

Design of a Circular Microstrip Patch Antenna with DGS (Defected Ground Structure) at 8GHz

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Abstract

In this paper, we propose a design of Circular Microstrip Patch Antenna (CMPA) with two rectangular slots etched ground plane as DGS. The defected ground structure concept is used to improve the bandwidth, impedance matching and the relocation of resonant frequency to make the compact CMPA. The bandwidth 1320MHz with respect to center frequency 8.15GHz. The percentage bandwidth of 16.2% and the average gain of 4.74dBi is achieved.

Keywords

CMPA, DGS, Broadband Antenna

I. Introduction

DGS (Defected Ground Structure) has been used very frequently by researchers for enhancement of characteristics of antenna. DGS has been increased the matching, reduced the VSWR [2], reduced losses [2] and enhanced gain predominantly and DGS has been used tool to researchers.

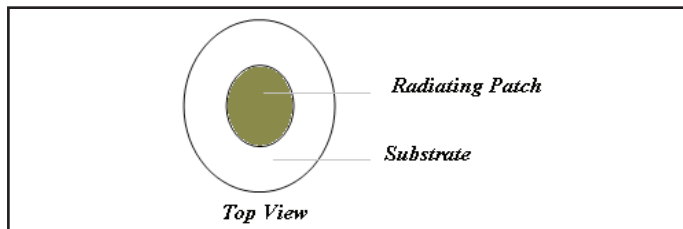


Fig. 1(a): The Top View of CMPA, (b) Bottom View of CMPA (Ground Plane)

Circular microstrip patch antenna has designed by embedding suitable slots on the ground plane as DGS (Defected ground Structure).

II. Antenna Design

The antenna is fabricated on substrate of FR4 epoxy with relative permittivity $\epsilon_r = 4.4$ and the thickness of 1.6mm. The radius of the patch (a) and ground plane are calculated using the formulas given in [1], for the resonant frequency of 8GHz.

The dimensions of the ground plane, patch are tabulated in the Table 1 given below.

III. SIMULATED RESULTS

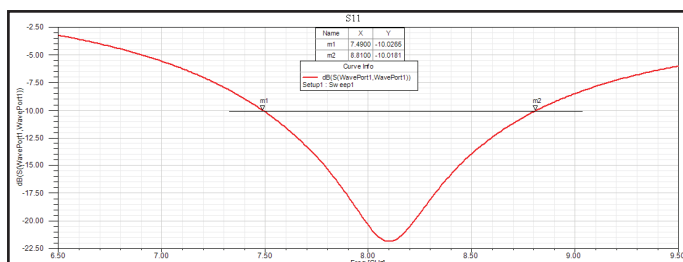


Fig. 2: Simulated Return Loss Versus Frequency of a CMPA

Simulated s11 can be seen from fig. 2 reflection co-efficient is very less at resonance return loss of the antenna is less than 10dB from 7.49GHz to 8.81GHz

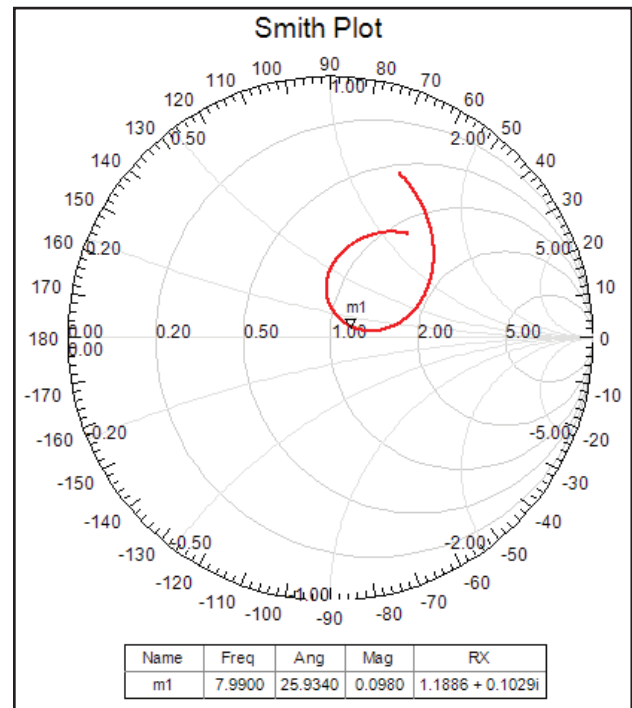
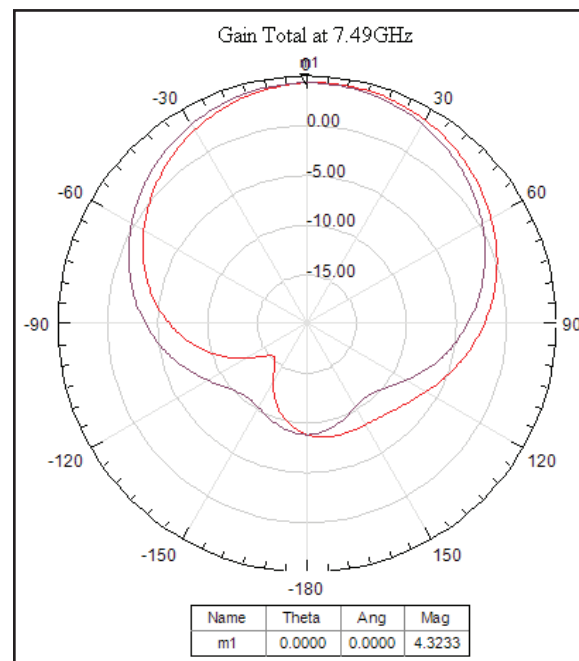


Fig. 3: Impedance Match

Impedance match of this antenna can be seen in fig.3, this clearly illustrates the frequency of the interest is very near to point 1, which is due to the DGS. In addition, impedance matching increases and reduces the loss.



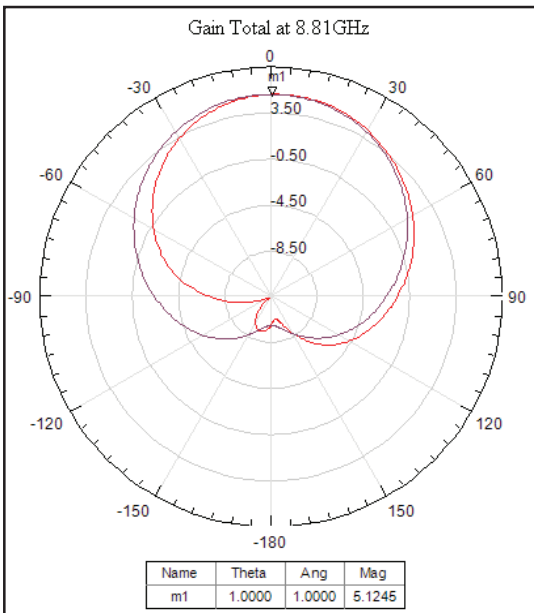
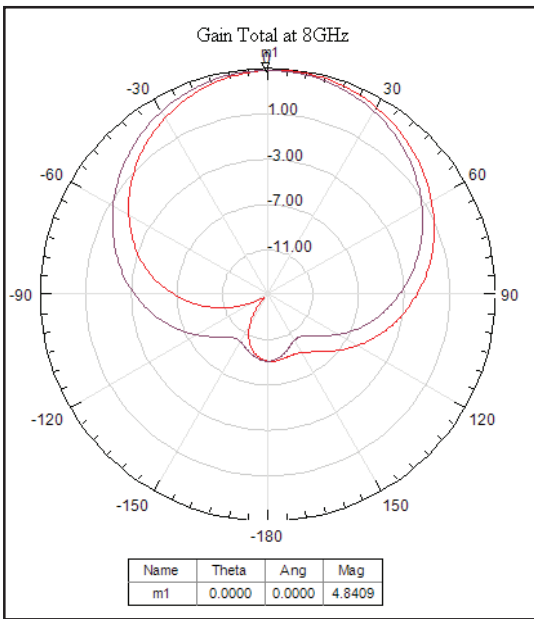


Fig. 4: Gain total at 7.49GHz, 8GHz and 8.81GHz

The radiation pattern of the proposed antenna showing the Gain total at different frequencies are shown in fig. 4. Gain total at 8.00GHz is 4.84dBi, and the gain total at 8.81GHz is 5.12dBi and gain total at 7.49GHz is 4.32dBi overall gain total in the whole frequency band of interest is tabulated and average gain is found out which is 4.74dBi

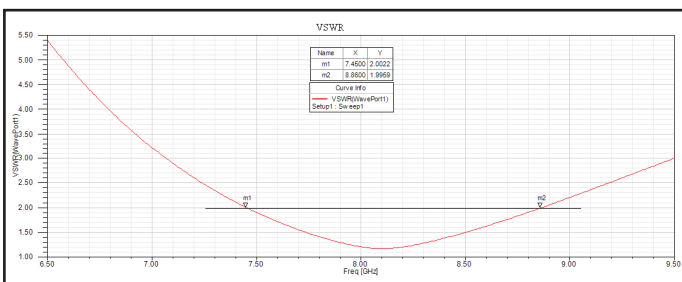


Fig. 5: VSWR of Proposed Antenna

The important property of any antenna is VSWR. In our proposed antenna we have achieved VSWR < 2 over the operating frequency. This can be seen in fig. 5

Table 1: Parameters and Dimensions of CMPA

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Patch Radius (a)	4.1mm
Ground Plane Radius (gpr)	10mm
Height of the substrate	1.6mm
S11	-21.7dBi
BW	1320MHz
%BW	16.2%
Average Gain	4.74dBi

IV. Conclusion

In this design we used effectively the DGS to improve the bandwidth and s11, we also achieved the bandwidth of 1320MHz and 16.2% bandwidth so we call broadband. The CMPA with DGS is fabricated. All the parameters and dimensions are tabulated in Table 1.

References

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