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Microstip Antenna for Wideband Application

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Abstract— This paper present, method of moments based IE3D software is used to design a Microstrip Patch Antenna with enhanced bandwidth. In its most basic form, a microstrip patch antenna consists of a radiating patch on one side of a dielectric substrate which has a ground plane on the other side. We are using IE3D simulation software for designing and analysis. The conducting patch can take any shape but rectangular and circular configurations are the most commonly used configuration. Other configurations are complex to analyze and require heavy numerical computations. The length of the antenna is nearly half wavelength in the dielectric, it is a very critical parameter, which governs the resonant frequency of the antenna. In view of design, selection of the patch width and length are the major parameters along with the feed line depth. Desired Patch antenna design is simulated using IE3D simulator. And Patch antenna is realized as per design requirements. A wideband circular ring patch antenna has been proposed. The antenna is thin and compact which makes it easily portable. The VSWR s parameter will found to be less than 2 within the operating frequency range. It can be used for the wide band application

Keywords-Bandwidth, Microstrip Antenna, Circular Rimg, VSWR, Microstrip Feed, IE3D.

I. INTRODUCTION

The recent progress in UWB wireless communications have remarkably increased the demand of wideband antenna with smaller dimensions than conventionally possible. Micro strip Antenna is commonly used because of its low profile, low cost and ease of manufacturing. A patch antenna is made by etching metal on one side of dielectric substrate where as on the opposite side there is continuous metal layer of the substrate which forms a ground plane .Microsrtip Antenna are inherently a narrow band antennas so; various bandwidth enhancement techniques are engaged while keeping its size as compact as possible to be perfectly used as a low profile antenna.

In this Paper a Circular ring with a Circular patch at the center is proposed. This antenna is applicable for C-band. The optimum performance is obtained by reducing dimension of ground plane. All these antennas have been initially analyzed using IE3D software [08] using glass epoxy substrate ($\varepsilon_r = 4.3$, h = 1.6 mm, tan $\delta = 0.02$).. The performance of proposed antenna is improved when compared with that of conventional circular patch antenna having identical radius

II. *CIRCULAR RING MONOPOLE ANTENNA*

A Circular ring Monopole antenna with micro strip feed line along with the dimension is shown in Fig.1. This proposed antenna is having the dimension as follows radiating circular patch of radius a=7.5mm,circular outer ring of radius b=10mm and inner radius of c=8mm micro strip feed line width is 3mm, substrate width is 40mm, the gap between the radiator and ground plane is 0.5mm. And the feed line width is 3mm in order to achieve proper impedance matching. length L1=12mm, length L2=11.6, substrate length L3=45mm with a feed gap of 0.4mm. The substrate used to fabricate the antenna is FR4 which is easily available and low cost.

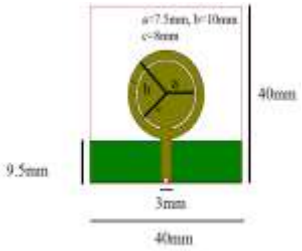

Figure 1. Circular microstrip antenna

The optimization in the design parameter is show in the below table . The dimension of both the ground plane as well as of the radiator have been optimized in order to get good result .

Ground plane	**A= inner radius**	**B=outer radius**	**C= gap**	**Bandwidth**
10mm	7.00mm	10mm	1.00mm	4.32GHz
10mm	7.25mm	10mm	0.75mm	4.44GHz
10mm	**7.50mm**	**10mm**	**0.50mm**	**4.52GHz**

Table 1: Variation in the Gap size

As we can see then when we keep the gap between the circular ring and the circular patch minimum highest bandwidth is achieved . so in the second optimization we keep the dimension at which we get the highest bandwidth and vary the ground plane. Variation in the ground plane and the bandwidth achieved is shown in the below table.

Ground plane	**A=inner radius**	**B=outer radius**	**C= gap**	**Bandwidth**
10.00mm	7.50mm	10mm	0.50mm	4.52GHz
9.80mm	7.50mm	10mm	0.50mm	5.32GHz
9.50mm	**7.50mm**	**10mm**	**0.50mm**	**6.16GHz**
9.00mm	7.50mm	10mm	0.50mm	5.01GHZ

Table 2: variation in ground plane

We can see the further reduction in the ground plane is not effective to increase the bandwidth. So the dimension which are shown in bold are used to fabricate the antenna.

III. Stimulated Result

The below graph shows that for the proposed antenna the vswr is below 2db from the frequency range 3.22GHz to 9.71 GHz . The reason why the vswr below is accepted is for the proper impedance matching. Hence this antenna can be used in c band application of the satellite.

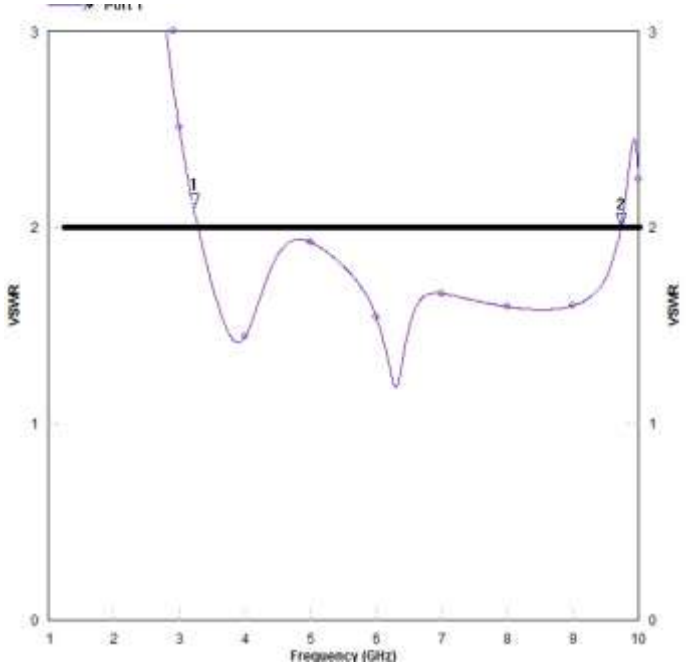

Figure 2: VSWR Graph

In the above graph we can see that from the point indicated by 1 to the point indicated by the 2, the vswr graph is below the 2 db .the point 1 and 2 are at 3.22 GHz and 9.71 GHz respectively.

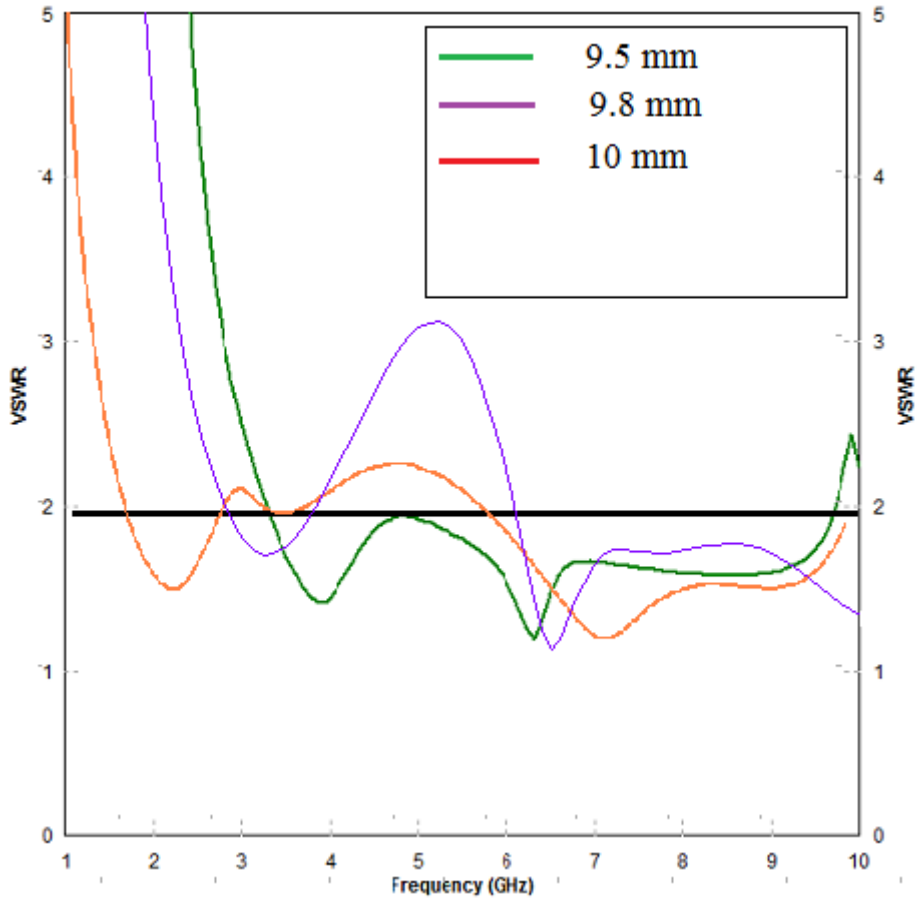

Figure 3: VSWR for different ground plane

In the above graph we can see that the line indicated by green has the widest bandwidth. And it's for the antenna having the ground plane of 9.5mm.

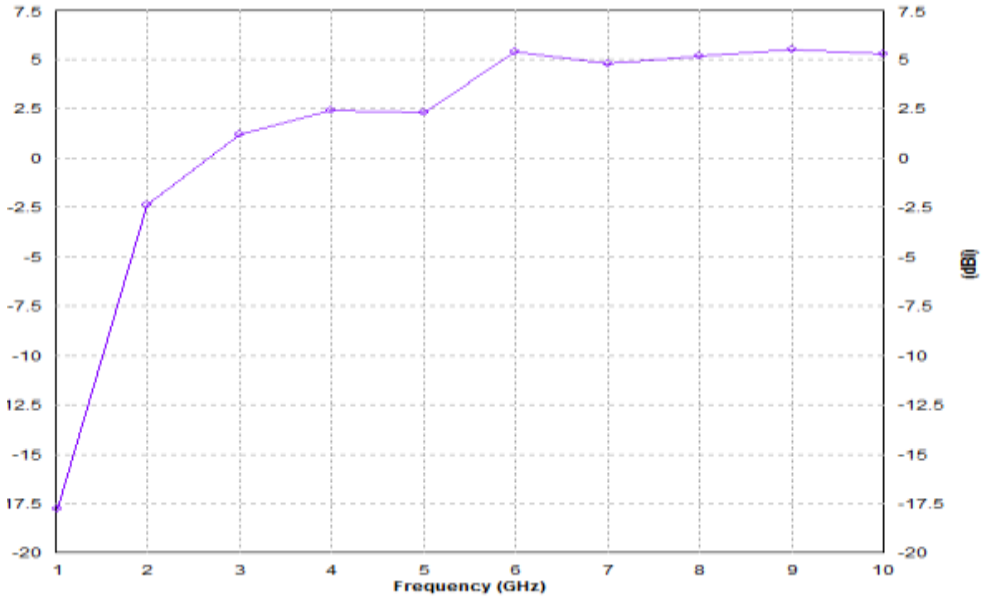

Figure 4: GAIN VS FREQUENCY

The maximum gain is achieved at the frequency 6 GHz of 5.02 db.

IV. CONCLUSION

The design of circular ring antenna for wideband application has been completed using IE3D software. The simulation gave results good enough to satisfy our requirements to fabricate it on hardware which can be used wherever needed. Microstrip patch antenna for wide band applications covering 3.22 to 9.71 GHz frequency has been presented. The proposed circular ring microstrip antenna it provides high bandwidth, return loss up to -22.02 dBi. The simulated result of design antenna shows good performance and thus can be used as various wideband applications such as wireless, satellite, mobile communication, and military.

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