Designing of a Dual-Band Circular Polarized Microstrip Antenna on Defected Ground

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Abstract- ***In this work a dual band circularly polarized microstrip antenna has been designed. Several techniques have been reported to reduce the size of a microstrip antenna having dual operating frequencies. Simulations performed on the designed antennas showed good dual- band operation of*** $f_{1=9.62\ GHz}$ ***and*** $f_{2=13.39\ GHz}$ ***having very good return loss. The accuracy of the design is validated by using two different electromagnetic simulation softwares.***

Index Terms- microstrip antenna, dual-band, DGS

I. INTRODUCTION

Using of slot or etching geometry in microwave circuits are recent trend. Various structures (antenna) have been developed for getting ultra wide band (UWB), compact size, dual frequency operation, circular polarization etc. Here we use etching geometry for dual-band operation. Defect created in ground plane in antenna gives back lobe radiation. The proposed antenna will work on X-band and Ku –band. For this work we care the overall performance like radiation pattern, efficiency, gain, directivity should not degraded by inserting square slot on the ground. By inserting the square slot on the ground of the antenna we can also achieve the polarization diversity. Here we also observe that performance of antenna is a function of shape, size, and position of DGS which is inserted. . By changing the position of square slot we can vary the position of second band more as compared to the position of the first band.

II. BACKGROUND

A single patch antenna is analyzed for circularly polarized dual frequency operation by cut a square slot on ground plane. This technique is called Defected Ground Structure. By varying the position of square slot on ground plane we can change the operating frequency of second band. This dual frequency microstrip antenna is very promising for many practical applications i.e. Radio Location, Space Research & Standard Freq. and Time Signal Satellite

III. DESIGN SPECIFICATION

We take substrate of $\varepsilon_{r=}$ 4.3 dielectric thickness h=1.588 mm, conductor thickness t=0.035 mm, Resonating frequency is 9.62 GHz and 13.39 GHz, feeding technique is microstrip feed.from the design equation, we get L = 9.06 mm and W = 11.86 mm .This dimension is simulated on CST Studio 2011. Dimension of square slot on ground plane is L=6 mm =W.

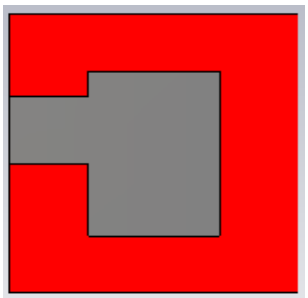

Fig. 1(a), Front View of Antenna

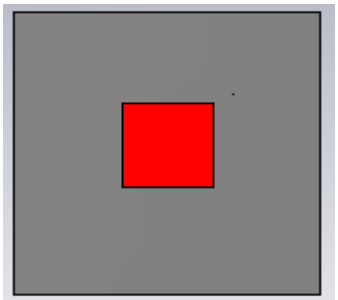

Fig 1(b), Back View of Antenna

IV. RESULT ANALYSIS

Measured return loss of microstrip patch antenna at f_1 = 9.62 GHz and f_2 = 13.39 GHz is plotted.

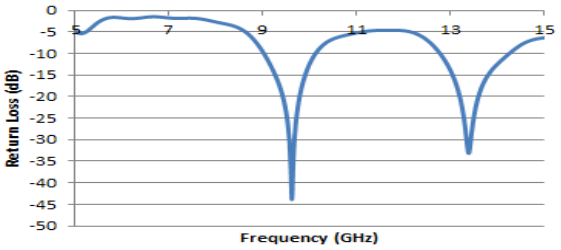

Fig 2 .plot of S_{11} in dB

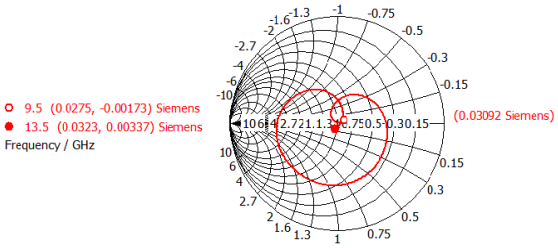

Fig 3, Smith Chart Plot

	$f_{1(GHz)}$ (9.62)	$f_{2(GHz)}$ (13.39)
Return loss(dB)	43.85	33.15
BW(MHz)(-10 dB)	114.64	110.83
Gain (dB)	3.4	3.7
VSWR	1	1
3-dB Angular Width (θº)	82.3	52.5
Side Lobe Level(-dB)	7.2	4
Axial Ratio	1	1
Polarization(θº)	0.0	0.0

Table-1

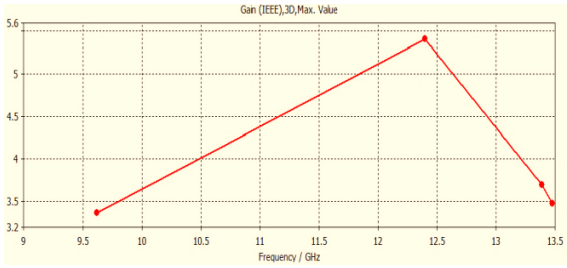

Fig 4(a).Gain of the Dual-Band Antenna

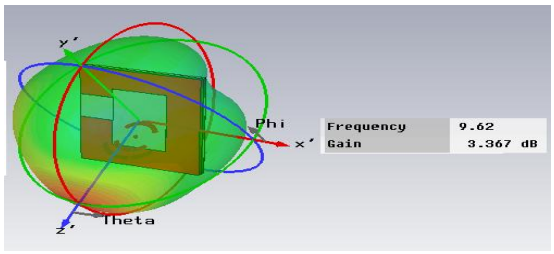

Fig 4(b). Gain of the Antenna at 9.62 GHz in 3-D

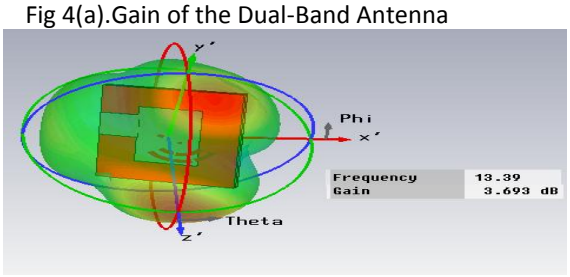

Fig4(c).Gain of the Antenna at 13.39 GHz in 3-D

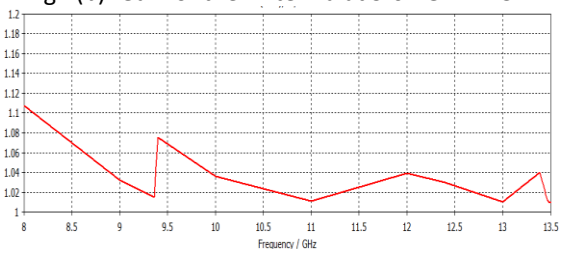

Fig 5. Axial Ratio of the Antenna

V. CONCLUSION & FURTHER WORK

The proposed antenna has been investigated numerically using two electromagnetic simulation software's. The accuracy of the design is very good. In this structure we use Defected Ground Structure but Defected Ground Structure also acts as radiating element which increases the back lobe radiation. Antenna is circularly polarized & vswr is very near to one. By changing the position of square slot we can vary the position of second band more as compared to the position of the first band .Work is currently under way in implementing the hardware for experimental verification.

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