Micro Strip Patch Antenna Using Broadside Coupling

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Abstract: - The prominent parameters of antenna are bandwidth and gain. For improving band width and gain there are many challenges for micro strip patch antenna. There are many designs for improving bandwidth and gain but there are some disadvantages of that design. The gain and bandwidth can be improved by using broadside coupling of patch. All designs are simulated with the help of HFSS software. Micro strip patch antenna used in mobile for communication purpose and also it is used in indoor and outdoor application for communication.

Keywords**:** *Bandwidth, Gain, Radiation pattern, Return loss.*

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I. INTRODUCTION

There are many designs in micro strip patch antenna and also many research papers are publish in past. The main advantages of micro strip patch antenna is low cost, compact size and easy to fabricate [4].but there are some disadvantage like narrow bandwidth, low gain. So we have to try to overcome this disadvantage and make it efficient antenna for communication purpose. There are several micro strip patch antenna like circular patch antenna, square patch antenna, fractal antenna array antenna etc. but commonly the disadvantage of patch antenna is low gain and narrow bandwidth. so we have to develop new design of patch antenna and try out to overcome this disadvantage to improve the bandwidth within increasing size of patch but after this we get bulky and big size patch antenna and we know the advantage of patch antenna is small size. so we have to develop various design of antenna to achieving high gain and bandwidth. There some techniques such as patch array antenna [9], patch fractal antenna [1], patch fractal array antenna [14], different shape antenna and in last simple patch antenna using broadside coupling [5]. The construction of micro strip patch antenna that one thick dielectric constant material use, the one side patch is located and other side is ground plane is located [4]. This is simple patch antenna but its bandwidth and gain is low. So researcher develop the simple circular patch antenna using broadside coupling to improve bandwidth and gain [5].patch is generally made of copper or conducting material.

II. MICRO STRIP PATCH ANTENNA USING BROADSIDE COUPLING

Broadside coupling patch circular antenna in which two patches is used. Top patch and bottom patch. Two dielectric substrate used and that two substrate coupled with broadside.subtrate 1 and substrate 2we can see in fig 1.

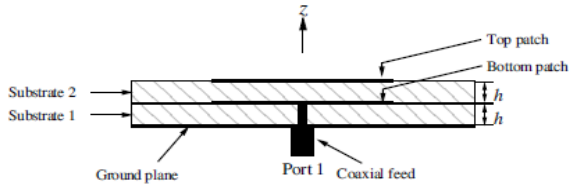


Figure. 1: Micro Strip Patch Antenna Using Broadside Coupling

Substrate 2 consisting a bottom patch at one side and other side ground plane. Bottom patch is sandwich between substrate 1 and substrate 2.subtrate 1 consisting bottom patch at one side and top patch at another side. In this antenna feeding given both patch with coaxial cable.[5] we can also give only one feed to patch and can conclude but researcher gave two feed in circular patch antenna using broadside coupling.

III. FEED TECHNIQUES

In micro strip patch antenna various techniques for feeding.1) Contacting feed- in this method the patch is directly feed with R.F power using the connecting element such as micro strip line or coaxial line.2) Non-contacting feed-in this method the patch is not directly fed with R.F power but instead power is transferred to the patch from the feed line through electromagnetic coupling. For example of contacting method is Micro strip feed, centre feed, offset feed, inset feed, quarter wave line feed. And example of non contacting method is coaxial feed, aperture feed and proximit feed.

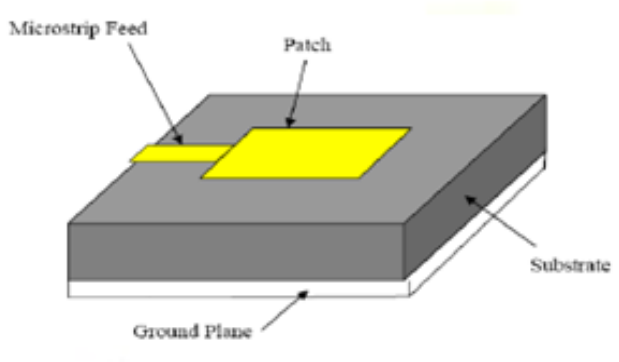


Figure. 2: MICROSTRIP LINE FEED

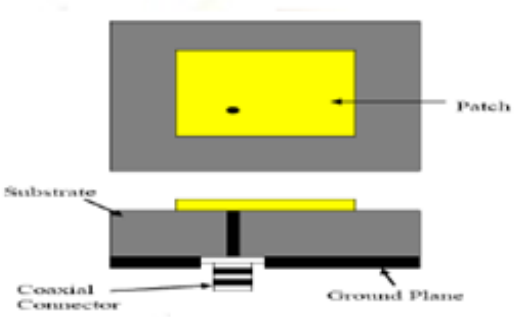


Figure. 3: Coaxial Feed

IV. Design and Calculation

To understand properties of circular patch we have to know about the radius of circular patch, thickness of patch, thickness of substrate and dielectric constant and feed techniques. Antenna work at resonant frequency so we have to know resonant frequency. Here researcher specify the radius of circular patch is R=15mm, substrate thickness h=1.524mm and resonant frequency is 6.4GHz.dieelectric constant of substrate is 3.38. The feeding is coaxial in this antenna due to low complexity [5].here we know the radius of patch so we can find out area within radius.

a) Calculation of the micro strip patch width:

$$w = \frac{c}{2f_0\sqrt{\epsilon_r + 1}}$$

b) Calculation of Effective dielectric constant:

$$\epsilon_{reff} = \frac{\epsilon_r + 1}{2} + \frac{\epsilon_r - 1}{2}[1 + 12\frac{h}{w}]^{-(1/2)}$$

c) Calculation of the effective length:

$$L_{eff} = \frac{c}{2f_0\sqrt{\epsilon_{reff}}}$$

d) Calculation of the Length Extension:

$$\Delta L = 0.412h\frac{(\epsilon_{reff} + 0.3)(\frac{w}{h} + 0.264)}{(\epsilon_{reff} - 0.258)(\frac{w}{h} + 0.8)}$$

e) Calculation of the micro strip patch length:

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

f) Calculation of substrate length:

$$L_s = L + 6h$$

g) Calculation of substrate width:

$$w_s = W + 6h$$

V. Results and Conclusion

The antenna has been design and simulated using HFSS software. After performing simulating we get some parameters of antenna that we compare all for different antenna that can be shown in table 1.

Table I: Comparison of Antenna Parameters

Research paper	Gain	Bandwidth	Substrate	Return loss	Complexity
Broadside coupler circular patch[5]	4.23db	5.85GHz	DUROID RO4003C	-32.45db	Higher
Micro strip square patch antenna[4]	5.78db	135MHz	ROGERS RT/DUROID 5880	-30.25db	Lower
A novel fractal antenna[1]	3.26db	880-2720MHz	FR4	-35.75db	Higher
Circular hexagonal fractal antenna[2]	4.38db	1-3GHz	FR4	-38.45db	Higher

From table 1 we can conclude that the highest bandwidth is broadside coupler circular patch but it has low gain and higher complexity. So we have to create a new design for high gain and also improve bandwidth .circular coupler patch antenna have less return loss but we need good return loss for antenna so we develop new design for all antenna parameters.

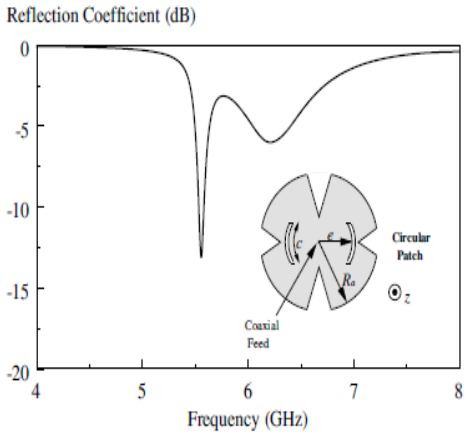
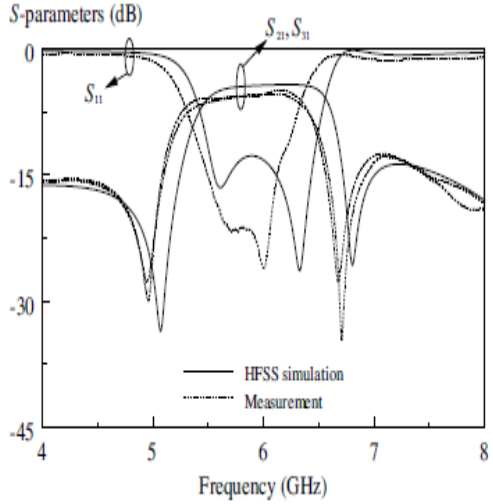


Fig. 4:
Reflection coefficient of circular patch using broadside coupling



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