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DEFECTIVE GROUND STRUCTURE MICROSTRIP FED MONOPOLE ANTENNA FOR WIRELESS APPLICATIONS

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ABSTRACT

In this work defective ground structure monopole antenna is designed for wireless applications. The proposed antenna having an E-shaped slot on a patch with two backward slits and H-Shaped defect on a ground plane .The antenna exhibits its response on working band of 4-6 GHZ with an impedance bandwidth of 2 GHZ .In this work the radiation characteristics like return loss, gain, radiation pattern and directivity of 5.84 are achieved. The proposed antenna is micro strip line fed technique operates at 5.2/5.5/5.6 /6.4/7.2/7.5/8.2/9.3 GHZ for IEEE 802.11 WLAN standards,5.5 GHZ for IEEE 802.16 for WIMAX standards, C-band, radar and satellite applications. Defective ground structure micro strip fed monopole antenna is simulated by HFSS software.

Keywords: C*-band, DGS, *HFSS, WLAN, WIMAX.

I. INTRODUCTION

In present generation wireless communication systems ,the high speed networking is necessary for multimedia communication. Micro strip patch antennas have various advantages like light weight, low cost and ease of fabrication. The main requirements to increase the performance of antenna are miniaturization, band width improvement, high input impedance and gain[1-2]. Due to demand in quality of service, increased throughput, security, handover purposes the wireless broadband communication is used widely[2].DGS is such a technique which can analyze much kind of wireless devices achieved than the standard applications[3-5]. DGS unit in a two element micro strip array that suppresses surface waves which gives the high isolation between the array elements. To improve the bandwidth, and to reduce the antenna size the defect in the ground plane is used. the ground plane of metal is modified to enhance the performance.DGS offers dual band gaps for bandwidth enhancement. By designing this the antenna size is reduced with defect in ground plane compared to antenna without defect.DGS is etched

periodic or non periodic cascaded configuration Defect in ground of planar transmission line which disturbs shielded current in the ground plane because of the defect[6]. It control excitation and EM waves[7].This causes the change of L,C components .This technique is cost effective because it is more convenient to operate in single antenna than multiple antennas[8].Here a defective ground structure micro strip fed monopole antenna is

presented. The DGS do not effect the odd mode transmission but slows the even mode transmission. It is parallel tuned circuit in series with the transmission line.

This allows current distribution along the edges of the slot. To make antenna work in large band of frequencies DGS and for high input impedance rectangular shape is chosen. A double layer antenna design with micro strip feeding is used. To achieve multi band operations at different applications .The E-shaped slot on the patch and H-shaped defect on the ground plane is presented. Because of this defect it use the antenna for wide number of applications.

II. ANTENNA GEOMETRY AND DESIGN

The glass epoxy substrate of height 1.6 mm and dielectric constant of 4.4 is used. The planar antenna with E-shape slot forms the substrate and H-shape defect fed at the corner is used. The transmission line model with line feeding is used in this technique. The dimensions of the proposed antenna is shown in the figure .The patch fed with micro strip feed line on a low cost FR4 epoxy substrate with 45.4mm x 45.4mm x 1.6mm as dimensions. The below figure shows the top view and back view of the proposed antenna. The figure 1 represents the top view and Figure 2 represents the back view of the antenna.

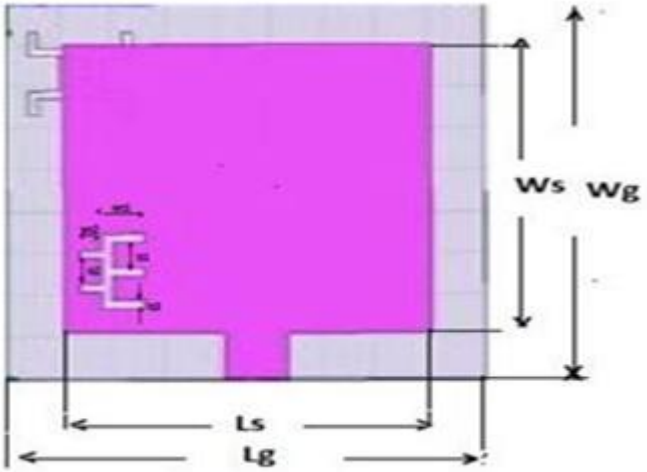

Fig 1: Top view of proposed antenna

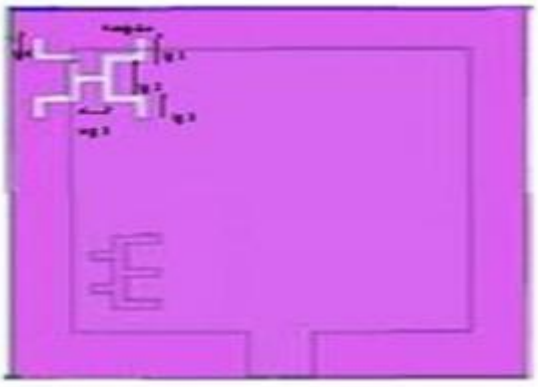

Fig.2: Back View of Proposed Antenna

In this the edge of the patch is connected to the fed directly. The planar structure can be provided. The parameters of the proposed antenna are shown in table1:

Table 1

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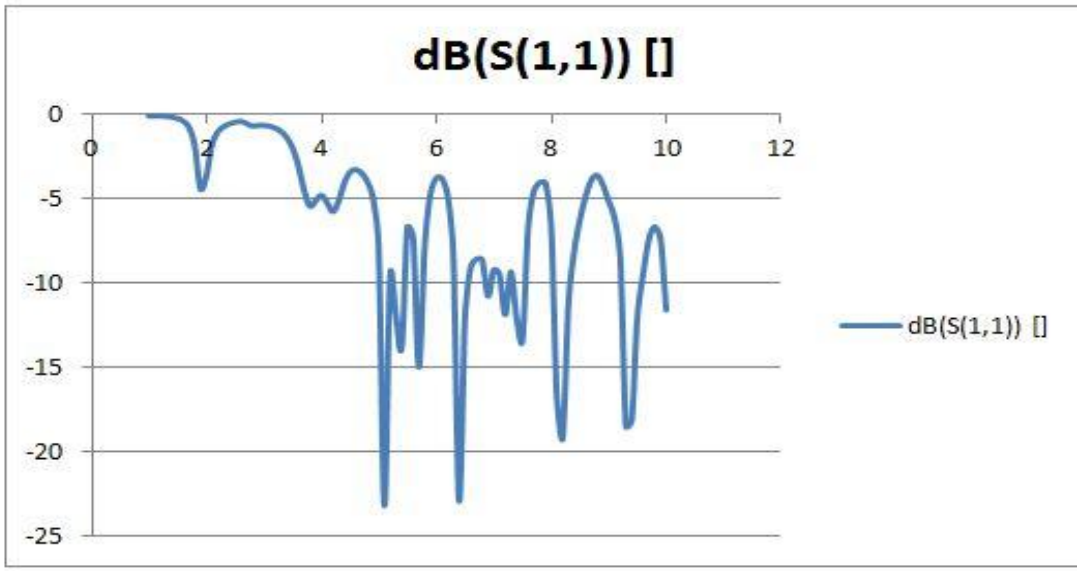
Parameter	specification	parameter	specification
Ls	34.7 mm	Lg4	3 mm
Ws	35 mm	Ls1,Ls2	3 mm
Lg	45.4 mm	Ls3	3 mm
Wg	45.4 mm	Ws1	4 mm
Ws2,Wg3	2 mm	Lg1	3 mm
Lg3	3 mm	Lg2	4 mm
Wg1	4 mm	Wg2	6 mm

To achieve better impedance in the antenna the H- Shaped defect is presented in the ground plane. The two parallel slits in the backward direction forms the E-Shaped slot. It effects the impedance and resonant frequencies performance using HFSS simulator.

III. RESULTS

The results of return loss, gain, radiation pattern, directivity of the optimized monopole antenna are shown here. The return loss of the simulated monopole antenna is shown in the figure 3.

The return loss achieved here is about -22.5db at 5.2 GHZ .The return loss for other frequencies are also obtained. The other frequencies are 5.4/ 5.6/ 6.4/ 7.2/7.5/ 8.2/ 9.3 GHZ. The. return loss is expressed in decibels(db).it is plotted frequency Vs return loss(db).



Frequency in GHZ.

FIG. 3: Return loss (S11) of proposed antenna

The Simulated 3D polar plot of gain in db is shown in the figure 4.The gain obtained of the proposed antenna is 1.45db.The gain can also be represented in rectangular 3D plot.

FIG.4:3D polar plot, gain in db.

The directivity of the proposed antenna is obtained as 5.84 db. The directivity is defined as the how much the signal is radiated in one direction.

The directivity can also be represented in rectangular 3D plot. The directivity is shown in figure 5:

FIG.5: Directivity of proposed antenna

The radiation pattern i.e.., 2D plot of the optimized antenna is shown in figure 6:

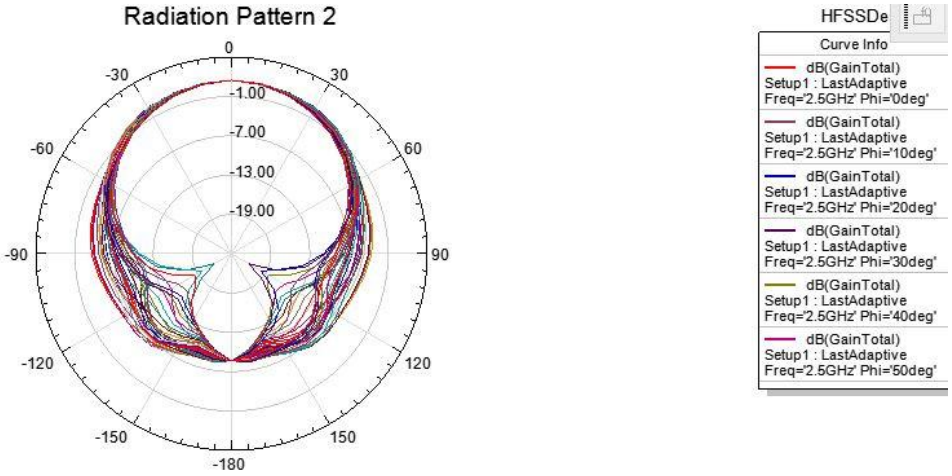


FIG. 6:Radiation pattern

The voltage standing wave ratio(VSWR) is defined as the input voltage to output voltage. The VSWR is shown in the following figure 7:

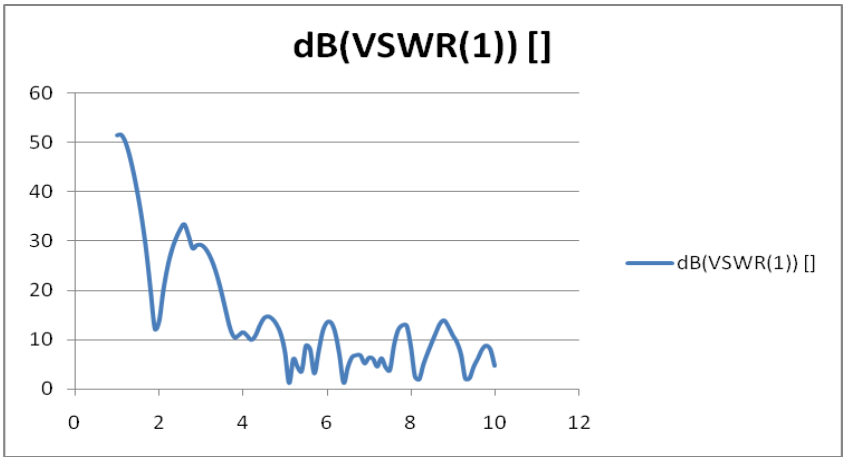


FIG 7: VSWR of antenna

Simulated return loss and frequencies obtained are used in many applications.

IV. CONCLUSION

The compact monopole rectangular patch with line fed is suitable for different applications such as WLAN,WIMAX, radar, satellite, C-band applications. using the h shaped defect on the ground plane an excellent impedance is achieved. moreover the antenna has several advantages like small size ,high directivity. these are very important in wireless communication systems.

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