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Miniature Implantable Antenna for MICS Band

S. Reena[1], M. Swathi[2], R. Sandhiya[3], M. Sakthi sreedevi[4], R. Kayalvizhi[5],

[1](Department of ECE, K.Ramakrishnan College Of Engineering, India)
[2](Department of ECE, K.Ramakrishnan College Of Engineering, India)
[3](Department of ECE, K.Ramakrishnan College Of Engineering, India)
4(Department of ECE, K.Ramakrishnan College Of Engineering, India)
[5](Department of ECE, K.Ramakrishnan College Of Engineering, India)

Abstract: *A Microstrip line-fed planar antenna with triple notched band is designed for Ultra Wide band application (UWB) communication applications. The triple band-pass characteristic is achieved by etching a single tri-arm resonator below the batch. The proposed antenna uses only one simple filter element to create and control triple pass bands, which give it advantages over the recently proposed band –notch antennas. In addition, the designed antenna achieved a good gain and exhibits Omni directional radiation pattern except at notched bands, which make it a suitable candidate for UWB application. The simulated and experimental results show that the designed antenna has achieved a wide bandwidth ranging from 2.98 to 10.76 GHz with three pass bands operating at 3.6GHz for Wi-MAX, 5.2GHz for WLAN and 7.5GHz for Satellite communication services. It also achieves the return loss of <=-10 dB.*

Keywords: *Ultra Wide band (UWB), HFSS, VSWR, Planar antenna.*

I. Introduction

In UWB systems, operating frequency band will cause to interference with the existing Bluetooth, WiMAX and WLAN networks operating in IEEE 802.11 wireless local-area networks (WLAN) standards 2.45 GHz (2.4– 2.484 GHz), 5.25 GHz (5.15–5.35 GHz) and 5.75 GHz (5.725–5.825 GHz) and the Worldwide Interoperability for Microwave Access (WiMAX) systems operating in the 2.35 GHz (2.3-2.4 GHz), 2.6 2 GHz (2.5–2.69 GHz), 3.35 GHz (3.3-3.4 GHz), 3.5 GHz (3.4–3.6 GHz), 3.7 GHz (3.6-3.8 GHz) and 5.8 GHz (5.725–5.85 GHz) bands[1].

Recently, several microstrip slot antennas and planar monopole geometries such as circular, square, rectangular, elliptical, etc. have been analyzed, providing wide impedance bandwidth [2]. The planar monopole antenna has received much more interest than others, due to its potential in providing the various radiation features required for dual band or multiband, wide bandwidth, low profile communication system. The microstrip line -fed monopole antenna has become very popular in WLAN and Wi-MAX systems, owing to its many attractive features such as, wider bandwidth, low radiation loss, simple structure of a single metallic layer and easy integration with WLAN integrated circuits [3].

II. Basic Of Miniature Implantable Antenna

The dual band-pass antenna was proposed by etching two slots in the ground plane and a pair of arc-shaped parasitic strips around the radiating patch or by putting two C-shaped slots and a U-shaped slot into the patch or by etching two nested C-shaped slots in the radiating patch and triple band-pass antenna was implemented by using meandering slots [4]. These antennas exhibit high performance, they still possess some inherent drawbacks such as use of multiple filtering elements, occupation of large space and increased complexity and cost.

A compact triple band-pass UWB antenna is designed and fabricated. To realize triple passed band, a tri-arm resonator has been inserted at the back of substrate. By adjusting the size and position of filtering element, the designed antenna achieved UWB characteristics with triple passed band [5].

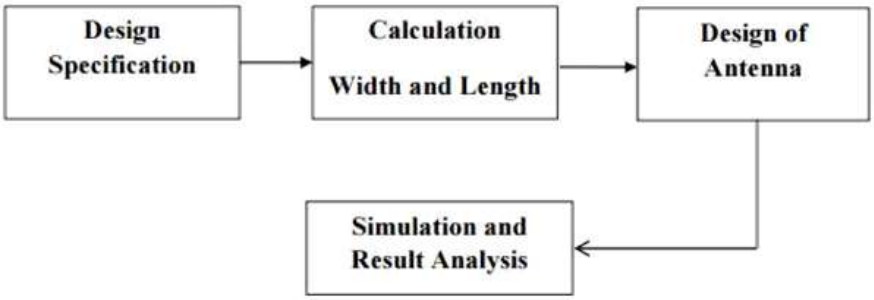

Fig1. Block Diagram of Antenna Design

III. Design Model

The Tri-arm resonator with patch surface to modify the dimensions of arms of the resonator to exhibit additional pass band. It uses substrate material of FR4 which has dielectric constant 4.6 and tangent loss 0.02. Third pass band can be used for interference suppression for an application of Satellite Service band i.e., X band which is in the frequency range of UWB.

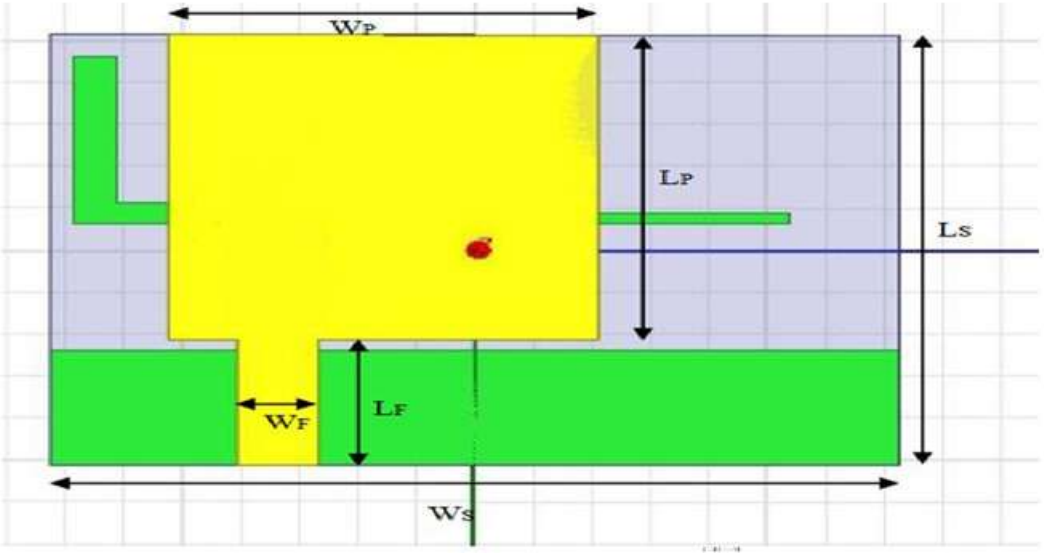

Fig2. Configuration of Proposed Antenna

IV. Results And Discussions

A prototype of developed antenna was measured for its radiation characteristics. The impedance bandwidth able covers the band from 3 to 10GHZ. The front back ratio is measured horizontal at xz plane and half power bandwidth and side lobe level on the vertical yz plane. The proposed antenna has been fabricated and tested [7].

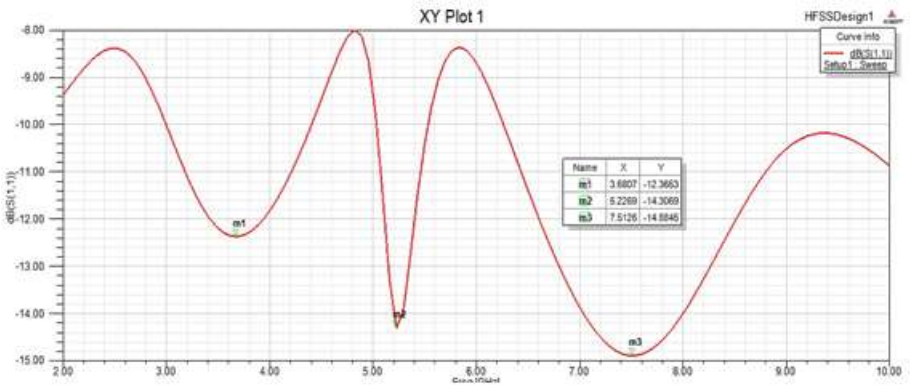

Fig4. Return loss of Simulated Result

The return loss when compared with the existing system for the desired bandwidth is very high that is greater than -10dB is shown in figure 5.1. The return loss is -10dB means the antenna is very good antenna that is 90% of the signal is absorbed and 10% are reflected away [8]. It is dB units return loss indicates the amount of power that is lost to the load and does not return as a reflection.

VSWR plot is reduced when compared existing system to the proposed system. VSWR is defined as the maximum voltage to the minimum voltage. VSWR is the measure of the how efficiently radio frequency is transmitting from a power source through the transmission line into load. In the existing system the VSWR value is low at the proposed system VSWR value is high.

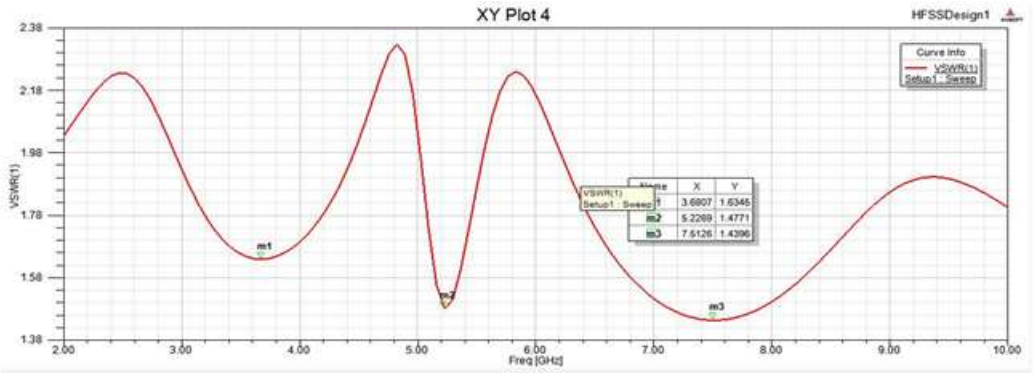

Fig6. VSWR of Simulated Result

The below Figure shows the radiation pattern of the triple band pass antenna. It achieves bidirectional radiation pattern.

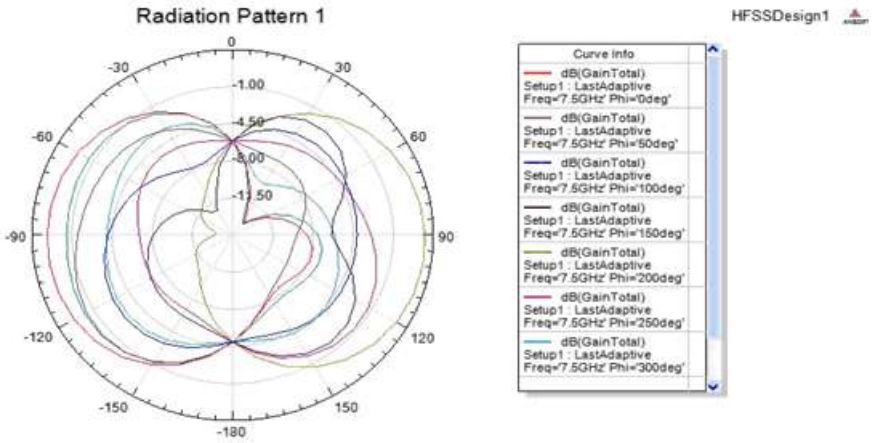

Fig8. Simulated results of Radiation Pattern

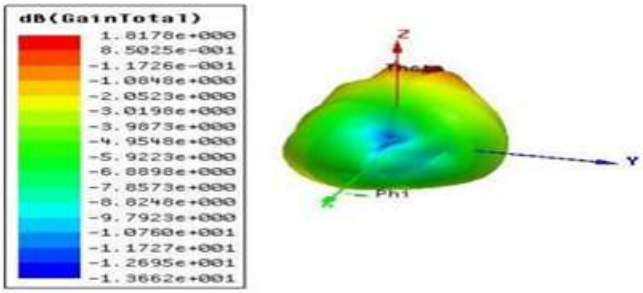

Fig9. Gain Plot

The above Figure shows the gain of the triple band pass antenna.

V. Conclusion

Acompact planar micro strip line-fed triple band-pass UWB antenna for WLAN, Wi-MAX and X-band satellite communication applications has been presented. The novel antenna consists of a tri-arm resonator at the backside of radiator. The simulated and measured results show that the demonstrated antenna can successfully suppress three bands operating at 3.6GHz for Wi-MAX, 5.2GHz for WLAN and 7.5GHz for Satellite communication services has been suppressed. In addition, the proposed antenna also provides good Omni directional radiation patterns at all operating frequencies and it has several advantages such as smaller in size, wide bandwidth and excellent gain reductions at pass frequencies. These characteristics make this proposed antenna is a good choice for portable UWB devices.

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