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Spike Shaped AMC Backed Patch Antenna for X Band Applications

C. Karthik[1], K. Damodar[2], P. Pragathi[3], S. Pavithra[4], and SK. Jasmin[5]

[1,2]Associate Professor, Department of Electronics and Communications Engineering, PACE Institute of Technology & Sciences, Ongole, Andhra Pradesh, India
[3]Assistant Professor Department of Electronics and Communications Engineering, PACE Institute of Technology & Sciences, Ongole, Andhra Pradesh, India
[4,5]UG Student, Department of Electronics and Communications Engineering, PACE Institute of Technology & Sciences, Ongole, Andhra Pradesh, India

Correspondence should be addressed to C. Karthik; karthick_c@pace.ac.in

ABSTRACT- In This paper, a single pole broken spike shaped antenna is there. The main objective is for the application of WiMAX band. For the required band, we carried out the proposed antenna into different iteration models. The proposed antenna which is heart shape works in WiMAX Frequency (3.2GHz-4,1GHz). To Increase the band width(900MHz), and gain (3dB), A two Slotted ring resonator in heart shape is done in them last iteration. In this design the parameters like VSWR is almost less than the WiMAX band and impedance will be 89% has been noted. Finallly the monopole antenna which in broken heart shape works at WiMAX band having medium gain, high efficiency, reduce in size that are useful for WiMAX band applications

KEYWORDS- VSWR, SRR (Slotted ring resonator), Borken heart shaped antenna, WiMAX

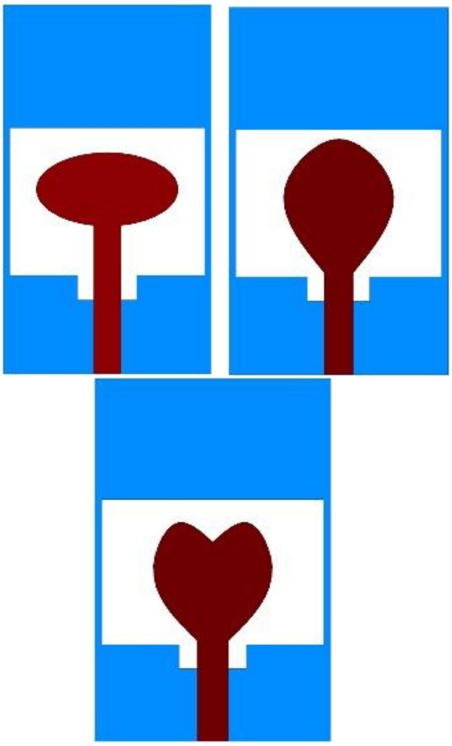
I. INTRODUCTION

From past years, the development of cutting-edge communications network standards has substantially improved due to the phenomenal expansion of wireless devices. Several communication protocols, including WiMAX and others, are now being developed for high frequency and high-speed communication. Because to the quick expansion of communication standards, there is a considerable need for broadband and narrow-band antennas that are easy to integrate into feed networks and have cheap production costs. From [1] writer investigated A circular polarized antenna with single feed line has beeen created by using (Fractal defected ground structure). From [2], the writer investigated a novel defective ground structure envisaged as an arc was extended of asymmetric nature that suppresses the cross-polarized fields but has no effect on resonance or co-polarized radiation In order to accomplish wideband applications, the writer of [3] described hexagonal ring patches in combination with triangular slotted symmetrical defective ground structure (DGS). In order to attain a super wide bandwidth, the writer of [4] proposed an octagonal slot-loaded radiating patch with a defective ground structure fed by a coplanar wave guide (CPW). To accomplish dual bans resonance in the ultra-wide band region, the writer of [5] constructed a microstrip patch antenna with a square slot serving as the radiating patch and an arc-based defective ground structure. In [6], the writer presented a T-shaped radiating patch for 5G wireless multi-input multi-output (MIMO) applications, paired with a semi-circular defeated ground structure. A trident-shaped radiating patch and an antenna with a UWB frequency response with a bandwidth of 3-12GHz are suggested in [7]. The bandwidth characteristics of rectangular and elliptical monopole antenna are improved by using a tapered step ground plane [8]. The antenna size has been decreased by a CPW feed monopole antenna design based on DGS structure [9–13]. EBG structure is used to enhance the bandwidth characteristics of the antenna is proposed in [14-15]. In [16], The writer proposed a square shaped antenna with various substrates for the reducing this shape of electronic devices. In this paper it has observe that a good VSWR. In [17], The writer proposed a monopole antenna which is in v-shaped to with a dielectric material results the multi bands. In this paper, it has observed that high resonance frequency for the various applications. In [18-19], the writer proposed a circular patch antenna with a substrate rogers duriod. In this paper it has observed that with a high peak gain of 13db and also it has observed that 15% bandwidth of axial ratio. [20–21] analyses the effects brought on by variations in the substrate's permittivity. In [22], [23], and [24], a slotted aperture antenna with multiband properties and an array antenna based on a liquid crystal substrate, respectively, are addressed. This article describes how to build a single band broken heart-shaped antenna for WiMAX applications. The suggested antenna was created using ANSYS electronics desktop-20 with Rogers RT/duroid 5880(tm) substrate material and a 0.8mm thickness. The working of the suggested antenna design and an analysis of the results have been done in this article's following sections.

II. ANTENNA DESIGN

Proposed antenna dimensions are 29 × 18.38 × 0.9mm, which contains the substrate Rogers RT/duroid 5880(tm). The antenna iterations are shown in fig. 1. In the below figure can see the iterations from elliptical patch antenna to egg shaped with having a defected ground structure

(DGS).



Iteration-1 Iteration-2 Iteration-3

Figure 1: Antenna Iterations

From above figure 1 the First iteration is taken as elliptical shaped antenna and it was converted a heart shaped patch antenna and converted we placed an inverted heart shaped ring and then it becomes patched slotted ring heart shaped ring. From below figure an inverted ring patch antenna is centered at slotted ring patch antenna from above figure, by using Etching process is applied on two rectangles makes the presented antenna of the ground in a DGS (Defected ground structure). The dimensions of two rectangles will be 12mm × 17mm and 2.1mm × 5.1 mm respectively as shown in above fig. 2 The sizes of the presented antenna are tabulated below.

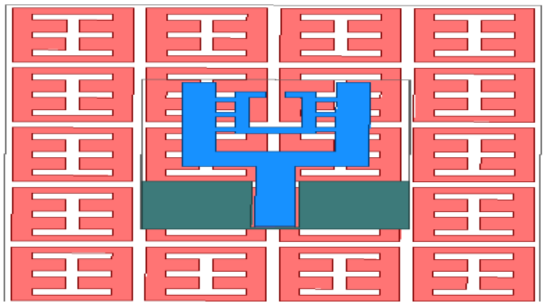


Figure 2: Dimensions of proposed antenna

Table 1: proposed antenna parameters

Parameters	Unit (mm)	Parameters	Unit (mm)
LS	30.00	WS	17.58
LP	9.80	WP	8.70
Lf	8.30	Wf	1.50
Lg1	12.00	Wgs1	17
Lg2	2.1	Wgs2	5.1
a	10.00	b	0.54
c	5.75		

III. RESULTS AND DISCUSSION

The reflection coefficients of presented antenna as shown in Fig.3. By using ansys HFSS Electronic Desktop 2021 stimulated software the presented antenna has been stimulated then it shows a reflection coefficient of the return loss will be -10dB at a band width from 3.1 to 4.2GHz. Due to presence of elliptical patched antenna the first iteration in the frequency range between 3.4 to 4.5GHz as in fig. 3. By modifying the elliptical patched antenna into egg shaped antenna the proposed antenna resonates at a frequency range of 3.5 to 4.7GHz in second iteration. By modifying the egg patched antenna to heart shaped patch antenna the proposed antenna operates at a frequency range of 3.8 to 4.4GHz in third iteration. And again by improving the proposed antenna design from heart shaped to closed ring resonator slot to get a frequency range of 3.2 to 4.2 GHz in fourth iteration. Finally, we modify the heart shaped ring slot into an inspired heart slotted ring resonator then the proposed antenna operates in a frequency range of 3.1 to 4.1 GHz in the fifth iteration.

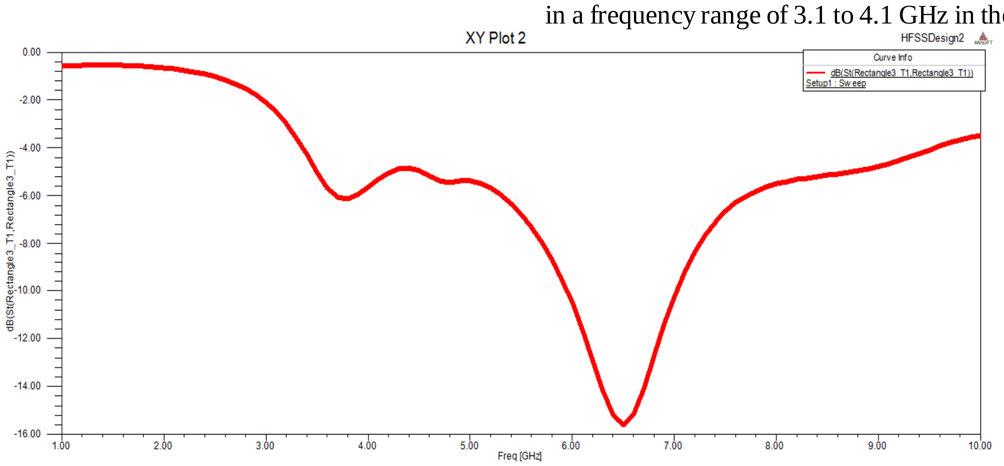


Figure 3: Iterations Reflection coefficient

Due to presence of a heart shaped into a broken heart slot by the inserting a bended and reduce size of broken heart shapes closed ring resonator then the antenna operates in the frequency range of 3.2 to 4.1 GHz in the sixth iteration. By modifying this broken heart shaped ring slot into heart shaped ring resonator slot by the inserting of bended and reduce in size of heart shaped open slotted ring resonator that the proposed antenna operates in frequency range of 3.2 to 4.3GHz in the final iteration

The current distributions and magnitudes of current of the proposed antenna at a frequency of 3.6GHz respectively as shown in fig. 4(a) and fig. 4(b). we can observe the resonance at 3.6GHz By the radiating of defected ground plane on both sides of heart shaped ring patch antenna. Finally, we can get that the proposed antenna is suitable for the applications WiMAX.

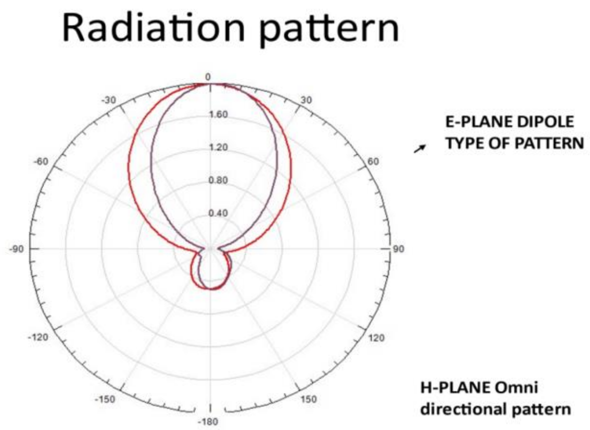


Figure 4: (a) current Distributions (b) Magnitudes of current

Table 2: Iteration wise band coverage, peak gain, average gain, RL(GHz)

	Band Cover-age (GHz)	RL (GHz)	Imp BW (%)	Peak Gain (dBi)	Avg Gain (dBi)
Iteration 1	3.1-4.2	3.7	13.51	2.734	2.714
Iteration 2	3.4-4.5	4.1	24.39	2.784	2.735
Iteration 3	3.8-4.4	4.1	19.51	2.788	2.778
Iteration 4	3.2-4.2	3.7	24.32	2.829	2.889
Iteration 5	3.1-4.1	3.6	25	2.855	2.896
Iteration 6	3.2-4.1	3.6	25	3.015	2.973
Iteration 7	3.2-4.1	3.6	25	3.117	2.98

The presence of feedline in the takes an important role in current flow. The value reflection coefficient is less than -10dB fot the presented antenna for the range of frequency is 3.2GHz to 4.1GHz. comparing between the iterations of the antennas of stimulated gain as shows in below Fig. 5. The gain changes from 2.7 to 3.1dB in 3.3 to 4.3GHz for the proposed antenna. from fig 5 the average gain of proposed antenna is 2.99dB.

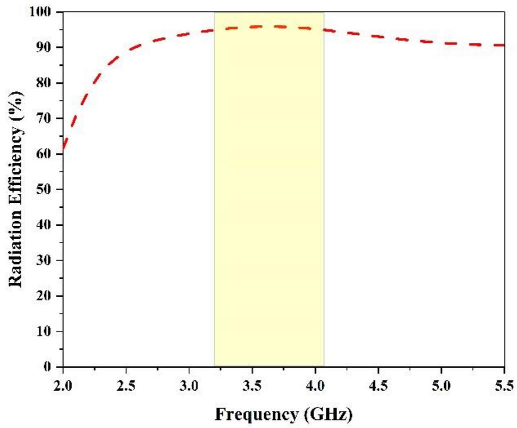


Figure 5: radiation Efficiency (%) vs Frequency(GHz)

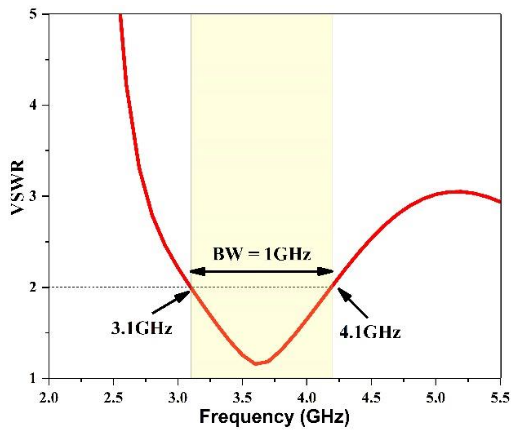


Figure 6: presented antenna VSWR

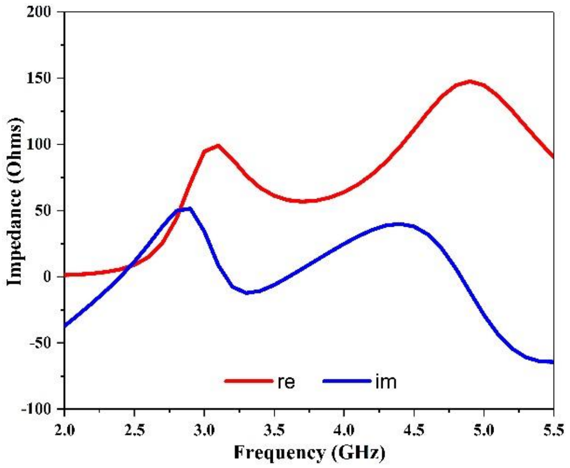


Figure 7: Impedance (ohms) vs. Frequency (GHz)

The results, the efficiency of the invented antenna is as shown in fig 6. we can see the above figure and say that the efficiency of presented antenna changes from 94 to 96% we can see the VSWR for the proposed in the fig 7. The VSWR working frequency band will be 3.1GHz to 4.1GHz this band range is also called as impedance matching. For that the impedance matching changes from 50ohms to 60 ohms that called as perfect impedance. we can observe radiation patterns in Fig9 for the presented antenna and also values are in Table. I

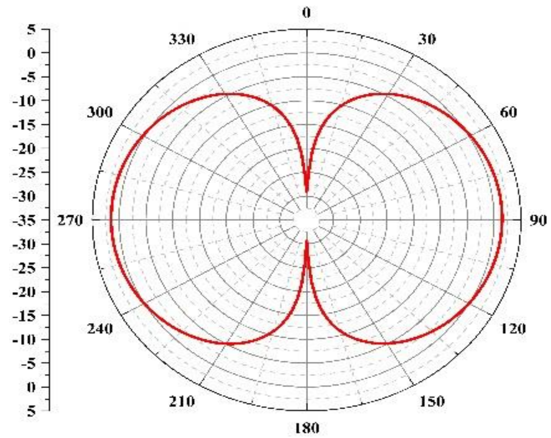


Figure 8: XY - plane - Radiation pattern

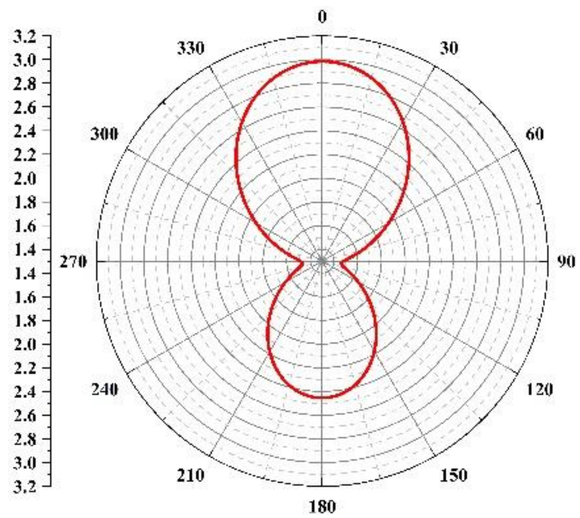


Figure 9: YZ plane - Radiation pattern

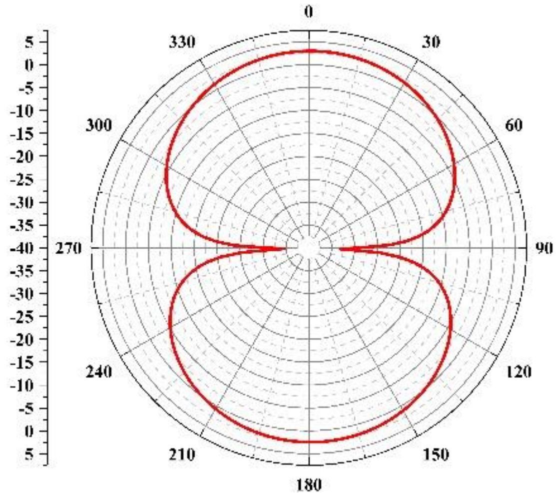


Figure 10: ZX - Radiation pattern

IV. CONCLUSION

We can conclude an antenna which is in broken heart shape has designed through any electronic desktop-20. From the design we had concluded that the antenna which we have proposed is useful of WiMAX band applications. We have analyzed all seven iterations for the band. We get the bandwidth from 3.2 GHz to 4.1 GHz with an average gain of 3db and has covered 900mhz for the proposed antenna. We get a efficiency of 87% for the proposed antenna which is useful of WiMAX applications. This design is an excellent candidate for WiMAX applications. VSWR and radiation patterns has been analyzed in this paper which strongly used for the WiMAX applications.

CONFLICTS OF INTEREST

The authors declare that they have no conflicts of interest.

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