Review on Compact Slot Antenna for Dual-band WLAN Applications

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Abstract— *The design of a simple two patches slotted antenna with microstrip feed line is present. In that use in 2.4/5.2 GHz wireless local area network, WLAN applications. The first piece designed as a rectangular shape, and the other intended as an inverted L shape with a protruding stub. The proposed antenna supposed to prints on an FR4 substrate with a thickness of 0.8 mm and relative permittivity of 4.6. The resulting antenna found to have a compact size of 25.80x22 mm2. This dual-band resonant behavior makes the proposed antenna covering many communication services such as ISM, RFID, WLAN and WiFi applications.*

Keywords— Compact antennas, Dual band antennas, Slot Antennas, Wireless applications, WLAN.

1. INTRODUCTION

Many small antennas with broadband and multiband or ultra wideband performances including the dipole antenna, the monopole antenna, and planar antenna configurations reported [1-6]. These are printed antennas with moderate radiating characteristics and operates dual & multiple frequency bands. For the antenna fabrication and designed, the slot structures require providing a broadband and dual and systems including frequency ranges of ISM, WLAN, WiFi, and operating frequency of RFID.

Recently several interesting structures of slot antennas with different geometric configurations for the bandwidth enhancement and the size reduction functions widely studied [7-12]. These antennas based on the groove design configurations and tunable antenna fabrications which developed to obtain full impedance BW and small size, but they complete creating structure. These slot Antenna design improved dual-band responses for wireless communications. The feed of the slot antennas using a centered or an offset microstrip feed line also reported.In this paper, a simple and compact dual slotted Antenna with a microstrip line feed proposed. The microstrip line dislocated from the center of the antenna. The proposed antenna exhibits dual-band characteristics with the lower resonant band of (2.66 – 3.01) G Hz and the upper band of (4.741 – 5.55) GHz.

2.LITERATURE SURVEY

2.1

J.-Y. Li The open-sleeve antenna is analyzed using the method of moment. The multi-band characteristic of the sleeve antenna investigated. The first and the third frequency bands come from the driven dipole; the 2nd frequency band due to a length of parasitic elements & the distance from the driven element and the parasitic elements. Useful outputs presented and discussed in this paper.

2.2

Long Chen In this paper, a small asymmetric coplanar strip (ACS)-fed printed monopole antenna for tri-band WLAN applications presented. The proposed Antenna is the design of a simple monopole with the high resonant mode at 5.8GHz, open-ended slot embedded on the ground plane with the small resonant mode at 2.4GHz, and a meandering trip shorted to the ground with the middle resonant mode at 3.5GHz. The three resonance frequencies of the antenna controlled by adjusting the geometries and the sizes of the monopole, the slot, and the strip.The antenna occupies a minuscule size of 22×12mm2including the ground plane, nearly omnidirectional radiation characteristics and reasonable gain in the operating bands. The simple feeding structure, compactness, and uniplanar design make it easy to integrated within the portable device for wireless communication.

2.3

V. Dark et.al A compact dual-band uniplanar antenna for operation in the 2.4=5.2=5.8 GHz WLAN=HIPERLAN2 communication band presented.Modifying one of the parallel strips of a slot line obtained dual-band antenna, thereby producing two different current paths. The antenna occupies a slight area of 14.5?16.6 mm2 including the ground plane on a substrate having dielectric constant 4.4 and h is 1.6 mm at 2.2 GHz. The antenna resonates with two bands from 2.2 to 2.52 GHz and from 5 to 10 GHz with good matching, excellent radiation characteristics, and moderate gain.

2.4

Y.-C. Lee et.Al This paper presents a printed slot antenna using the printed structure improve its dual-band and small size results. The printed slot structure used as additional resonators to produce dual-band operation for covering the worldwide interoperability for microwave access and the 5.2-GHz wireless local area network bands. To achieve wideband and multi-band operation, the slot antennas with a slotted structure and an inverted-L slot structure for covering the wireless communication service developed. Finally, we propose a novel and compact printed slot antenna with mixing groove structures to obtain and include for the 2.4-GHz WLAN (2.4–2.484GHz), the WiMAX (IEEE 802.16e in the Taiwan: 2.5–2.69/3.5–3.65GHz), and the 5-GHz WLAN (5.15–5.35/5.725–5.825GHz). Several properties of an antenna for dual- and multi-band characterize radiation performances such as impedance, bandwidth, radiation pattern.Measured gain confirmed experimentally for the multi-band wireless communication systems.

2.5

Jyoti R.et.al Design of a simple microstrip-fed folded strip monopole antenna with a protruding stub in the ground plane used for the application in the RFID and WLAN. The antenna has two resonant paths, one in the radiating element folded strip and other in the protruding stub of the ground plane, supports two resonances at 581 MHz and 24 MHz, which the center frequencies of the WLAN and RFID. Effectively consistent radiation pattern and significant percentage bandwidth observed. The percentage bandwidth at 2.4 GHz (2.06 GHz to 2.82 GHz) is 31.14, and the percentage bandwidth at 5.81 GHz(5.57 GHz to 6.08 GHz) is 8.75.The proposed antenna is simple in size providing broadband impedance matching, consistent radiation pattern and appropriate gain characteristics in the RFID frequency range.

2.6

S. R. Bhadra et.al In that project bandwidth enhancement technique of asymmetrical slot Antenna with two different excitation methods presented. One method of excitation microstrip line feed & the other coplanar waveguide feed. The rectangular slot excited by microstrip line feed gives an impedance bandwidth of 14.76%. When the rectangular slot excited by a coplanar waveguide, it offers an impedance bandwidth of 26.61%. Both radiation and impedance characteristics of these antennas are studied.

2.7

Yingying Tan Printed slot antenna fed by a microstrip line with a diamond-shaped tuning stub for bandwidth enhancement proposed and experimentally validated. An impedance bandwidth, radiation pattern, and gain characteristics of the proposed antenna investigate. The simulated results show that the impedance matching of the draft rotated slot antenna is significantly affected by the dimension of the groove and by the size and the position of the diamond-shaped tuning stub. The experimental results demonstrate that this antenna exhibits an ultra-wide impedance bandwidth, which is over 123% for $|S11| \leq -10$dB ranging from 2.80 to 11.81GHz. Moreover, a stable and omnidirectional radiation pattern is the observed within the operating bandwidth.

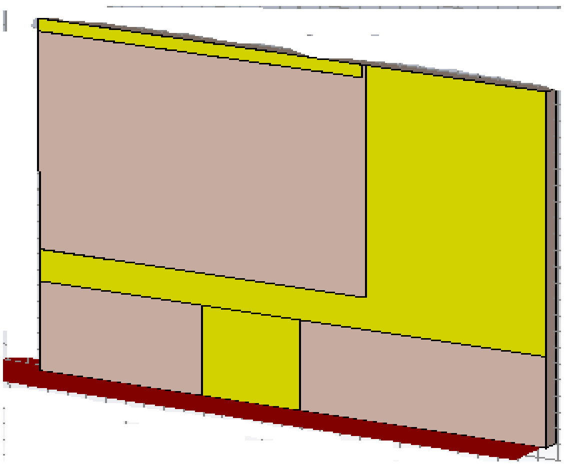
3. PROBLEM FORMULATION

Many small antennas with broadband and multiband or ultra wideband performances including the dipole antenna, the monopole antenna, and planar antenna configurations. These printed antennas with moderate radiating characteristics and can operative at dual & multiple frequency bands. Moreover, for the antenna fabrication and design, the slot structures require providing a broadband and dual-band systems including the frequency ranges of WLAN, WiFi, and also the operating frequency of RFID.

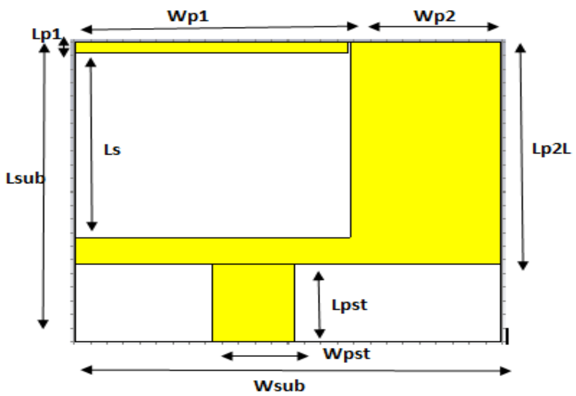
4. THE PROPOSED ANTENNA STRUCTURE

The geometry of the proposed antenna shown in Figure1. Figure1 (a) demonstrates the layout of the antenna coordinate system, while Figure1 (b) shows the front view of the structure which comprises two elements separated by a slot. The first item designed as a rectangular shape with (Wp1×Lp1) dimensions, while the second component intends as an inverted L-shape consisting of Wp2, Lp2L, and Lp2S dimensions also contain a protruding stub off Lpst length and Wpst width at the lower edge of it which located d away from the center of the structure. The antenna is excited using an offset 50-ohm microstrip line as shown in Figure 1 (c) which is the represents the bottom view of the structure. The dimensions of the microstrip line are (Wf×Lf) where it offset by d from the center of the structure & exactly same the protruding stub.

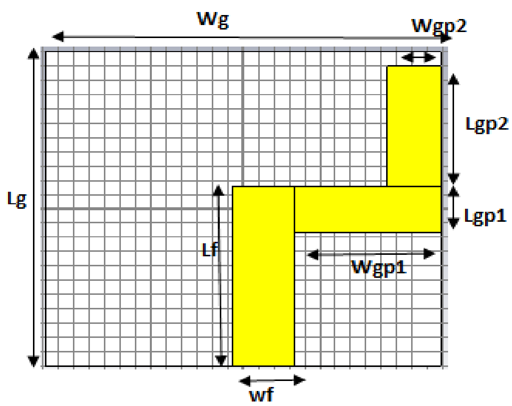
Figure 1 (c) shows a reduced ground plane designed as L shape & conducted the upper end of a microstrip line. The reduced ground plane consist of two parts connected to each other. The dimensions of the horizontal part of the ground plane are while the dimensions of the vertical part. The total size of an antenna is 25.80×22 mm 2, which printed on an FR4 substrate with 0.8 mm thickness and relative permittivity of 4.6. Table 1 summarizes the exact dimensions of the antenna parameters as labeled in Figure 1.



(a)



(b)



(c)

Fig1:- (a)perspective view of the proposed antenna entire structure (b)front view (c) the bottom view.

Table: 1 DIMENSIONS OF THE PROPOSED ANTENNA (MILLIMETERS)

Wp1	***Lp1***	***Ws***	***Wp2***	***Lp2L***	***Lp2S***
16.51	0.80	1.15	9.1	16.35	2
Ls	***Wpst***	***Lpst***	***d***	***Wf***	***Lf***
12.51	5	5.65	-2.07	4	12.6
Wgp1	***Lgp1***	***Wgp2***	***Lgp2***	***W***	***L***
9.55	3.25	3.5	8.35	25.75	22

5. ANTENNA DESIGN

The proposed two patches slotted dual-band antenna designed to resonate with the lower frequency locate at 2399 MHz. After optimizing the different antenna parameters, a proper structure was chosen to get the required results with the dual-band characteristics.During the design optimizations, it found that the dominant factors in the proposed antenna are the slot dimensions which the inside edges of the two patches, (Wp1+Ls), regarding the guided wavelength λg.

where εeff is the effective dielectric constant.

Then the lower resonant frequency, fL, about the radiating elements edges is formulated by:

$$\lambda_g = \frac{\lambda_0}{\sqrt{\varepsilon_{eff}}} \qquad (1)$$

where εeff is the effective dielectric constant.

Then the lower resonant frequency, fL, relative to the radiating elements edges is formulated by:

$$f_L = \frac{c_0}{2(L_s + W_{p1})\sqrt{\varepsilon_{eff}}} \qquad (2)$$

where c_0 is the speed of light in free space.

6.CONCLUSION

A compact two patch slotted antenna fed by an offset microstrip line proposed for dual-band WLAN and WiMAX applications. The proposed antenna analyzed, and its performance has been evaluated using a method of finite integration technique based CST MWS. Simulation results have shown that the antenna offers dual-band response covering the operating bandwidths for RFID, WiFi, and WLAN application. In spite of the simple antenna, the compact size demonstrates acceptable reflection coefficient, close to omnidirectional patterns over the two service bands. A study conducted to explore effects of the location of protruding stub and the consequences of the position of the microstrip feed line on the resonant frequencies and the values of their reflection coefficients.

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