# The effect of the location of feedpoint to a square patch antenna

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## Abstract

The paper presents a double-layered square patch antenna fed by a probe. The simulation result shows that the location of feed_point can be tuned to ajust different resonant frequency. The antenna achieves an impedance bandwidth(VSWR$\leq$2) of 11.6%(8.23 Ghz~9.26Ghz) and the maximum gain of 10.6dB.In addition,the paper presents the return loss pattern and gain varing with the location of the probe,respectively.

## Introduction

Microstrip patch antennas offer a number of unique advantages over other types of antennas such as low profile, conformability to surfaces, and simplicity of fabrication and integration with microwave circuits. The ease of designing these antennas to perform multiple functions makes them a popular choice in many communications systems.However, microstrip antennas have the inherent disadvantage of narrow bandwidth.Many methods[2]–[5]have been employed in literature to enhance the bandwidth characteristics of patch antennas.In this paper,a probe_fed square patch antenna having wider band is developed and presented.The antenna exhibits a vertical monopole antenna on an infinite ground plane radiation pattern.

## Discription of antenna

The geometry of the antenna is shown in Fig 1.The square patch is supported by a dielectric layer on the ground,and coverd by another substrate layer the parameter of the antenna are: $L = W = 3cm$ ,the size of substrate is $10\times10cm^2$ , $\varepsilon_r = 2.55$ , height is $0.159cm$ .The ground thickness is $1cm$ .The probe location varies from 0 to 0.6 on the x and y direction ,respectively. Note that when the location of the feed point is $x = y = 0.4cm$ ,the impedance bandwidth(VSWR$\leq$2)is 11.6%.

## Simulation Results and Discussion

According [6] ,for a square patch with $L = W = 3cm$ ,either $TM_{02}$ mode or $TM_{20}$ mode could be excited by placing the along the x-axis or y-axis,respectively.When the feed is placed at the center( $x = 0, y = 0$ ),the both modes are equally excited but the input impedance is very high.By shifting the feed-point along the diagonal to $x = 0.4, y = 0.4$ ,better matching is obtained.The BW is 1.03GHz at 8.62GHz. The simulation results is shown in Table 1.From Table 1,the resonant frequency increase with the offset increasing,but the best bandwidth can be obtained at 0.4cm offset. The S11 and VSWR pattern are shown in Fig. 2-Fig.3.Because two modes are excited,then two resonant frequency according two modes are also obtained,when the two frequency are very close,the bandwidth could become very wide.Figure.2 shows that the resonant frequency , as well as the impedance bandwidth increases as the offset increases. We also see the extreme cases that the offset is 0 and 1 in Figure.2.The offset is the distance away from center point along the x-axis or y-axis.VSWR varing with offset are also shown in Figure.3 with different offsets.we can see that when the offset is 0.3 or 0.4 , the impedance bandwidth improves obviously.Figure.4 and Figure.5 shows the radiation pattern and gain of different offsets(0.3,0.35,0.38,0.4,0.5),respectively.The gain decreases with the frequency increasing,except offset 1cm.8.6GHz is a frequency that we can utilize.

## Conclusion

In this paper,the effect of the location of the feed_point is studied in theory and simulated with software based on the finite integration.The result shows that the resonant frequency increases slowly with offset increasesbut the impedance bandwidth does not. When offset is 0.4cm,better matching can be obtained,and the BW% can arrive 11.6%.The result gives the support data on experiment to study and design circular polarized square patch antenna.

## Refference

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| (x , y)/cm | BW% | Resonant Frequency/GHz |
|---|---|---|
| (0.3,0.3) | 8.98 | 8.50 |
| (0.35,0.35) | 10.6 | 8.57 |
| (0.38,0.38) | 8.25 | 8.60 |
| (0.4,0.4) | 11.6 | 8.62 |
| (0.5,0.5) | 10.1 | 8.63 |

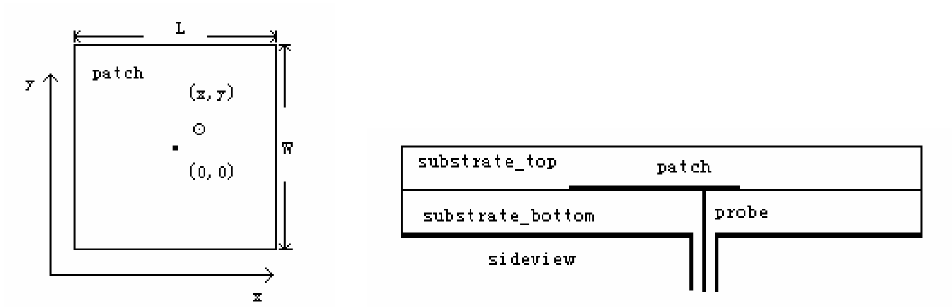


Figure.1

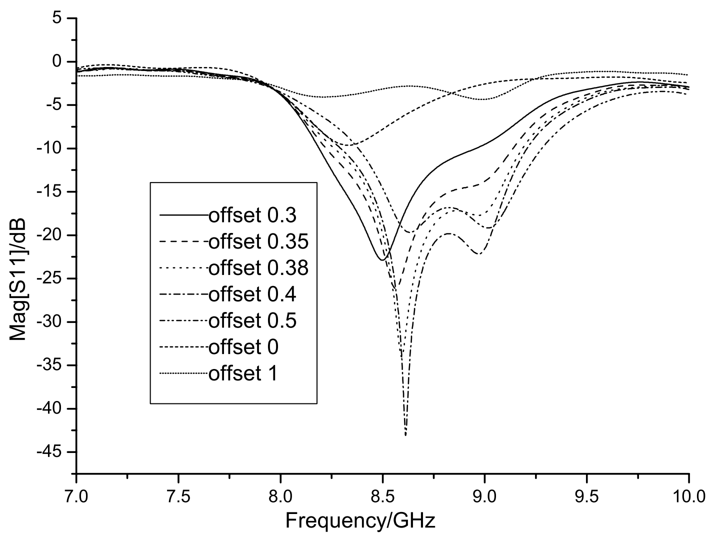


Figure.2

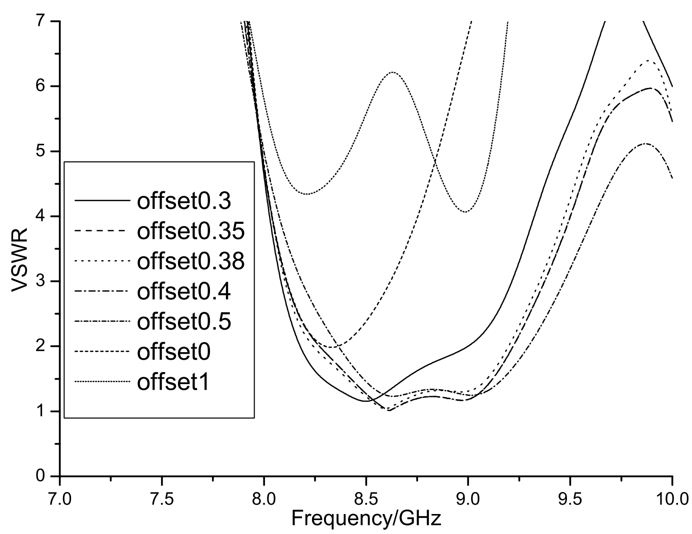


Figure.3

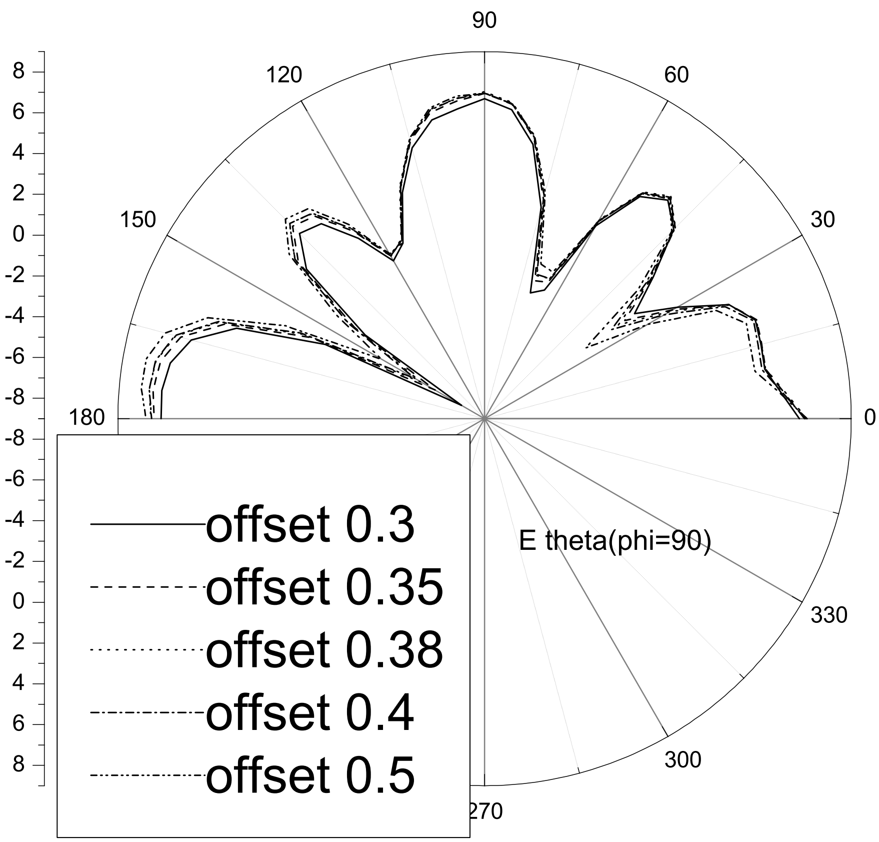


Figure.4

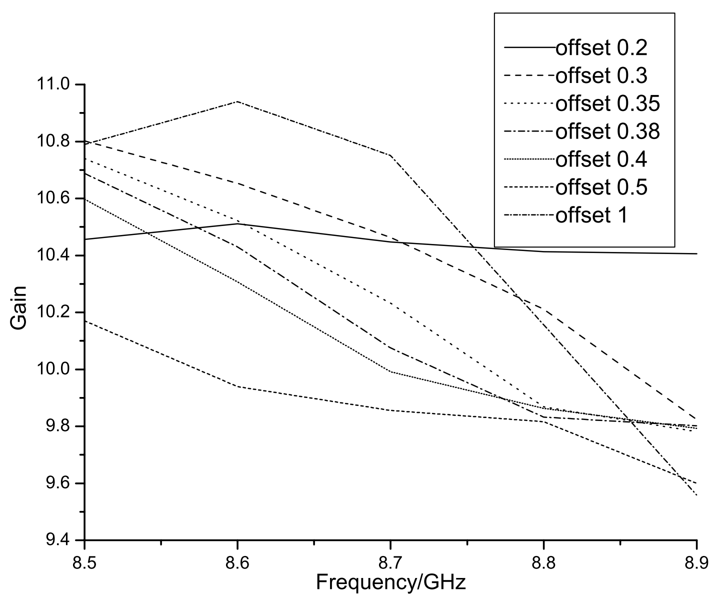


Figure.5