A Review on slotted microstrip antenna for different feed

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***Abstract-* The slot in an antenna on the patch or ground plane makes it more compact and conformal. It can be fed by the resonator, coplanar waveguide (CPW), coaxial, slot line, or microstrip with some modifications, and it would be employed in all areas of wireless communication. A small low profile microstrip antenna with various types of fed configuration is carried out for different applications. The addition of a slot increases the bandwidth of these small antennas, making them more applicable in wideband applications. In this report, we highlight the different feeds used in an antenna for bandwidth improvement in terms of better performance. The effect of the different fed techniques on the characteristics of a microstrip patch antenna is discussed in this study.**

Keywords- Patch antenna, Feed, Wireless communication.

1. INTRODUCTION

Recent innovations in the wireless communication sector continue to drive demand for compact, interoperable, and economical microstrip patch antennas in today's world. The antenna is a device that converts electrical signals into electromagnetic waves [1].
A metal conductor known as an antenna is used to transmit radio frequency (RF) waves from one location in space to another. This device has signal sending and receiving capabilities [2–3]. Radio signals are created when a voltage is delivered to a transmitting antenna; they are then sent to a receiving antenna, where they are received and converted back into electrical energy in the form of information. Microstrip or patch antennas are gaining popularity as a result of the fact that they may be printed directly onto a circuit board. Mobile phones are increasingly using microstrip antennas. Patch antennas are affordable, have a small profile, and are easy to build [4–8].

2. ANTENNA DESIGN

As seen in Figure 1, microstrip antennas are composed of rectangular patches with W and L dimensions that are affixed to a ground plane with a substrate thickness and a dielectric constant. Various substrates can be used to create microstrip antennas, and their dielectric constants typically range from 2.2 $<\varepsilon r<$ 12.. Microwave circuitry benefits from thin substrates with higher dielectric constants since they require closely bound fields to reduce unwanted radiation and coupling, resulting in smaller elements. In this paper, we designed a feed line and coaxial feed technique to radiate the patch. In the ANT1 feed line, MSA as shown in fig.1 is designed to resonate at 8.4 GHz with an antenna length is 22 mm, antenna width is 18 mm, and substrate thickness is 1.635.

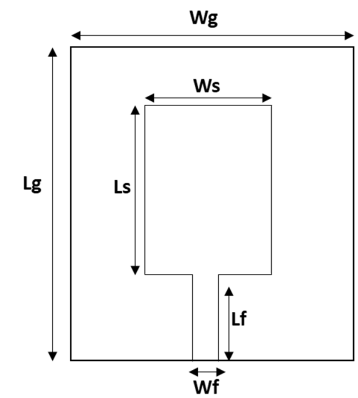

Fig.1. Rectangular patch antenna with line feed

In antenna 2 a coaxial probe feed microstrip antenna, such as the one illustrated in fig. 2, is designed to resonate at 9.4 GHz with a substrate thickness of 1.635 mm, and a length of 22 mm. W=18mm. The co-axial feed is provided at 0.7 and mm, 1.59 mm along the X, and Y-axis respectively. The length and the width of the patch are calculated by the given relationships.

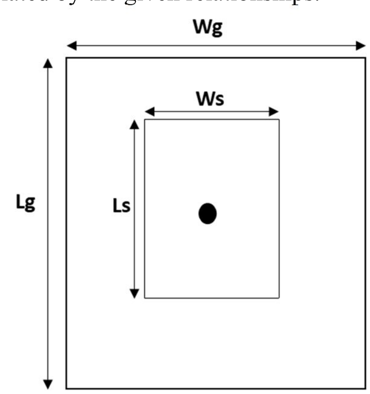

Fig. 2 Coaxial feed microstrip antenna

Step 1: To Calculation Width (W) -

$$W = \frac{C}{2f0\sqrt{\frac{(\mathcal{E}r+1)}{2}}}$$

Step 2: Calculate the Effective Dielectric Constant. This is based on the height, dielectric constant of the dielectric, and the width of the patch antenna.

$$\mathcal{E}_{eff} = \frac{\mathcal{E}_r+1}{2} + \frac{\mathcal{E}_r-1}{2}\left[1 + 12\frac{h}{2}\right]^{-1/2}$$

Step 3: Calculation of the Effective length

$$L_{eff} = \frac{C}{2f0\sqrt{\mathcal{E}_{eff}}}$$

Step 4: Calculate ΔL using the formula below

$$\Delta L = 0.412h\frac{(\mathcal{E}_{eff} + 0.3)(\frac{w}{h} + 0.264)}{(\mathcal{E}_{eff} - 0.258)(\frac{w}{h} + 0.8)}$$

Step 5: Calculate the length of the patch

$$L = L_{eff} - 2\Delta L$$

3. RESULTS AND ANALYSIS

CST Microwave's studio was used to replicate the proposed antenna. The resonance frequency has an impact on the placement of the feed since it is one of the crucial components of the microstrip antenna. Figure 3 depicts the antenna 1 structure's simulated reflection properties. Here, the frequency ranges from 8.23GHz to 8.44GHz and resonates at 8.33GHz.

In Antenna 2 we used coaxial fed which dimension is mentioned in table 1 and the same as antenna1. Using this fed technique, the resonate frequency is increased from 9.25GHz to 9.57GHz and resonated at 9.40GHz.

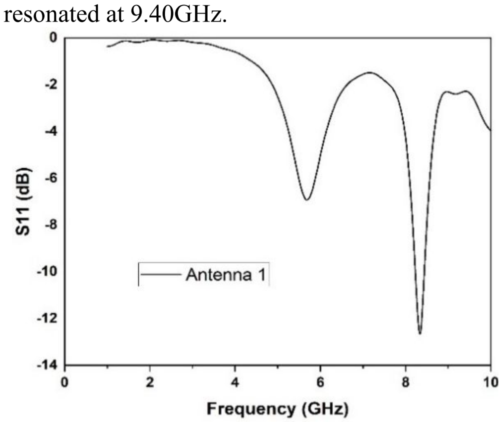

Fig. 3: Reflection coefficient Vs frequency plot for antenna1

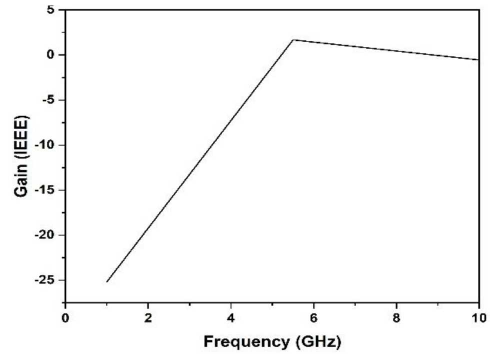

Fig. 4 Simulated peak gain versus frequency of the antenna

The gain of the rectangular feed antenna is shown in Fig.4, where we can find the maximum gain of 1.5 dBi between 4.5-8.5GHz frequency. But there is no significant gain when we used a coaxial feed for Antenna2, without changing other dimensions.

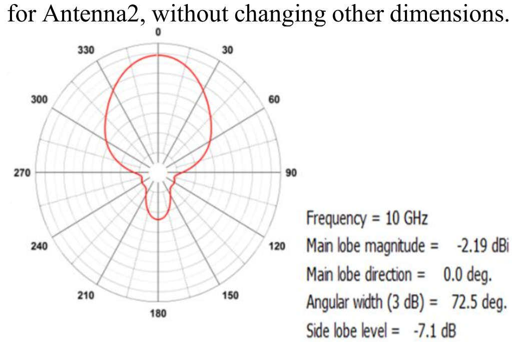

Fig. 5: Radiation pattern of antenna 1

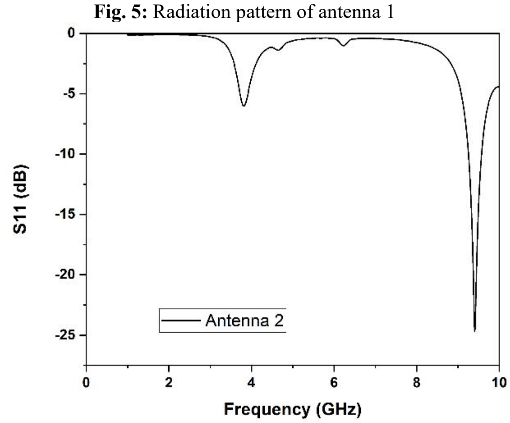

Fig. 6: Reflection coefficient Vs frequency plot for antenna 2

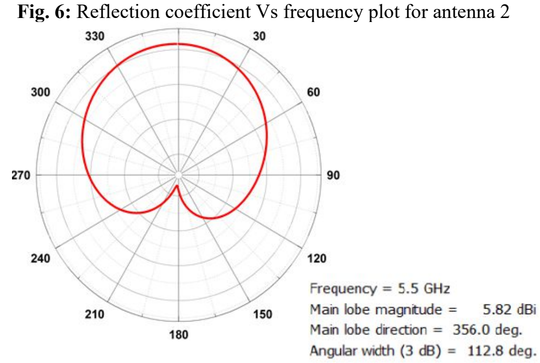

Fig. 7: Radiation pattern of antenna 2

Fig 5 and Fig 7 depict the simulated and measured radiation pattern at the resonant frequency of 10 GHz and 5.5 GHz respectively.

Table 1: Margin specifications

S.No	***Parameter***	***Letter***	***Values (mm)***
1	Substrate length.	L	22
2	Substrate Width.	W	18
3	Substrate Height.	Sh	1.635
4	Ground Length.	Lg	22
5	Ground Height.	mt	0.035
6	Patch length.	Lp	16
7	Patch width.	Wp	14
8	Patch Height.	h	1.67
8	Length of feed	Lf	9

4. CONCLUSION

In this article, we design a coaxial and microstrip-fed microstrip antenna. CST studio simulation of the proposed structure. The proposed microstrip antenna coaxial fed technique is superior to the microstrip line fed in terms of radiation, and it also fully suits the various wireless frequency bands, according to design and simulation findings.

5. ACKNOWLEDGEMENT

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