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M - Shaped Micro-strip Multiband Antenna for Wireless Applications

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ABSTRACT

Novel designs for compact triple-band microstrip antennas are proposed with a symmetric M-shaped patch. sAn micro-strip of triple band antenna operating at 7.7 GHz, 10.5GHz and 11.4GHz resonant frequency. A triple-band antenna with enhanced bandwidth is designed. We have simulated the design using software HFSS(version 13). This antenna operates in C band(2-8GHz) and in X band(8-12GHz). The patch antanna exhibits high gain(9db). The antenna is of - height:55mm and width:68mm. The dielectric co-efficient is 4.4. This design offers the enhanced gain and directivity of antenna which is applied for high efficiency antenna.. The antenna cover 8-12 GHz range also which can meet the requirement of WLAN, WiMAX applications. A relationship is drawn among the performances of the antennas in terms of gain, return loss, VSWR and directivity of the antennas.

Keywords: Microstrip Antennas, Inlet-Feed, Radiation Pattern, Return Loss, WLAN/WiMAX, HFSS Simulation.

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I. INTRODUCTION

Micro-strip patch antennas are widely used because of their many advantages, such as low profile, light weight, and easy construction. For superior antenna performance, broadband antennas are in strong claim as they offer truthful to utilize the different wireless communications in particular juncture. The CPW feeding line also has reward over microstrip feed lines such as low dispersion, low radiation leakage, their uncomplicated integration with active devices like SOC's (System On Chip) or MMICs (Monolithic Microwave Integrated Circuits) and capacity to manage their characteristics impedance. The microstrip feed line has superior transmission loss, high dispersion, high radiation leakage and superior profile chiefly on high frequency band.

The Triple band antenna which has 7.7GHz resonant freqency in C band and s10.5GHz and 11.4GHz resonant frequency in X band which is appropriate for Wi-Fi and WiMAX applications. The antenna usses a inlet feed system for excitation. The ground planes is at the back side of the substrate and the other side has M shaped patch. HFSS uses a numerical technique called the Finite Element Method (FEM). This is a method where a structure is subdivided into several smaller subsections called finite elements. The finite elements used by HFSS are tetrahedra, and the entire collection of tetrahedra is called a mesh. A solution is established for the fields within the finite elements, and these fields are interrelated so that Maxwell's equations are satisfied across inter-element boundaries. Yielding a field result for the entire and exclusive structure. Once the field result has been set up, the generalized S-matrix solution is determined.

II. ANTENNA DESIGN AND STRUCTURE

The configuration of the proposed antenna is shown in Figure1. The dimension the anna is 68mm x 55mm. The antenna has 35 mm x 40 mm M shaped patch. The dielectric material selected for this design has dielectric constant (εr) =4.4 and substrate height (h)=1.53mm.

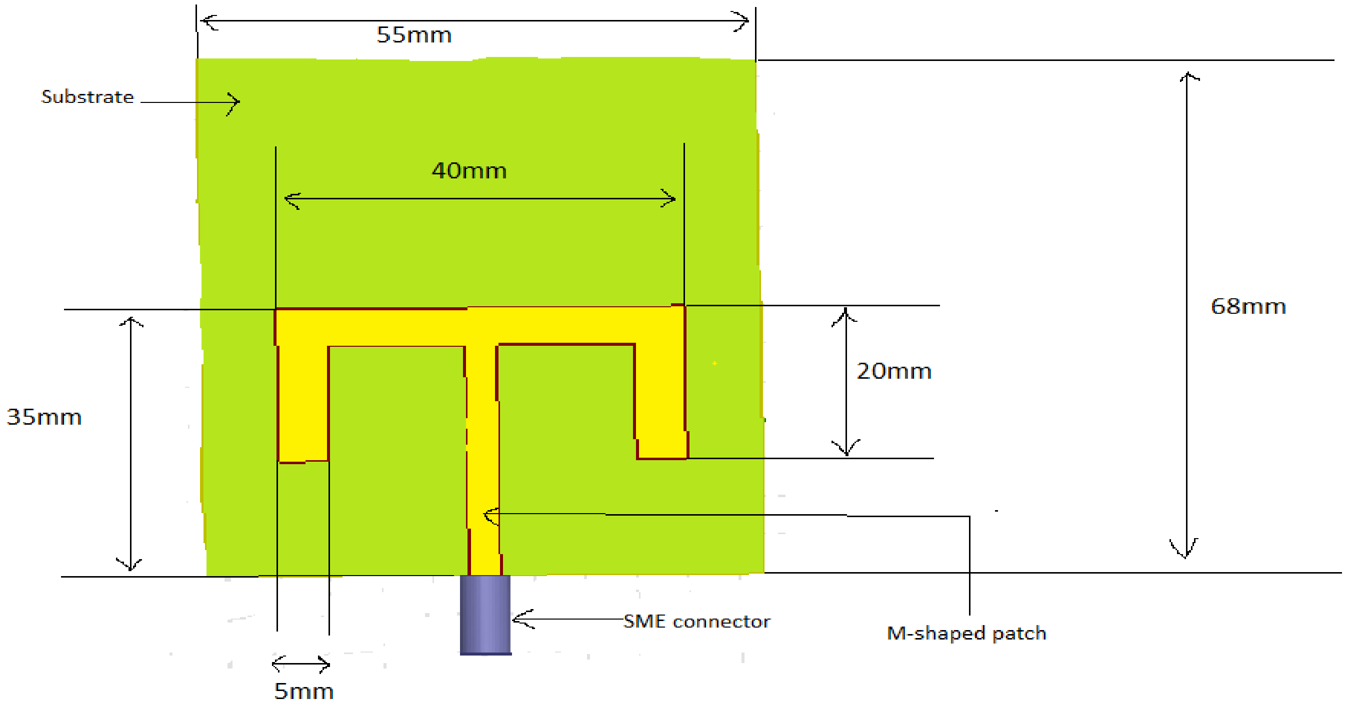

Fig 1. Geometry of the antenna

The geometry of the proposed antenna is shown in Figure1 & its 3D design is shown in figure2. The design of the antenna is started with determination of important parameters which directly influenced the antenna performance.

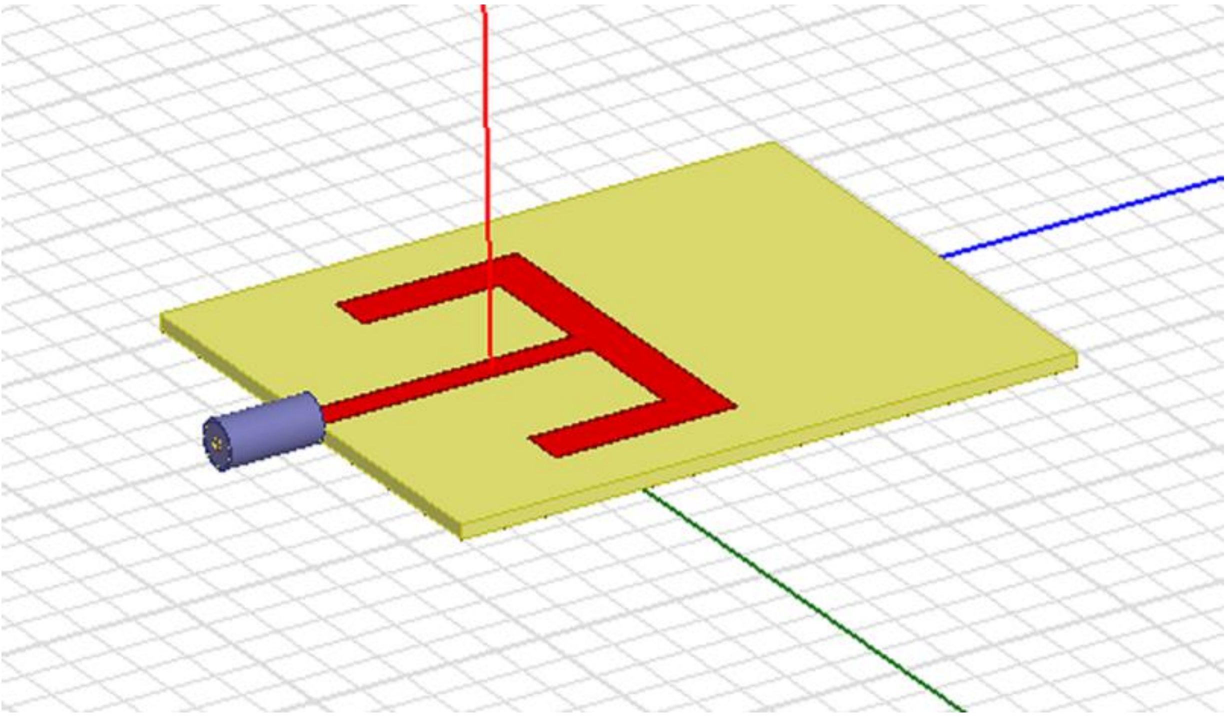

Fig 2. 3D structure of the antenna

III. RETURN LOSS

The simulated return loss of the proposed antennas is shown in Fig 3. The triple band antenna has return loss found of about -14.8587 dB at 7.7 GHz with corresponding bandwidth is 200 MHz, about -13.648db at 10.5GHz with bandwidth 830MHz and about -26.3482db at 11.4GHz with bandwidth of 450MHz respectively.

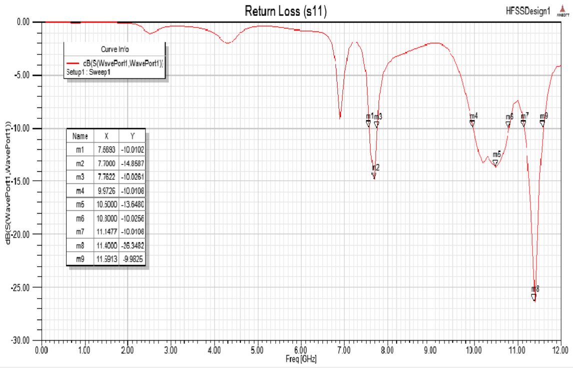

Fig 3. Simulated return loss of the proposed antenna

VSWR:

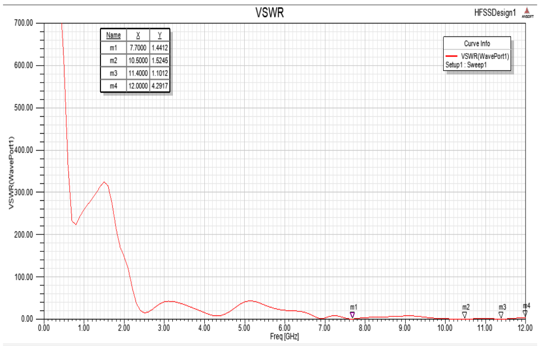

Fig 4. VSWR

Ideal case is VSWR=1, but of course it does not subsist in the real life so the superior ratio fluctuating between 1.0 to 1.2, over 1.5 is bad. As signal amplitude (voltage) is a amount of impedance so VSWR equal to ratio between load impedance and transmit media, any difference will cause high VSWR. Here (VSWR) <= 1.52 at 7.7GHz, 10.5GHz and 11.4GHz.

Directivity:

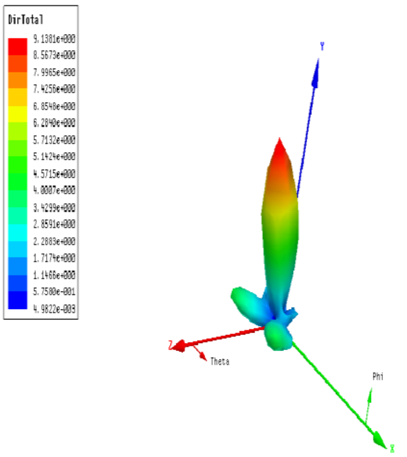

Fig 5. Directivity

As from the above outcome we can examine that antenna model in fig 3 is very directional.

Gain:

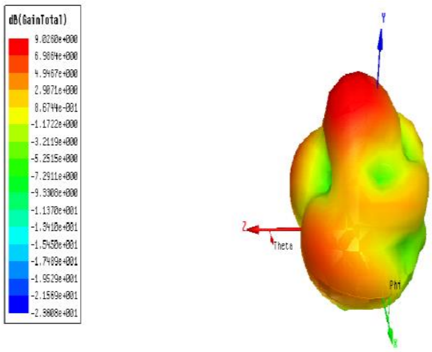

Fig 6. Gain

As revealed in the figure, the maximum achievable peak gain is 9db at 7.7GHz, 10.5GHz and 11.4GHz.

IV. CONCLUSION

Novel designs for compact triple-band microstrip antennas are antenna are observed. Moreover, there are resonant frequencies with wide band-width in X band, resulting in better performance. The triple-band antenna is designed which gives good resuls in X-band frequencies.

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