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Design and Comparative Study of Meander Antenna and Microstrip Patch Antenna

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Abstract – In Wireless communications antennas plays a major role to direct the field in one all directions. There are different types of antennas available to distinct application. The paper also presents the detail step of designing antennas like microstrip patch antenna and meander antenna. By using the patch antenna the return loss, gain, directivity increases in the resonant frequency of 12GHz operates at the X- band and useful for satellite communication than meander antenna. ADS software is used to compute the bandwidth, gain, directivity, and S11 of the antenna.

Index Terms—Microstrip patch antenna, meandered antenna, Gain, Bandwidth.

I. INTRODUCTION

A. MEANDER ANTENNA

The advent of new technology in communication systems and widespread use of this technology, leads engineers to design cheaper and simpler communication equipment's. One of the most usage of communication is WLAN and RFID systems. Antenna is an inseparable part of these systems. Meander line antenna has some advantages, it is electrically small, low profile antenna and has simple structure thus gives higher bandwidth [1]. But these antennas have some disadvantages, low radiation efficiency.When the size of antenna is reduced, the radiation resistance is reduced.

B. MICROSTRIP PATCH NATENNA

With the rapid development of wireless field, microstrip antennas became more appealing in antenna community. These antennas are low-profile, low price and dismount. However, Surface waves are a major drawback for this type of antenna as they lower the antenna efficiency.This technological trend has focused much effort on the design of a Microstrip patch antenna.Patch antennas play a very significant role in today's world of wireless communication systems. A Microstrip patch antenna is very simple in the construction using a conventional Microstrip fabrication technique. The most commonly used Microstrip patch antennas are rectangular and circular patch antennas. These patch antennas are used as simple and for the widest and most demanding in allapplications. In this work, the pattern of a Microstrip patch antenna have been analysed and studied.[2]

II. ANTENNA CONFIGURATION

Table 1

List of Antenna Parameters

PARAMETER	MEANDER	MICROSTRIP
Operating Frequency	**2.5 GHz**	**2.5GHz**
Slot/Patch Length	**15 mm**	**8.37 mm**
Slot/Patch Width	**1.2 mm**	**11.338 mm**
Transmission Line Length	**1.2 mm**	**5.1 mm**
Transmission Line Width	**3.8 mm**	**.9 mm**
Dielectric Constant, ε_r	**FR-4 2.2**	**FR-4 2.2**

III. ANTENNA DESIGN

A.MICROSTRIP PATCH ANTENNA

The patch antenna is feeded through various feeding technique as microstrip line feeding, inset feeding, coaxial feeding, proximity coupling feeding and aperture couple feeding [3]. We are using microstrip line feed of 50 ohm impedance with the $\lambda/4$ transformer placed at the edge of patch on its width in this design. Fig 1 shows the proposed design of microstrip patch antenna dielectric substrate having dielectricconstant ε_r

=2.2with height of substrate h=1.5mm,losstangent=0.0022 and resonating frequency f_o=12 GHz. By using these substrate parameters the dimension of patch calculated as:

Length of patch L=8.37mm

Width of patch w=11.338mm

The width of the patch should be chosen larger than the length of patch in order to get the higher bandwidth.The antenna is designed to operate at 12 GHz frequency.

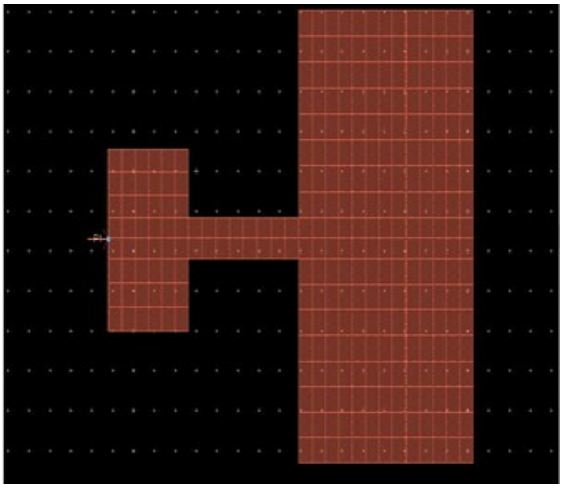

Figure 1: Microstrip Patch Antenna in ADS

B. MEANDER ANTENNA

Except the substrate length and width the remaining
data are same. Fig 2 shows the proposed design of Meander antenna.

Length of patch L=1.5 mm
Width of patch w=1.2 mm

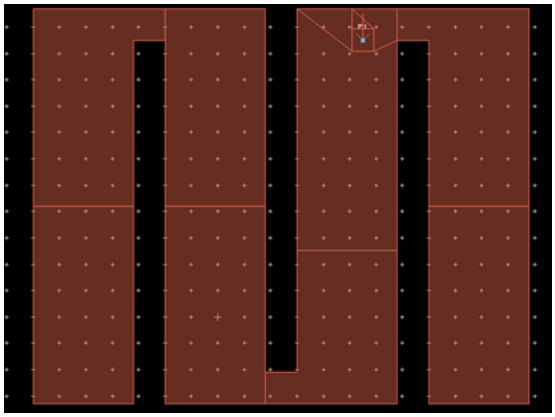

Figure 2: Meander Antenna in ADS

IV. RESULT AND DISCUSSION

It become easy to simulate the design through computer before real time implementation. The ADS tool helps us to determine the impedance bandwidth, return loss, gain and directivity.This simulator also helps to reduce the fabrication cost because only the antenna with the best performance would be fabricated. The simulated results of antenna for Microstrip and Meanderhave been shown in fig 3 and fig 4.

A. RETURN LOSS AND BANDWIDTH

The return loss of patch antenna is -25.509db at 12.12 GHz resonating frequency and return loss of Meander antenna is -16.724 at 12.28GHz resonating frequency.The negative value of return loss signifies that there are significantly less losses in the antenna.
The bandwidth is calculated from fig 4 and fig 5.The bandwidth of patch antenna is 12.12 GHz. i.e 4% Bandwidth of Meander antenna is 12.28 GHz which is 27.17%.The Meander antenna bandwidth is higher than the patch antenna

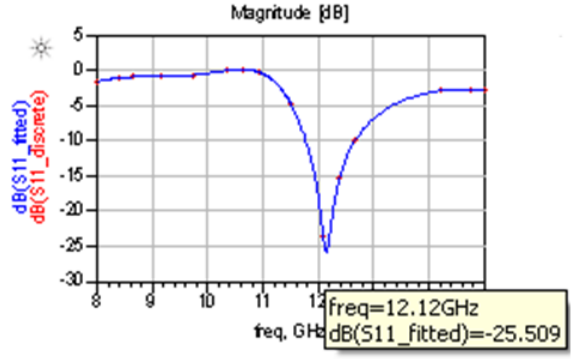

Figure3: Return loss of Microstip Patch Antenna

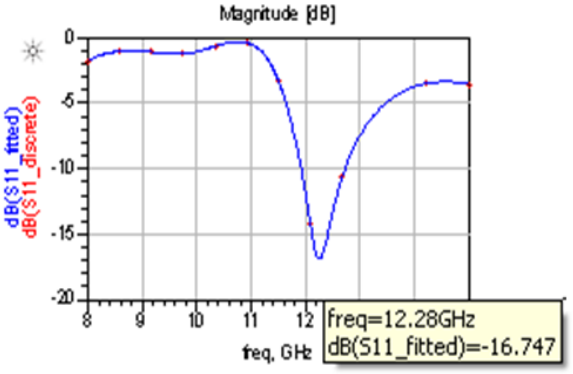

Figure4: Return loss of Meander Antenna

B. GAIN AND DIRECTIVITY

The antenna parameters of patch antenna and Meander antenna is shown in fig 5 and fig 6.

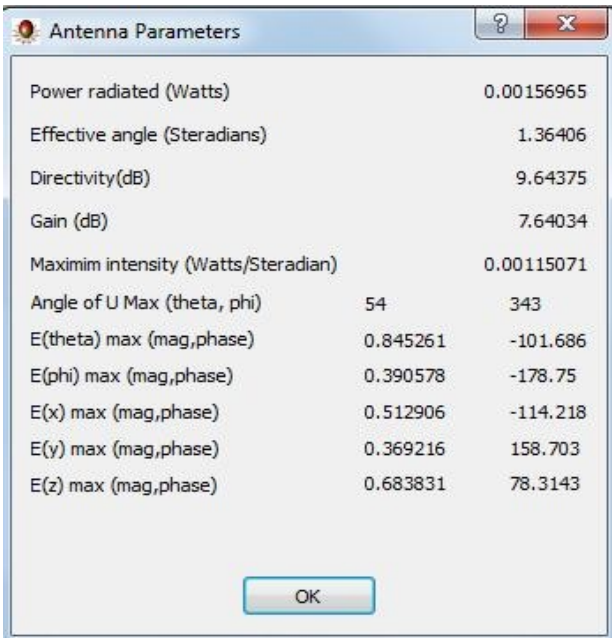

Figure 5: Antenna parameter of Microstrip patch antenna

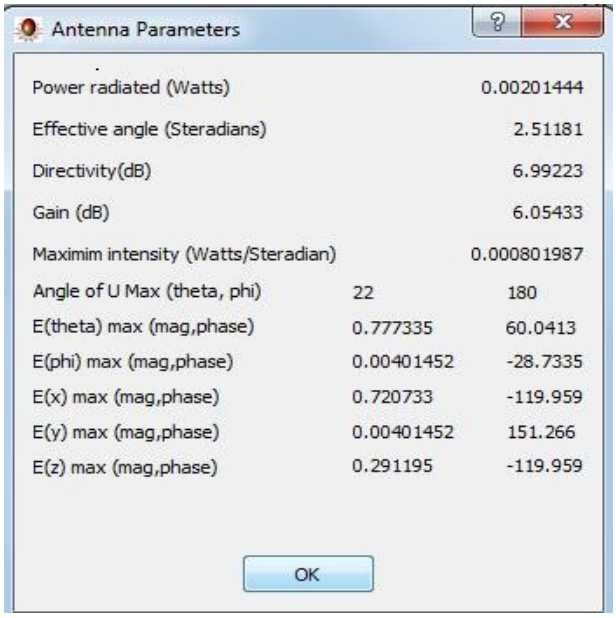

Figure 6: Antenna parameter of Meander antenna

V. CONCLUSION

The purpose of this paper is to design Microstrip patch antenna and Meander antenna with same operating frequency of 12 GHz so that, it can be used for X-band application and compare the result to find the performance of above two antenna. Microstrip patch antenna gives higher gain, directivity, return loss which will avoid the loss and gives high improvement in noise reduction.

VI. REFERENCES

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