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METHOD TO IMPROVE BANDWIDTH OF MICROSTRIP ANTENNA

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ABSTRACT
For high speed internet, multimedia communication and broadband services more broader bandwidth is required. Microstrip Antenna is famous for its small structure , but inherently microstrip antennas are narrow band antennas.The areas of application open to microstrip antennas have been limited by their low operating bandwidth .Various techniques are used to enhance the bandwidth of microstrip antenna. This paper discusses bandwidth enhancement techniques employed on microstrip patch antennasusing multi-layer configurations with vertically stacked resonator geometries.IE3D software is used for the design of Microstrip Antenna.

KEYWORDS : Microstrip Antenna, IE3D, Bandwidth**.**

INTRODUCTION
As we know that, antennas are the foundation to any communication technology, hence there is need to improve the quality of antennas to enhance the quality of communication. Microstrip antennas are a thrilling and novel technology for band broadening [1].In this approach of broad banding [2], two or more layers of dielectric substrates are used**.** Resonant patch radiators are stacked one above the other with the intervening dielectric layers, thus sharing a common aperture area [3]. The patches may be fed individually from microstrip lines and co-axial probes, or only one or two patches may be fed directly while the others coupled parasitically with capacitive coupling [4].The vertically stacked multi-resonator configurations have become the most widely used broadband microstrip antenna elements.
Their general advantages being [5]:
1. Sharing of a common aperture and thus compatibilitywith the array gridstructure.
2. Stagger tuning resulting in an increase in the bandwidth.
3. One of multiple resonant frequencies and the polarization schemes.
4. Use of different substrates and Inter resonator spacing to meet with optimumneeds.

DESIGN PROCEDURE
The formula 1 to 4 are used for calculating Length and width of the rectangular Patch [2]**.**

The expression for ε ref is given by

$$\varepsilon_{reff} = \frac{\varepsilon_r + 1}{2} + \frac{\varepsilon_r - 1}{2}\left[1 + 12\frac{h}{W}\right]^{-\frac{1}{2}}$$

---------------------(1)

Where,
εreff = Effective dielectric constant
ε r = Dielectric constant of substrate
h = Height of dielectric substrate
W = Width of the patch

DIFFERENCE IN THE LENGTH (ΔL)

$$\Delta L = 0.412h \frac{(\varepsilon_{reff} + 0.3)\left(\frac{W}{h} + 0.264\right)}{(\varepsilon_{reff} - 0.258)\left(\frac{W}{h} + 0.8\right)}$$

----------------------(2)

The effective length of the patch Leff now becomes

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

----------------------(3)

For efficient radiation, the width W is given by

$$W = \frac{c}{2f_o\sqrt{\frac{(\varepsilon_r + 1)}{2}}}$$

----------------------(4)

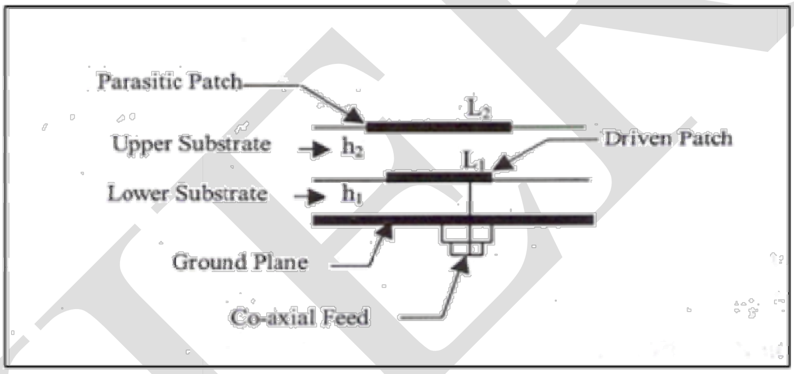
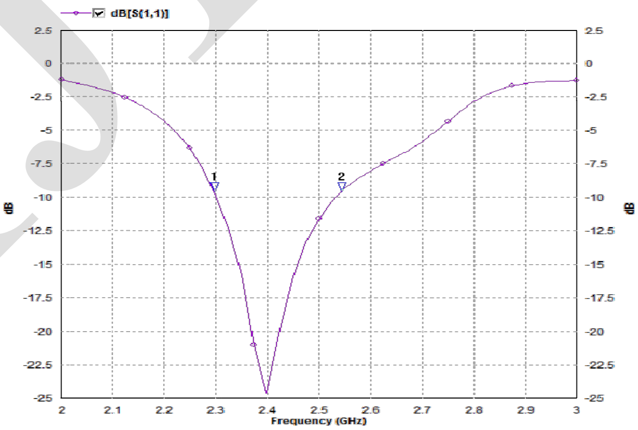


Fig-1 Stack Patch Microstrip antenna



Return Loss Stack patch antenna with air-foam substrate designed in IE3D software

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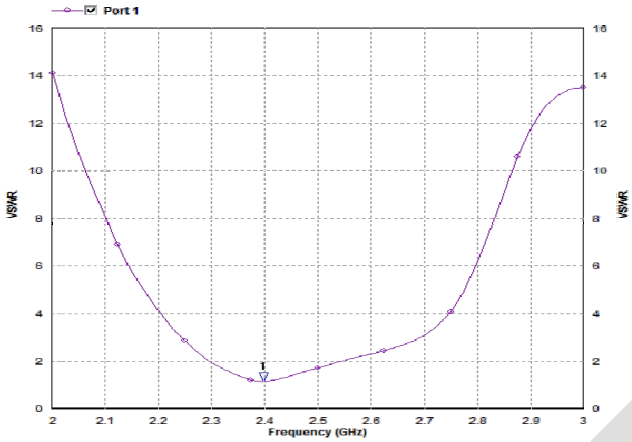
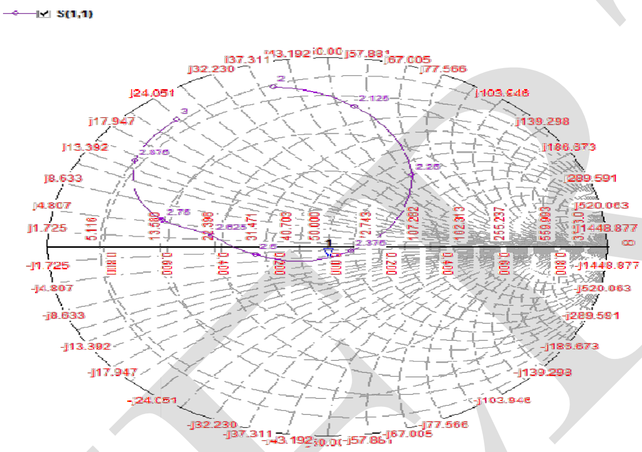
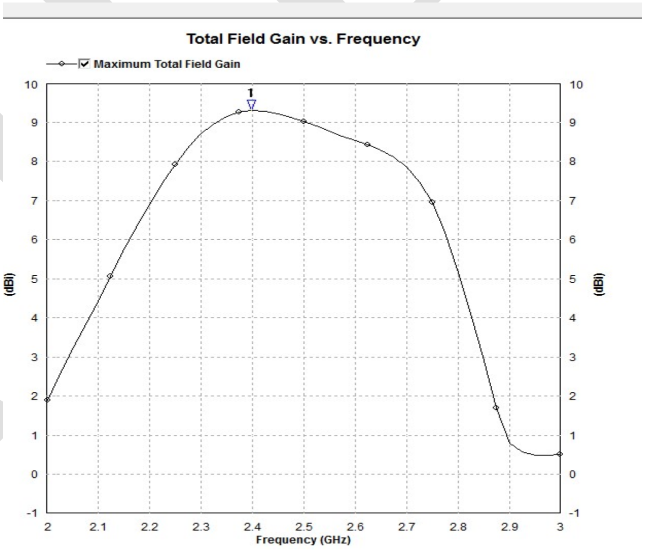


VSWRStack patch antenna with air-foam substrate designed in IE3D software



Smith chart Stack patch antenna with air-foam substrate designed in IE3D software



Gain Stack patch antenna with air-foam substrate designed in IE3D software

Fig-2 Results of Stack patch antenna with air-foam substrate designed in IE3D software

SIMULATION RESULTS

Table 1. Summary of simulation Results.

Parameters	Bandwidth	Gain	Antenna efficiency	VSWR
Stacked patch antenna with air -foam substrate	10.20%	9.39dB	98.14%	1.10

CONCLUSION

Simulation results predict that by using above mentioned techniques Bandwidth of Microstrip Patch Antenna can be improved significantly which will overcome limitation of Microstrip Patch Antenna such as narrow Bandwidth.

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