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MICROSTRIP ANTENNA WITH COMBINED STAR AND ELIPS PATTERN PATCH

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ABSTRACT

This paper describes about microstrip antenna which made from FR-4 substrate and copper for patch, this antenna has a small size and unique form. This antenna works for dualbands that consist of the first band at 2.296 GHz - 2.402 GHz which can be applied on Wi-Fi. For build this antenna, has been simulated using CST STUDIO SUITE 2014.

Keyword: combined star and elips patch, microstrip antenna, wimax, CST microwave studio.

INTRODUCTION

In the 21st century the development of telecomunication technology is growing so fast and so do the human who always wanted better, faster, easier, simpler communication. Antenna is the one of factor that influence the performence of communication. A better antenna provides more benefits, like a better signal received, if the information trasmitted is sound so the receiver will have a clear and nice sound. [1] A further signal range which is affect for the efficiency of telecomunication network. The antenna is a toolkit that is used to transmit or receive a signal that is sent or received. There are so many type of antenna, Microstrip is one of them. This kind of antenna is cheaper, simpler, and easy to build and operate, easier than other type of antenna. [2]The antenna which designed in this paper meets the criteria of a good antenna performance on frequency 2.296 GHz-2.402 GHz this application for WIMAX/WBA on this frequency.[3]

GEOMETRY OF MICROSTRIP PATCHANTENNA

This antenna has a patch with combined star and elips pattern, and for the slot at groundplane is a star pattern. This antenna has the opposite pattern to the paper "star microstrip antenna with combined star and elips pattern slot".

Microstrip Antenna with Combined Star and Elips Pattern Patch has 4.4 permitivity and FR-4 for the substrate with thickness of 1.6 mm, length of 75mm, and the width of 50 mm with linefeed microstrip rationing technique. And for the groundplane, the length and width are 70mm and 50mm.

DESIGN PARAMETERS

To show the shape of this antenna design, it can be seen in Figures 1 and 2 and all simulation to design the wideband microstrip feed patch antenna for WLAN/Wimax applications is completely by CST Microwave Studio Software.

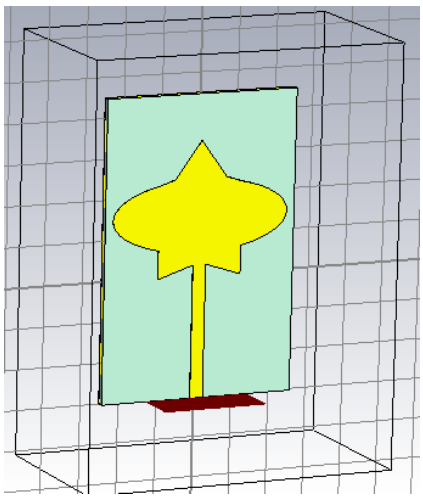

Figure-1. Front view geometry of designed antenna.

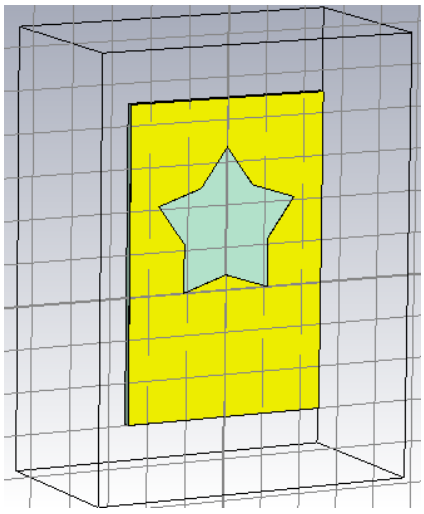

Figure-2. Back view geometry of design antenna.

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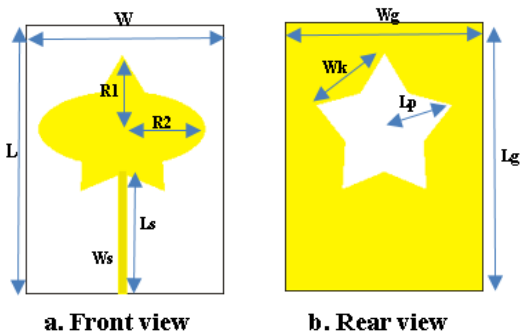

Figure-3. The antenna design; with 1.6 mm FR-4 substrate (ε_r= 3.9) W= 50 mm; L= 75 mm; microstrip-line feed with the dimension of Ws= 3.372 mm; R1= 18.5 mm; R2= 23 mm; Ls= 34 mm;and ground plane with the dimension of Wg= 50 mm; Lg= 75 mm; Wk= 21.8 mm; Rp= 18.5 mm.

SIMULATED RESULTS

a. Bandwidth

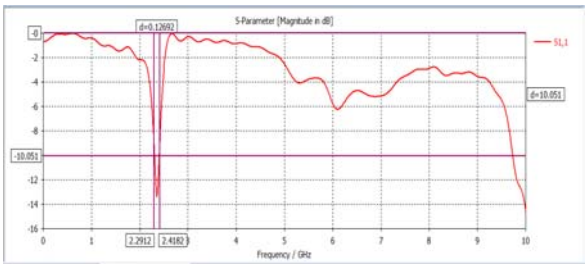

Figure-4. Bandwidth.

The first band which showed in Figure-4 has frequency range between 2.291 GHz - 2.418 GHz (Wimax/WBA) which resonate at frequency 2.361 GHz and this bandwidth is 127 MHz. [3].

b. Return loss

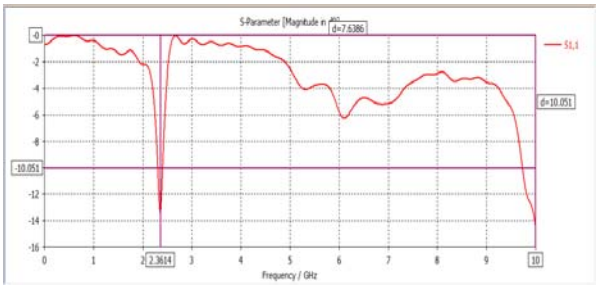

Figure-5. Return loss.

In Figure-5, graph shows the return loss at frequency 2.291 GHz - 2.418 GHz and at this frequency this antenna is meet the minimum requirements for antenna which has maximum value of return loss is 9.54 dB.

c. VSWR

Figure-6. VSWR.

In Figure-6grapgh shows about VSWR. A good antenna can works well if meet some of parameter, one of them is if VSWR value is less than equal to 2 (VSWR <= 2). [4] And for this antenna the frequency range that meet that condition is at 2.291 GHz-2.418 GHz.

d. Surface current

The surface current shows the flow of current at the patch surface is shown in Figure-7.

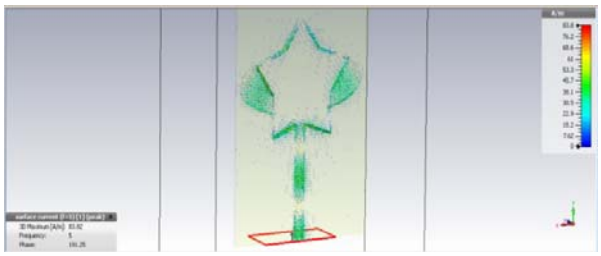

Figure-7. Surface current.

In Figure-7we show the surface current. Frequency 2.291 GHz-2.418 GHzhave a current distribution as shown in the picture.

e. Directivity

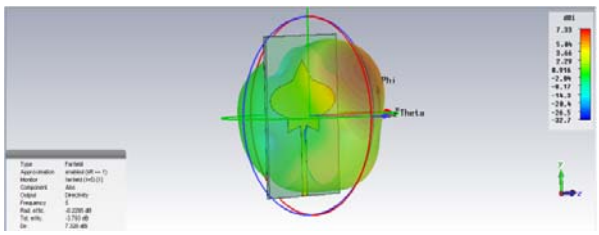

Figure-8. Directivity.

Figure-8 is showing the directivity of wave beam on this antenna which has a value 7.3 dBi toward to front of the patch.

f. Gain

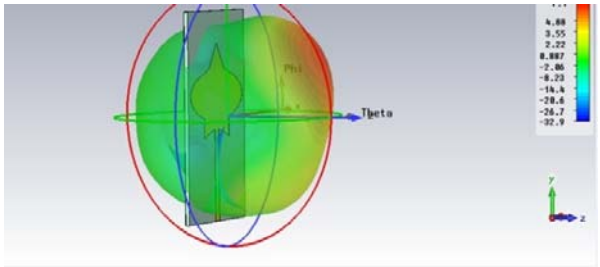

Figure-9. Gain.

Figure-9. Explains the gain microstripantenna thatthe gain obtained at frequency 2.291 GHz – 2.418 GHz.

CONCLUSIONS

The microstrip antenna with combined star and elips patternfor its patch and for the groundplane is star pattern. In this antenna the relative permittivity is 4.4. The FR4 substrate has the thickness h=1.6 mm,and the width the samevalue as 50 (which is symbolized by W) and the length the same value as 75(which is symbolized by L). Where this antenna has high bandwidth and high directivity, and this antenna has a small size and has a unique design. [5-8]. This antenna has onebands, and bandwidth for thisantenna has frequency range between 2.296 GHz-2.402 GHz on that frequency range includes Wimax/WBA [3],[8].

ACKNOWLEDGEMENT

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REFERENCES

[1] R. Best, Dr. Steven. 1998. Antenna Properties and their impact on Wireless System Performance. Cushcraft Corporation.

[2] Alsager, Ahmed Fatthi. 2011. Design and Analysis of Microstrip Patch Antenna Arrays. Electrical Engineering Communication and Signal processing. Thesis No. 1/2011.

[3] Otasowie P.O and Ogujor E.A. 2009.Voltage Standing Wave Ratio Measurement and Prediction. Departement of Electrical Engineering University of Benin, Nigeria.

[4] Yuwono Rudy, DhuhaGezadio and Ramadhan Faisal: 2014.The Additional Ellipse ShapePatch Microstrip Antenna for Operating Frequency at 1.924 GHz-3.009 GHz. Electrical Engineering Department University of Brawijaya Malang, Indonesia.

[5] Yuwono R., Purnomowati, E.B., Afdhalludin M.H. 2014. UB Logo-shaped ultra-wideband microstrip antenna (Article) ISSN: 18196608.Asian Research Publishing Network. ARPN Journal of Engineering and Applied Sciences. 9(10): 1911-1913.

[6] Yuwono Rudy, Silvi A.D. Permata, ErfanA. Dahlan and Ronanobelta S. 2014. Design of Rugby Ball Patch Microstrip Antenna with Circle Slot for Ultra Wideband Frequency (UWB).American Scientific Publishers Lett.20, 1817-1819.

[7] Ruengwaree A., Yuwono R., Kompa G. 2005. Anoble rugby-ball antenna for pulse radiation. IEEE Conference Publications, the European Conference on Wireless Technology. pp. 455-458.

[8] Yuwono, R,Syakura, R. 2014. Star-L shaped circularly polarized microstrip antenna for wireless applications. Applied Mechanics and Materials. Volume:548-549. pp.776-779.