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Comparative Study of Continuous Ground and Separated Ground for Dual Band Microstrip Antenna

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***Abstract*—In today's telecommunication industry, antennas are the most needed to create a communication link. For mobile applications, aerospace, because of their low power handling capacity, low profile and light weight microstrip antennas are the most suited. They can be designed in a variety of shapes in order to obtain enhanced bandwidth, dual band and gain. In order to have an antenna suitable for lower band and higher band of frequencies, we are working on dual band microstrip antenna. This paper concentrates on comparative study of a dual band and high bandwidth antenna. This antenna can operate in UMTS Bands of 1800 MHz frequency, 2400MHz and 2600MHz frequencies. HFSS is used to design antenna. Antenna design on FR4 substrate with size of 65 mm x 65 mm, thickness of 1.6 mm and relative permittivity of 4.4.**

Keywords—High bandwidth; Dual Band; Separated ground.

I. INTRODUCTION

This chapter explains introductory part related to design of dual band antenna through single feed. Achieving dual band using a microstrip antenna opens many designs for antenna. Changing antenna design changes its radiation pattern also the operating bandwidth. Microstrip antenna has application for low cost, light weight, portable device. By using principles of electromagnetic radiation we can change the design of antenna, so as to achieve specific radiation pattern over wide bandwidth. Small change in length can vary few parameters of antenna. Considering those deigns are made.

For next generation mobile communication [1] there is needed to transfer high data, within less time. Keeping this in mind, we have to deal with antenna to achieve high bandwidth. Hence there is need to have a single antenna which would operate at wide band. One of the ways is explained in this paper.

The antenna is compact, cost-effectively, an omni-directional pattern and a sufficient bandwidth for all of the above mentioned WLAN standards. This printed antenna might be a choice for nowadays or future multi-band, multi-mode WLAN applications.

MIMO is key techniques in current 3G and future 4G wireless systems [2] such as Worldwide Interoperability for Microwave Access (WiMAX) and the Third Generation Partnership Project (3GPP) Long Term Evolution (LTE). Previous research on MIMO mainly aims to increase bandwidth but rarely concerns this type of approach. Thus how to design of significant design with wide band antenna is very important. This chapter is providing an overview on the state of the art on this issue along with design strategies for wide band microstrip antenna.

II. DESIGN STRATEGY AND SIMULATION

Design strategies are always among the hot topics in cellular communications. However early work in this area is mainly focused on Bandwidth, coverage, spectral efficiency and capacity. Recently as energy consumption has become a primary concern low power antenna design with multi bands attracted increasing interest.

There are many resonant frequencies of an antenna which depends on matching impedance. Generally it is easier to find first resonant frequency of antenna, for dipole with length of λ/2 approximately. Adding stub is a better technique to have both bands, but for a wideband we have to deal with antenna shape and radiation pattern [4] accordingly.

In HFSS we have created substrate of FR-4 epoxy with thickness 1.6mm, c = 4.4 and dimensions as 60mm x 60mm.Ground plane is of 60mm x 60mm as a perfect electric conductor. Patch is also perfect electric conductor. "*Fig.1,"* shows the design of continuous ground microstrip antenna.

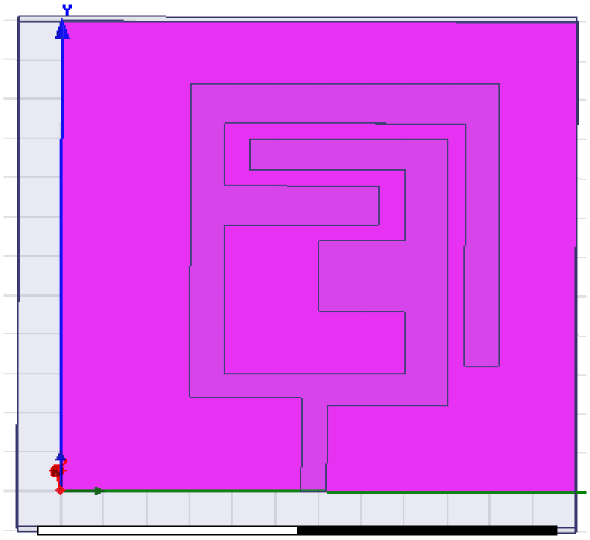

Fig. 1. Design for dual bands

Here continuous ground is used for design and the simulation results are as shown in “*Fig. 2*”.

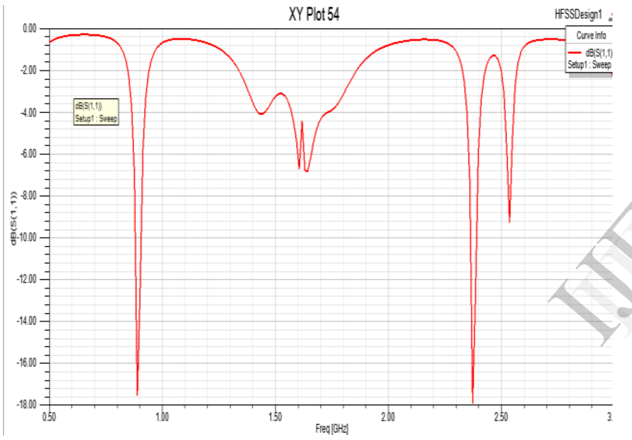

Fig. 2. Simulation results of design for dual band with continuous ground

As seen in “*Fig. 2*,” S11 is good at 900MHz and 2.4GHz. We are working to get better results. Radiation pattern at 900MHz, 2.4GHz, 2.6GHz are not satisfactory.

III. ANTENNA WITH SEPARATED GROUND

The basic idea behind the separation of the ground is to improve performance of antenna. Dimensions of the antenna are as same as previous antenna. Only the difference here is, at ground we separate three regions.

In electronics circuit, if we have two different currents, we separate their ground. Same concept is tried to implement here. Due to this parasitic capacitance increases, which gives voltage lead, hence increase in bandwidth.

“*Fig. 3*,” shows the ground is separated with a ring outside and also with the stubs matching at patch.

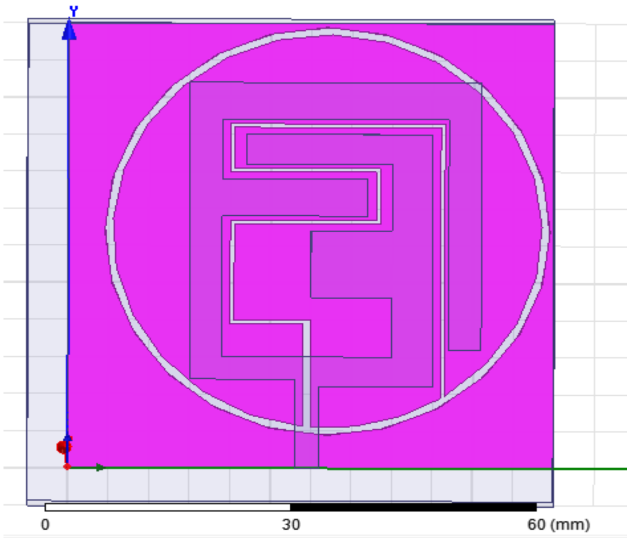

Fig. 3. Separated ground design for dual band

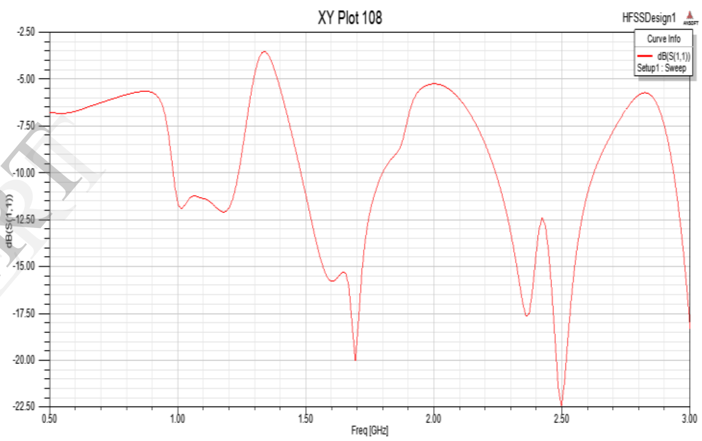

Fig. 4. Simulation result of separated ground design for dual band

Return loss for antenna is increased in “*Fig. 4*,”-10dB return loss we use for practical purpose. As compared to previous simulation results, we can easily say that this new approach is attractive for widening of the bandwidth.

Almost 900MHz bandwidth is covered in these three bands.

IV. CONCLUSION

Instead of adding more number of stubs, we separated ground of the antenna for better results. To increase the usable bandwidth of antenna was a challenge, but comparative study tells the solution for that. All of these are done with HFSS 13.0. The design is simple for fabrication. Application for mobile handsets with multiple bands is suitable. Hence, these results prove that, the new approach with separation of ground is better over a continuous ground. This method can be use for any kind of antenna irrespective of its dimensions.

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