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Multi- Bands a Circular Polarized Radial Shape With Small Disc Patch Antennas and Enhancement Factors on Ground Slots.

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ABSTRACT *This paper mainly dealing with the design and simulation of irregular shaped of patch antennas in form of radial shapes and small discs (six small discs). this proposed antennas are investigated in this paper. All the designs will be implemented on Roger substrates of dielectric constant εr=2.2 and thickness of 0.175 mm. The purpose of this work is not only to study and analyze the design of a radial patch antenna with several discs attach to it, but also to investigate the effect of enhancement factors which is known as parasitic elements and which is generated in the ground plane Also aground slot have been utilized to convert the linear polarization into circular one is investigated .. Enhancement factors to improve the proposed antennas parameters such as gain ,bandwidths and radiation patterns will be fully demonstrated in this paper.*

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I. INTRODUCTION

Microstrip patch antennas are increasing in popularity for use in wireless applications due to their low-profile structure. Therefore they are extremely compatible for embedded antennas in handling wireless devices such as cellular phones, pagers etc... The telemetry and communication antennas on missiles need to be thin and conformal and are often in the form of Microstrip patch antennas. A Microstrip Patch antenna consists of a radiating patch on one side of a dielectric substrate which has a ground plane on the other side as shown in Figure (1). The patch is generally made of conducting material such as copper or gold and can take any possible shape [1]. Microstrip patch antennas radiate primarily because of the fringing fields between the patch edge and the ground plane[2]. The constructions of antenna in this paper compose of six array of discs attached with radial disc with total dimensions of antenna 12.1 mm tall and 3.3 mm high. Roger substrates of dielectric constantεr=2.2 and thickness of (0.175mm) are utilized.

Type 1:

Figure 1 shows the layout of the proposed patch antenna type one. This patch antenna composes of six small disc connected radial disc. This antenna is designed to operate at a frequency of 28.5 GHz and to be fabricated on Roger substrate.

Figure 2shows the return loss of this antennawith double horizontals slots. It is obvious from the frequency that this antenna operates at 28.5 GHz with bandwidth of 1.2 GHz as it is predicted.

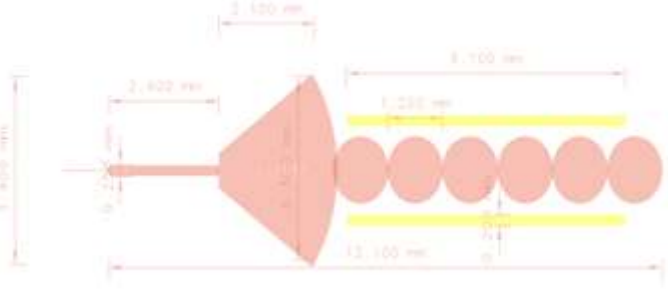


Fig 1 shows the Layout of proposed Antenna.

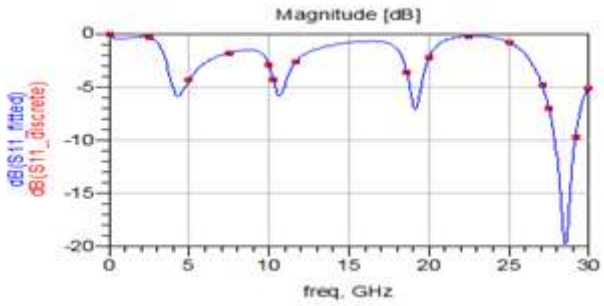


Fig 2 The return loss

Figure 3 represents the 3D radiation Pattern of this proposed antenna. A perfect circular polarized radiation pattern is formed as expected.

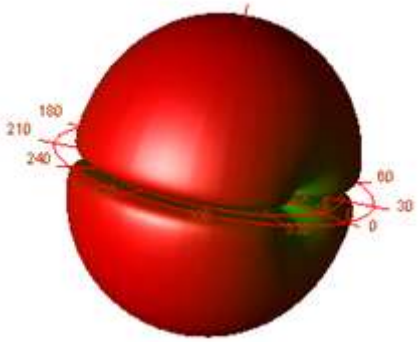


Fig 3 shows the 3D radiation pattern of the antenna with circular polarization.

Type2:

Figure 4 shows the second type of figure (1)which has the same substrate as type one but the only different in this antenna is including the enhancement factors.

Shift in frequency from 28.5 GHz to 13.25 GHz is observed, while a decrease in the bandwidth from 1.2 GHz to 0.25 GHz is noticed .see figure 5.

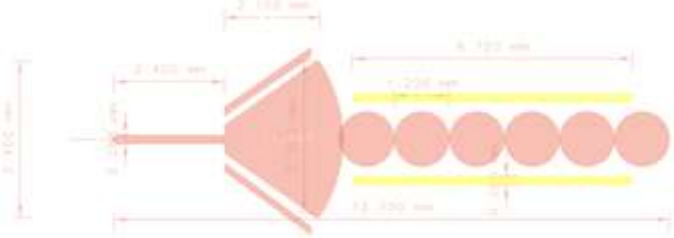


Fig 4 Layout of proposed Antenna type 2.

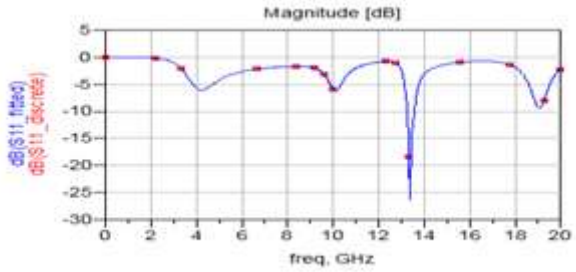
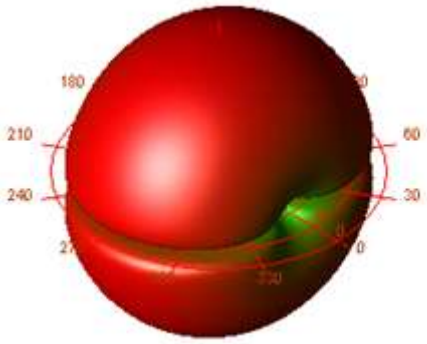


Fig 5 The return loss

Figure 6 represents the 3D radiation Pattern of this proposed antenna. A perfect circular polarized radiation pattern is formed as expected.



The 6 3D radiation pattern of the antenna with circular polarization.

Type 3:

Figure7 describe the third type of figure 1 which has the same substrate as type one , but the only different in this antenna is including the enhancement factors on the radial disc of this antenna, while structure of the antenna and the rest remains the same. This antenna design to operate at 13.59 GHz with bandwidth of 0.15 GHz

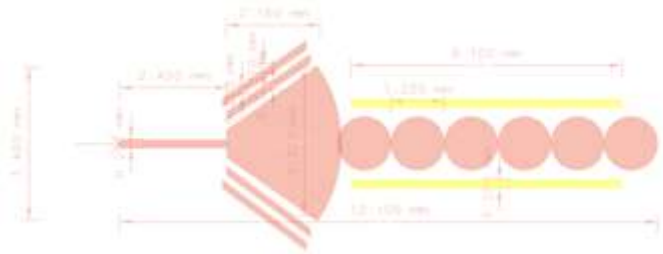


Fig 7 Layout of proposed Antenna type 3.

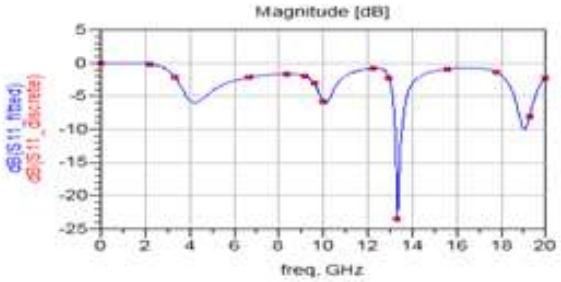


Fig 8 The return loss

Figure 9 represent the 3D circular polarized radiation pattern which has been formed as expected. A perfect 3D circular polarized radiation pattern has been achieved.

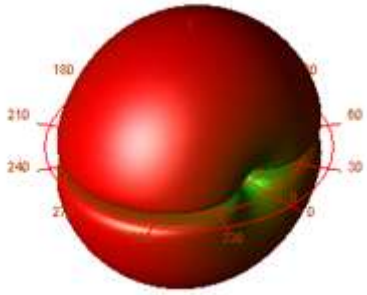


Fig 9 The 3D radiation pattern of the antenna with circular polarization.

Type 4:

Figure 10 represents the forth type of type one patch antenna. The only difference between them in the structure by adding third enhancement factors on the radial disc part, while the rest of the structure remains the same.

Figure 11 shows the return loss of figure 3.87, from these obtained results one can see that a dual narrow band operation is formed at 8.8 GHz and at 12.2 GHz respectively.

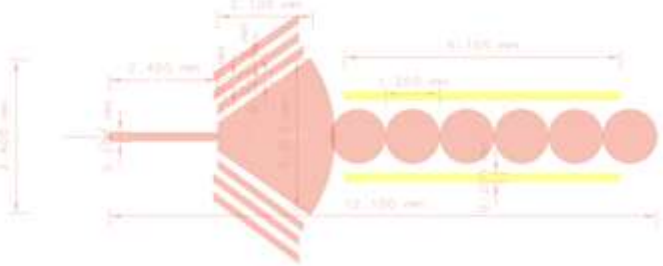


Fig 10 Layout of proposed Antenna type 4.

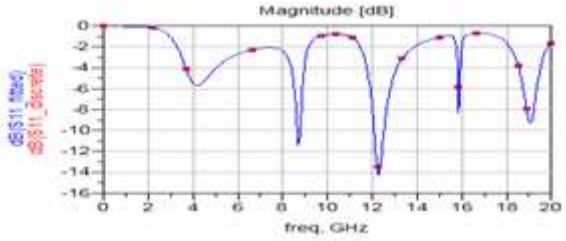


Fig 11 The return loss

Figure 12 represent the 3D circular polarized radiation pattern which has been formed as expected. A perfect 3D circular polarized radiation pattern has been achieved.

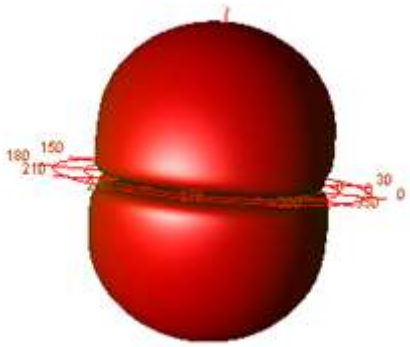


Fig 12 The 3D radiation pattern of the antenna with circular polarization.

Type 5:

Figure 13 represents the fifth type of type one patch antenna. The only difference between them in the structure by adding forth enhancement factors on the radial disc part, while the rest of the structure remains the same.

Figure 14 shows the return loss of figure 3.90 from the frequency response one can deduce that a dual frequency operation has established unfortunately two narrow bandwidths have been observed at frequency 10.6 GHz and at 12.5 GHz respectively.

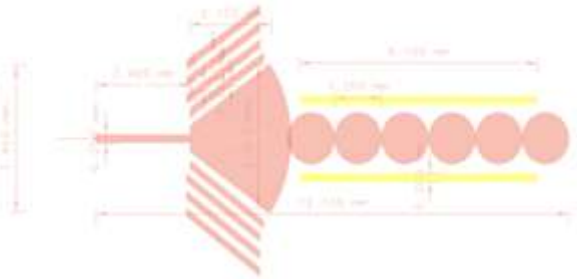


Fig 13 Layout of proposed Antenna type 5

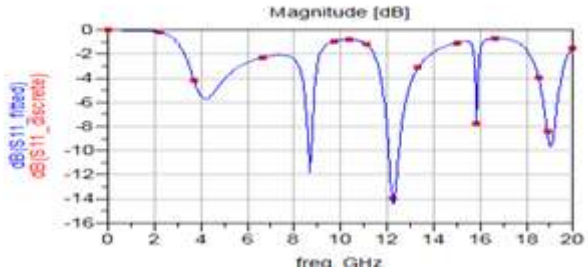


Fig 14 The return loss

Figure 15 shows the formed 3D circular polarized radiation pattern by figure 3.90 one can observe that a perfect circular polarization pattern has achieve an actual ratio of 0.0 dB is found.

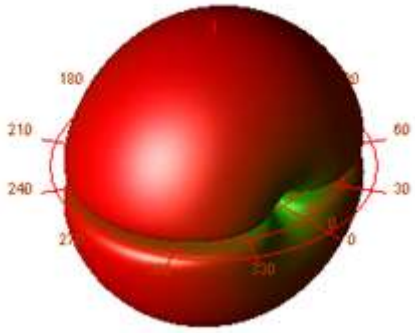


Fig 15 The 3D radiation pattern of the antenna with circular polarization.

II. RESULTS AND DISCUSSION:

The simulation results of proposed antennas parameters will be listed in table (1). Discussion of the obtained results, type (1) has shown some of this patch antenna parameters performance. These parameters are Gain (9.5 dB), Directivity (9.5 dB), return loss (-20 dB) and bandwidth of 1.2 GHz. And type (2) has Gain (9.5 dB), Directivity (9.5 dB), return loss -24 dB and bandwidth of 0.25 GHz when type (3) we obtained parameters, Gain (10 dB), Directivity (10 dB), return loss -24 dB and bandwidth of 0.15 GHz. for type four Gain(12 dB), Directivity(12.5 dB), return loss -14.1 dB and bandwidth of 0.5 GHz. Finally type five parameters as Gain (12.8 dB), Directivity (12.06 dB), return loss (-15 dB) at the central frequency. From this discussion we observe that gain increased gradually when added slots meanwhile return loss decreased. Figures 16-20 show as the manufacture of antenna that we are simulated by using software program(ADS)

Table 1

	Gain	Directivity	Bandwidth	Return loss
Type 1	9.5 dB	9.5 dB	2 GHz	-20
Type2	9.5 dB	9.5 dB	0.6 GHz	-24
Type3	10 dB	10dB	0.2GHz	-24
Type4	12 dB	12.5 dB	0.5 GHz	-14.1
Type5	12.8 dB	12.8dB	1.5GHz	-14

Fig 16 show types 1 fabricate.

Fig 17 show types 2 fabricate.

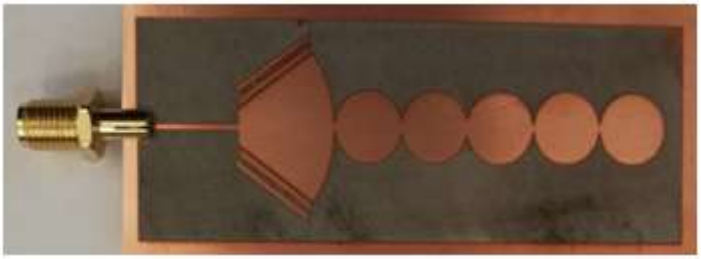


Fig 18 show types 3 fabricate.

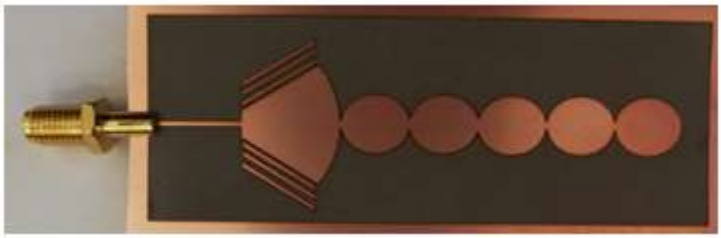


Fig 19 show types 4 fabricate.

Fig 20 show types 5 fabricate.

III. CONCLUSION.

The effort of the generating ground plane slots on the 3-D radiation pattern are it illustrated in this paper. The influence of the enhancement factors on this proposed work are fully demonstrated antenna parameter.

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