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Design and Analysis of Multiband Frequency Reconfigurable Microstrip Patch Antenna Structures For Wireless Applications

A.Anusuya[1], J.Janetstephy[2], prof.G.Jegan[3]
[1,2,3]Faculty of Electronics and Communication, Sathyabama University.
[1]anushya21ganga@gmail.com , [2]jannetstephy@gmail.com,[3]jjsfss@gmail.com

Abstract

The comparative analysis of reconfigurable microstrip patch antenna is presented in many papers. In orders to satisfy the requirements' for the advanced system in modern wireless applications, different multiband and re-configurable antenna have been proposed and investigated in the past years. In proposed idea different shapes of antenna were presented (such as E & U shape and Circularly polarized shape) especially to achieve multiple frequencies for various wireless applications. This antenna is smaller in size and can build on a double side of the printed circuit board or stamped from thin sheet metal. Similarly microstrip patch antenna for different frequency range will be implemented in order to meet the demand (like bandwidth or else to reduce narrow band) in emerging communication field with respect to size, cost and weight of the antenna. Design of rectangular multiband microstrip patch antenna includes the analysis of antenna parameters such as bandwidth,gain,return loss etc. these parameters have to be analysed using certain dimensions. This antenna can be used for different applications.

Introduction

Due to fast advancement in wireless communication technology, use of small size antenna has rapidly increased. Not only the size of the antenna its costs, performance, eased of installation everything have been taken care while designing the antenna. To meet this entire requirements microstrip antenna is proposed. Nowadays microstrip antennas are used in many places such as aircrafts, spacecraft's, satellite and missile applications. Microstrip antennas are used for many purposes due to their light weight and low cost. Especially the reconfigurable type antenna has a capability to reconfigure its characteristics such as frequency, pattern, bandwidth and polarization to adapt to the environment. So, recently reconfigurable antennas have received much attention in wireless communication systems due to their selectivity for operating frequency and polarization. In this proposed system antenna is designed with different

shapes such as circularly polarized, E-shape, multistandard patch antenna and Rectangular fractal antenna. Which works in the range between 0Hz to 10GHz.In order to simplify analysis and performance prediction, the patch is generally square, rectangular. Circular, triangle, elliptical or some other shapes. Substrate material, dimension of antenna, feeding technique will determine the performance of microstrip patch antenna. Hence among different feeding techniques, line feed technique is used here for the designing the antenna.

Antenna Design:

Microstrip patch antenna are commonly used in mobile communications terminals due to their many attractive features due to their many attractive features such as simple in structure, low production cost,lite weight and ease of installation. Here two different shapes of antennas were presented and this antennas works in four modes of operation they are 4.063GHz, 9.232GHz. Detailed description about these antennas was given below.

Circularly Polarized Antenna

This antenna is small wideband antenna which is designed to operate in the range of 4GHzand it can cover wide band frequency because the antenna is slotted with certain dimensions. Here the dimension is L=18mm and W=15mm.

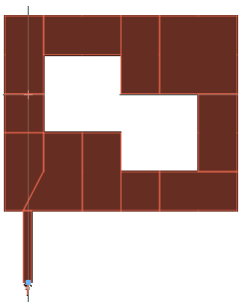


Figure 1.1: circularly polarized antenna

Polarized antenna has the advantage to mitigate signal fading in multipath propagation environments and provide double transmissions channels for frequency reuse radio transceivers it can be applied to multisystem operation in order to reduce the number of the required antenna.

Return Loss

Return loss is nothing but loss of power in the signal retuned/reflected by a discontinuity in a transmission line or optical fibre. That discontinuity is due to mismatch with the terminating load or with a device inserted in the line. For fig1.1 the return loss is given below in fig1.2 which achieved -19.1db. For the good antenna the return loss should be 10db.

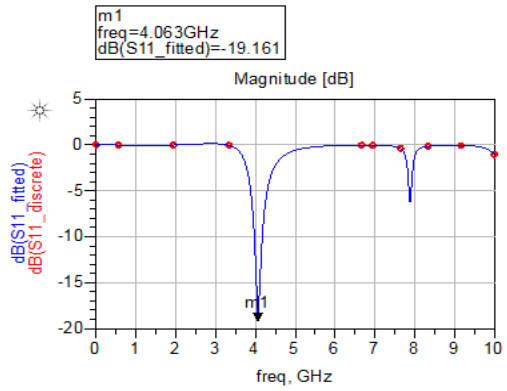


Figure 1.2: Return loss

Smith Chart

S-parameter smith chart of rectangular microstrip patch antenna with proposed antenna structure is shown below. Impedance variation within the simulated frequency range and on the basis of smith chart information about impedance matching can be easily defined.

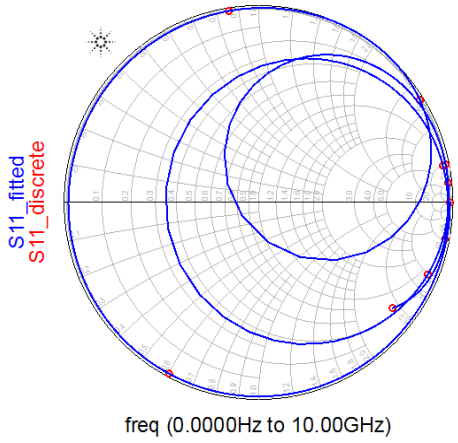


Figure 1.3: Smith chart for cp

E&U Shape Antenna

This antenna is designed with both E and U shape. Both structures were combined together to achieve high frequency. It supports the frequency of 9.232GHz.The dimension is L=38mm and width=28mm.

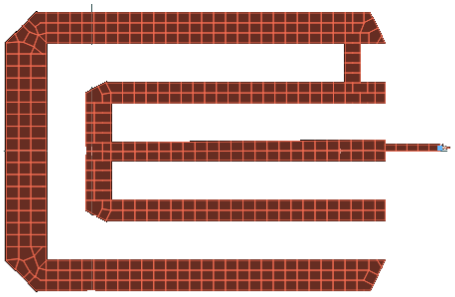


Figure 2: E & U Shape

Return Loss

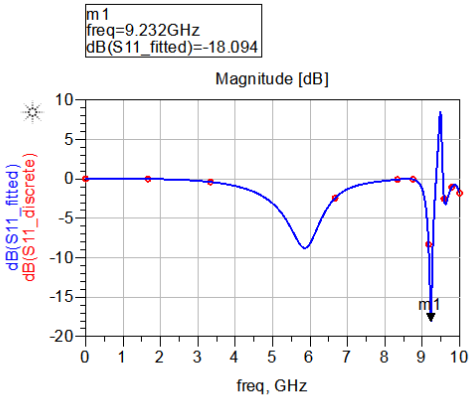
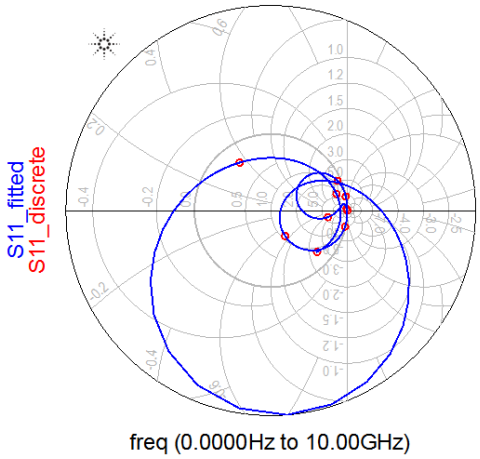


Figure 2.1: Return loss for E &U shape

For fig 2 return loss is given in the fig 2.1. For this antenna structure the return loss is achieved up to -18.0db.

Smith Chart

As mentioned in above description smith chart is used to label impedance variation within the simulated frequency. Using this smith chart impedance variation can be easily obtained.



Conclusion

In existing system the structure was done manually and the signal strength is measured with CRO (in the range of GHz). In proposed antenna design it was designed with the use of ADS software. Here return loss was achieved up to -18db and -19db. In future it can be optimized and can achieve good bandwidth and high return loss.

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