabetic character Plot, main lobe direction is zero deg. and its magnitude is -11.4dB.

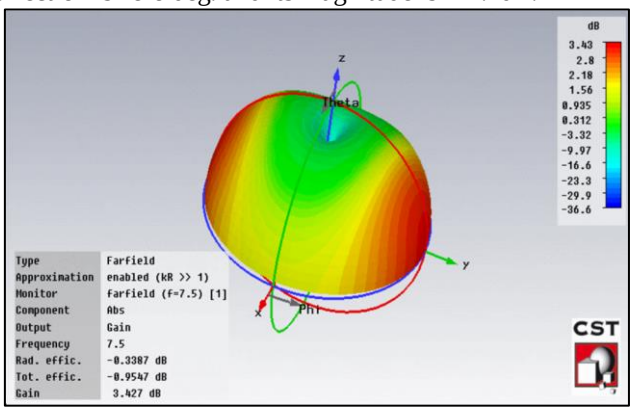

Fig. 4: Gain

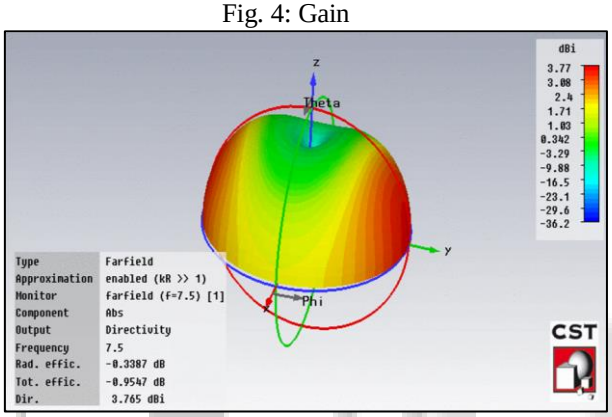

Fig. 5: radial asymmetry

As from the Fig. 4 and Fig. 5 gain and radial asymmetry area unit three.765dBi and three.427dB severally. Total radiation potency will be calculated as:

Reff = (3.427-3.765)

Ref f = -0.338

Reff = 10(-0.338/10)

Reff = (0.9251*100) =92.51%

The on top of calculation shows that the planned antenna is ninety two.51% economical.

C. E-Field and H-Field Distribution Pattern

Field distribution pattern E-field distribution and H-field distribution area unit shown below in Fig. 6 and Fig. 7, these plots area unit found at resonant frequency nine gigahertz.

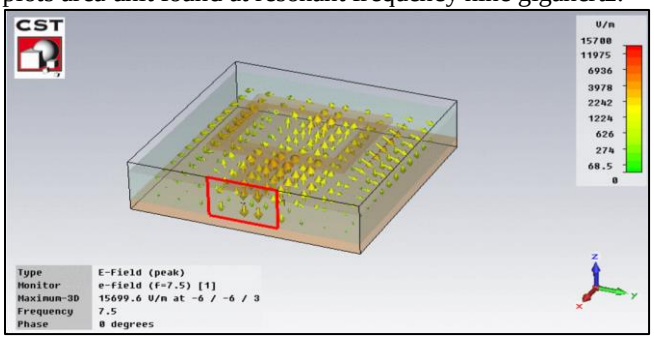

Fig. 6: E-field distribution

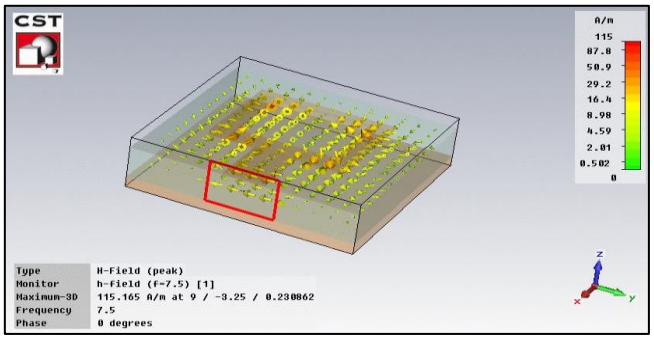

Fig. 7: H-field distributions

VI. VSWR PLOT

Voltage undulation magnitude relation (VSWR) is employed to live to search out however dead antenna is matched with cable. The simulated VSWR of planned antenna is shown in Fig. 8. The matching frequency vary is from three to twelve gigahertz, wherever the VSWR < a pair of and come loss (S11) < -10 dB.

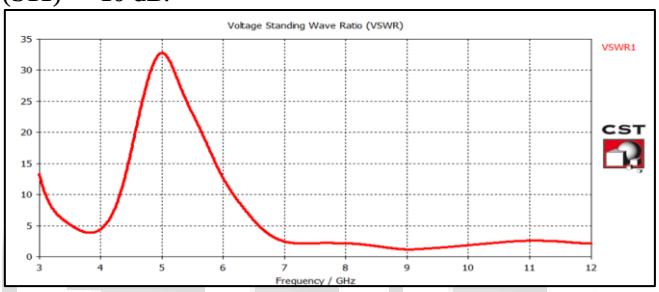

Fig. 8: VSWR for planned antenna

On-Going Project on Microstrip Antenna

1) Study and optimization of Microstrip Antenna System to receive satellite link moving trains
2) Development of a superb heterodyne microwave measuring instrument and chemist probe system for the aim of unaggressive continuous plasma condition observation (Funded by IRPA).
3) Development of 2.3 rate a pair of beam microstrip partd array antennas practice 2 bits section shifter (Funded by UNITEN).
4) The stacked ultra-wide band antenna: Development and application in wireless PAN (Funded by Ministry of Science at a lower place eScience).
5) Development of a 2.4 rate microstripline tutorial trainer set for the aim of transmission high frequency microwave technology tp student, individual and engineer (Funded by IRPA).

VII. CONCLUSION

The analysis motivation of this project is to well observation of microstrip patch antenna. The technological advancement of the microstrip antenna is increasing day by day. Many analysis work goes on microstrip antenna for its higher utilization at intervals the long run. Many techniques unit of measurement used for compensating the gain and information live of the microstrip antenna, all unit of measurement mentioned throughout this paper. The survey shows that the microstrip antenna is one in each of the sunshine weighted, compact size antenna that will be used for vary of application. The plane whereby the electrical field varies is thought

because the polarization plane. Microstrip antenna basically shows 2 forms of polarization, specifically linear and circular.

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