International Journal of Engineering Research and Development
e-ISSN: 2278-067X, **p**-ISSN: 2278-800X, www.ijerd.com
Volume 7, Issue 5 (June 2013), PP.95-98

Enchancing And Directing Radiation With Planar And Ebg Reflectors

J. Tagoor babu[1],J. Doondi Kumar[2],O. Ranga rao[3],D.N Bhushan Babu[4],S.Sasidhar[5]
B.Tech,ECE Dept,GMRIT,Rajam,AP,India[1]
M.Tech Student,ECE Dept,LBRCE,Mylavaram,AP,India[2]
Assistant professor,ECE Dept,VIT, Bheemavaram,AP,India[3]
Assistant professor,ECE Dept,ALIET,Vijayawada,AP,India[4]

Abstract:- In this paper, we present the idea of using reflectors to direct the radiation pattern of antenna into the required areas the paper illustrates the idea of radiation steerability. We use the EBG at one side of the antenna to reflect the radiation or to enhance the radiation into the opposite direction of the antenna. Generally these EBG structures are used to mitigate surfacewaves. For analysis we take monopole antenna as example to explain the concept. We place EBG at one side and planar reflecting surfaces at other to sides and the results are analysed in the remaining side. The radiation pattern curves will explain the idea of this paper.

Keywords:- EBG, Surface waves, steering radiation, Reflecting waves, Enhanced radiation.

I. INTRODUCTION

The monopole antenna is used in wireless communication mainly in cellular applications but these antennas suffer narrow BW and excitation of surfacewaves in order to overcome this problem several techniques are used the concept of surfacewave supression is used here in this paper. These EBGS are compatible with the Integrated designs and low cost, low wieght, and versatile. The limitations of the antenna can be overcome by the recent efforts on EBGS. In this paper we use the monopole antenna for analysation at one side we place the EBG structure this will improve its BW and construct the same phase radiation into opposite direction and destruct the opposite phase radiation. This is one of the property of EBGS. Then we place the planar reflectors to make the antenna into directional the radiation will be directed to two areas by the use of these planar reflectors the idea will be explained by the simulation results illustrated in the paper.

II. DESIGNING THE MODELS

A monopole antenna with the hieght 3.16cm is taken and it is filled with pec material. And the EBG is desined with the base dimensions as 10.05×3.16cm along y and z directions and the via hight is 0.5cm and the patch dimension are 1.4×1.4cm. and this antire EBGS is placed at negative X direction area. The design with only EBG as reflector and the EBG along with planar reflectors is shown in the following figure [1]. In the figure [1] the first schematic shows only EBGS is used there the radiation is enhanced in the +X direction where when the two planar reflectors are acted at both sides of the EBG the radiation will be directed symmetrically along +x to +y and +x to –y directions.

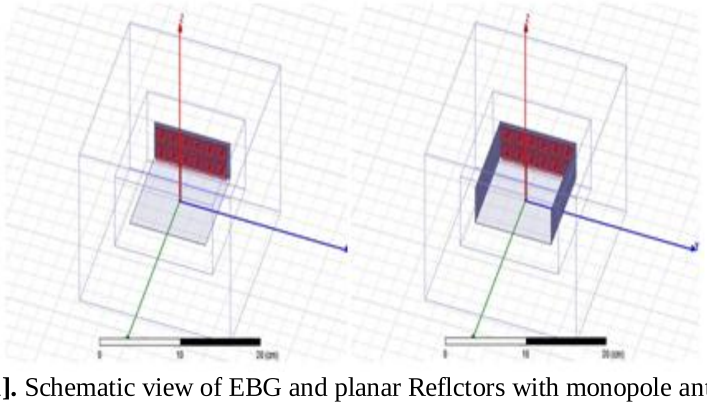

Fig [1]. Schematic view of EBG and planar Reflctors with monopole antenna

III. SIMULATED RESULTS

The proposed design is implemented and executed by using anasoft HFSS software and the results are illustrated below.

A. Return loss

The return loss curves are drawn between the S parameter and frquency the operating frequency of the monopole antenna is 1.9091GHz when only EBG is used and when the two planar reflectors along with EBG are used the the operating frequency is changed to the 1.8485GHz. the return loss curevs are shown in below figure [2]. It will explains the comparision between the designs.

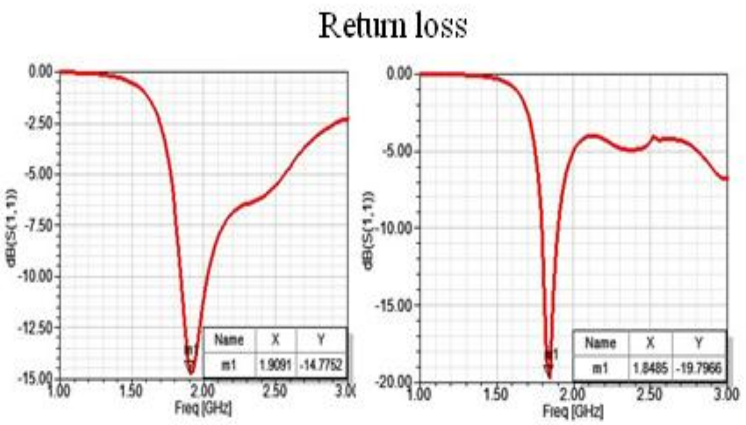

Fig [2]. Return loss VS frequency curves

By the above curves we can see that the return loss for first design is only -14.7752dB and for second design it is -19.7966dB.

B. Radiation pattern

The radiation pattern of the antenna will explains how the energy is distributed around it is shown in the following figure[3] that the radiation for 90º along phi direction is elaborated when the planar reflectors are acted thus the energy is more widely distributed in the design the radiation pattern curves are shown in the below figure [3].

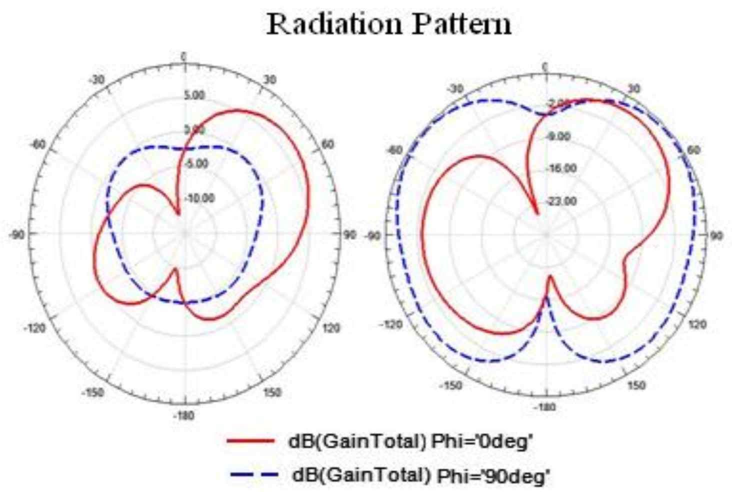

Fig [3]. Radiation pattern curves

C. Total gain in 3D

The total gain in 3D for both proposed design are illustrated for better understanding the 3D gain is taken along the +X direction form top view and the gain nothing but energy of the antenna is enhanced up to 6.8385dB form figure [4]. And the energy distribution in form of conical shape. And when planar reflectors also acted then it is 4.2491dB and its shape in +X direction is double conical which is symmetric in shape along the +X direction, here +X direction indicates the antenna side where there are no reflecting surfaces are placed.

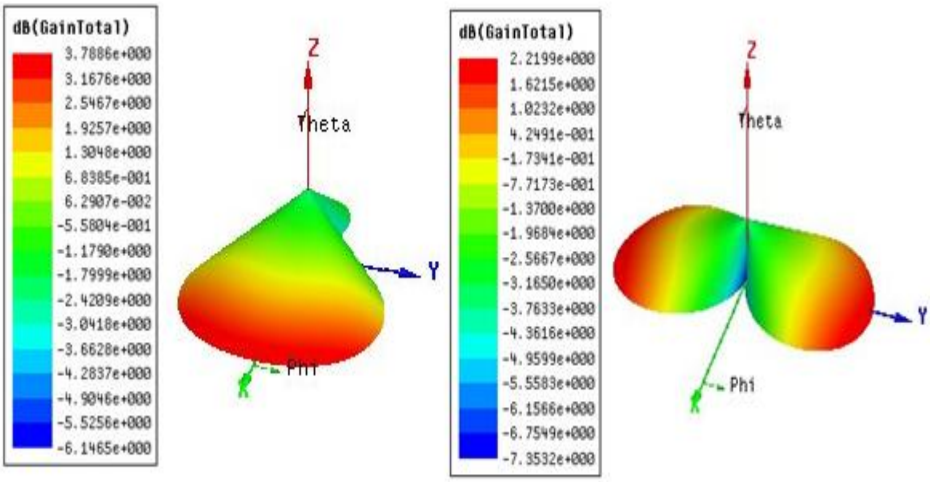

Fig [4]. 3D gain from top view

The over all total gain is present in fig [5] where the maximum gain for EBG reflcetor is 9.7624dB and for EBGS along with Planar reflectors is 9.1321dB.

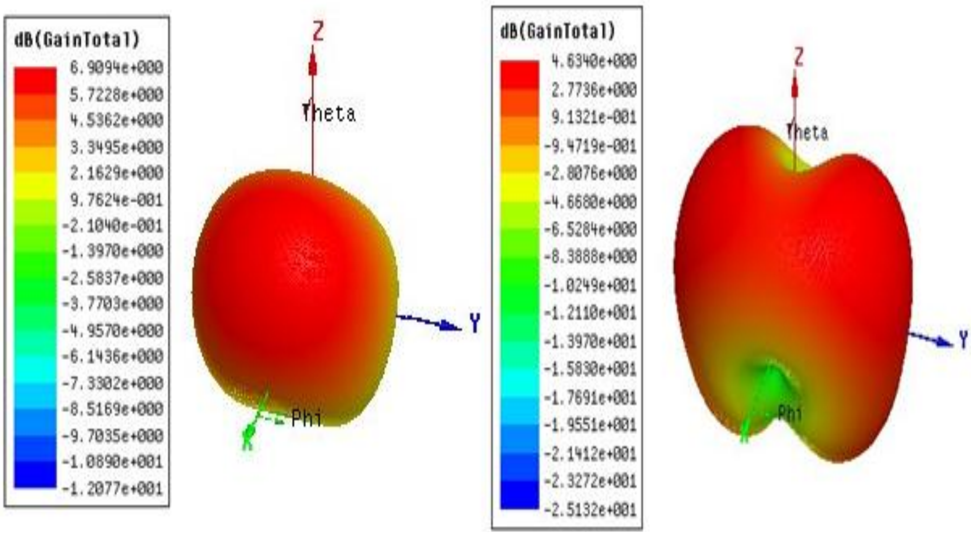

Fig [5]. Total gain in 3D

D. Antenna parameters

The comparison of some other antenna parameters like the peak directivity, peak gain, max U, incident power, Radiated power, efficiency, and front to back ratio are listed in the following table [1].

Quantity	Value	
Max U	0.377674(W/sr)	0.228817(W/sr)
Peak Directivity	4.88352	2.90199
Peak Gain	4.90844	2.90671
Peak Realized Gain	4.7461	2.87547
Radiated Power	0.97186(W)	0.990862(W)
Accepted Power	0.966925(W)	0.989253(W)
Incident Power	1(W)	1(W)
Radiation Efficiency	1.0051	1.00163
Front to Back Ratio	4.90055	1.7354

Table [1]. Antenna parameters

IV. CONCLUSION

The refelctors can be used in antennas either to enhance its radiation are some other antenna parameters to overcome the limmitations of antenna and the EBGS are very useful in this and the radiation can be set in to particluar areas by placing the refelctors in proper manner so that we could satisfy some other applications in communications this paper will explain the radiation distribution around antenna when the reflectors are used along side of the antenna.

REFERENCES

[1]. C. BALANIS, ANTENNA THEORY, ANALYSIS, AND DESIGN 2ND ED., JOHN WILEY AND SONS, NEW YORK (1997).

[2]. C. Balanis, Antenna theory, Analysis, and Design 2nd ed., John Wiley and sons, New York (1997).

[3]. J. Doondi kumar , “Analysis of Monopole Antenna by Placing High Impedance Absorber Surface at one Side” /Volume-2Number-1PP- 317 321.pdf

[4]. J. Doondi kumar , “Design and Analysis of C0-axial Feed Rectangular Patch Antenna on High Impedance Surface” /Volume-2Number-1PP-405-410.pdf.

[5]. Yang, F. and Y. Rahmat-Samii, \Microstrip antennas integrated with electromagnetic band-gap (EBG) structures: A low mutual coupling design for array applications," IEEE Transactions on Antennas and Propagation, Vol. 51, No. 10, 2936{2946, Oct. 2003.

[6]. D. Sievenpiper, E. Yablonovitch, U.S. provisional patent application, serial number 60/079953, filed on March 30,1998

[7]. Sievenpiper, D. F., \High-impedance electromagnetic surfaces," Doctorate thesis, University of California, 1999.

[8]. D. Sievenpiper, ―High - Impedance EM surfaces‖, Ph.D. Dissertation, University of California, Los Angeles, 1999.

[9]. D. Sievenpiper, J. Schaffner, B. Loo, G. Tangonan, R. Harold, J. Pikulski, R. Garcia, “Electronic beam steering using a varactor-tuned impedance surface,” *Dig. of Int. Symp. of Antenna and Propag. Soc.*, vol. 1, 8-13 July 2001, pp. 174-177.

[10]. Sievenpiper, D, F., \Review of theory fabrication and applications of HIS ground planes," Metamaterials: Physics and Engineering, Explorations, Chap. 11, 287{311, Edited by N. En- gheta and R. Ziolkowski, Wiley Interscience, 2006

[11]. Y. Kotsuka, M. Amano, ―Broadband EM Absorber Based on Integrated Circuit Concept‖, Microwave Symposium Digest, 2003 IEEE MTTS International, Volume 2, 8-13 June 2003 Page(s):1263 – 1266 vol.2.

[12]. Yang, F. and Y. Rahmat-Samii, “Step-like structure and EBG structure to improve the performance of patch antennas on high dielectric.