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DESIGN OF ULTRA WIDEBAND CPW ANTENNA WITH DUAL NOTCH BAND CHARCTERISTICS

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ABSTRACT

In this paper a ultrawideband (UWB) coplanar waveguide (CPW) fed dual band notched monopole antenna using uniplanar EBG and a T-shaped slot is proposed. This antenna produces an impedance bandwidth from 3 to 10 GHz with VSWR less than 2.The upper notch is implemented using symmetrical EBG on either sides of the feed line and the lower notch is obtained using the T-shaped slot. The substrate used for fabrication is FR-4 material of 1mm thickness. The proposed antenna is used for short range, high data rate transmission applications.

KEYWORDS: Wideband, Coplanar waveguide, FR-4 EBG structures.

I. INTRODUCTION

Recently in RF and Microwave industry periodic structures have gained more attention than ever before because of their filtering properties. Electromagnetic bandgap structures are the important periodic structures. These structures are embedded or etched on metal layer.EBG structures provides features of band stop filters by rejecting a particular band of frequencies. Some examples of EBG fabricated on metal layers or on signal lines[9].

The advantage of Coplanar waveguides over other feeding techniques is that it provides single metal level fabrication.CPW is also easy to fabricate and characterize. CPW's have applications in Microwave Integrated Circuits and Monolithic Microwave Integrated Circuits and Micromechanical Systems (MEMS).The rectangular apertures in the EBG are the only adjustable parameters.

Designs with both CPW and EBG offer greater design flexibility, where the pattern of slots and square apertures are ethched on ground plane [10].There is only a little knowledge known about EBG structures modeling and performance as band stop filters. In this paper a new EBG structure based on unloading and loading is investigated. Dispersion diagram is obtained by combining the software and Floquet's theorem to analyze the electromagnetic behavior within a unit cell. Band stop filter is formed by cascading the EBG unit cell on either side of the feed line. MEMS surface process is used to fabricate the filter.

Advanced Design System tool is used for simulation of antenna design and analysis. The 2-D structure of antenna is obtained from ADS. Parameters such as return loss, reflection coefficient gain and VSWR of the antenna are calculated.

II. PROPOSED DESIGN

In this section, the ultrawideband antenna design is introduced. The antenna works in the unlicensed spectrum of 3.1-10.6 GHz region. The aim of this design implementation is to provide two notch bands between this frequency range .The lower notch is implemented by using T-shaped slot on the radiating element. It rejects the WiMAX application band operating between 3.3 to 3.7GHz.The upper notch is implemented using symmetrical EBG structures placed on either sides of the feed line to provide strong rejection characteristics. The upper notch rejects a frequency band at 6.5 to 7.2GHz used for C-band INSAT applications. This EBG design acts as resonator. Changing the dimensions of the slot and EBG will result in varying notch characteristics So optimized dimensions are applied and analysed for better notch characteristics.

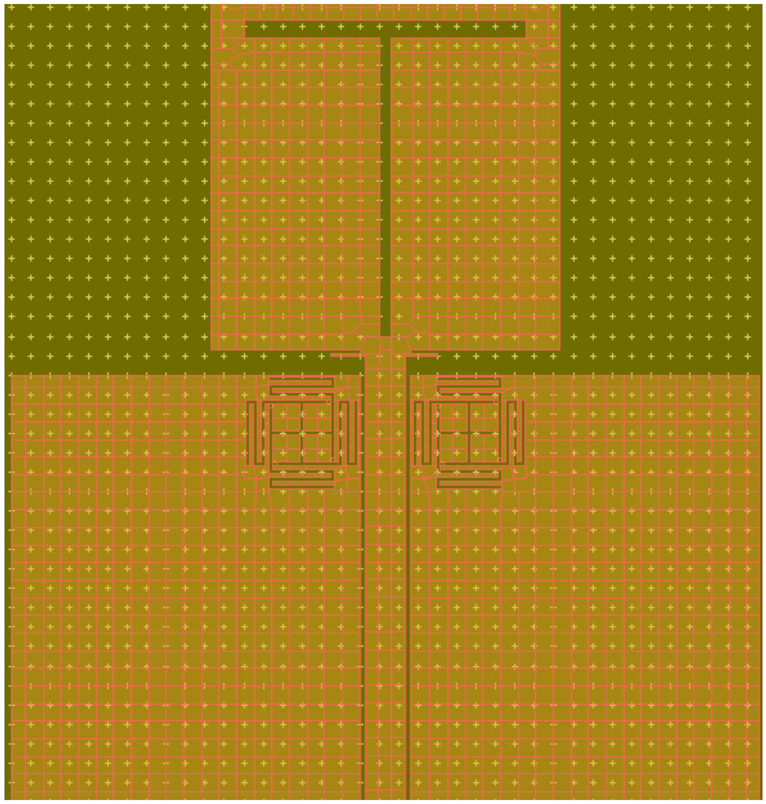

Fig-1: Proposed Antenna

III. METHODOLOGY

The proposed antenna is designed using a T-shaped slot with 2mm width and 40mm height in a substrate of 1m thickness. The relative permittivity of substrate is 4.4.The width and length of radiating element are 17mm and 20mm respectively. The radiating element is placed on the partial ground plane with a rectangular patch. The 50Ω coplanar waveguide feeding design has a feed width of 2mm.To obtain impedance bandwidth in UWB region two truncated rectangular slots are placed near the bottom edge of the patch surface. The above antenna is designed and optimized using Advanced Design System tool to obtain good impedance bandwidth in UWB frequency range and to produce proper notched bands. The lower notch band characteristics are produced by the T-shaped slot and upper notch band characteristics are produced by the EBG unit cells placed on either sides of the feed line symmetrically to obtain the notch band characteristics.

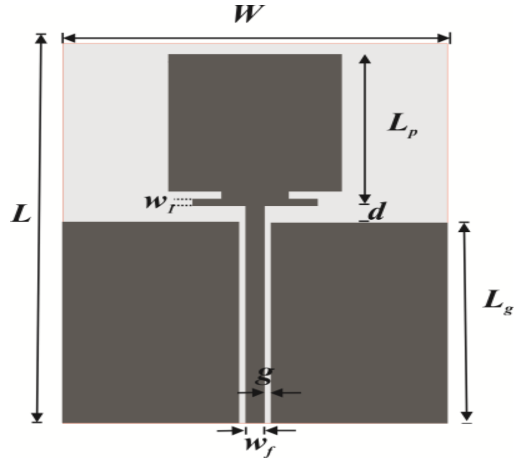

Fig-2: Antenna Dimensions without Slot and EBG

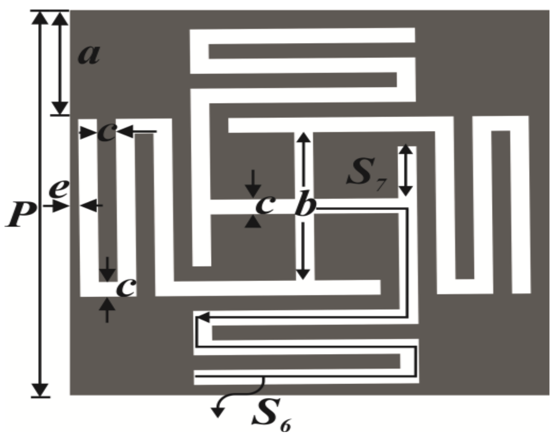

Fig-3: EBG Dimensions

Dimensions of Fig-2:

Parameters	Values(mm)
W	40
L	52
Wp	17
Lp	20
Lg	28
W1	0.5
Wf	2
D	1
G	2
Thickness of substrate	1

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Dimensions of Fig-3:

Parameters	Values(mm)
S1	16
S2	10
S3	10.5
S4	0.8
S5	0.8
P	5.2
A	0.9
B	2
C	0.2
E	0.2

IV. SIMULATION RESULTS

The reflection coefficient is given by the:

S (1,1) graph

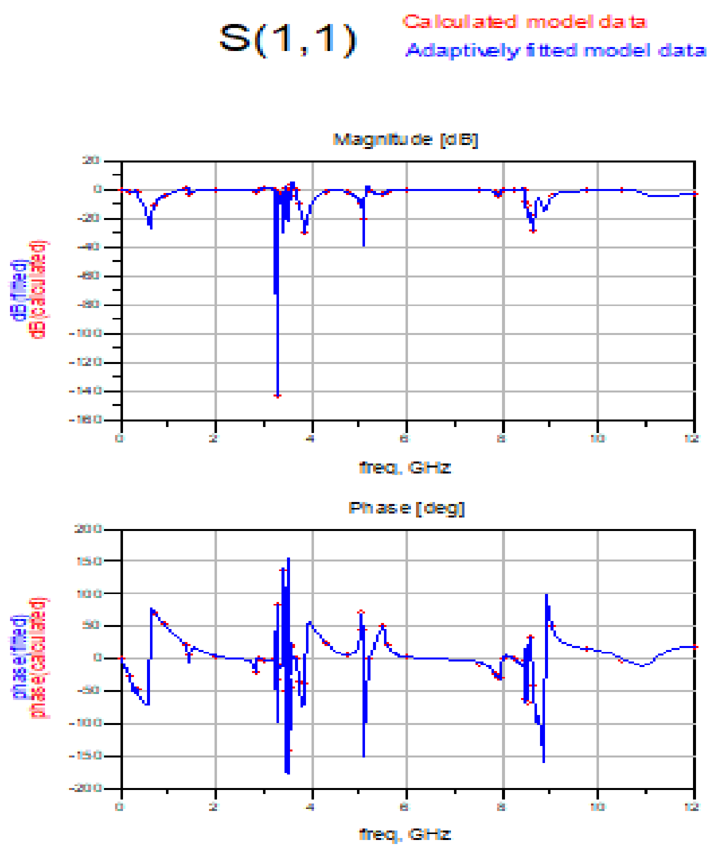

Fig-4: S (1,1) Plot

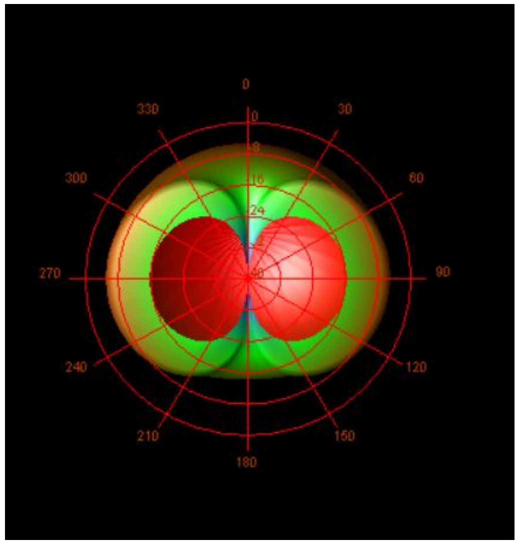

Fig-5: Radiation Pattern

V. REFERENCES

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