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MIMO Multiband Balanced Antenna Design for Wireless Communication

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ABSTRACT
In this paper the wide band antenna with broad bandwidth that can be utilized in different frequency band. Band covers from 750 to 5000 MHZ and GSM, UMTS, Bluetooth, GPS, & Wifi applications is examined The antenna has been design on HFSS. It is a low Profile Balanced antenna. Linear phase and constant radiation pattern with proper return loss and resonant on multiple frequencies

General Terms
Wide band balance antennas, low profile balanced antenna, unbalanced antenna, VSWR, radiation pattern, Return losses,

Keywords
Low profile, MIMO balanced antenna, VSWR, radiation pattern.

1. INTRODUCTION
As Technology is growing day by day. Antenna is fabricated near the ground plane, which affects the overall efficiency of the antenna. Balanced antenna technology was introduced to cop up with this problem and minimize the current in the ground plane. In this design current will only flow in the antenna elements, and minimizing the effect of the current flow on the ground plane. In this paper Wide band balanced antenna for wireless communication was designed and analyzed, also the antenna will be able to resonant on multiple frequencies.HFSS was used to measure the different aspects of the antenna i.e. return loss, current gain and radiation parameter. Deigned antenna was then fabricated on FR-4 Epoxy and the results were exacted from the network analyzer and anechoic chamber and compared it with theoretical aspects

2. DESIGNED ANTENNA
The designed antenna shown in figure 1(a) has a ambled rectangular patch practical on the FR-4 epoxy substrate. In balanced antenna, current distribution in ground plane is cancel minor copy of the patch is executed with is unique one
The dimensions of the single substrate are (30mm x 7mm x 1.6mm).The ground having dimensions (80 x 30) is used as reference mobile ground. As shown in figure 1(a) &1(b).

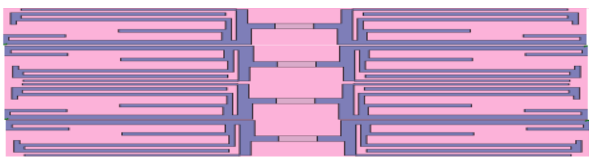

Figure 1 (a): designed balanced patch antenna

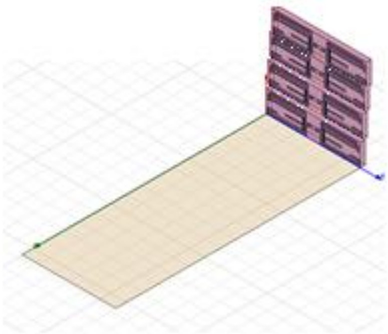

Figure 1 (b): Balanced patch antenna with ground

Probe feeding technique is used for the feeding of the antenna. Same magnitude but opposite in phase and two different individual feed line inputs are used to feed the antenna.

Antenna is able to resonant on multiple frequencies band range due to multiple paths lengths. The lower path is regulatory the lower frequency bands. The upper most paths are regulatory the higher frequency bands. The middle path is playing roll in the middle notch and the bandwidth of the antenna. You will see these prospects in results section

3. RESULTS
In this section, Mentioned are the simulated results of the and (a) Return loss, (b) Radiation patterns and (c) VSWR graph of the implemented design are displayed under:

3.1 Return Loss
In figure 2 the return loss [18] simulated in HFSS

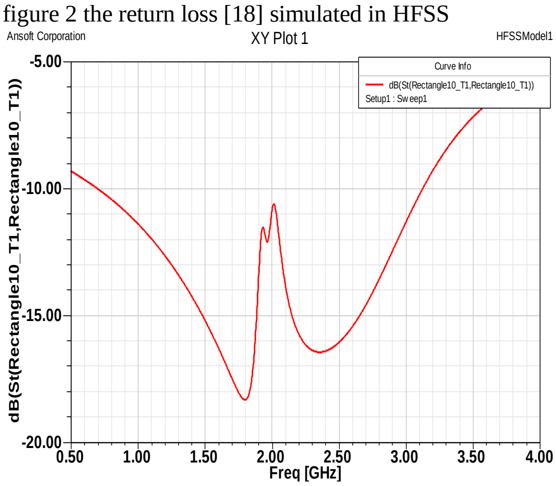

Figure 2: Return loss of proposed antenna

3.2 Radiation Patterns 2D

The 2D XY, YZ, ZX radiation pattern at multiple operating frequencies are displayed in figure 3(a) to 3(e).

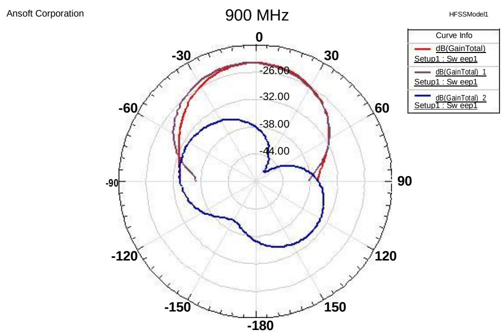

Figure 3(a): 2D Radiation pattern at 900 MHz

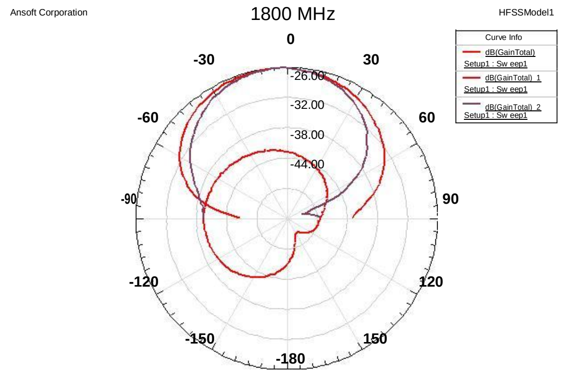

Figure 3(b): 2D Radiation pattern at 1800 MHz

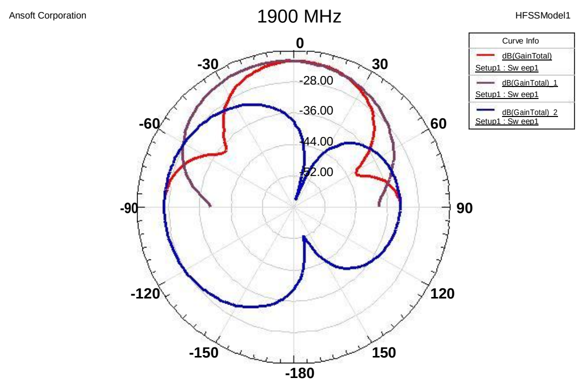

Figure 3(c): 2D Radiation pattern at 1900 MHz

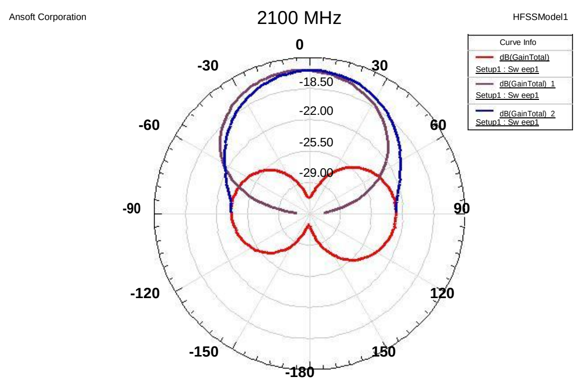

Figure 3(d): 2D Radiation pattern at 2100 MHz

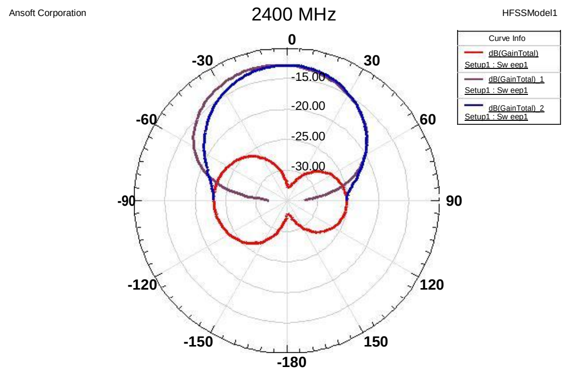

Figure 3(e): 2D Radiation pattern at 2400 MHz

3.3 VSWR

For low gain mobile terminal antennas $\rho \leq 2$ and $\rho \leq 3$ [16]. Preferably, in case of no transmission line mismatch. VSWR is equal to unity

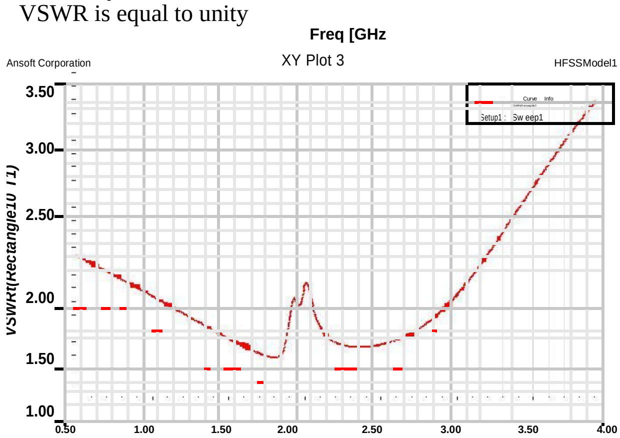

Figure 4: Showing VSWR characteristic of final antenna i.e. less than 2 for the operating region

3.4 3D Polar Plots

The 3D polar patterns at multiple operating frequencies are shown in figure 5(a) to 5(h).

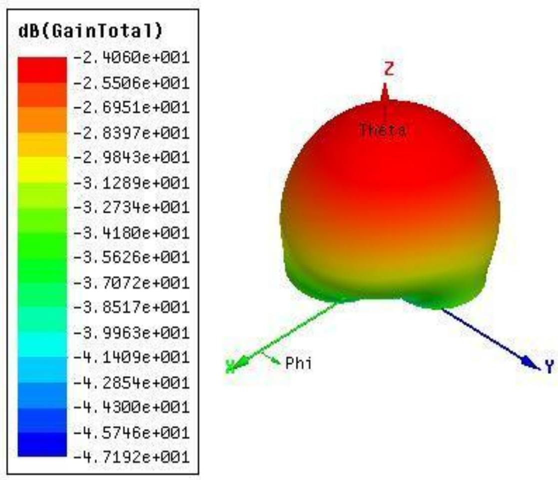

Figure 5(a): 3D polar pattern at 900 MHz

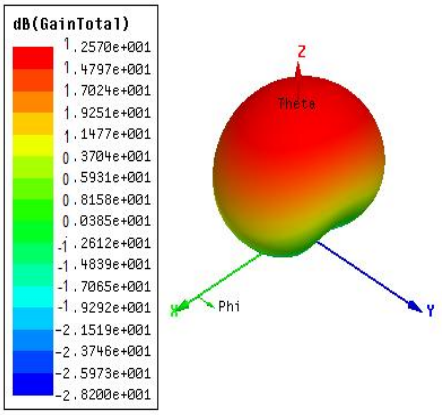

Figure 5(b): 3D polar pattern at 1800 MHz

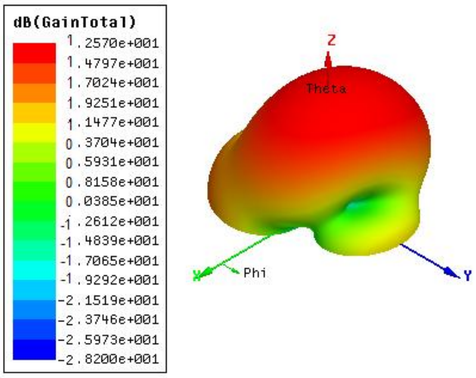

Figure 5(c): 3D polar pattern at 1900 MHz

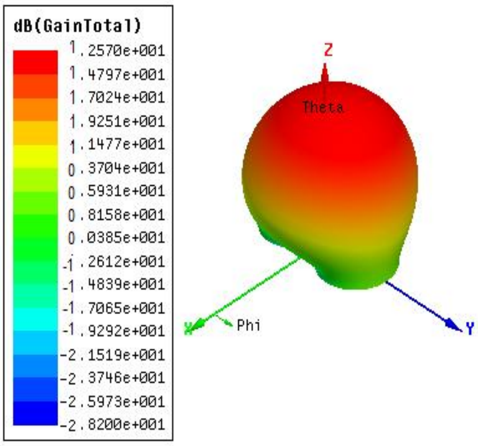

Figure 5(d): 3D polar pattern at 2100 MHz

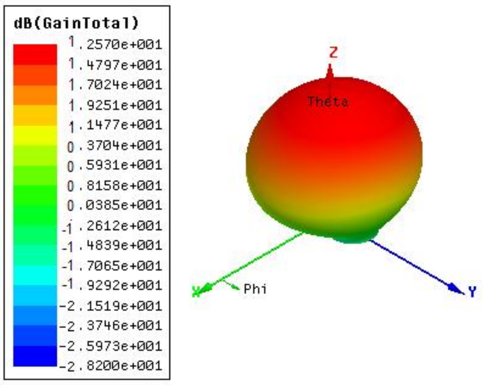

Figure 5(e): 3D polar pattern at 2400 MHz

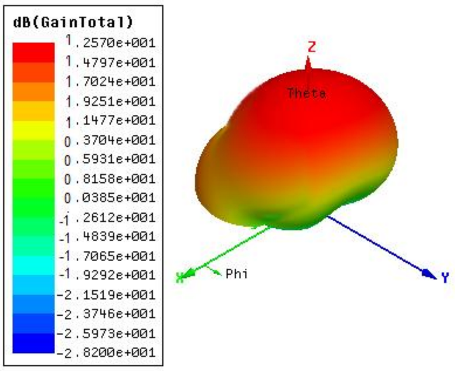

Figure 5(f): 3D polar pattern at 3000 MHz

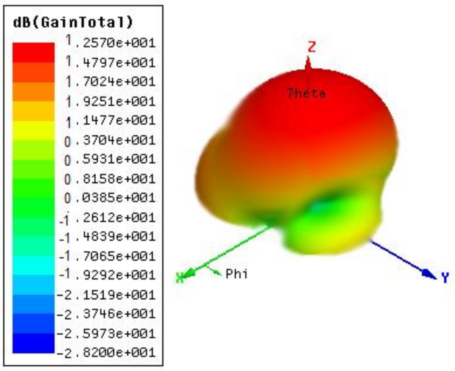

Figure 5(g): 3D polar pattern at 5000 MHz

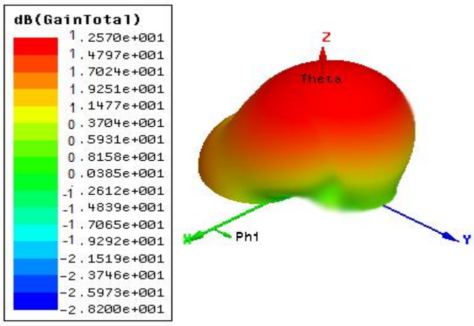

Figure 5(h): 3D polar pattern at 7000 MHz

4. PROTO TYPE

A prototype MIMO Balanced antenna is fabricated
In the process of fabrication, Copper layered substrate is used. For the etching the copper patch on the substrate ferric chloride id utilized.80X30mm sheet is used to ground the antenna, Mentioned in the figure **7 (a)**

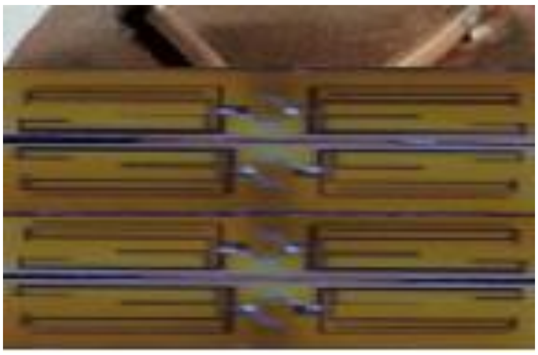

Figure 7(a): The proto type design of the antenna

Fabricated antenna is then measured by the matlab and network analyzer, as shown in the given below figure 8 (a) and 8 (b)

Figure 8(a): Return loss of the antenna on Network analyzer.

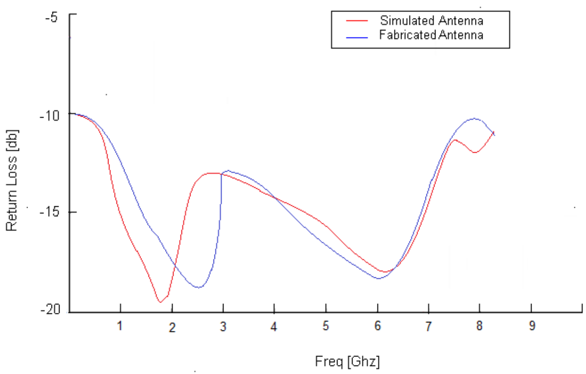

Figure 8(a): Return loss plotted on Matlab

There is difference in the fabricated and simulated antenna that can been easily seen from the figure mentioned above, as the s11 parameter [18] a bit shifted to the left side from the main reference S11 parameter of the base simulated antenna, the reason is that feeding cable are not perfectly matched, also there is the losses of SMA connectors, But still it will resonate on pre-described frequency band [14,15].

5. CONCLUSION

This MIMO Multiband balanced antenna can be used in mobile phones, and wireless adopters (Wi-max, Wi-Fi) because of its compact size, low profile and Isolation of Ground plane Radiation Patch Antenna is very much efficient and vital in developed technology of these days, but commonly unbalanced antennas are used which normally level down the efficiency of the antenna. In this paper this is been instructed that low profile antenna can work efficiently on mobile application [12, 13] working bandwidth of 750 MHZ to 3000 MHZ.

This type of antenna can able to resonant on multiple bands of frequencies of various applications and also the efficiency of the antenna be hold with effective level when it fabricated near to ground plan The problem was solved by proposing a balanced patch on the FR-4 substrate, in order to retains its efficiency and reduction of current in lumped (R, L & C) elements. Finally it is able to provide the reasonable bandwidth which is perfectly utilized for the mobile communication. [6, 10 &11].

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