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Design of E Shape Microstrip antenna for Wireless Local Area Network

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Abstract **In satellite communication, there are many forms of micro-strip antennas, the foremost common of that is "Micro-strip patch antenna". Micro-strip patch antenna with slots placed parallel on the oblong patch has developed and bestowed during this paper. Slots on the planned patch are often wont to increase the information measure of antenna. a relentless radiation diagram with improved information measure, for AN operative frequency of four.5GHz are often simply achieved. Configuration of AN antenna is simple to style. totally different parameters like come back loss that is -31.2492 at 4.7399GHz,gain on θ, Ø directions, radiation diagram in 2nd & 3D wherever the 2-D gain is eight.0082 dB, E (9.3322e+002),H (1.3894e+000) field distributions and current distributions (2.2219e+000) are simulated victimization HFSS 13.0 This kind of planned patch are often used for varied applications in S, C – bands**

Keywords — Micro-strip patch antenna, Surface waves, Return loss , Gain , S,C-bands.

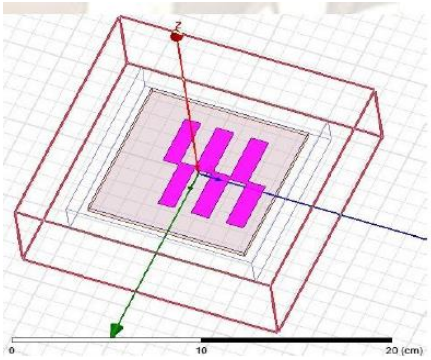
I. INTRODUCTION

Micro-strip patch antennas have drawn the eye of researchers over the past decades. However, the antennas inherent slim information measure and low gain is one among their major drawbacks. this can be one among the issues that researchers round the world are attempting to beat. The patch antenna has been quickly employed in varied fields like house technology, aircrafts, missiles, mobile communication, GPS system, and broadcasting. Patch antennas are lightweight in weight, small size, low cost, simplicity of manufacture and simple integration to circuits. additional vital is these are often created out into varied shapes like rectangular, triangular, circular, square etc. several techniques are urged for achieving the high information measure.[6] These techniques includes: victimization parasitic components either in same or alternative layer, utilization of thick substrates with low stuff constant, and slotted patch. However, high information measure, small size, simplicity, and compatibility to the remainder of the RF front-end are fascinating factors of an antenna. Huge effort has been invested with on planning frequency freelance or terribly wide band antennas. One among the most important drawbacks of such antennas is their comparatively massive size which might probably eliminate their use for mobile wireless applications. Industrial UWB systems need little affordable antennas with Omni directional radiation patterns and huge information measure. it's a widely known incontrovertible fact that slot antennas

Present very appealing physical options, like easy structure, little size and low value, micro-strip slot antennas are very enticing to be employed in rising UWB applications. The slots on the patch can assumed to own a slim breadth. Increasing the breadth will increase the information measure.[3] The down information measure (FBW) for skinny slots are often as low as 3-5%; wide slots will have a FBW on the order of seventy fifth. Employing a rectangular wring the diverging patch will increase the upper-edge frequency, and it's doable to regulate this frequency by adjusting the slot breadth. By cutting a changed slot of appropriate dimensions at the diverging patch a brand new fed configuration are often made.[1]

In this paper, a small size micro-strip slot antenna is planned with dielectric substrate as Rogers RT/duroid 5880(tm) with εr=4.4 and dimensions are base on resonant frequency. varied makes an attempt are created to regulate the size of the patch to boost the parameters like information measure, come back loss, gain on θ, Ø directions, radiation diagram in 2-D and 3D, E and H Field Distributions, Current Distributions victimization HFSS 13.0.[5]

II. DESIGN MODEL



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The planned structure of the antenna is shown in Fig. The antenna is simulated on an Rogers RT/duroid 5880(tm) substrate with a permittivity constant of eight.854 and a porousness of one.2566. The thickness of the substrate is zero.36cm. The realm of the antenna is seventeen.98cm*2cm, that is appropriate for satellite communications transmissions, some Wi-Fi devices, some conductor telephones and a few radiolocation systems. Some numerical results and experimental knowledge are bestowed. Here, oblong patches are often fed with groundwork with slots placed parallely on the patch thought of through ground plane. The convenience of insetting and low radiations is benefits of probe feeding as compared to rectangular micro-strip line feeding. the size of formed patch shown in Fig. (1) are L=2.64cm, W=2cm that are designed at operative frequency four.5 GHz.[3]

ANTENNA PERFORMANCE MEASUREMENTS

To successfully design an antenna a number of measurements must be made to quantify the antenna performance [4]. Below are the various antenna performance measurements.

A. Impedance and Antenna Bandwidth

Antenna impedance is typically measured as return loss or VSWR [4]. The instrumentality accustomed live this parameter may be a Network analyzer. The electrical phenomenon (and the information measure over that the electrical phenomenon is acceptable) should be measured with the antenna put in within the device with all elements put in. The electrical phenomenon menstruation typically needs special fixtures and assemblies to permit access to the antenna terminals. It is not uncommon that the antenna needs some tiny calibration changes once the device is finally totally assembled. At this stage, if the initial design was well done, most embedded antennas are often quite easily tuned with small changes to the PCB layout or sheet metal part, and/or with the addition of passive elements on the antenna or the radio PCB.[2]

B. Gain and Radiation Patterns

Calibrated measurements of associate degree antenna gain and radiation patterns are created in an room. The unreverberant atmosphere eliminates all reflections and permits precise and repeatable measurements to be created. The device beneath take a look at is often revolved 360 degrees in multiple orientations to see the form of the graphical record from many various directions. Reference antennas are used as calibrated gain standards. As with electrical phenomenon measurements, gain and radiation patterns should be measured using a complete product.[2],[3]

C. Efficiency Measurements

As mentioned earlier, efficiency may be the single most important parameter to be measured, especially for an embedded antenna which can have degraded efficiency due to its tight integration with the device. Efficiency may be calculated from the tag gain and graphical record menstruation however this will be a long effort.[2]

III. MICROSTRIP ANTENNA CALCULATION

The rectangular microstrip antennas square measure created of an oblong patch with dimensions width (W) and length (L) over a ground plane with a substrate thickness (h) having stuff constant (εr). There square measure varied substrates that may be used for the planning of microstrip antennas, having their stuff constants sometimes within the vary of two.2 ≤ εr ≤12. those that square measure most fascinating for antenna performance square measure thick substrates whose stuff constant is within the lower finish of the vary as a result of they supply higher efficiency; larger information measure loosely sure fields for radiation into house, however at the expense of larger component size [2].The design of microstrip patch antenna assumes that the specified information includes dielectric constant of substrate (εr), height of substrate (h) and resonant frequency (fr) [3]. After specifying εr, fr and h determine the values of Width (W) and Length (L). [1],[2]

To obtain better radiation efficiency the width is given by equation below:

$$W = \frac{1}{2fr\sqrt{\varepsilon 0 \mu 0}}\sqrt{\frac{2}{\varepsilon r + 1}}$$

$$= \frac{v0}{2fr}\sqrt{\frac{2}{\varepsilon r+1}}$$

As we know that v_0 is free-space velocity of light.

Microstrip antenna having effective dielectric constant from equation below:

$$\epsilon eff = \frac{\epsilon r + 1}{2} + \frac{\epsilon r - 1}{2}\left[1 + 12\frac{h}{W}\right] - \frac{1}{2}$$

Expression of extension of length as in [7] is given by

$$\Delta L = h\frac{(\epsilon reff + 0.3)(\frac{W}{h} + 0.246)}{(\epsilon reff - 0.258)(\frac{W}{h} + 0.8)}$$

Then actual length of patch can be calculated

$$L = \frac{1}{2fr\sqrt{\varepsilon ref}\sqrt{\mu o \varepsilon o}} - 2\Delta L$$

IV. SIMULATION RESULT

IE3D simulator [12] is used for simulation and various results of rectangular microstrip antenna are presented in figure

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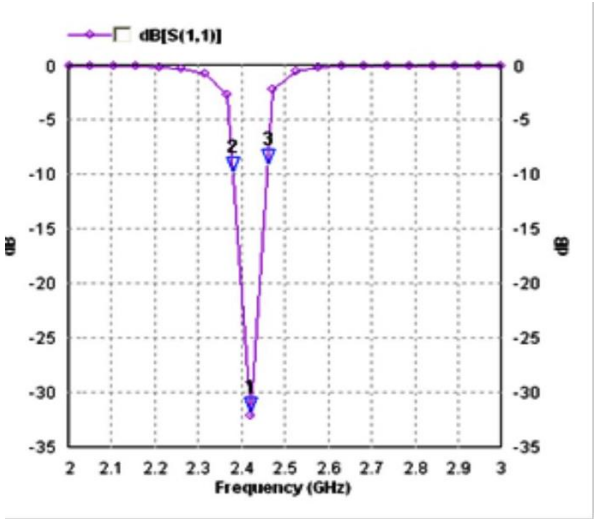

Fig. 1 Return Loss versus Frequency plot

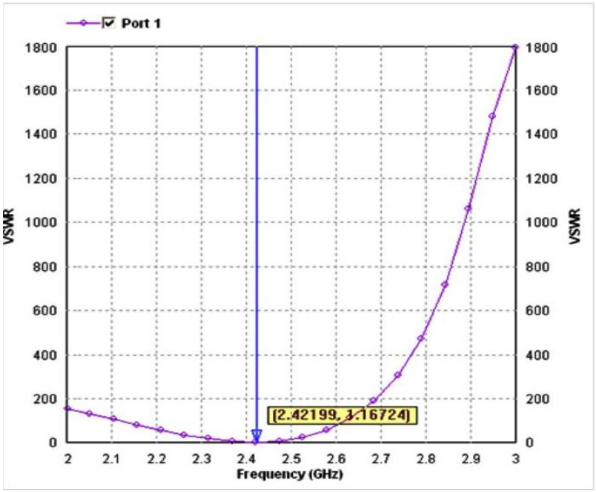

Fig.2 VSWR versus Frequency plot

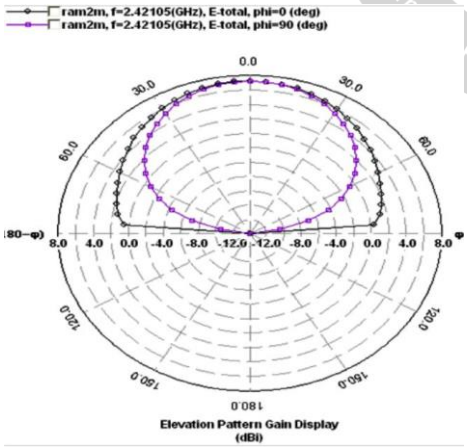

Fig. 3 2D Elevation Pattern Gain Display

Figure one plots the Return Loss results of the antenna. The Return losses are -31.9 at 2.42GHz frequency with lower and better bring to an end frequencies square measure a pair of.38GHz and a pair of.46 GHz severally. Figure a pair of plots the VSWR (Voltage undulation ratio) result. The VSWR versus frequency curve shows its price one.16 at 2.42 GHz & figure three shows 2nd elevation pattern gain show.

V. CONCLUSION

In this paper, a micro-strip patch antenna having slots placed parallely on the oblong patch with wide information measure capability for UWB applications is planned. Microstrip antenna design for WLAN application. The antenna Simulation done in IE3D & simulation result shows that antenna useful for WLAN purpose. During this style, the planned antenna will operate at four.5GHz with return Loss < ten dB and therefore the planned antenna displays a decent Omni-directional graph even at higher frequencies. Smart come back loss and graph characteristics square measure obtained within the band of interest.

REFERENCES

[1] Balanis C.A, "Antenna Theory: Analysis and Design", 3rd Edition (Wiley India), 1997.

[2] R. Garg, P. Bhartia, I. Bahl, and A. Ittipiboon, "Microstrip Antenna Design Handbook", Artech House, 2001.

[3] Jayant G. Joshi, Shyam S. Pattnaik, Swapna Devi, Mohan R. Lohokare, "Bandwidth Enhancement and Size Reduction of Microstrip Patch Antenna by Magnetoinductive Waveguide Loading", Wireless Engineering and Technology, Vol. 2011(2), pp. 37-44.

[4] Antenna Fundamentals Technical Brief, AT & T, 2009.

[5] Anil Kumar Agarwal, Shyam Sunder Pattnaik, S Devi, J G Joshi, "Broadband and high gain microstrip Patch Antenna for WLAN", Indian journal of Radio and Space Physics, Vol. 40, October 2011, pp. 282-286.

[6] C. A. Balanis, "Advanced Engineering Elctromagnetics", John Wiley and Sons, New York, 1989.

[7] E. O. Hammerstad, "Equation for Microstrip Circuit Design", Proc. Fifth European Microwave conference, pp. 268-272, September 1975.

[8] A. H. Ramadan, K. Y. Kabalan, A. El-Hajj, S. Khoury and M. Al-Husseini, "A Reconfigurable U-Koch Microstrip Antenna for Wireless Applications", Journal of Progress In Electromagnetics Research, Vol. 93, pp. 355-367, 2009.

[9] Xu-bao Sun, Mao-yong Cao, Jian-jun Hao, Yin-jing Guo, "A rectangular slot antenna with improved bandwidth", International Journal of Electronics and Communications (AEÜ), 66 (2012) 465– 466.

[10] Yiming Li, "Simulation-based evolutionary method in antenna design optimization", Mathematical and Computer Modelling, Vol 51, pp. 944 – 955, 2010.

[11] I. J. Bahl and P. Bhatia, "Microstrip Antennas". Artech House, Dedham, MA, 1980.

 DOI : 10.18231/2454-9150.2019.0386