Comparison of Probe feed and Proximity coupled feed technique for Rhombus Shaped Antenna

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Abstract:- **In this paper we have compared the results of Probe feed and Proximity coupled feeding technique for the resonating frequency of 2.4GHz.The parameters like Bandwidth, Impedance, and Return loss are obtained by simulating the designed antennas in IE3D tool and compared to obtain the best technique.**

Keywords:- Probe feed, Proximity coupled feed, Resonating frequency, Return loss

1. INTRODUCTION

In recent communication system, antenna plays a very vital role. The rapid expansion and advancement of wireless technology has drawn new plethora for integrated components including antennas. Antennas are the largest component of the integrated low profile wireless communication systems, hence antenna miniaturization is necessary for achieving an optimal design with multiband characteristics [1].

The four most popular feed techniques used are the microstrip line, coaxial probe (both contacting schemes), aperture coupling and proximity coupling (both noncontacting schemes). In this paper we have given the comparison between Probe feed and Proximity coupled feeding technique.

Probe feed technique is a trail and error method. This kind of feed arrangement has the advantage that the feed can be etched on the same substrate to provide a planar structure, but it results in results in undesirable cross polarization effects.

Proximity coupled feed technique is also called as the electromagnetic coupling scheme. Two dielectric substrates are used such that the feed line is between the two substrates and the radiating patch is on top of the upper substrate. Proximity coupled microstrip patch antennas [2] offer various advantages over conventional edge or probe fed patches.

This simple configuration provides enhanced bandwidth without undesired radiation causcd by the discontinuities and asymmetry of contacting feed methods. Bandwidth enhancement via non- contact feeding methods can also be achieved by using aperture coupling [3].

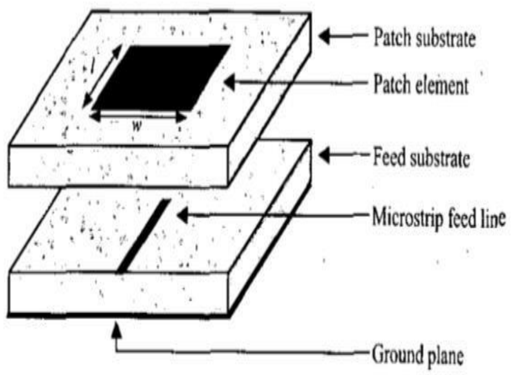

Fig 1 Layout of proximity coupled feeding

2. ANTENNA DESIGN

The Antenna is designed by using two substrates made up of glass epoxy having each of thickness of 1.6mm which is placed one above the other optimized resonating frequency of the designed antenna which operating at 2.4Ghz for that we have considered length and width of a radiating patch is 29mm×29mm

The proximity coupled Rhombus shaped antenna whose substrate material used is glass epoxy with dielectric permittivity of ε_r=4.4, which is designed to operate at 2.4GHz. The optimized dimensions of designed antenna as follows: h1=1.6mm, L=29mm, W=29mm, Lf=19mm, Wf=3mm and h2=1.6mm.

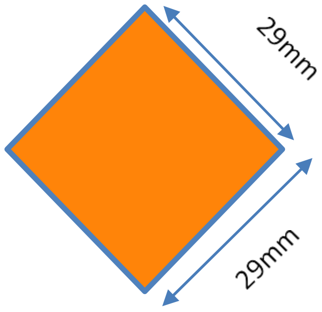

Fig 2. Dimension of Rhombus shaped antenna

3. RESULTS AND DISCUSSION

In Fig 3 and 4 Both the antennas are Rhombus shaped and each of size 29×29 mm^2, but the feeding technique is different. In Fig 1 Probe feeding is used where x=4 and y=8 and in Fig 2 Proximity coupled technique is used with the feed length 19mm. When these patches are simulated we obtain following results

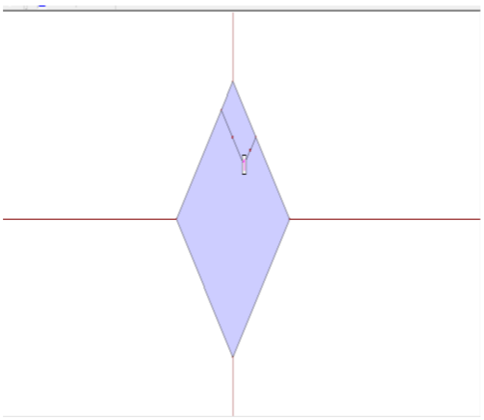

Fig 3. Probe feeding

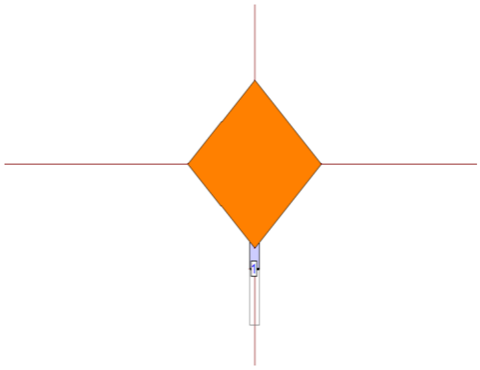

Fig 4.Proximity coupled feeding

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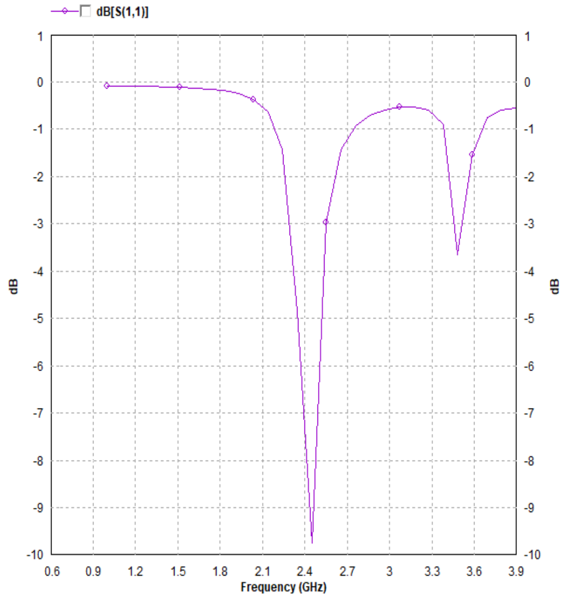

Fig 5. Return loss v/s frequency response of Probe feed antenna

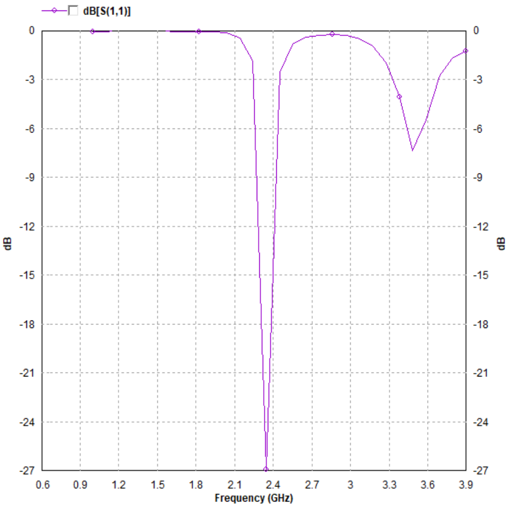

Fig 6. Return loss v/s frequency response of Proximity coupled antenna

The return loss of an antenna signifies how well the antenna is matched to the 50Ω transmission line (TL). Return loss indicates how much of the incident power is reflected by the antenna due to mismatch. An ideal antenna when perfectly matched will radiate the entire energy without any reflection.

Return loss(dB)=10log(pincident / preflected)

Fig 5 shows the return loss versus frequency plot of probe feed antenna and Fig 6 shows the return loss versus frequency plot of proximity coupled antenna. In probe feed antenna frequency obtained is 2.45Hz and return loss is -9.8db. To improve the return loss we go for proximity coupled antenna where we obtained resonating frequency of 2.34hz and return loss -27db.

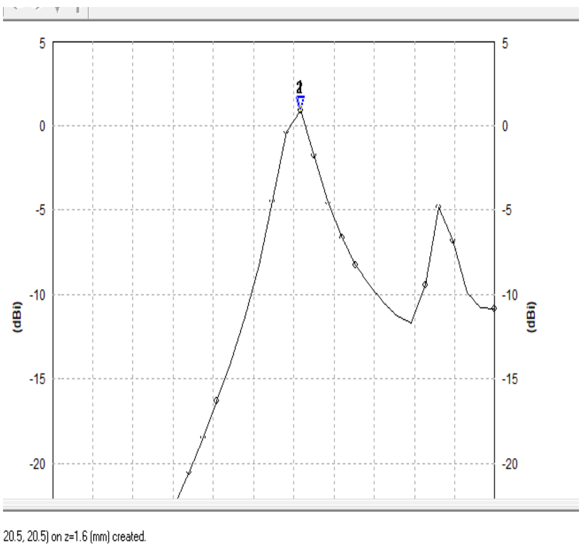

Fig 7. Gain v/s Frequency response of Probe feed

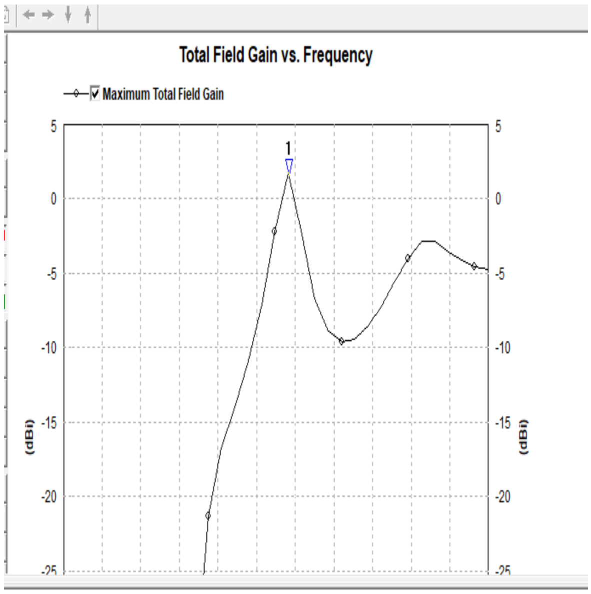

Fig 8. Gain v/s frequency of proximity coupled

Gain indicates the radiation in the direction of interest compared to the isotropic antenna, which radiates uniformly in all directions. This is expressed in terms of dBi—how strong the radiation field is compared to an ideal isotropic antenna

In Fig 7. gain v/s frequency plot of probe feed technique for the resonating frequency of 2.45Ghz gain obtained is 0.92 and in proximity coupled feed for resonating frequency 2.34Ghz gain obtained is 1.545. As we can observe gain is improved approximately 60%

Table 1. Comparison of probe feed and proximity coupled feeding techniques

Type of feeding technique	Probe feed	Proximity coupling
Resonant frequency(Hz)	2.45	2.34
Return loss (dB)	-9.8	-27
Gain (dB)	0.92	1.545
Bandwidth (Mhz)	0	130

4. CONCLUSION

Comparison of Probe feed and Proximity coupled feeding technique is proposed. Return loss of Proximity coupled feeding has improved by 36% and gain by 60% than Probe feeding technique. By this we can conclude that Proximity coupled technique is better than Probe feed technique.

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