International Journal of Industrial Engineering, 2019;3(4):33-37.
ISSN: 2456-8449.
http://ijie.gjpublications.com

Research Article

Design of CPW fed Antenna for WI-MAX Applications

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Abstract

Here, compact CPW fed shaped antenna is proposed for WI-MAX applications. The proposed antenna is designed on 23.5x28.5mm with Flame Retardant (FR4) substrate contains tan∂=0.02, dielectric constant of 2.4 and thickness 1.6 mm. The antenna works at a resonance frequency of 5.5 GHz and designed using IE3D software. The simulation result shows the return loss, VSWR, radiation pattern, efficiency; gain and impedance are well suited for Wi-MAX applications.

Keywords: Coplanar waveguide; Flame retardant 4; Worldwide interoperability for microwave access; Voltage Standing Wave Ratio.

Introduction

In communication field, the Wireless Local Area Network (WLAN) and Worldwide Interoperability for Microwave Access (WI-MAX) are mostly depends on the size, gain, bandwidth and efficiency. The bandwidth of the antenna can be adjusted by changing the slot width. In CPW fed antenna center strip carries the signal and side plane act as a ground. The Proposed antenna supports wide coverage of area, reliability and high data rate. The obtainable consequences show that the antenna is well-organized and gives satisfactory performance for LTE applications. The coplanar wave guide antenna has been popular in WiMax because it consists of low radiation loss, compact size, large bandwidth and easy integration. Comparing with wifi, wimax contain more advantages like wide coverage, and easy installation.It is widely used in microwave and cellular based applications. The frequency range of WI-MAX application is 2-66 GHz but it can only focus only focusing on the 2-6 GHz range. Quality of service mechanism is used in WI-MAX based on link among the base station and the user device. Each connection works under specific scheduling algoritham. It is a wide range systemand covers many kilometers. IEEE 802.16 indicates WI-MAX, It defines wireless adhoc network and Peer to Peer Networks [1].

Coplanar Waveguide (CPW) fed antenna has low radiation loss, less dispersion, and wider bandwidth compare with microstrip antenna. The proposed antenna is one of the mainly well-liked methods for getting WI-MAX frequency behaviour. It is designed using FR4 substrate contains tan∂=0.02, dielectric constant of 2.4 and thickness 1.6mmwith mentor graphics IE3D software [2-3].

The radiation pattern of our antenna shows unidirectional with gain5.9dBi.Based on strip length the resonant frequency of the antenna can be varied. The proposed antenna is 50 ohm impedance matching at 5.5GHz for both calculated and simulated results [4-5].

The ultimate characteristic of this CPW fed antenna is determined by the requirement of miniaturization and necessity of WI-MAX in the wireless applications. Here, coplanar waveguide feeding techniques are used because more accuracy and minimize the rear radiation of the antenna. The proposed antenna has compact size [6-7]. So it contains high electric constant material. Slot structure can minimize the antenna size but gives complex design. The CPW has many advantages like less scattering, low emission loss and uniplanar construction [8-10].

Received: 25.03.2019; Received after Revision: 13.04.2019; Accepted: 14.04.2019; Published: 27.04.2019

Proposed method

The geometry structure of the antenna is presented in Fig, 1. The width and length of the antenna shows 23.5x28.5 mm and antenna fed is 50 ohm impedance matching. The proposed antenna contains tan∂=0.02, dielectric constant of 2.4 and thickness 1.6 mm. CPW contains two ground plane are same width and length.FR4 means flame retardant and it having high electrical and mechanical qualities in humid and dry conditions. Here, bandwidth and resonant frequency can be optimized based on choosing antenna parameter like l1 and w1.

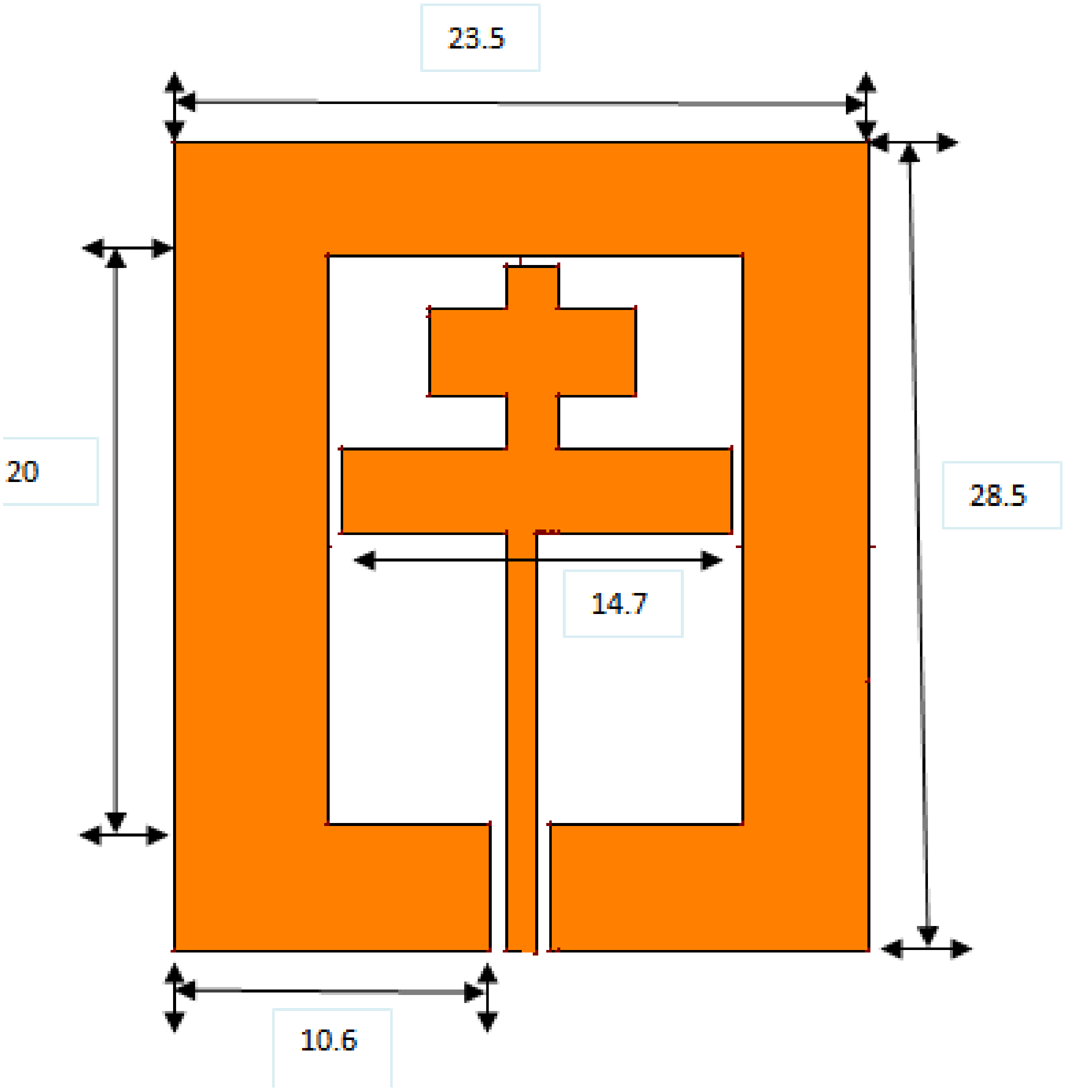

Fig. 1. Proposed antenna structure (All dimensions are in mm)

Results and discussion

Return loss

The antenna performance was examined by simulation via IE3D software. S parameter computation has been done for CPW fed antenna. The return loss is minimum at the frequency range is 5.5 GHz. Fig. 2 shows the calculated and simulated results are matched.

Voltage standing wave ratio

For an ideal antenna, VSWR must lie in the limit of 1:2 ratios which has been attained for 5.5 GHz frequency (Fig. 3).

Radiation pattern

The radiation pattern is a function of space coordinates and it is represented by mathematically or graphically. The radiation pattern (the Elevation and azimuth plane of proposed antenna) showing directivity for the intended antenna for the known frequency at 5.5 GHz. From the Fig. 4 shows, Gain of 5.9 dBi for both Elevation and azimuth plane at 5.5 GHz. Fig. 5 shows unidirectional azimuth pattern of our antenna at 5.5 GHz for both E plane and H plane.

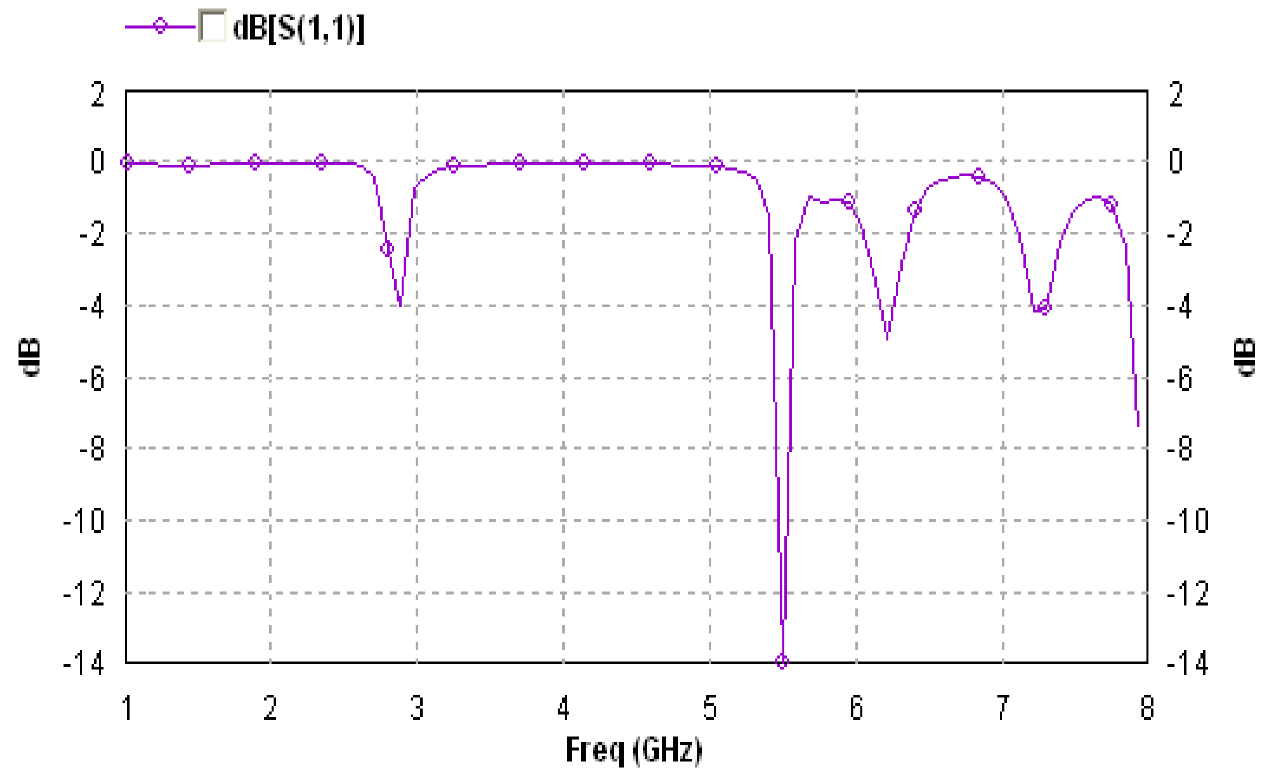

Fig. 2. Return loss of proposed antenna

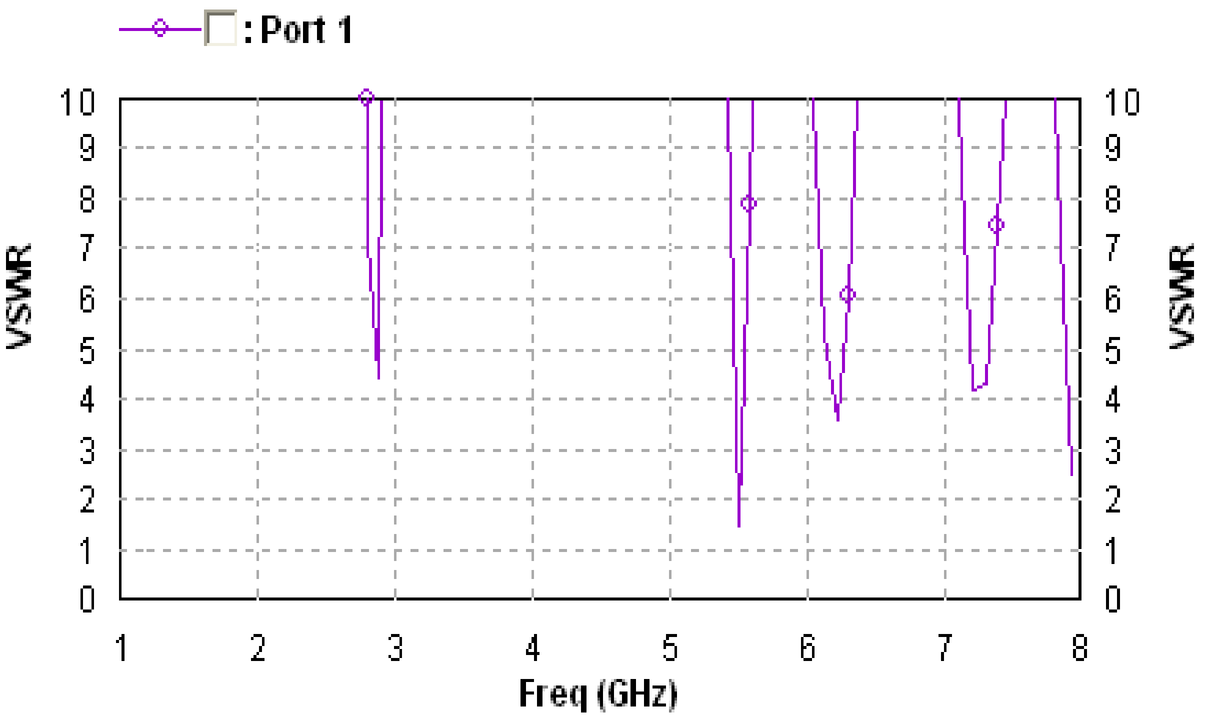

Fig. 3. VSWR of Proposed Antenna

***Current distribution**:*

Efficiency is defined as the ratio between the radiated power to the input power. From that fig. 6 shows the current distribution of our antenna. Green color region shows Maximum current distribution at 5.5 GHz frequency.

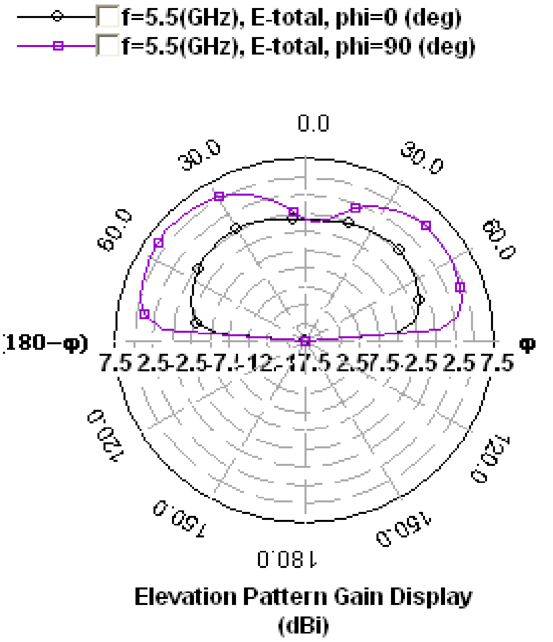

Fig. 4. Radiation pattern of elevation plane

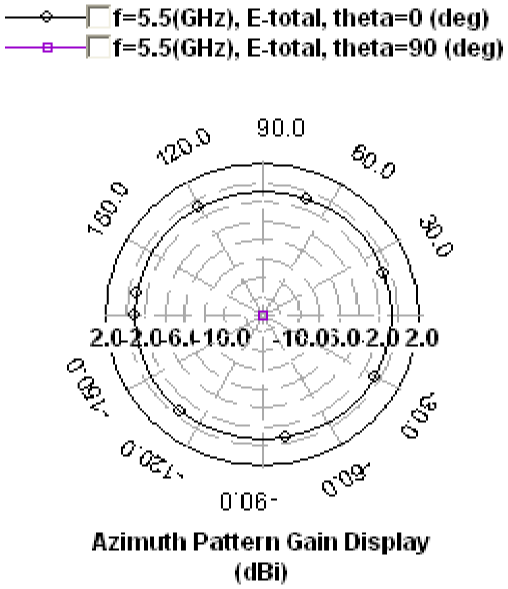

Fig. 5. Radiation pattern for azimuth plane

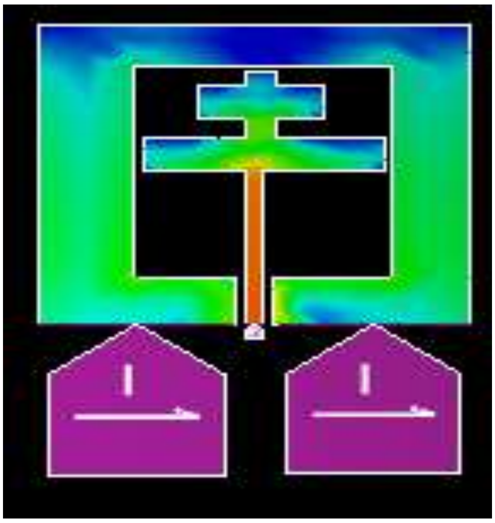

Fig. 6. 3D Current Distribution

Conclusions

The simulated antenna showed better gain and a good impedance matching.The rectangular structure of our proposed antenna designed using IE3D and fabricated using FR4 substrate. The frequency and bandwidth depends on T shaped slot of our antenna.The antenna parameters are satisfied for Wi-MAX applications at 5.5 GHz. It includes return loss, Radiation pattern, VSWR, current distribution, gain and impedance. The dimension of the antenna develops into additional dense and simple to apply for WLAN and WI-Max applications.

Conflicts of interest

Authors declare there are no conflicts of interest.

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