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Dual Polarization of Antenna for Wireless Applications

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***Abstract*-**An antenna can be designed with simple inductance and capacitance (LC) circuit. The resonant frequency can be introduce with C-shaped cut to increase the inductance value L without affecting any disturbance for parallel capacitor C. This paper presents a design of an antenna with C shaped metamaterials for polarization. The T-shape is used as feed to C slot cut metamaterials for widen bandwidth. This can be used for short range two way communications which provides low cost profile.

Keywords*—C shaped cuts, LC parallel circuit, and T-shape feed, left handed materials.*

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I. INTRODUCTION

In wireless communications, it is desirable for small antennas to the stations that is handsets and base stations in available space for the purpose of installation is limited. The antenna which has a good choice due to low profile features but naturally the microstrip patch antennas suffer from weakness for narrow bandwidth. The conventional patch antenna may be too large due to the resonant length is about half wave length for practical application in frequency ranges of microwave applications. Several techniques have reported for reducing the patch size of antenna in the literature. The technique is used for design the antenna for effective patch size and low loss of antenna using four symmetrical C-shapes slots on the miniature patch antenna and opposed to theoretical knowledge.

II. Literature Survey

A miniature slot antenna has introduced with its length. Since it has single resonance and obtains a narrow bandwidth by adding a microstrip line directly as feed of 50Ω.

In this paper, single polarized antenna is used with C-shaped structure slots and T-shaped feed are introduced. The aim of our designed patch antenna is to provide a resonance extra for wider bandwidth by using a T-shape microstrip feed and also antenna is designed for dual polarization for the widen bandwidth using four symmetrical C-shape slot. The use of low dielectric constant will provide a wider bandwidth. The quality factor of an resonant antenna is inversely proposal to bandwidth of an antenna is expressed as Qr

$$Qr = (3/16)\ (\varepsilon_r/pc1)\ (L_e/w_e)\ (1/\ (h/\lambda_0))$$

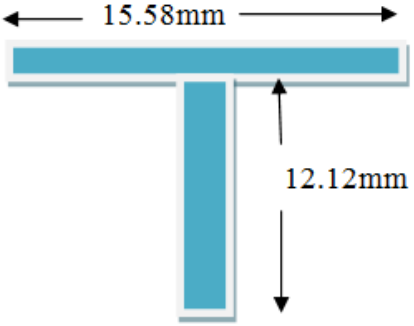

Figure 1: T-shape microstrip feed

The designed antenna is not only has the performance of miniaturizing and also gives the excellent characteristics of wide band using T-stub matching for wider bandwidth as using the thicker the substrate which gives a wide bandwidth.

III. PROPOSED WORK

The antenna is design with square patch with different feed techniques for dual polarization for effective patch size and low profile of an miniature patch antenna for WI-MAX and WLAN applications. The T-feed technique is used to widen the bandwidth and to keep the excellent characteristics with dimension, gain, return loss. The Dual polarization antenna is design and simulated using HFSS software then antenna is fabricated and measured using vector network analyzer (VNA). Using simple LC parallel resonant circuit a dual polarized antenna is modelled.

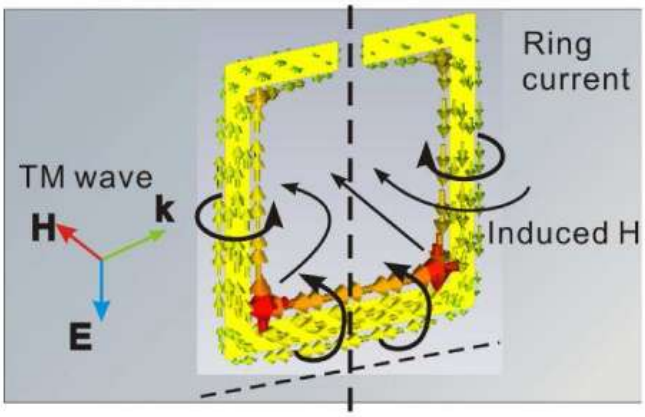

Figure 2:-Square ring slot cut with C-shape patch

Generally the network model is used to represents a dual port patch antenna and from the feeding point the current flows toward the opposite edges of sides. The patch area is remains unchanged even if increase in inductance value of the angular frequency of parallel inductor and capacitance circuit. It means the low of resonance frequency by C-shaped slots, alternatively the patch is miniaturized by scaling if the patch is decrease alternatively the resonance frequency remains unchanged.

By using a two-layer substrate with 4-C shaped slot and T-shaped microstrip feed for wideband dual-polarization for

2.4GHz .the another T-shape feed is added for purpose of matching of an designed antenna. These shows a extra resonance for widen bandwidth and obtain the double frequency response of the designed antenna and the equivalent circuit of 4-C slots T-shape feed and the open stub as show in figure 4.5 .Although there are many drawbacks for single layer substrate of patch antennas for dual polarizations or circular polarization which are involved for compact as active integrated antennas lies DC component between pans toward the patch.

IV. WORK DONE

For the proposed method Design of polarization antenna with feed line for excitations polarization will be achieved by using a several tools to design an antenna commercial. By using the High Frequency Structural simulator (HFSS) the design of transmission lines, packaging and complex RF electronics circuits elements including the filters.

The proposed C-shaped patch with the T-shaped feed line along with desire parameters as shown in table (1) and figure 3.a

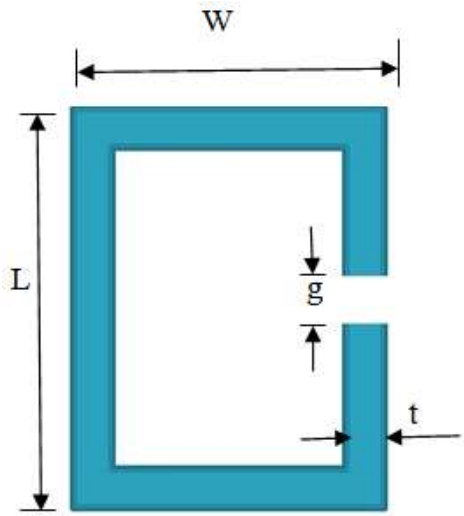

Figure 3: C-shaped patch

Parameter	Dimensions(mm)
Length (L)	48
Width (W)	48
Thickness of C-shaped cut (t)	0.65

Table.1: parameters of C shaped patch

V. DESIGN AND RESULT

Design of polarization antenna is used with feed line by giving 50 Ω feed line at the width of the patch on the operating frequency of 2.4 GHz. So that the vertical polarization is obtain in the output at a frequency response of 3.2 GHz. The antenna is designed with single C-shaped metamaterials as in figure 4.1 and the resulted frequency response of S-parameter and radiation pattern's shown in Figure 4.2 and 4.3

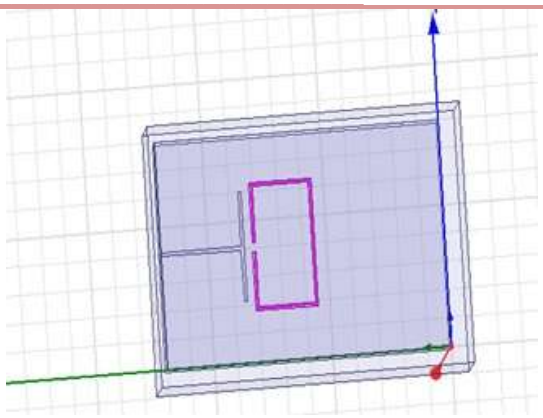

Figure 4.1: Design of antenna with single C-shape patch

The Antenna is designed with two T-shape microstrip feed line by giving 50 Ω feed line with their respective parameters of the patch on the operating frequency of 2.4 GHz. Another second T-shape feed is used for matching stub for the antenna and the design parameters and their dimensions are shown in the table (2).

Parameters	Dimensions(mm)
Length of upper layer substrate	16
Width of upper layer substrate	16
Height of upper layer substrate	1.6
Length of lower layer substrate	48
Width of lower layer substrate	48
Height of lower layer substrate	1.6
Height of radiation box	31
Gap between inner patch and feed	0.7
Gap between two c-cuts	0.65

Table 2:-Design parameters and dimensions of antenna.

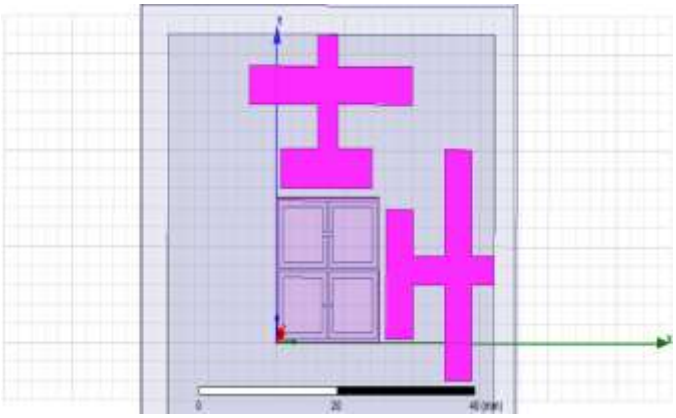

Figure4.2:-Design of antenna with 4C-shaped with two T-shape feeds.

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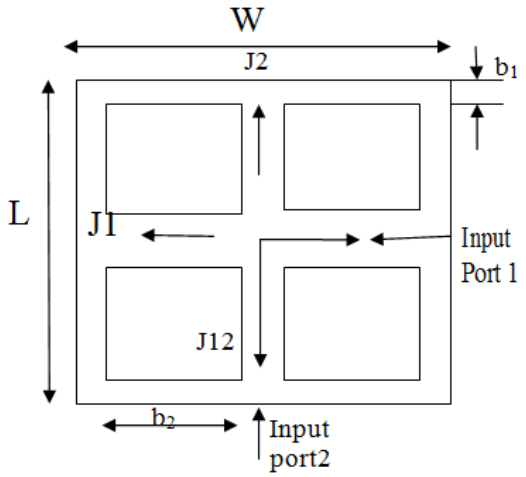

Figure 4.3:- Current distribution between 4C-slot and FR4 is used for both upper and lower layers and the measurements of lower substrate are L=W=16mm, b1=0.65mm and b_2=5.75mm

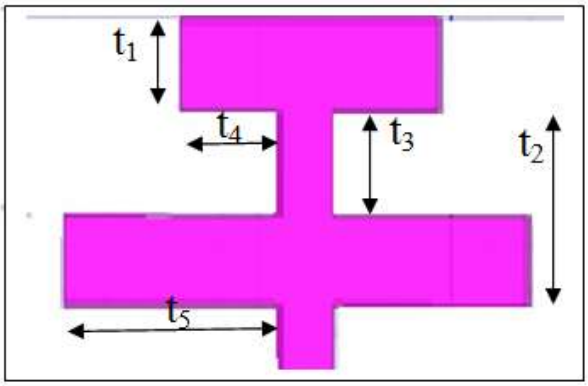

Figure 4.4:- T-shaped micro strip feed with matched stub and their measurements are t_1=4.15mm, t_2=7.97mm, t_3=3.57mm, t_4=5.8mm and t_5=10.3mm respectively.

The current flow from J1 and J2 respectively between the slots on the patch antenna, the derivation of current that is charge distribution of capacitance are low affected by the C-shaped slots that can say as effect is not affected on capacitance. The expression of angular frequency is given by $w_o=\sqrt{}$ (1/LC) for parallel circuit(LC),even if it increases the inductance by adding the additional series value means a lower of resonant frequency f_o,conversliy it says that patch is now miniaturized.

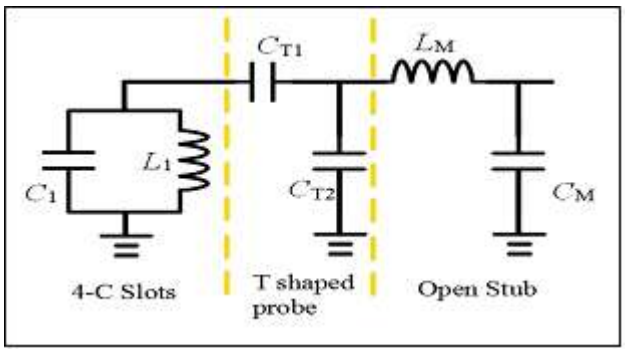

Figure4.5:- equalivent circuit of 4C-symmertical slots patch antenna

The obtain by designing the polarized antenna. It resonates at 2.4 GHz frequency. Frequency responses with the return losses are shown in fig 4.b

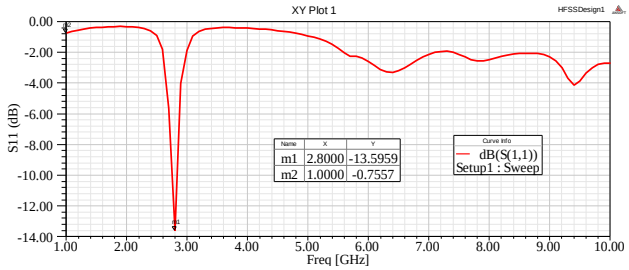

Figure 4.6:- Return loss verses frequency for single C-shaped patch antenna.

The response of an single C-shaped patch antenna is at 2.8GHz and the return loss of antenna dB S(1, 1) is -13.59 for designed the polarized antenna.

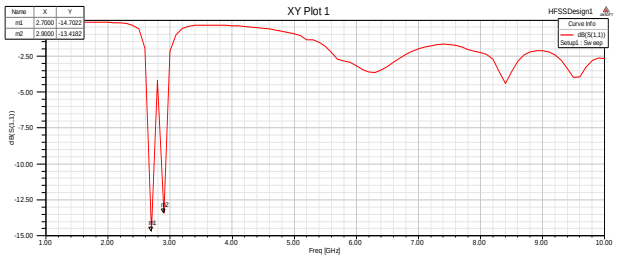

Figure4.7:-Frequency response at S (1, 1) port of 4C-symmertical shaped patch antenna with two T-shaped microstrip feeds.

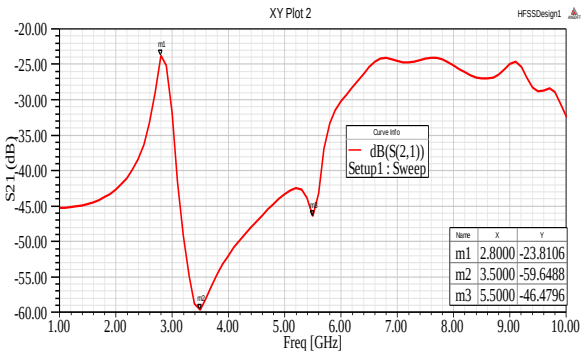

Figure4.8:- Frequency response at S (2, 1) port of 4C-shaped patch antenna

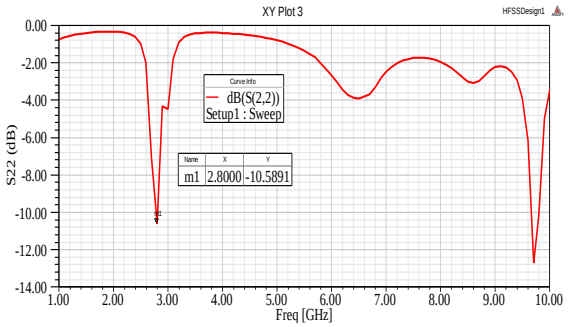

Figure4.9: Response at S(2, 2) port of 4C-shaped patch antenna

So that we can measure Gain obtained at certain frequencies which can be calculated by radiation pattern.

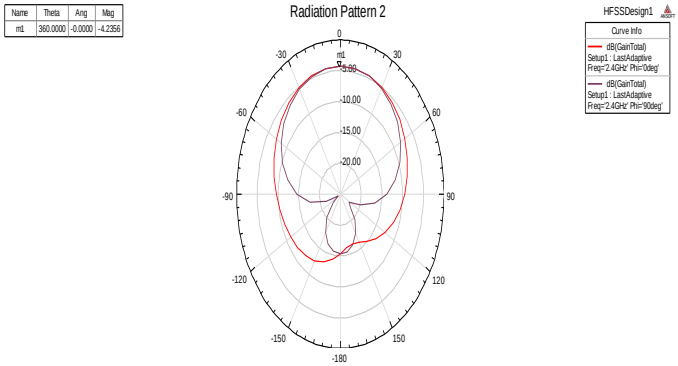

Figure 4.10: Radiation pattern of antenna

VI. CONCLUSION

The polarization antenna with simple LC-circuit and T-shape feed technique is used for widen bandwidth, and stub matched have been employed in the study for the 2-port antenna. The $|S_{11}|$ and $|S_{22}|$ are the reflection coeffections and the transmission coefficients $|S_{12}|$ has studied with the good simulated results has been absorb.

The design 4-C patch antenna, matching stub can be replaced by lumped components and can be miniature with excellent port isolation which has low cost devices to present current market for the two-way communication systems. By connecting the transmitting port and the output port of the transceiver that is port1 and port2 are sophisticated high loss of antenna couplers of transceiver can eliminated.

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