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***Research Article***

# Design of T Shaped CPW Fed Monopole Antenna for WLAN Applications

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## Abstract

A CPW fed T shaped slot antenna is proposed for modern wireless communication and worldwide interoperability applications. The proposed antenna simulated using mentor graphics IE3D.The maximum return loss of our antenna shows at 5.5 GHz. It shows maximum gain of 5dBi and designed using FR4 substrate. The dimensions of the rectangular antenna are 43 X 41 mm. The radiation pattern of our proposed system shows that bidirectional in E plane and omnidirectional in H plane.

**Keywords:** Coplanar waveguide; FR4 substrate; Wireless local area networks; IE3D Software.

## Introduction

Current investigation in the meadow of wireless communication such as WI-MAX and WLAN are mostly focusing on the antenna size, Better gain, operating bands, and efficiency etc... For Wi-MAX applications three frequency bands are allocated, the frequency ranges such as 2.5 to 2.8 GHz, 3.2 to 3.8 GHz, and 5.2 to 5. 8 GHz. Many features of Wi-MAX applications are including elegant grid, metering and telecommunication services. The wideband antenna systems are attracted because it requires huge quantity of information at high data rates. The monopole antenna is trouble-free in the geometry and extremely simple to build because it has easy installation [1]. The monopole antenna having low profile, low cost, compact structure and simple design. Rectangular, triangular slotted, many different shapes of wide and multiband monopole antennas are proposed but this proposed system. Contains Omni directional radiation pattern, high gain, better impedance matching and lower return loss, and bandwidth [2-3].

To grip the higher wireless technology similar to WiMAX its better to have the additional supple antennas like monopole antennas. These antennas will give maximum gain with less return loss and VSWR at 5.5 GHz frequency range. The construction of monopole antenna is used in practical applications. The antenna consists of a CPW fed. It is used to increase the bandwidth. In spite of the rising insist for very high-speed internet access in areas where wireless local area networks (WLAN) is not suitable, Wi-MAX technology has been familiar and used as an alternative to give wide-range wireless broadband services. The IEEE 802.16 has been accepted in the wireless communication standard Weimar. This device gives wireless communication data from single point to multipoint links [3-4].

Monopole antenna is a product of a different frequency bands to offer systems to integrate many functions in practice. The monopole antenna has various emission features like broad bandwidth, small profile Communication system. Now a day's coplanar waveguide (CPW) fed monopole antenna is often used in WLAN and Wi-MAX systems because of wider bandwidth, simple structure and easy integration. Wireless communication standard intended to offer 30 to 40 megabit-per-second data rates. A dense T-shaped antenna is proposed in Wi-MAX applications with a return loss around -10dB.The antenna give high performance with high disparity in the size of its structure [5-7].

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## Antenna design

Fig. 1 shows the geometric structure of our proposed antenna, it shows the Dielectric substrate of $\varepsilon_r$ =2.4 and thickness h=0.8mm. The antenna length and width are 43mmx41mm and it fed using a coplanar wave guide.FR4 means flame retardant and it indicates safety of flammability. Dry and humid condition is required retain its high mechanical values and electrical insulation properties. The proposed antenna was fabricated with FR4 Substrate and it is shown in Fig. 2. CPW antennas have many features like simple integration of monolithic integrated circuits, lower dispersion, less radiation loss than micro strip lines. CPW means Coplanar wave guide. It can be fabricated using printed circuit board technology, and is used to convey micro wave frequency signals.

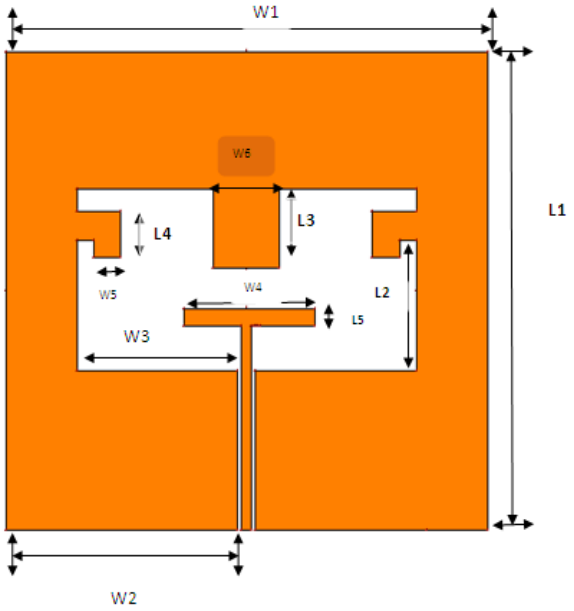


Fig. 1. Proposed antenna structure (All dimensions are in mm)

## Results and discussion

### *Return loss*

Antenna performance was studied by simulation with IE3D software. Fig. 2 shows the return loss of our proposed antenna measured and simulated return loss. The proposed antenna shows maximum return loss of -28 dB at 5.5 GHz frequency. It is a reasonably accurate simulation result and it shows that the resonant frequency and the bandwidth of the antenna is perfect. For an ideal antenna, VSWR must be lie in the range of 2:1 ratios which has been achieved at 5.5 GHz for WI-MAX applications. The VSWR ratio at 5.5GHz frequency is 1.5as shown in Fig. 3.

### *Radiation pattern*

The radiation system (proposed antenna h- e aircraft and aircraft) showing the directivity of the antenna is designed for 5.5 GHz frequency. The proposed antenna pattern E plane and H plane rose pattern shows two 5dBi gain. The whole frequency band of the antenna radiation efficiency suitable. Radiation patterns often show high directivity

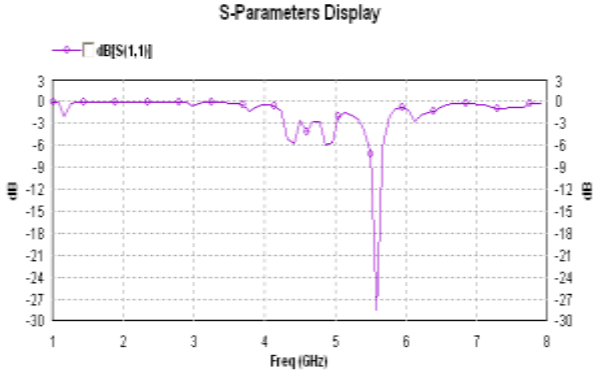


Fig. 2. Return loss of the proposed antenna

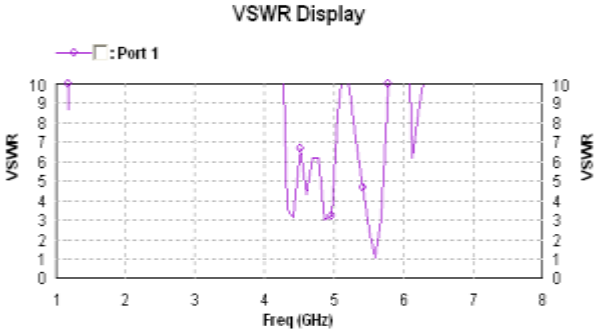


Fig. 3. VSWR of the proposed antenna

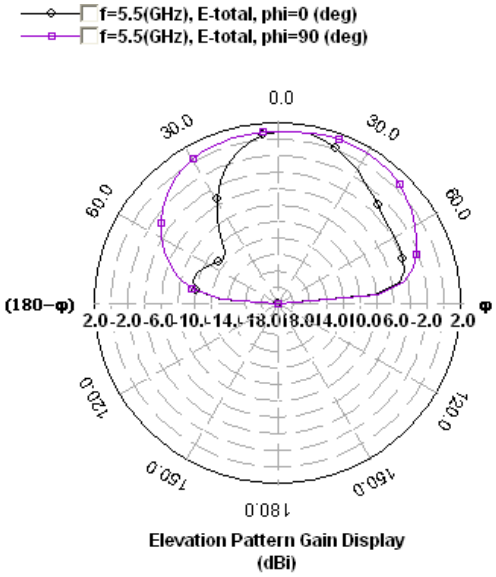


Fig. 4. Radiation pattern for elevation plane

### *Gain*

Fig. 5 shows the gain of our proposed antenna. It depicts maximum gain of 5.5 dBi at 5.5 GHz (Table 1). Azimuth antenna pattern E plane and H plane vertical shape at 5.5 GHz, has both fields.Omni-directional radiation pattern is similar for both the X-Z plane and the y-Z plane

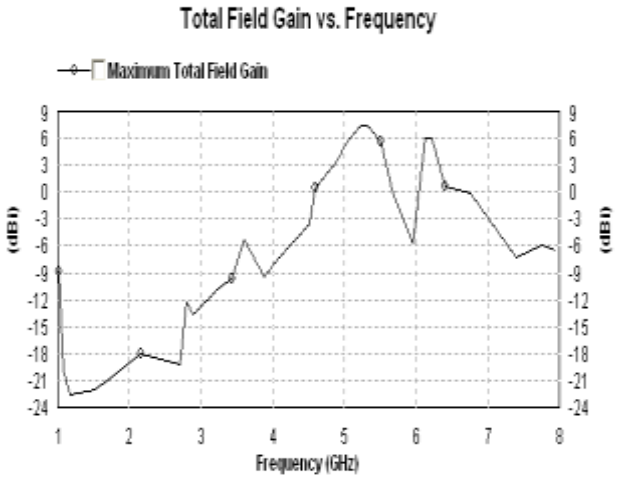


Fig.5 Gain of Proposed Antenna

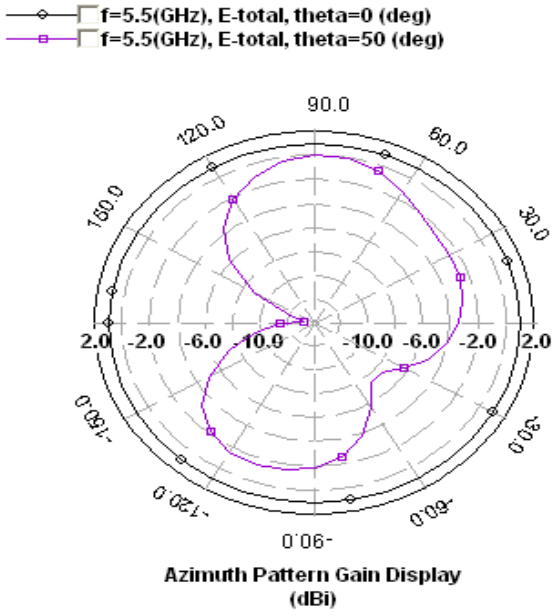


Fig. 6. Radiation Pattern for azimuth Plane

### *Z Parameter*

The Z parameter of the proposed antenna is shown in Fig. 7. It shows 50 ohm impedance matching at 5.5 GHz (Table 1).

### *Current Distribution*

Fig. 8 shows maximum current distribution of our proposed antenna. Green color region shows Maximum current distribution of our antenna.

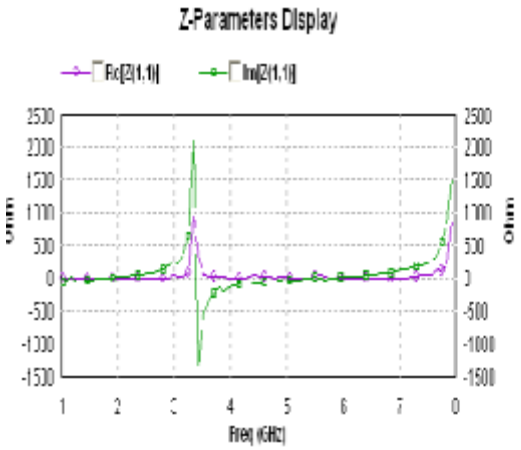


Fig 7. Radiation pattern for azimuth plane

Table 1. Performance evaluation of the proposed antenna

| Requirements | Specified value |
|---|---|
| Operating frequency | 5.5 GHz |
| Maximum dimension | 43 x 41 mm |
| Thickness | 2.4 |
| Peak gain | 5 dBi |
| Return loss | >10 db |
| VSWR | 1.5 |
| Z parameter | 50 ohm impedance matching |

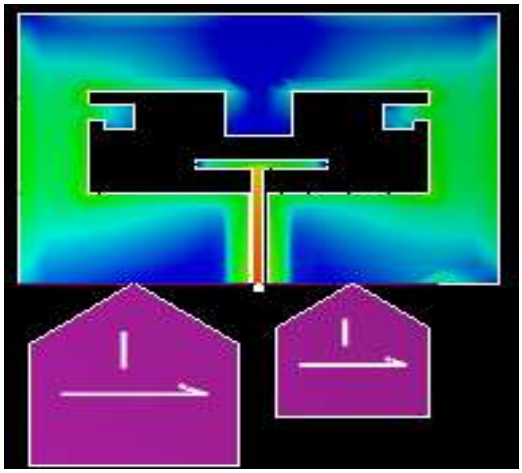

Fig 8. Current distribution of proposed antenna

### Conclusions

Hence the proposed antenna is designed I n rectangular structure and fabricated. The proposed antenna is capable to achieve good results for the Wi-Max and WLAN applications which are the examples of wireless communication in the frequency range of 5.5 GHz with lower return loss value and miniaturized size. The size of the antenna is more compact and easier to implement for Wi-Max and WLAN applications. The proposed antenna also shows the highest gain value of 5.9

 

dBi at 5.5GHz frequency which is suitable for Wi-MAX application.

## Conflicts of Interest

Authors declare no conflict of interest

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