

Review On Design Of Multiband Monopole Antenna Using Defected Ground Structure For WLAN And Wimax Application

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Abstract :-The antennas are very essential device for communication system. It is used for transmitting and receiving data. Now a day's the demand is for the design of an antenna with triple- or multiband application has increased since such an antenna is very essential for integrating more than one communication standards in a single system. To achieve this recruitment we used monopole antenna with Defected Ground Structure. DGS is simple and effective method to reduce the antenna size with increasing resonance mode. This paper gives review on design of multiband monopole antenna using DGS for wireless application.

Keywords :-Defected ground structure, multiband, monopole antenna, WLAN, WiMAX.

I. INTRODUCTION

An antenna can be described as a device, which transforms the electromagnetic waves in an antenna to radiating in a free space medium. Previously, mobile systems were designed to operate for 2G systems, which are Digital Cellular System, Personal Communications service and Global System for Mobile Communications networks. Presently, many mobile communication systems use several frequency bands such as GSM 900/1800/1900 bands(890-960 MHz and 1710-1990MHz); Universal Mobile Telecommunication Systems (UMTS) and UMTS 3G expansion bands (1900-2200MHz and 2500-2700MHz); and Wi-Fi (Wireless Fidelity)/Wireless Local Area Networks (WLAN) bands (2400-2500 MHz and 5100-5800 MHz)[1]. For such demand, the developed antenna must not only be with a triple/multiband operation but also have a simple structure, compact size, and easy integration with the circuit. Among the known triple/multiband antenna prototypes, the monopole antenna with various structures has become a familiar candidate because of its attractive characteristics including low profile and weight, low cost, and versatile structure for exciting wide impedance bandwidth, dual- or multi resonance mode, and desirable radiation characteristics. The main difficulty in designing antenna challenges engineers when the size of the antenna reduces and the number of operating frequency bands increases. So far, for size reduction, bandwidth enhancement, and resonance-mode increment, numerous monopole antennas have been proposed by using defected ground structure[2]

II. BRIEF INTRODUCTION OF CONTRIBUTED PAPERS

Antenna Design, simulation and measurement.

2.1. Design of Triple-Frequency Microstrip-Fed Monopole Antenna Using Defected Ground Structure[2].

In this paper, a triple-frequency microstrip-fed planar monopole antenna for multiband operation is proposed. Figure shows the radiating element was modified by loading it with protrudent strips and feeding it with a cross-shaped stripline with the ground was cut out by shaped slots forms a DGS. It provide good triple-broad impedance bandwidths and radiation characteristic suitable for two multiband wireless communications such as WLAN 2.4/2.5/5.8 GHz and the WiMAX 3.5/5.5 GHz. The structure of the antenna has a microstrip feed which consists of a rectangular radiator; a 50- Ω microstrip feed line, and a ground plane. The antenna has an overall area of 20 x 30 mm² and a thickness of 1.6 mm with FR-4 substrate with dielectric constant of 4.4. The optimal geometrical parameters are listed in table 1.

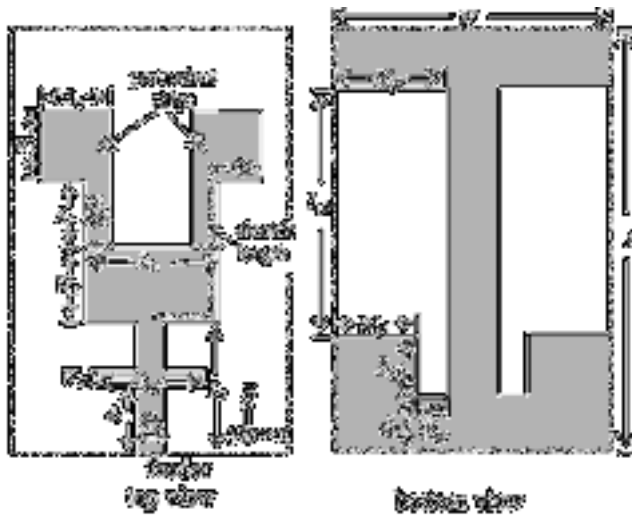


Fig.1. Antenna Design

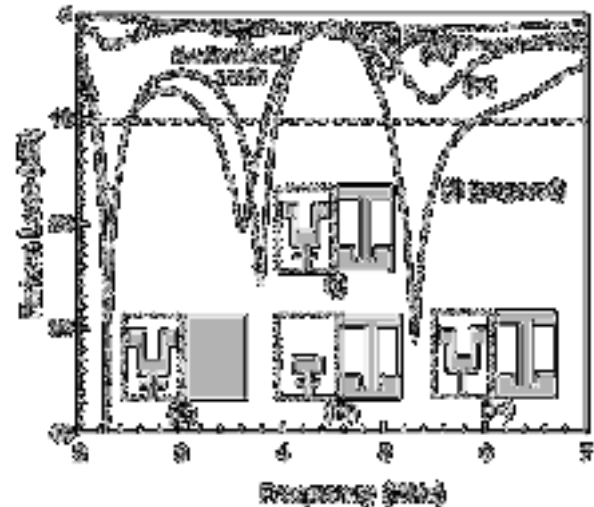


Fig.2 Simulated Return

TABLE 1. OPTIMAL GEOMETRICAL PARAMETER OF PROPOSED ANTENNA (MM)

L	W	L1	W1	L2	W2	L3	W3	L4	W4
30	20	9	2	8	1	10	6	5	2
L5	W5	Lg1	Wg1	Lg2	Wg2	Wg3	d1	d2	
5	5	4	2	18	8	6	5	4	

The simulated result shows that proposed antenna gives three resonance mode. The effect of the DGS to the matching condition at the highest operating band is obtained. The lowest resonant mode is shifted toward the higher frequency band, which gets affected slightly. Three resonant modes at frequencies of 2.31, 3.42 and 5.44 GHz were obtained. The measured impedance bandwidths are about 380 MHz (2.14-2.52 GHz), 920 MHz (2.82-3.74 GHz), and 870 MHz (5.15-6.02 GHz). The average efficiencies for the three bands are about 50, 58, and 74.5 %. For directivity the measured average values are 5.5, 4.8, 4.5 dBi and gains are about 2.2-2.6, 2.1-2.6, and 2.5-3.4 dBi.

2.2 Printed Double-T Monopole Antenna for 2.4/5.2 GHz Dual-Band WLAN Operations [3]

In this paper, a simple printed dual-band double –T monopole antenna is proposed. The antenna comprises two stacked T-shaped monopoles of different sizes, which generate two separate resonant modes for the desired dual-band operations. The proposed antenna has a low profile and can easily be fed by using a 50 Ω microstrip line. Prototypes of the proposed antenna designed for WLAN operations in the 2.4 and 5.2 GHz band. These printed monopole antennas are very suitable to be integrated on the circuit board of a communication device, leading to the attractive features of occupying very small volume of the system and decreasing the fabrication cost of the final product. The structure is, Simply by loading a horizontal conducting strip to a T-shaped or top-loaded monopole antenna, dual-band operations for a printed monopole antenna can be easily obtained. Both of the two T-shaped monopoles and the microstrip line are printed on the same side of the dielectric FR4 substrate of thickness 0.8 mm and relative permittivity 4.4 was used. The antenna has overall area is 100 L x 75W mm².

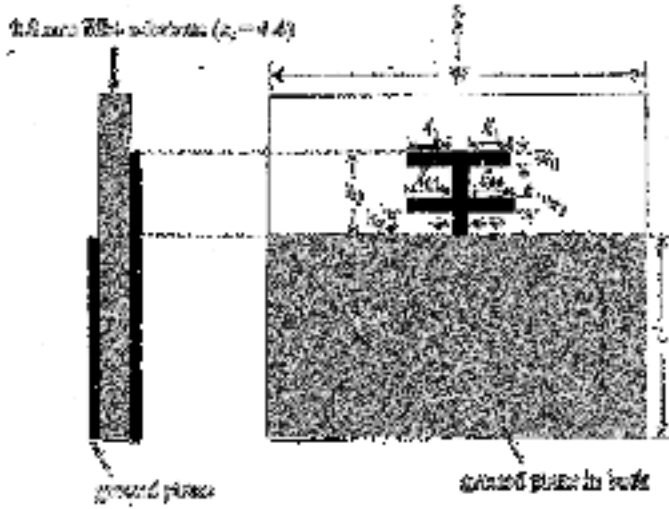


Fig. 3. Proposed Antenna Design

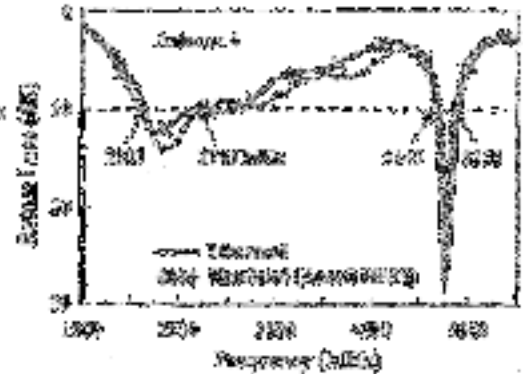


Fig 4. Return Loss

The peak antenna gain in the 2.4 GHz band (2.4–2.484 GHz) is about 1.3–1.8 dBi, while that in the 5.2 GHz band (5.15–5.35 GHz) is about 0.8–1.5 dBi.

2.3 Compact Triple-Band Antenna Using Defected Ground Structure For WLAN/WiMAX Application [4]. In this paper, A triple-band microstrip-fed planar monopole antenna with defected ground structure (DGS) is proposed for WLAN and WiMAX applications. The proposed microstrip-fed antenna consists of a rectangular patch, dual inverted L-shaped strips and a defected ground. The designed antenna can generate three separate resonances to cover both the 2.4/5.2 GHz WLAN bands and the 3.5 GHz WiMAX bands while maintaining a small overall size of 20mm x27 mm. the planar monopole antenna is capable of integrating both wireless local area network (WLAN) and worldwide interoperability for microwave access (WiMAX) into one single system. In these proposed monopole antennas, a large solid ground plane having the shape of a square, rectangle, circle, or ellipse is usually adopted. Different from these antennas, a novel ground structure named DGS has recently been investigated and found to be a simple and effective method to reduce the antenna size as well as excite additional resonance modes. It is designed on a 1mm thick FR-4 substrate with relative permittivity of 4.4, and the overall dimensions are only 20.0 x 27.0mm², shown in fig.

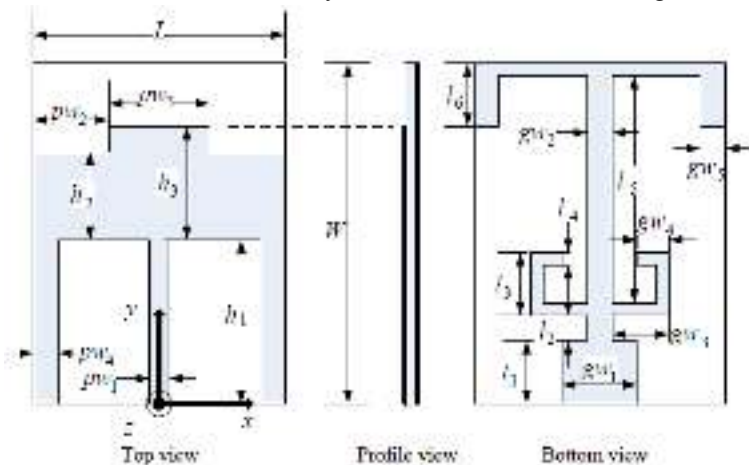


Fig .5. Configuration Of Proposed Antenna

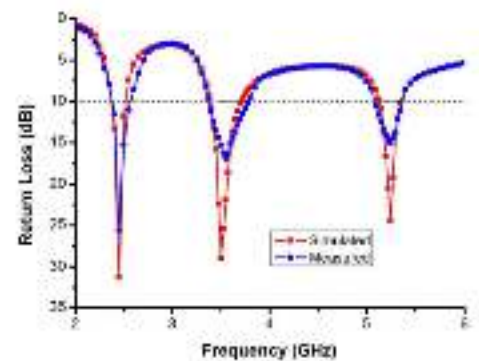


Fig 6. Return Loss Of Proposed Antenna

TABLE 2. OPTIMAL PARAMETERS OF PROPOSED TRIPLE BAND ANTENNA (MM)

L	W	h1	h2	h3	pw1	pw2	pw3	pw4	l1
20	27	13	7	9	1.5	6	8	2	5
12	13	14	15	16	gw1	gw2	gw3	gw4	gw5
2	5	2	18	5	6	2	4.5	2.5	2

Three resonant modes at frequencies of 2.43, 3.54, and 5.25 GHz are obtained. The measured impedance bandwidths are about 180MHz (2.38-2.56 GHz), 380MHz (3.39-3.77 GHz), and 280MHz (5.08-5.36 GHz), For the 2.37-2.52 GHz working band, the gain varies from 2.06 to 2.78 dBi. Results in the medium band of 3.39-3.72 GHz, the peak gain and gain variation are 2.14 dBi and 0.75 dBi, respectively. The measured peak gain within the highest operating band is stable, which varies from the 1.84 to 2.14 dBi.

2.4 Enhancement of Micro strip Monopole Antenna Bandwidth by Using EBG Structures[5].

In this paper, A novel compact design for UWB planar monopole antenna is presented in this letter. The basis for achieving the UWB operation is through using semicircular microstrip monopole antenna with circular modified ground plane. This shape produces bandwidth ranging from 3 to 35 GHz with discontinuities in certain bands from 7 to 10 GHz and from 12.5 to 17.5 GHz. The antenna size is around 27% of the size of a conventional rectangular microstrip patch antenna. Electromagnetic band-gap (EBG) structures are used for further improve the antenna performance.

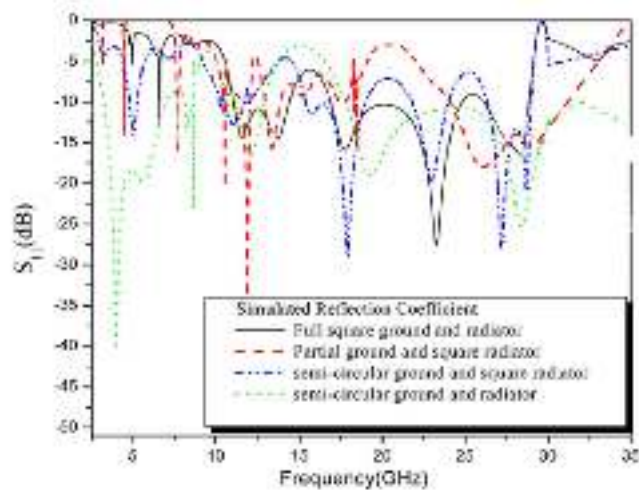
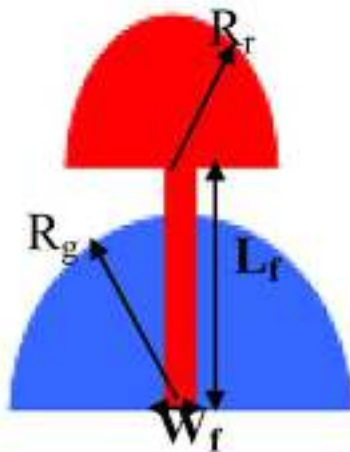


Fig.7.Design Of Proposed Umbrella Shaped

Fig 8. Return Loss Monopole Patch Antenna.

The microstrip feed line length is $fL=16\text{mm}$ and width $fW=1.9\text{mm}$. The antenna is printed on FR4 substrate with permittivity 4.7 and thickness 3.2 mm. The bandwidth of microstrip antenna is improved in the frequency band 1 to 35 GHz when EBG structure is used and the average antenna gain is 6.5 dBi.

2.5 A Novel Triple-Band Microstrip-Fed Meandered Monopole antenna with Defected Ground Structure[6].

This paper gives review of different structure which are used to obtained multiband or multi frequency operation suitable for WLAN and WiMAX application. From the study of different paper the conclusion is, Defected Ground Structure is simple and effective method to reduced the antenna size as well as it is used to excite additional mode. DGS is also used to obtained good impedance bandwidth over operating range of frequency. This antenna structure provides good amount of gain, as well as this antenna structure works in multiple frequency band as shown in return loss curved and provides a good bandwidth as compare to conventional antenna design.

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