

## A Tripale-Band Microstrip Antenna Design For Wi-Max, X-Band And Radar Communication Applications



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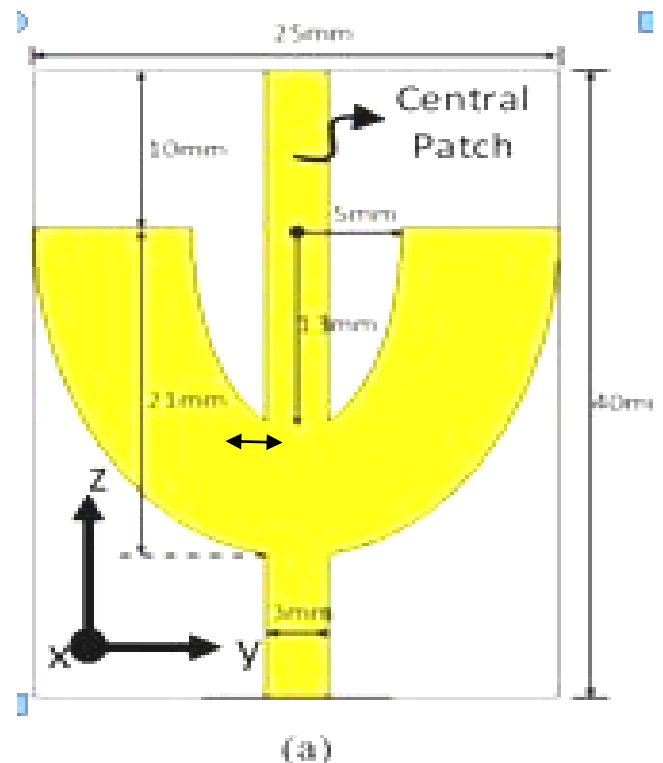
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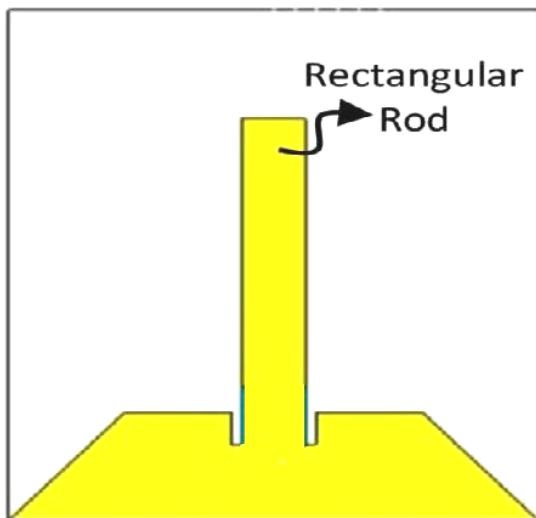
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**Abstract:** This paper demonstrates a triple band micro strip antenna to use at three bands of Wi-Max, X-band and radar communication. The demonstrated antenna is placed layer on a FR4-epoxy substrate with dielectric constant 4.4. The Antenna covers entirely UWB band (3-10.5GHZ) at three individual bands of their resonance frequencies are 3.1GHZ, 6.6GHZ and 10.19GHZ respectively.

**Key Terms:** *Micro-strip Aantenna, Ultra Wide-Band Antenna (UWB), Triples Band, Wi-Max, X-Band, Multiband*

**1. Introduction:** Micro strip ultra wide band antennas which operate at two or more bands is used for preventing band-width limitations of micro strip antenna. A multiband antenna is used for both interior and exterior uses but high band width UWB antenna [with less than bands] is used for interior uses only[x]. Other than UWB band we can], WLAN [5]. As FCC (federal communications also operate micro trip antenna in GPS [4 commission][5] UWB antennas are repeats worked from 3.1 GHZ to 10.6 GHZ.





(b)

**Figure.1:** Geometry of the proposed triple band antenna (a) front view, (b) back view.

A UWB antennas are designed with either fixed band notches or controllable notches and especially in ref [6] they a lived to create notch at 5GHZ. The conversion of UWB antenna into a multiband antenna then it can handle more than two applications simultaneously [7],[6]



**Figure.2:** Port of the triple band antenna.

The above figure shows the port of the triple band micro strip antenna. This type of port is used for line feeding technique in micro-strip antennas. In this paper we proposed a triple band micro strip antenna which is modified design of discussed earlier [9]. There is no other antennas work at 3 bands or 3 different bands in entire UWB band then this paper introduces this micro strip antenna which operates in three bands in entire UWB band. Another important point in this paper is if we

operates this micro strip antenna in range of 1-20 GHZ we get at least 5 different bands we may also use this antenna for other than UWB band.

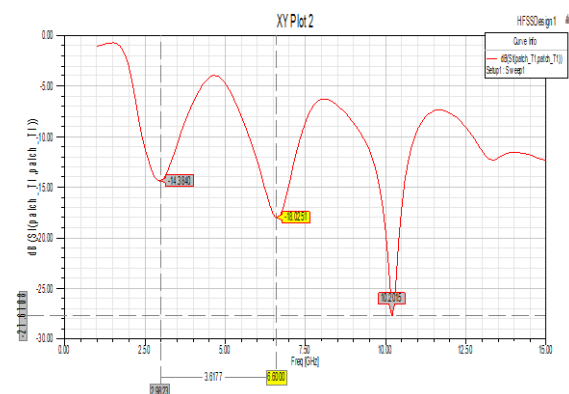
**2 Antenna Configuration:** This front view and back views are shown in figure 1. The front view of this micro strip antenna is almost same as discussed in [9]. But at back view of this micro strip antenna is both ground plane and rectangular rod are connected directly. The design of triple

band micro strip patch antenna, which consists of patch as shape of u-shape with two stubs is shown in fig1 (a). The dimensions of the substrate FR4-epoxy with dielectric constant 4.4 are 40mm\*25mm\*1.6mm = $L_{sub} * w_{sub} * h_{sub}$  and antenna is fed by 50Ω-micro-stripline.

**3 Simulation Results:** In order to find results we use software HFSS (high frequency structure simulation) and we got finally 3 types of results are

- Reflection coefficient v/s frequency
- Voltage standing wave ratio (VSWR)
- Radiation pattern diagrams

a. Reflection coefficient v/s frequency:-

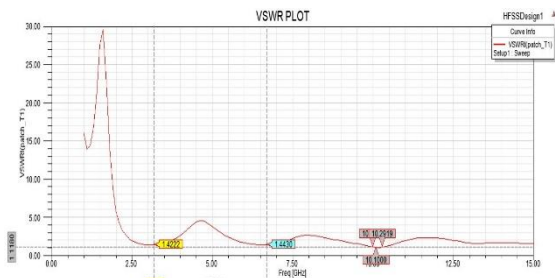


**Figure.3:** Reflection coefficient v/s frequency. The reflection coefficient v/s frequency plot for this triple band micro strip antenna gives the three bands with respective resonance frequencies are 3.3GHz, 6.6GHz, and 10.16GHz. At these frequencies corresponding reflection coefficient values are -15db,-18db,-27db respectively.

$$VSWR = \frac{1+|\Gamma|}{1-|\Gamma|}$$

If the reflection coefficient is given then the VSWR is defined as: The VSWR is always a real and positive number for antennas.

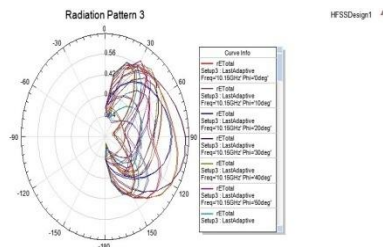
b. Voltage standing wave ratio(VSWR)



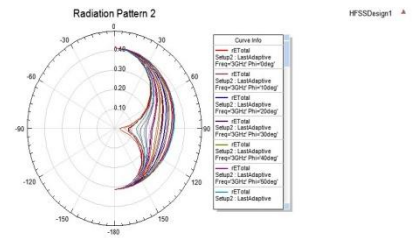
**Figure.4:** VSWR v/s frequency

With this design, the VSWR is less than 2dB in the 3.1GHz-10.5GHz frequency range.

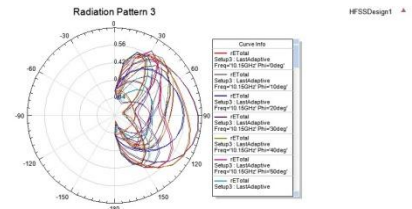
c. Radiation pattern diagrams



(a)



(b)



(c)

Figure 5: Radiation pattern diagrams for (a) f=3.1GHz,(b) f=6.6GHz and (c) f=10.15GHz. The above fig.5. Shows the radiation patterns for three different frequencies are f=3.3GHz, f=6.6GHz and f=10.16GHz respectively.

**4. Conclusion:** A Triple band micro strip patch antenna has been designed by using HFSS software, by this antenna design we obtained three different bands with corresponding frequencies are 3.1GHz ,6.6GHz , 10.15GHz. It successfully operated at three applications such as WI-max, X-band satellite communications and Radar communications.

**References:**

[1] K.L wong, compact and Broad band microstrip Antennas. Hoboken, NJ, USA: wiley 2002.  
 [2] X. Begaud ,Ultrawide-band Antennas.Hoboken,NJ,U.S.A: wiley,2011.  
 [3] FCC,F.C.C repeat and order on ultra wide band technology,federal communications, Washington DC,2007.

[4] A. Foudazi, H.Hassani, and S. Nezhad, "small UWB planar monopole antenna with added GPS/GSM/WLAN bands", IEEE Trans, Antennas propag., vol. 60, no. 6, pp.2987-2992, jun.2012.

[5] S.Mishra, R. Gupta, A. Vaidya, and J. Mukherjee, "A Compact dual-band fork-shaped Monopole Antenna for Bluetooth and UWB applications," IEEE Antennas wireless propag., Lett., Vol. 10, pp. 627-630.2011.

[6] T.U.Mcrllick, M.E.Ershad, M.A.Matin and Rahman, "Design of UWB antenna with a band notch at 5GHZ", Loughborough Antenna and propagation conference. pp.1-4. November 2012.

[7] Z. Wang, L. Lee, D.Psychoudakis, and j. Volakis, "Embroidered multiband body-worn antenna for GSM/PCS/WLAN communications," IEEE Trans. Antennas Propag., vol. 62, no. 6, pp.3321-3329, jun 2014.

[8] F.Alnahwi, M.Zidan, and N.Islam, "Design and analysis of planar single feed, four-band microstrip antenna operating in the same polarization plane," J. Telecommun., vol. 26, no. 2, pp. 1-5, Aug.2014.

[9] Falih M.Alnahwi, Khalid m.Abdul hasaln, and Naze. Islam, "An ultrawide band to Dual-band Switchable Antenna Design for Wireless communication applications", March 31, 2015

[10] L.Guo, "study and miniaturisation of Antennas for ultra wide band communication systems," ph.D disserlation, school of

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