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30th JSST Annual Conference (JSST 2011)
International Conference on Modeling and Simulation Technology

October 22-23, 2011
Tokai University Takanawa Campus, Tokyo, Japan

Ginza, Tokyo :

Final Call For Papers

ABOUT JSST 2011:

The 30th JSST Annual Conference (JSST 2011), which is sponsored by Japan Society for Simulation Technology (JSST) will be held to explore challenges in methodologies for modeling, control and computation in simulation and their applications in various fields including social, economic and financial as well as already established scientific and engineering solutions. For more details, visit the homepage of JSST: http://www.jsst.jp/e/JSST2011.

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The Conference will take place in Tokyo at the Tokai University Takanawa Campus:
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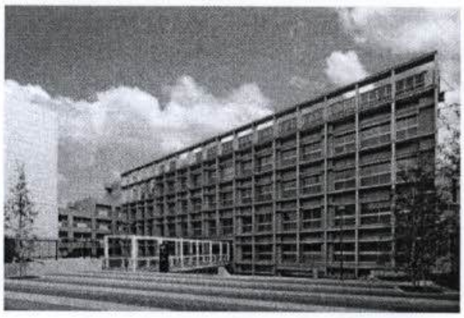

TOPICS:

Artificial Intelligence, Brain Science, Computational Engineering, Evolutionary Computation, Financial Engineering, Fluidics, Fuzzy Control, Genetic Algorithms, Innovative Computations, Management Simulation, Micro Machines, Mobile Vehicle, Monte Carlo Simulation, Neural Networks, Neurocomputers, Numerical Simulation, Risk Handling, Robotics, Virtual Reality, Visualization, Other Related Fields.

PROCEEDINGS:

Electronic proceedings (CD-ROM) are delivered during the conference. For selected papers, the conference makes official recommendation to be re-submitted to one of the following journals:

- International Journal of Simulation Technology (IJST)
- Transaction of the Japan Society for Simulation Technology (in Japanese).

IMPORTANT DATES:

April 15, 2011 (The data was extended)	Submission of proposals for organized sessions
June 25, 2011 ~~June 15, 2011~~ (The date was extended)	Submission of an extended abstract (within 2 pages, PDF format)
July 25, 2011 (The date was extended)	Notification of acceptance
August 20, 2011	Submission of the full text of the paper (within 8 pages, PDF format)

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(CFP Version 2011/05/06)

Study on The Properties of Hexagon Shape Monopole Antenna

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Abstract—This paper present the properties of hexagon shape monopole antenna. is presented for simultaneously satisfying wireless local area network (WLAN). Antenna is designed on FR4 substrate, since it is small size, easy fabrication and low cost. The design methodology is outlined and the overall size is 43.98×35×1.67 mm. This antenna was numerically designed using IE3D simulation software package. The Results -10 dB bandwidth for return loss is from 2.4GHz (2,3GHz – 2.58GHz) 5.05GHz(4.6GHz – 6.6GHz), covering all the 2.4/5.2/5.8GHz WLANbands 2.5/5.5GHz WiMAX bands.

Keywords—CPW-Fed, WLAN, Monopole

1 Introduction

Recently, there has been increasing demand for broad dual- or multi-band operation for various portable wireless communication devices to provide image, speech and data communications at anytime and anywhere around the world. This indicates that future communication terminal antennas must not only meet the requirements of being dual- or multi-band, but also have a simple structure, compact size and easy integration with the circuit. The Micro strip antenna has been very popular due to their may advantage ,such as low profile and cost ,light weight ,and small size [1,2] The IE3D software as referred in [3] was used to analyse the proposed antenna So far, many promising planar antennas [4–8], such as the planar dipole antenna [4], planar antenna with reflector backing [5], planar inverted-F antennas [6], planar monopole antennas [7] and coplanar waveguide (CPW) antennas [4 – 7] have been reported for dual or multi-band operation. Among these designs, the single-layer planar patch antennas, especially the CPW-fed antennas, have received much attention owing to their distinct advantages such as wide bandwidth, low profile, light weight, easy realizations and integration with system circuits. However, most of the currently proposed CPW-fed antennas use a symmetrical arrangement for the ground structure. Although this kind of ground arrangement for a CPW-fed antenna is usually capable of producing dual or multi-band resonant modes, it mostly requires either greater complexity of antenna shapes or larger antenna size for practical. This paper presents simple dual band design of the printed a CPW feeding structure with hexagon shape. By properly a radiating patch and carefully selecting the ground size, good radiation characteristics and dual-broad impedance bandwidths suitable for wireless communication systems such as the wireless local area network (WLAN) operation in the 2.4GHz (2.4GHz - 2.484GHz) and 5.05GHz/5.8GHz (5.15GHz - 5.35GHz /5.725GHz - 5.825GHz) band, the worldwide interoperability for microwave access (WiMAX) application and operation in the 2.5/5.5GHz(2.5GHz - 2.69GHz /5.25GHz-5.85GHz). Details of the antenna design were studied, and prototypes of the proposed antenna were constructed, including input return loss, impedance bandwidth, surface current distribution, and radiation pattern.

A coplanar waveguide (CPW) is formed form the conductor separated form a pair of ground planes, all on the same plane, on a dielectric medium. In the ideal case, the thickness of the dielectric is infinite, in practice, it is thick enough so that electromagnetic filed die out before they get out of the substrate. Coplanar waveguide structure and electromagnetic properties. A coplanar waveguide structure consists of a median metallic strip of deposited on the surface of a dielectric substrate slab with two narrow slits ground electrodes running adjacent and parallel to the strip on the same surface that is shown in Fig.1 [1]

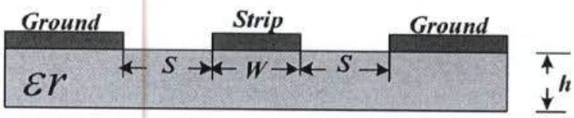


Fig.1 Coplanar waveguide structure

2 Antenna Geometry

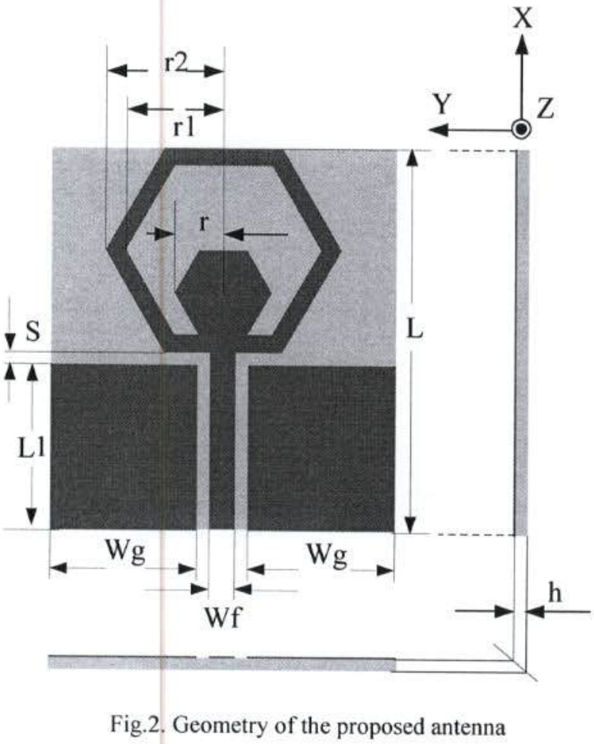


Fig.2. Geometry of the proposed antenna

Calculate the guide wavelength

$$\lambda g = \frac{\lambda_0}{\sqrt{\varepsilon_{eff}}} \quad (1)$$

$$\lambda_{eff} \approx \frac{\varepsilon_r + 1}{2} \quad (2)$$

The geometry of the Hexagon shape monopole antenna is depicted in Fig.2 whose conductor is printed on a FR4 substrate of thickness 1.64 mm (h) and dielectric constant 4.4 (εr). a CPW transmission width of 3 mm and a gap distance of 1 mm between the strip and ground is used for feeding the antenna. The printed monopole is connected to the end of the CPW transmission line with a spacing of 1mm from the ground plane. To examine the performance of the proposed antenna configuration in terms of enhancing the bandwidth, the commercially available moment method code, IE3D, was used for required numerical analysis. To test the proposed design, the geometries in Fig.1.

3 Parametric Study

The simulation and analysis are performed using the commercial computer software package IE3D. To obtain broadband characteristic, a feeding structure composed of a coplanar waveguide (CPW) micro strip line is proposed. the first frequency resonance design is to make the impedance. To realize this, an arc r is etched on the hexagon patch, which is designed to resonant at WLAN band. The radian of the hexagon stub is 0.52 λ where λ is the dielectric wavelength at 2.4GHz. Fig.3 shows the simulated effects on the antenna frequency response by changing the length r. The value of r is varied from 5 to 8 mm, the first frequency is shifted to lower frequency when increase r. However, when r is increased more than 8 mm, there was decreased the impedance bandwidth of the antenna. A large frequency shift occurred in the first resonance when changing the parameter r. The minimum return loss is -29dB at 2.6 GHz when r is varied to 5 mm.

Table 1 Antenna Dimensions in Millimetres

h	1.64	L	43.98
Wf	3	r	6.5
Wg	15	r1	12
L1	17	r2	15
S	1		

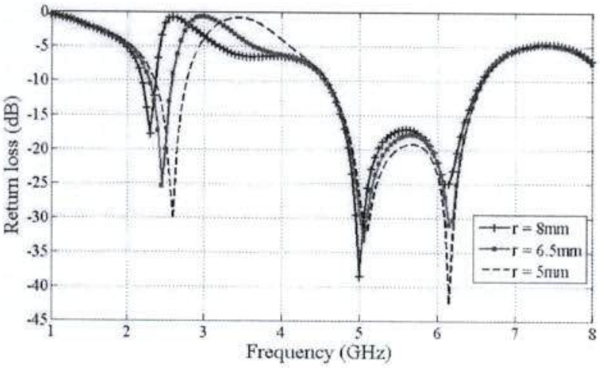
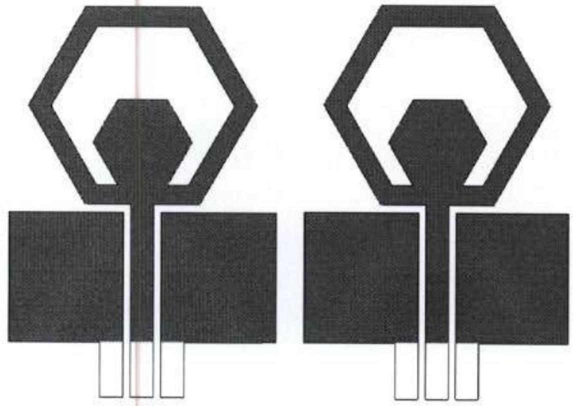


Fig.3. Comparison of S11, with different radius

Fig.4 illustrates the current distribution on the radiation patch. As shown in the figure, the current is mainly distributed along the edge of r at 2.4GHz pass band. However it concentrates mainly along the r at 5.05GHz. Simulated return loss of the proposed antenna is depicted in Fig.5 The simulated show that the proposed antenna achieved dual-band are 2.4 GHz and 5.05 GHz with impedance bandwidth cover WLAN application. Fig.6 presents the simulated VSWR for different r. By comparing the curves in Fig.6, it is found that the resonance band and the VSWR level can be effectively changed by adjusting the radian of r. After many optimization processes using commercial software IE3D, the structural parameters of the antenna show in Table 1.



(a) 2.4 GHz (b) 5.05 GHz

Fig.4. The current distribution of the proposed antenna

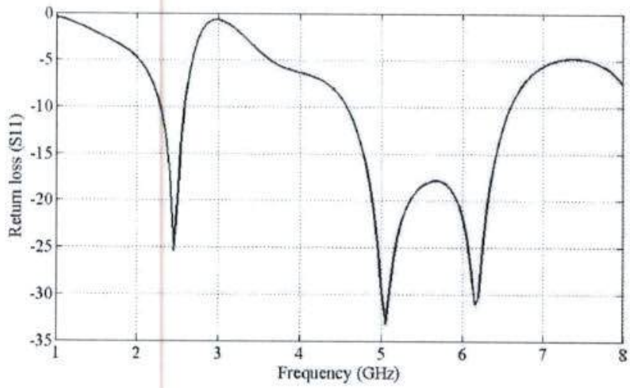


Fig.5. Simulation return loss for the proposed antenna

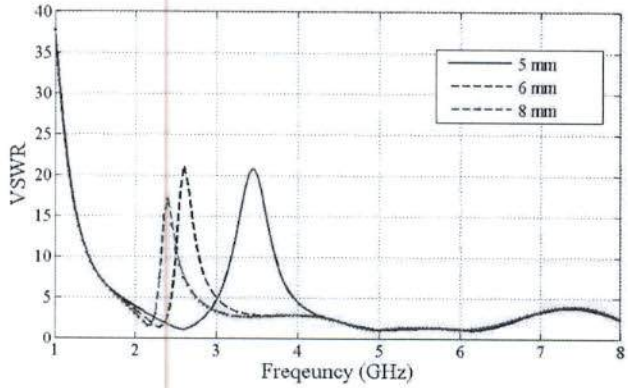


Fig.6. Simulated VSWR for different r

4 Radiation Patterns

The simulation radiation of 2-dimension in elevation pattern of the proposed antenna at frequency 2.4 GHz is shown in Fig.7. The elevation radiation pattern illustrates 2-directional pattern with maximum gains at 0° and 180° with directivity 3 dBi and the nulls occur at 90° and 270°. The 2-dimension of azimuth pattern of proposed antenna at frequency 2.4 GHz simulation at 0° is shown in Fig.8. The pattern is an bi-directional pattern with maximum gain at 3.1dBi and there doesn't have null in any angle. The 3-dimension pattern of proposed antenna at frequency 2.4 GHz shows in Fig.9. There have maximum gains at 0° and 180° about 3.4 dBi.

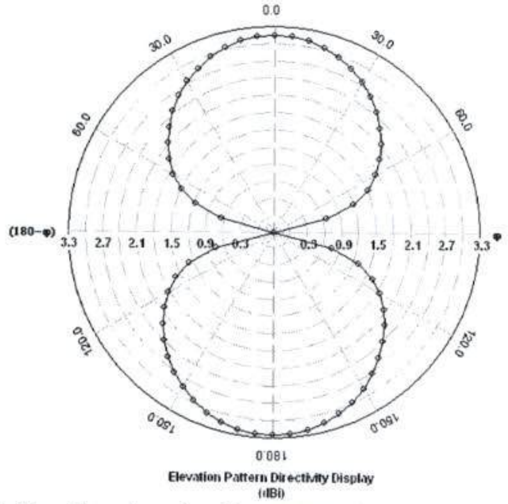


Fig. 7 Tow dimension elevation pattern of proposed antenna at frequency 2.4 GHz

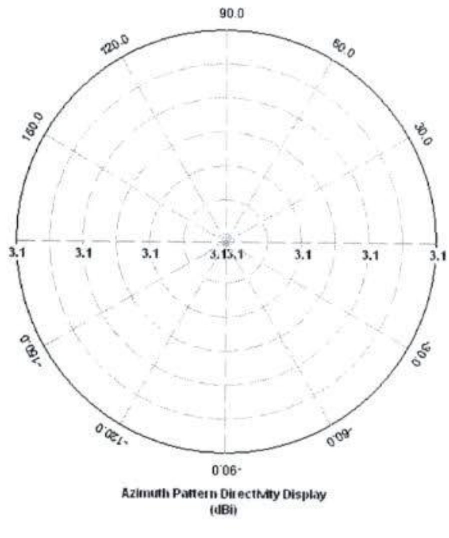


Fig. 8 Tow - dimension azimuth pattern of proposed antenna at frequency 2.4 GHz

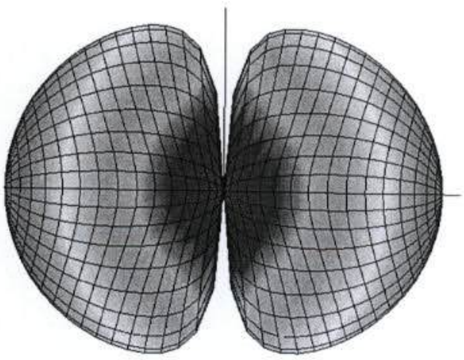


Fig.9 Three dimension pattern of proposed antenna at frequency 2.4 GHz

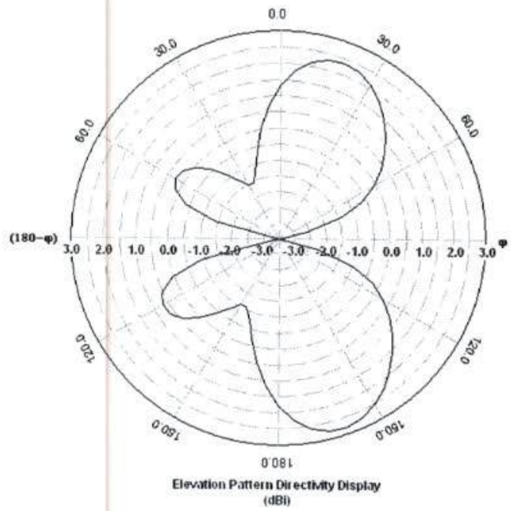


Fig. 10 Tow dimension elevation pattern of proposed antenna at frequency 5.05 GHz

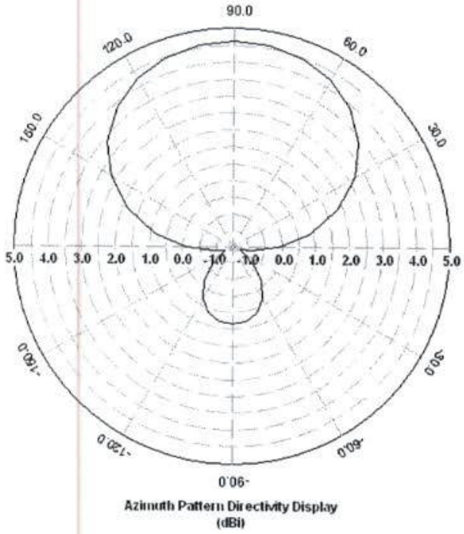


Fig. 11 Tow dimension elevation pattern of proposed antenna at frequency 5.05 GHz

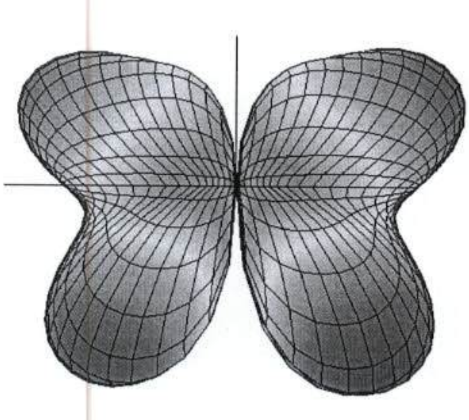


Fig.12. Three dimension pattern of proposed antenna at frequency 5.05 GHz

The simulation radiation of 2-dimension in elevation pattern of the proposed antenna at frequency 5.05 GHz is shown in Fig.10 The elevation radiation pattern illustrates 2-directional pattern with maximum gains at 27° and 155° with directivity 2.4 dBi and the nulls occur at 90° and 270°. The 2-dimension of azimuth pattern of proposed antenna at frequency 5.05GHz simulation at 90° is shown in Fig.11 The pattern is an bi-directional pattern with maximum gain at 4.5dBi and there doesn't have null in any angle. The 3-dimension pattern of proposed antenna at frequency 5.05GHz shows in Figure 12. There have maximum gains at 155° and 27° about 2.4 dBi.

5 Conclusion

The paper present the hexagon shape monopole antenna. Antenna is designed on FR4 substrate. This antenna was numerically designed using IE3D simulation software package. The Results -10 dB bandwidth for return loss from 2.4GHz (2.3GHz–2.58GHz) and 5.05GHz(4.6GHz – 6.6GMHz).This monopole antenna covering all the 2.4/5.2/5.8GHz WLAN bands 2.5/5.5GHz WiMAX bands and(2.4-2.484GHz) Bluetooth band.

Acknowledgements

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