Design and Simulation of Different Structures of Micro Strip Patch Antenna for Wireless Applications

Anil. J. Kokare, Mahesh. S. Mathpati, and Bhagyashri. S. Patil

Abstract The need for multiband, bigger addition and low profile radio wires to help numerous remote applications prompted the plan of Microstrip reception apparatuses. Microstrip radio wires because of their little profile configuration take less zone. This paper presents a straightforward rectangular Microstrip Patch Antenna, E-Shaped, U-Shaped, +-Shaped radio wires work at 2.2 to 3.8 GHz. The Proposed reception apparatus will be in lightweight, keen and conservative unit contrast and comprises of metallic fix and ground between which is a dielectric medium called the substrate. This various structures of MSA are utilized for military, remote and common applications. The CADFEKO programming is utilized to register the increase, power, radiation example and S11 of receiving wire.

Keywords Microstrip · Fractal · Multiband · WLAN · LTE · CADFEKO

1 Introduction

Taking into account the advancement of the ongoing remote correspondence frameworks and its application, more extensive data transfer capacity, multiband and low profile radio wires are in incredible interest for both business and military applications. The quick increment of remote interchanges prompts an enormous interest in the planning of a multiband radio wire. Expectedly, every reception apparatus works at single or double recurrence groups, where distinctive receiving wire is utilized for various applications. The plan of proposed receiving wires is utilized for the fast,

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versatile correspondence and furthermore advancement of microwave frameworks, for example, WLANs, WiMAX alongside the conveyance of rapid information. Various receiving wire plans, for example, E-formed radio wires have been introduced for such multi-standard portable terminal application. A tale GPS fix reception apparatus with fractal EBG structure utilizing an attractive natural substrate is introduced, which can meet the prerequisites of scaling down and elite of GPS [1]. Hexagonal fractal receiving wire configuration begins with the first emphasis of square fix and is portioned by eliminating the centre square from it. For the second emphasis, the square is cut into nine harmonious sub squares by 3-by-3 evaluation, and the focal sub-square is eliminated. A similar system is then applied recursively to the excess eight sun squares, and for the third emphasis again, we take 33% of second sub squares [2]. An enhanced and minimized printed double band fractal reception apparatus reasonable for WLAN applications. The proposed reception apparatus takes a shot at 2.4 and 5.2 GHz [3]. A composite scaled-down fractal radio wire as a mix of Minkowski and Koch bends is introduced. The structure of the proposed reception apparatus is after the effect of the alterations made with the essential fractal square and three-sided bends. The radio wire can be utilized for most handheld gadgets and subsequently finds wide applications in the field of remote and portable applications [4]. A test took care of E-formed fractal fix reception apparatus (EFPA) for heptads band LTE/WWAN (GSM850/900/1800/1900/UMTS/LTE2300/2500) activity is proposed, and different cycles of this fractal receiving wire are looked at, and an improved plan is introduced.

2 About Fractal Geometries

The term fractal was begotten by the French mathematician B.B. Mandelbrot during the 1970s after his spearheading research on a few normally happening sporadic and divided calculations not contained inside the domains of customary Euclidian math [5]. The term has its underlying foundations in the Latin word fractus, which is identified with the action word finger (which means: to break). These calculations were commonly disposed of as amorphous; however, Mandelbrot found that specific uncommon highlights can be related to them. He found a typical component in huge numbers of these apparently sporadic calculations and figured speculations dependent on his discoveries [6]. Two instances of normally happening fractal calculations are snow-chips and limit of geographic mainlands. The fractal receiving wires are not the same as customary radio wires since it is fit for working at various frequencies all at once. The vital favourable circumstances of fractal radio wires are diminished reception apparatus size, uphold multiband and wideband activity with improved receiving wire execution. These can be accomplished utilizing fractal calculation like Hilbert, Sierpinski, Koch and Minkowski are the different kinds of fractal calculations [7]. All these fractal calculations are utilized to plan a little size multiband and wideband reception apparatuses.

3 Methodology

The patch antenna has been designed for the following dimensions to achieve the requirements of wireless communication applications.

Resonant frequency (f_r) = 2.4–4.8 GHz, Dielecrtric constant (ε) = 4.4.

3.1 Rectangular and E-Shaped Microstrip Patch Antenna

The radio wire is planned at 2.4 GHz recurrence and built as a fix on the substrate. Model number one in Fig. 1 shows a rectangular fix receiving wire configuration to work near 3.8 GHz will be demonstrated. The model is first developed as a fix on an infinitely huge substrate since it rushes to make and to recreate. Figure 2 shows an E-formed fix radio wire plan fractal math is in gendered in an iterative style, prompting self-comparative structure.

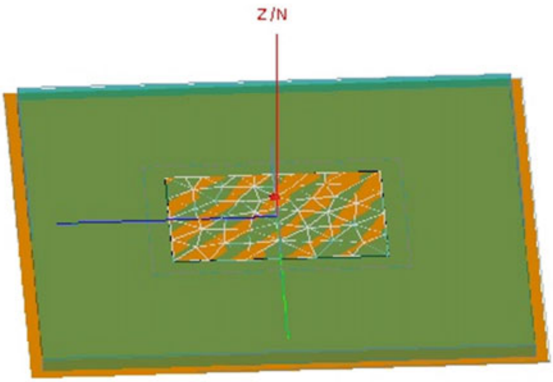


Fig. 1 Rectangular patch antenna

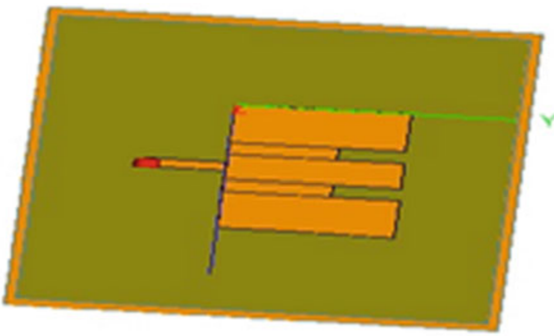


Fig. 2 E-shaped patch antenna

3.2 U-Shaped and Plus Shaped MSA

Figure 3 shows Plus-formed structure. This is a reference receiving wire or base shape reception apparatus. Further, this base shape radio wire is adjusted by embedding's level spaces on the two sides with the separate focus of fix can be utilized in remote correspondence applications. Figure 4 shows U-molded structure can work at 2.5 GHz for some applications in ongoing remote correspondence.

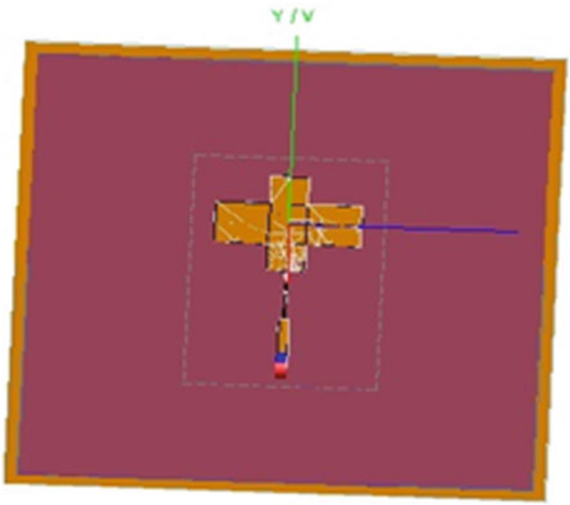


Fig. 3 Plus-shaped patch antenna

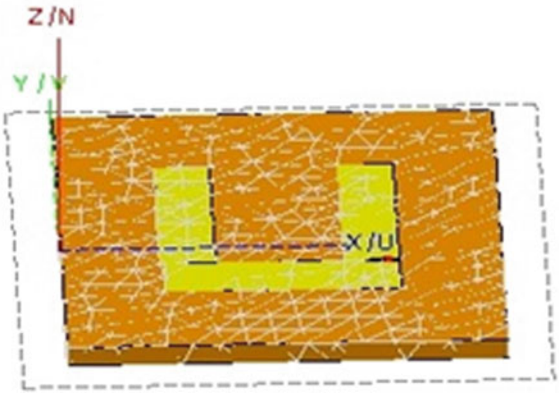


Fig. 4 U-shaped patch antenna

Table 1 Comparison of different structures of microstrip patch antennas

Parameters	Rectangular	Plus shape	U shape	E shape
Resonant frequency (GHz)	2.7	3.8	2.5	2.4
Reflection coefficient (dB)	−40	−36	−38	−11
VSWR	1.5	1.83	2	1.85
Impedance (ohm)	50	48	49.5	51.2
Return loss (dB)	−22	−23	−22	−18

4 Simulation Results

Table 1 shows the comparison of different shapes of the microstrip antenna.

For the examination of proposed Different shape of microstrip patch fractal reception apparatus, the receiving wire boundaries like reflection coefficient, VSWR, addition and transmission capacity are recreated utilizing reproduction programming CADFEKO. CADFEKO is a full-wave electromagnetic field test system that depends on the Method of Moments (MoM). It is a business programming device that can be utilized for receiving wire plan, radio wire situation examination, RF structure execution forecast, EMC just as dissipating issues and bio-electromagnetics. The initial four cycles of the middle feed E shape fractal reception apparatus are mimicked by utilizing CADFEKO programming, and results are demonstrated as follows.

The Reflection coefficient for the of the E shape fractal receiving wire is plotted in Fig. 5. Reflection coefficient esteems—11 dB, at particular thunderous frequencies 2.4 GHz. The E formed fractal radio wire creates a low reflection misfortune contrasted with the standard qualities needed for portable application at GSM band. Impedance and VSWR plots are shown in Figs. 6 and 7 with the appropriate value required for wireless application. The antenna radiation pattern is plotted in a 3D view, as shown in Fig. 8.

5 Conclusion

It would have been a major bit of leeway to know the CADFEKO 14.0 reproduction programming already as a lot of estimations might have been applied. Miniature strip radio wires and their hypothesis get substantially more perplexing as you need to make more proficiency. The various sorts of reception apparatuses are explored and effectively reproduced in this paper. The reproduced reflection coefficient, impedance and radiation design demonstrated well execution. Miniature strip reception apparatuses have become a quickly developing territory of examination. Their potential applications are boundless, on account of their lightweight, conservative size, and simplicity of assembling. E-formed micro strip reception apparatus is entirely

Fig. 5 Reflection coefficient of the patch antenna

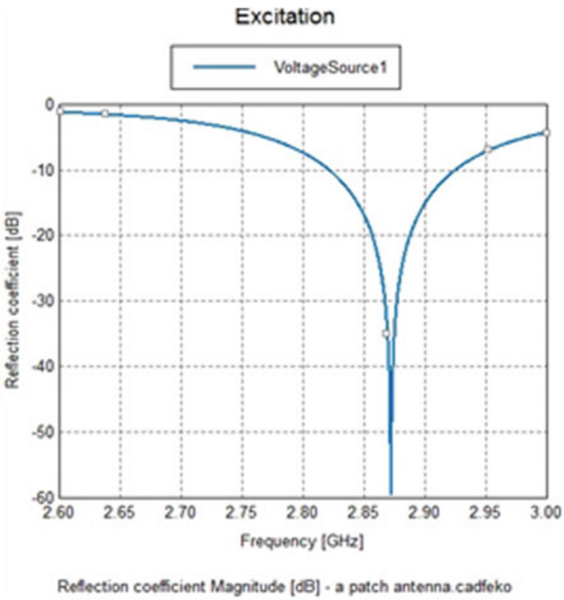
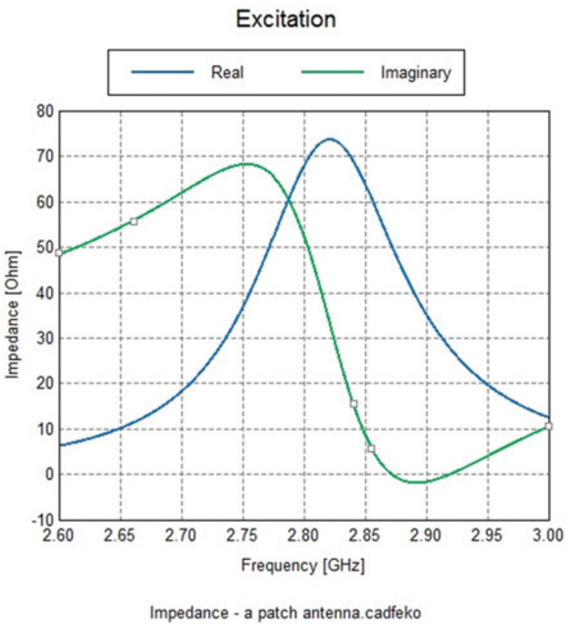


Fig. 6 Impedance of patch antenna



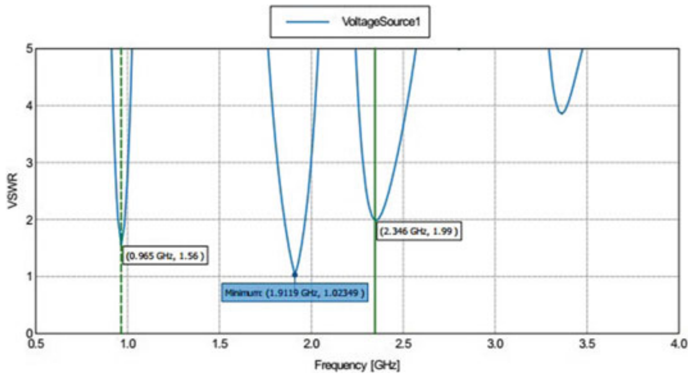
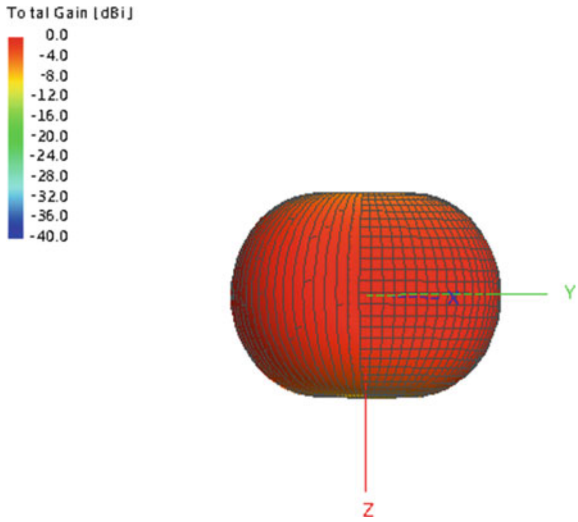


Fig. 7 VSWR of E-shaped patch antenna

Fig. 8 E-shaped patch antenna radiation



planned with an expanded transmission capacity as compared to rectangular miniature strip receiving wire antenna. Comparison of different shapes of the microstrip antenna is simulated and presented.

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