Band Width of Micro Strip Antenna Improved By Using Uniplanner EBG Structure

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Abstract-*In this paper represent the band width of microstrip antenna improved by using rectangular type uniplanner EBG structure. This antenna provides 101% bandwidth at 2.361 GHz resonance frequency. The geometry parameters are optimized for best performance and proposed antenna is simulated using IE3D software. This antenna can be used in Bluetooth, WiMax, Broad band and Wireless communication*

Keywords- Microstrip antenna, strip line feed, IE3D Simulation, impedance matching, finite ground plane.

1.Introduction

Microstrip antenna is a most popular used antenna because of their excellent properties such as low profile, low cost, conformability and ease of integration with active devices. Now a day it used different applications such as mobile, satellite, missile etc. However, microstrip antennas have many disadvantages. One of them is the excitation of surface waves that occur in the substrate layer. Surface waves are undesired because when a patch antenna radiates, a portion of total available radiated power becomes trapped along the surface of the substrate. It reduces total available power for radiation to space wave and there is harmonic frequency created.[6-7]There are many methods for reducing surface waves of microstrip antenna, one of them is by using electromagnetic band gap(EBG) or photonic band gap structure(PBG).[4-8]By which the gain, bandwidth, efficiency etc of microstrip antenna can be improved.

1.1 EBG Definition

Electromagnetic band gap structures (EBG) are defined as artificial periodic (or sometimes nonperiodic) objects that prevent/assist the propagation of electromagnetic waves in a specified band of frequency for all incident angles and all polarization states. EBG structures are usually realized by periodic arrangement of dielectric materials and metallic conductors. They can be categorized into three groups according to their geometric configuration: (1)Three dimensional volumetric structures (2) Two dimensional planar surfaces,(3)One dimensional transmission lines. The 2-D EBG surfaces have the advantages of low profile, light weight, and low fabrication cost, and are widely considered in antenna engineering.[2-3]

2.Antenna design

The proposed antenna design for X-band applications. The feeding is give by stripline. The size of proposed antenna 70mm×50mm and the size of patch is 40mm×10mm. The dielectric constant of substrate is around 4.2. The substrate thickness is 1.6mm and loss tangent is 0.0013.The size of rectangular type uniplanner EBG structure is 6mm×6mm and space between is taken 1mm. The proposed antenna is shown in figure.

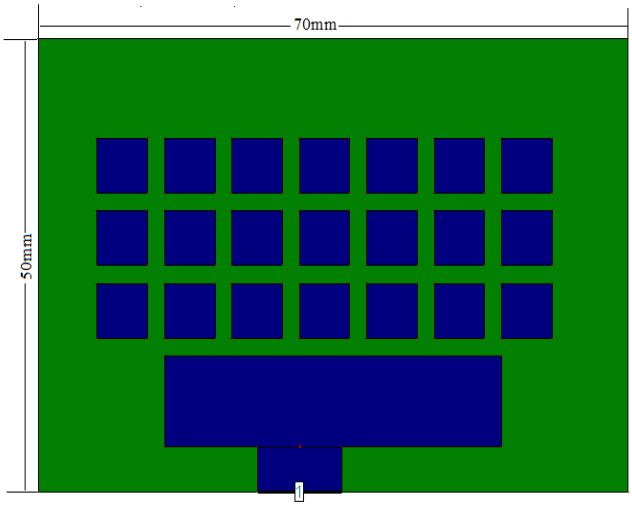


Figure (1): Figure for proposed microstrip antenna

3.Simulation design and analysis

The proposed microstrip antenna design and analysis by using IE3D(12.32 version) simulation software.[5] The procedure of simulation is done by taking ground plane as a finite plane and result are simulated at 50Ω strip line feed. The resonances occur at 2.361 GHz, and band width is calculated at the frequency range where the return loss (S_{11}) is approximately 10 or below,[1-6]Thus calculated band width of micro strip antenna is 101.6%.The return loss of proposed antenna is -42.3db,it shows impedance matching between strip line to the antenna. The gain of proposed antenna is 3.2dbi and the directivity of proposed antenna is 8.23dbi. Simulated radiation patterns of proposed antenna at 2.587GHz resonant frequency is shown in Figs. (2-6)

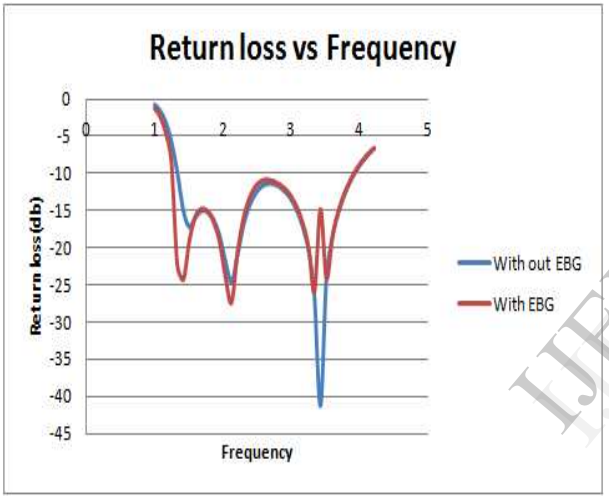
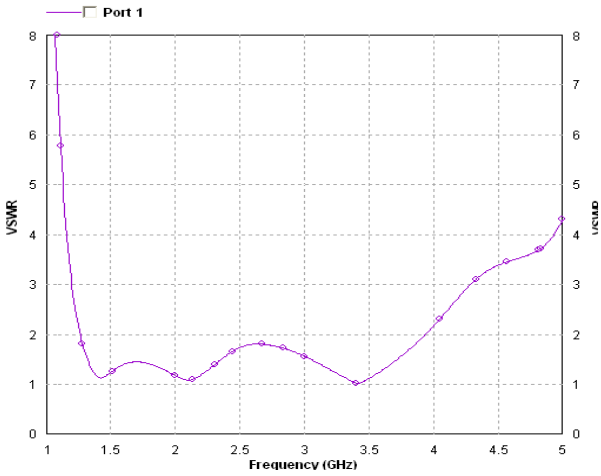
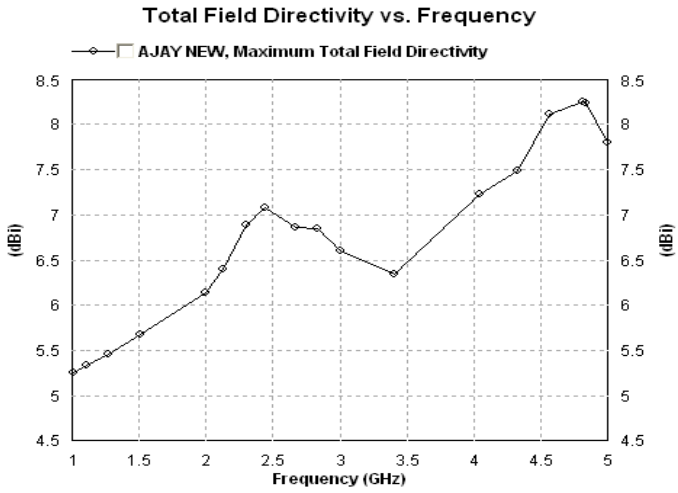


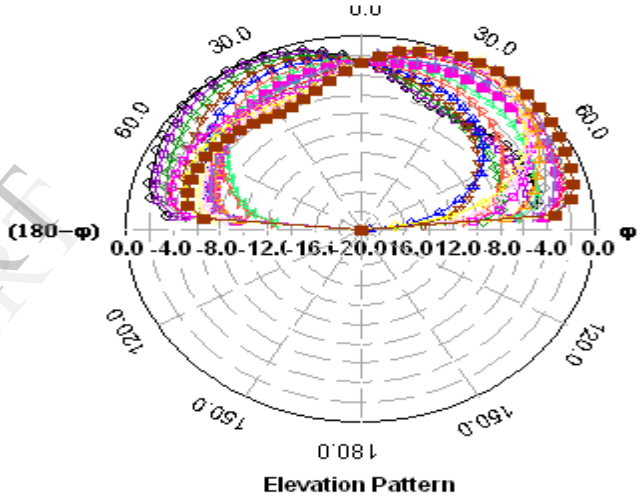
Figure (2): Return loss Vs Frequency for the proposed antenna



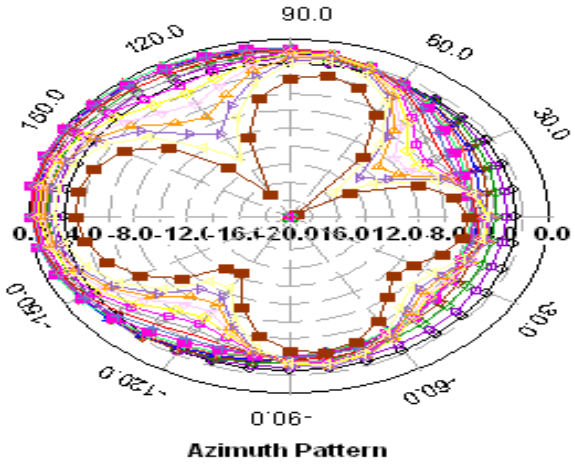
Figure(3): VSWR for the proposed antenna



Figure(4): Total Field Directivity Vs Frequency



Figure(5): Elevation pattern for proposed antenna



Figure(6): Azimuth pattern for proposed antenna

4. Conclusion

In this proposed antenna main focus the band width of microstrip antenna. The bandwidth of proposed antenna without using uniplanner EBG Structure is 98.2% but if we used uniplanner EBG Structure then its band width is 101.6%. The band width of proposed microstrip antenna is improved by reducing surface wave. The surface wave reduce with the help of EBG structure. The application of proposed antenna is in wireless, WIMAX, Bluetooth, Broad band etc.

5. Acknowledgement

We would like to thanks Associated Professor Dinesh kumar Srivastava, who had been guiding through out to complete the work successfully and we would also like to say thanks HOD and other Professors of Electronic Department of Bundelkhand Institute of Engineering & Technology, Jhansi (India) for their providing help and support.

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