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COMPACT DUAL BAND MICROSTRIP ANTENNA USING GROUNDED ASYMMETRIC COPLANAR STRIP (GACS) FOR WLAN APPLICATIONS

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Abstract:A compact dual-band antenna using grounded asymmetric coplanar strip (GACS) proposed in this paper for Wireless Local Area Networks (WLAN) application. The GACS techniques is used to miniaturization of antenna. It has compact size is 19 mm × 19 mm × 1.6 mm^3. The suggested antenna has been design on FR4 material with εr =4.4 with 1.6 thickness. The monopole antenna is modified byadding L-shape element in radiating structure of patch to obtain dual-band resonance. The proposed antenna has WLAN application in the bands of 2.45 GHz (2.41 GHz-2.52 GHz) and 5.55GHz (5.46 GHz-5.60 GHz).The bandwidth of antenna getting 110MHz and 140MHz at 2.45GHz and 5.55GHz. All the three band has VSWR less 1.4. The experimental and simulated results observed good matching except some slight variation

Index Terms **- Monopole, Dual-band, GACS, ACS, WLAN and L shape.**

I. INTRODUCTION

Many paper has been study on dual-band antenna for wireless applications. This can be obtained using different techniques like fractal, shorting pin, slotted patch and meander line structure etc. Apart from the dual-band application, antenna requires compact and better accuracy. Recently, CPW have great techniques for dual-band due to their wideband performance. Recently several work on CPW and Asymmetric Coplanar Strip (ACS) has been study which include different structure like T-shape, F- Shape, S-shaped and inspired metamaterial structure etc. were design to satisfied wireless applications. CPW antenna offers better impedance matching and great isolation Asymmetric Coplanar Strip (ACS) fed technique is modified of CPW and it has 50% less than ground area with relate to CPW structure.

In this paper, a compact Dual-band GACS microstrip antenna is proposed. In proposed antenna covers 2 frequency bands of 2.45GHz and 5.55GHz.A compact dual-band antenna with good impedance bandwidth is proposed.

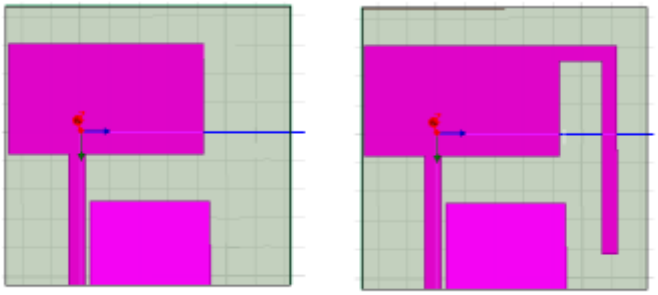
II. ANTENNA CONFIGURATION

The proposed GACS antenna has been designed by introducing the L-shape strip element at edge of monopole antenna as shown in Figure 2. We take simple monopole patch antenna 1 to generate 5.5GHz freq in Figure 1. (a), Next Antenna 2 we attached L shape strip at side edge of monopole antenna as shown in Figure. 1. (b) which produce dual frequency 2.4GHz and 5.5GHz.In this model, the proposed antennas were designed using FR4 Substrate with εr=4.4 and thickness (h) is 1.6mm. In this antenna asymmetric coplanar strip (ACS) feeding techniques is used. At the bottom side of antenna having extra gnd plane to get better performance. The dimensions of monopole antenna length (L) =7.6mm and width (W)=13.5mm at resonant frequency of 5.50 has been calculated by using the equations 1 to 3. The proposed dual band antenna using GACS are shown in figures of 1, 2 below.

$$Width = \frac{c}{2f_o\sqrt{\frac{\varepsilon_R+1}{2}}}; \quad \text{------- (1)}$$

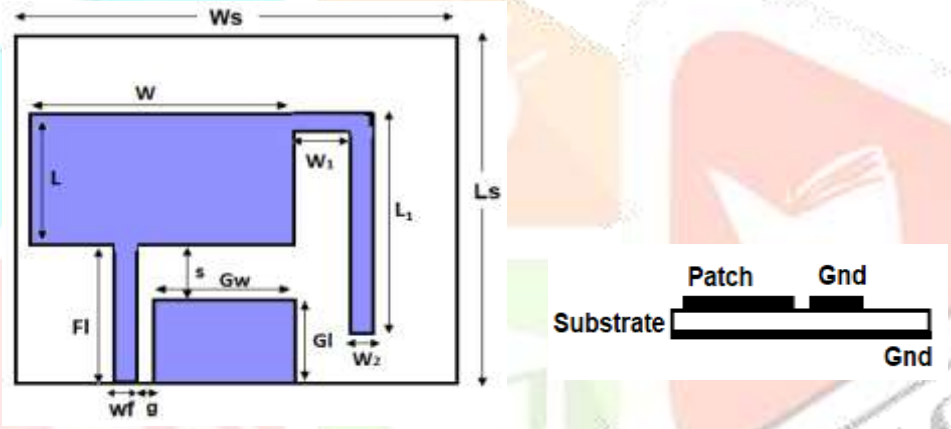
$$\varepsilon_{eff} = \frac{\varepsilon_R+1}{2} + \frac{\varepsilon_R-1}{2}\left[\frac{1}{\sqrt{1+12\left(\frac{h}{W}\right)}}\right] \quad \text{------- (2)}$$

$$Length = \frac{c}{2f_o\sqrt{\varepsilon_{eff}}} - 0.824h\left(\frac{(\varepsilon_{eff}+0.3)\left(\frac{W}{h}+0.264\right)}{(\varepsilon_{eff}-0.258)\left(\frac{W}{h}+0.8\right)}\right) \quad \text{--- (3)}$$



(a) Antenna 1 (b) Antenna 2

Figure 1. Design steps of the dual-band monopole antenna



(a) (b)

Figure 2. Geometry of the proposed Dual band GACS antenna (a) Top View (b) Side View

Table 1: Optimized Parameter Values

Parameter	Dimensions (mm)	Parameter	Dimensions (mm)
L	7.6	Ls	19.0
W	13.5	Ws	19.0
L1	14.4	W1	2.9
s	3.2	W2	1.3
Fl	9.0	g	0.5
wf	1.1	Gl	5.8
Gw	8.0		

III.RESULTS AND DISCUSSION

The proposed dual antenna has been design using HFSS software. The simulated return loss of Antenna1 and Antenna 2 designs is shown in figure 3 Blue graph (Antenna 1) getting single freq at 5.52GHz and Red graph (Antenna 2) getting dual band 5.50GHz and 2. 47GHz.The good impedance matching observed on both bands.

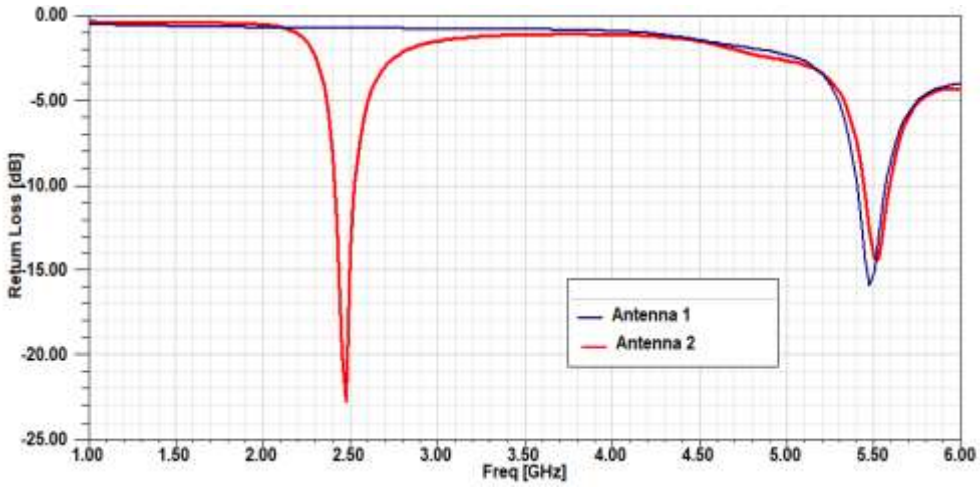
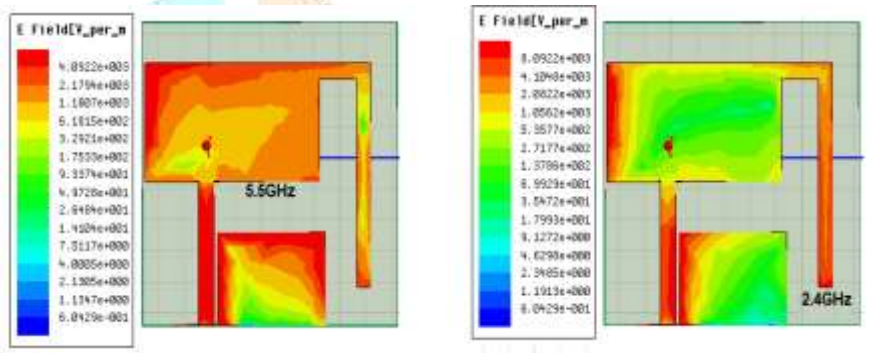


Figure 3: Simulated return loss of all two antenna structure



(a) (b)

Figure 4 Surface current distribution (a) 2.40GHz (b) 5.50GHz

The Antenna has been tested on Agilent Network Analyser N9923A series. The simulated and fabricated S11 of the proposed GACS dual-band antenna is shown in figure 5. The Simulated Vs measured radiation pattern at different resonance frequencies is shown in figure 6.

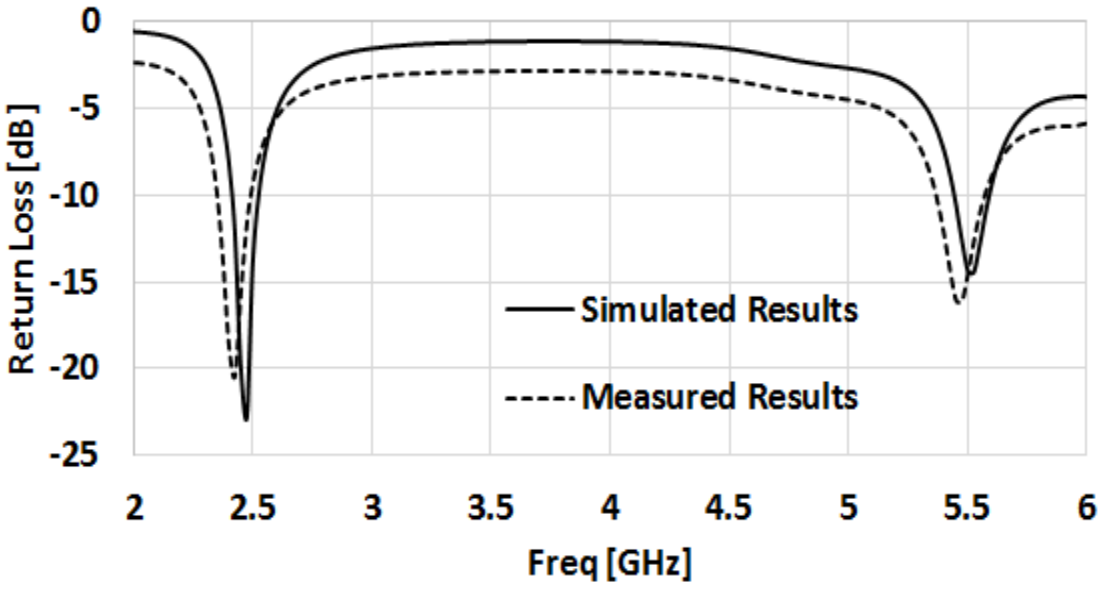
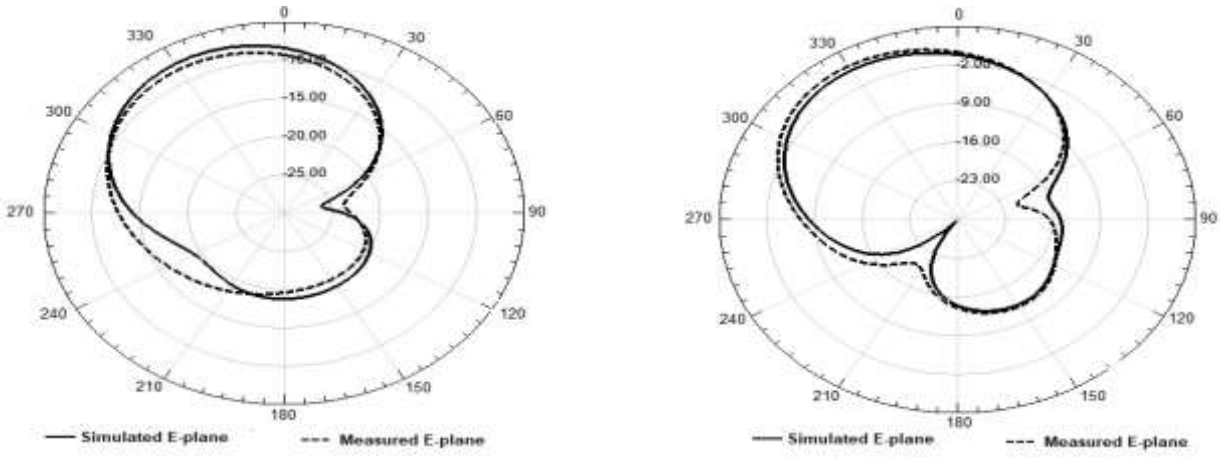


Figure 5. Simulated Vs Measured Return loss of proposed antenna

Figure 5 conclude that simulated and measured return loss observed good agreement except some slightly variation. The proposed antenna offers bandwidth of 110MHz at 2.45GHz and 140Mhz at 5.50GHz.

Figure 6(a)-(b) shows the E-plane of proposed antenna at 2.45 GHz, and 5.50 GHz. The good matching observed between simulated and measured radiation patterns.



(a) (b)

Figure 6. Radiation Patterns of proposed antenna at (a) 2.45GHz and (b) 5.55GHz.

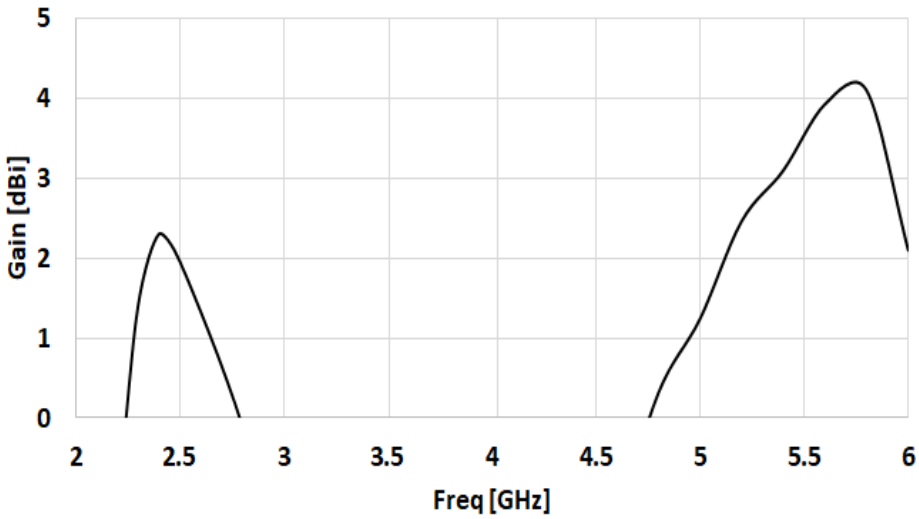
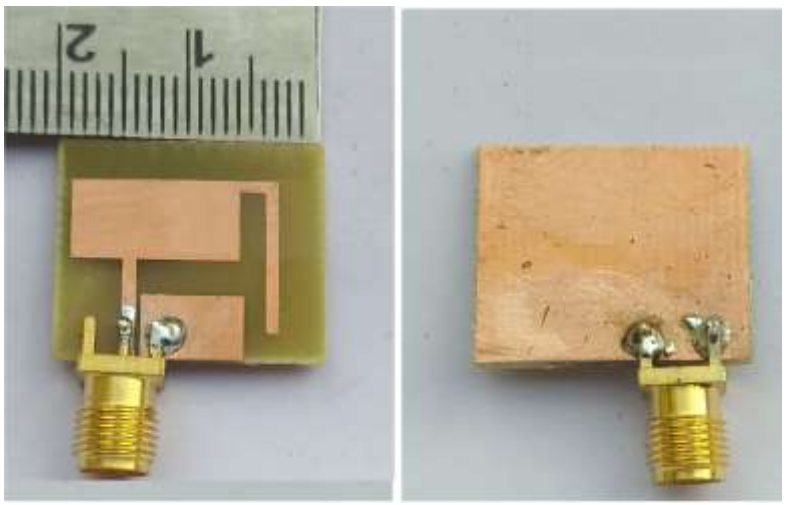


Figure 7. Measured average gain of the proposed antenna

The proposed antenna has a peak gain of 2.3dBi at 2.4GHz, and 5.5GHz freq band is 4.8dBi.



(a) TOP View (b) BOTTOM View

Figure 8. Prototype Proposed GACS dual-band antenna

IV. CONCLUSION

A compact GACS fed dual-band monopole antenna is presented for WLAN applications. The overall size of antenna is very small 19×19×1.6 mm^3. In design steps of dual-band antenna started with simple GACS fed monopole for 5.5 GHz is designed and then and adding L strip structure in radiating monopole patch structure to obtain dual-band band resonance. The frequency and bandwidths of the bands can be adjusted by tuning the lengths of the attached L-strip of monopole. Radiation pattern is stable both dual frequency bands with good gain. The experimental and simulated results observed good matching except some slight variation.

REFERENCES

[1] C. A. Balanis, Antenna Theory: Analysis and Design. Hoboken, NJ,USA: Wiley, 2005.
[2] Philip Tang and Parveen Wahid, "Hexagonal Fractal Multiband Antenna," Antennas and Propagation Society, International Symposium, IEEE, vol. 4, pp. 554-557, June 2002.
[3] Asit K.Panda, Manoj K.Panda, Sudhansu S.Patra "A Compact Multiband Gasket Enable Rectangular Fractal Antenna" IEEE2011 International Conference on Computational Intelligence and Communication Systems. Page(s):11-13
[4] S. Chamaani and A. Akbarpour, Miniaturized dual-band omnidirectional antenna for body area network base stations, IEEE Antennas Wireless Propag. Lett., vol. 14, pp. 17221725, 2015.
[5]Deshmukh, Amit A., et al. "Triple Band E-shaped Microstrip Antenna." Procedia Computer Science 93 (2016): 67-73.
[6] Ansoft High Frequency Structure Simulator (HFSS). ver. 13, Ansoft Corporation, 2010.
[7] Dang L, Lei ZY, Xie YJ, Ning GL, Fan J. A compact microstrip slot triple-band antenna for WLAN/WiMAX applications. IEEE Antennas Wireless Propagation Letters. 2010;9:1178-8.
[8] Khattak MI, Khan MI, Najam AI, Saleem M, Shafi M. A planar UWB antenna with tripple notched bands. In2017 9th International Conference on Computational Intelligence and Communication Networks (CICN) 2017 Sep 16 (pp. 1-5). IEEE.
[9] Liu W-C, Wu C-M. Broadband twin frequency CPW fed flat monopole antenna with rectangular notch,Electron Letters,2004.