Design and Analysis Of Extended C-Shaped Microstrip Patch Antenna For Wideband Application

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Abstract

This paper presents a survey of extended C-shaped Microstrip patch antenna. The extended C-shaped Microstrip antenna is designed and simulated using IE3D software Ver.15.2. The substrate thickness is taken as 1.6 mm, dielectric constant of 4.2, loss tangent of 0.0013. The obtained bandwidth is 31.15%, gain of 2.50233dbi, directivity of 3.73959dbi, antenna efficiency of 88.4338% and radiation efficiency of 89.2121%. The extended C-shaped Microstrip patch antenna is designed by cutting a notch in rectangular patch antenna.

Keywords: Extended C shape, ground plane, patch antenna, single band.

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1. Introduction

In wireless communication the basic need is that device size should be small. There are many directional antenna like Horn, Helical, Yagi Uda ete have very high gain and bandwidth but they have complex 3D structure and installation of these antennas is very typical. So, for wireless needs Microstrip antenna is best suited. These antennas have planar and non-planar configuration, small size, cost effective but major disadvantages of these antennas are narrow bandwidth and gain. To overcome these disadvantages various techniques like different patch shape such as E shape[1,8], W shape[3], cutting slots and notches are used. In this research paper extended C shaped antenna is designed and simulated using IE3D software Ver.15.2.The analysis of bandwidth, gain and efficiency is done in next section.

2. Research Methodology

Research methodology includes designing of extended C shape antenna using IE3D software by cutting a notch in rectangular patch antenna and co-axial probe feed is used to feed the antenna. Using IE3D software we can measure various parameter like bandwidth, gain, efficiency etc.

3. Antenna Design

The design of antenna is shown in *figure 1* and dimensions of antenna are also given in table as well.

Parameter	Size in mm
Ground plane	50x70
Patch Size	30x50

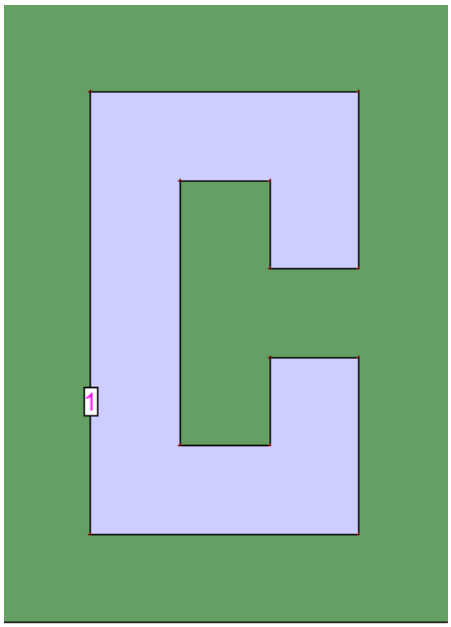

Fig 1. Extended C shaped Microstrip patch antenna

4. Result and Discussion

In this section we discuss about the results regarding to extended C shaped Microstrip patch antenna. First we consider return loss curve which is used to determine the bandwidth. Return loss curve is shown below in *figure 2*.

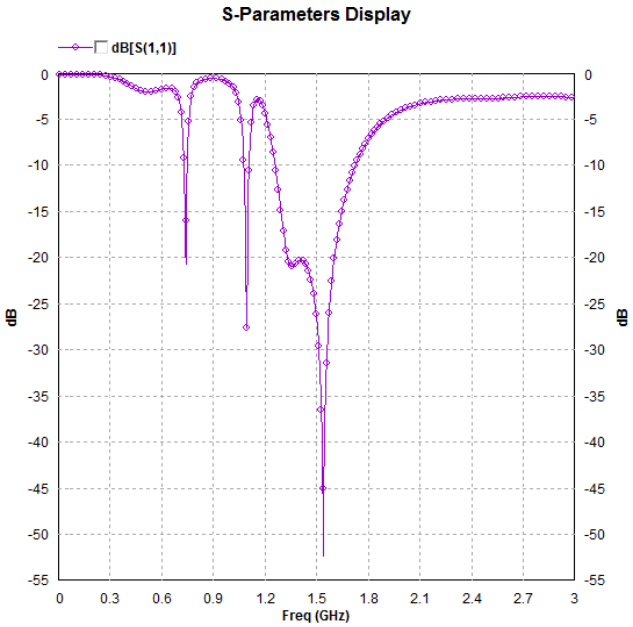

Fig.2 Return loss Vs frequency curve

Calculation of Bandwidth

f_l =1.26067 , f_h = 1.72584

f_c = 1.493255

Bandwidth= $(f_l - f_h) / f_c$ = **31.15%**

Next figure gives information about VSWR to determine whether bandwidth is useful or not. VSWR figure is shown in *figure 3*

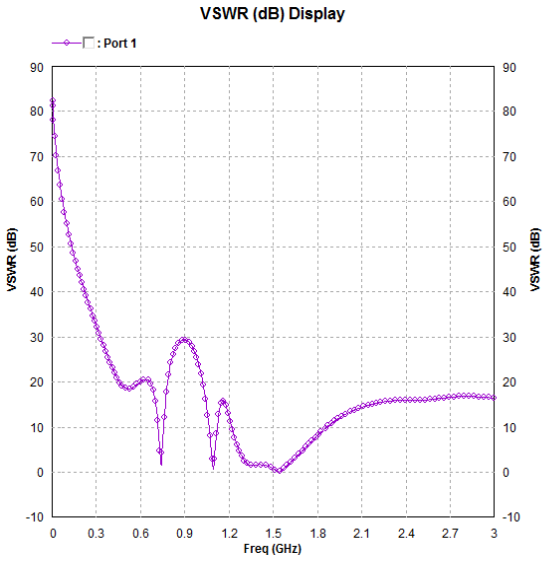

Fig.3 VSWR Vs frequency curve

From figure it is clear that VSWR is below 2 in desired frequency range, so obtained bandwidth is useful.

Next figure gives information about gain of antenna which is given in *figure 4.*

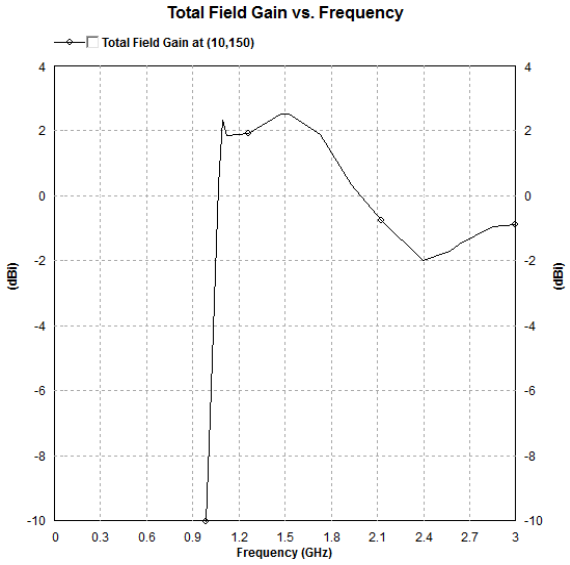

Fig.4. Gain Vs frequency curve

From the figure it is clear that gain is about 2.50233dbi which is quite good for this structure.
Next figure gives information directivity of the extended C shaped Microstrip antenna which is shown in *figure 5.* The directivity is about3.73959 dbi.

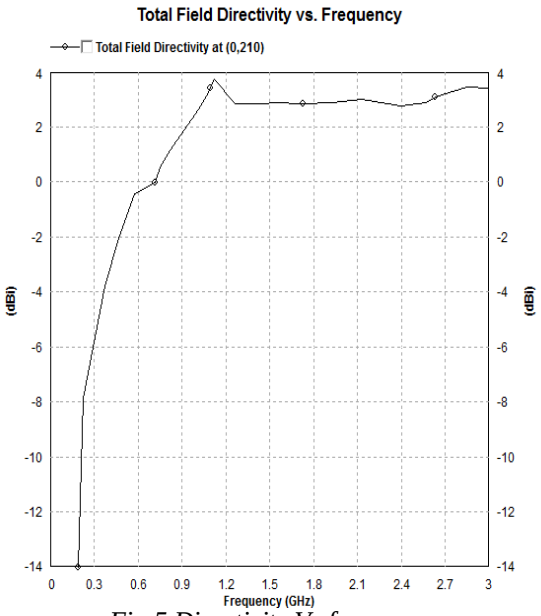

Fig.5 Directivity Vs frequency curve

Next figure gives the information about antenna efficiency which is given in *figure 6.*

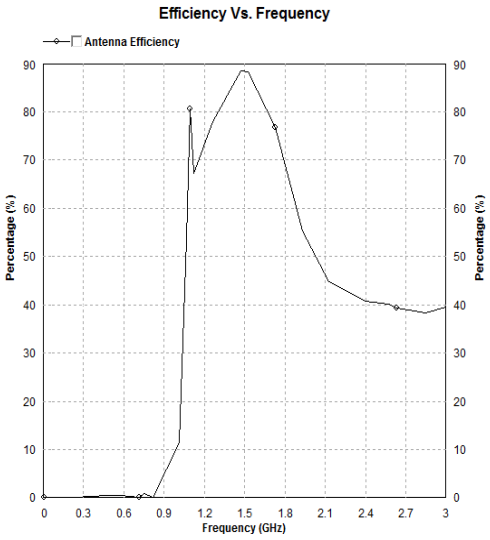

Fig.6 Antenna efficiency Vs frequency curve

Antenna efficiency is about 88.4338% at 1.4764 GH_Z.

Next figure gives information about radiation efficiency of antenna which is shown in figure 7. Radiation efficiency is about 89.2121% at 1.12584 GH_Z.

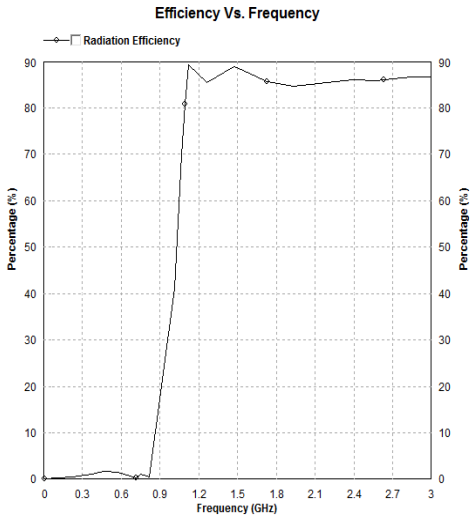

Fig.7 Radiation efficiency Vs frequency curve

5. Conclusion

Finally extended C shaped Microstrip patch antenna is designed and analysed using IE3D software with quite good amount of bandwidth of 31.15%, gain of 2.50233 dBi, directivity of 3.73959 dBi, antenna efficiency of 88.4338% and radiation efficiency of 89.2121%. Further development of increasing bandwidth and gain of Microstrip antenna is still continued.

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