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A NOVEL OF ENHANCED BANDWIDTH USING STACKED MICROSTRIP PATCH ANTENNA

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Abstract

Microstrip patch antenna is one of the important element in modern wireless communication system due to their low profile, low cost an ease of fabrication and easily available.But, Microstrip patch antenna has several limitations like narrow bandwidth, low gain and low power handling capacity. Patch antenna can be designed on simulation software like HFSS. This paper present Design and simulation of E and S Stacked microstrip patch antenna for overcome the limitation of bandwidth of the microstrip patch antenna and conclude that Stacking better for the improvement parameter of the antenna.

Key Words:*Stacked microstrip patch antenna; ansoft HFSS; Band width.*

INTRODUCTION

A microstrip antenna is used due to many advantages like, small in size, low cost and an ease of fabrication, low weight but main disadvantage ofmicrostrip patch antenna is its bandwidth. To overcome this limitation of microstrippatch antenna different bandwidth enhancement technique is adopted.In this Stacking patch antenna are used for enhancement of bandwidth and it is better forimprove the parameter of the antenna [4].

MICROSRIP PATCH ANTENNA

Microstrip patch antenna its simplest form consists of a radiating patch on one side of a dielectric substrate and ground plane on the other side. The patch is made of copper or gold and can take anypossible shape. The radiating patch and the feed lines are usually photo etched on the dielectric substrate. Radiating patch conductivity is determiningthe antenna performance and gives the limit of the antenna application.

Microstrip patch antenna radiate fringing field between the periphery the patch and ground plane. To enhance the fringing field from the patch, which account for the radiation, the width w of the patch is increased. The fringing fields are also enhanced by decreasing the ε_r or by increasing the substrate thickness h. microstrip patch antenna uses microstrip patch with larger width and substrate with lower $\varepsilon_r$and thicker h.

DESIGN PROCEDURE

The below equation are used for the find the length L and width w of the patch using the parameter like height of substrate h ,the dielectric constant ε_r and resonant frequency $f_r$which are given in formula as:

STEP 1: Width of microstrip patch can be calculated below equation as:

$$w = \frac{c}{2f0\sqrt{\frac{\varepsilon r+1}{2}}}$$

STEP 2: Equation of effective dielectric constant as:

$$\varepsilon reff = \frac{\varepsilon r+1}{2} + \frac{\varepsilon r-1}{2}\left[1 + 12\frac{h}{w}\right]^{1/2}$$

STEP 3: Equation effective length as:

$$Leff = \frac{c}{2f0\sqrt{\varepsilon reff}}$$

STEP 4: Equation of the length extension as:

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

ANTENNA CONFIGURATION

The Geometry proposed stacking microstrip patch antenna presented work in fig.

Design Specification:

Patch material(upper patch E shaped and lower patch S shaped)	Copper
Substrate material upper layer and lower layer	Roger RT duroid 5880
Substrate height layer 1 and layer 2	12mm
Substrate dimension	100mm×90mm

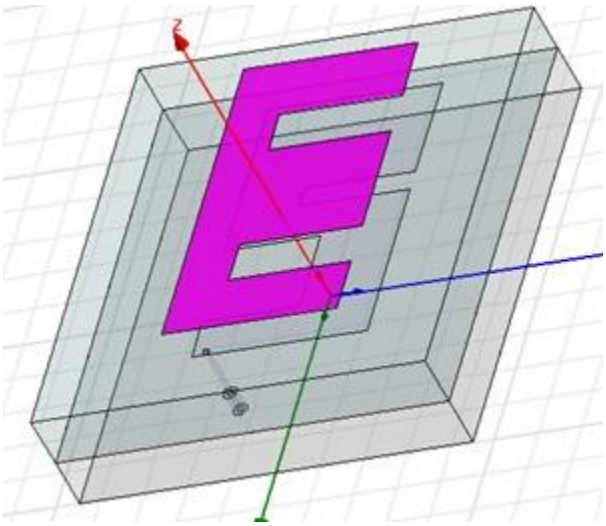

Fig.1 The Geometry of stackingmodel (3D model)

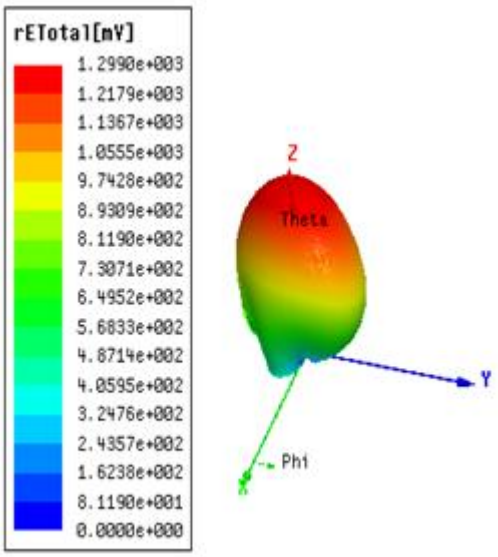

Fig.2 The Geometry of mesh plot

Above figure shows the geometry of stacking E patch and S shaped microstrip patch antenna. In this coaxial feed technique is used. Here above geometry dimension of the substrate $100\times90mm^2$ over shown in fig.1

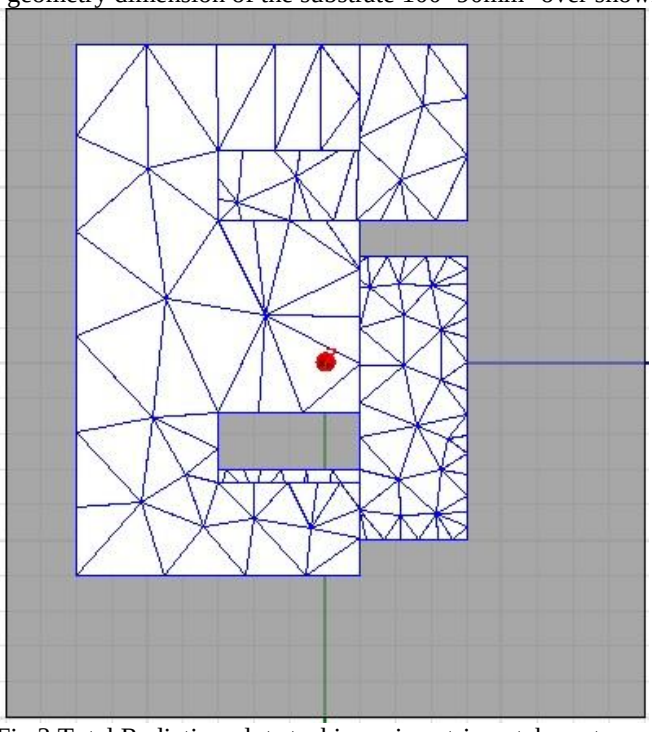

Fig.3 Total Radiation plot stacking microstrip patch antenna

RESULT AND DISCUSSION

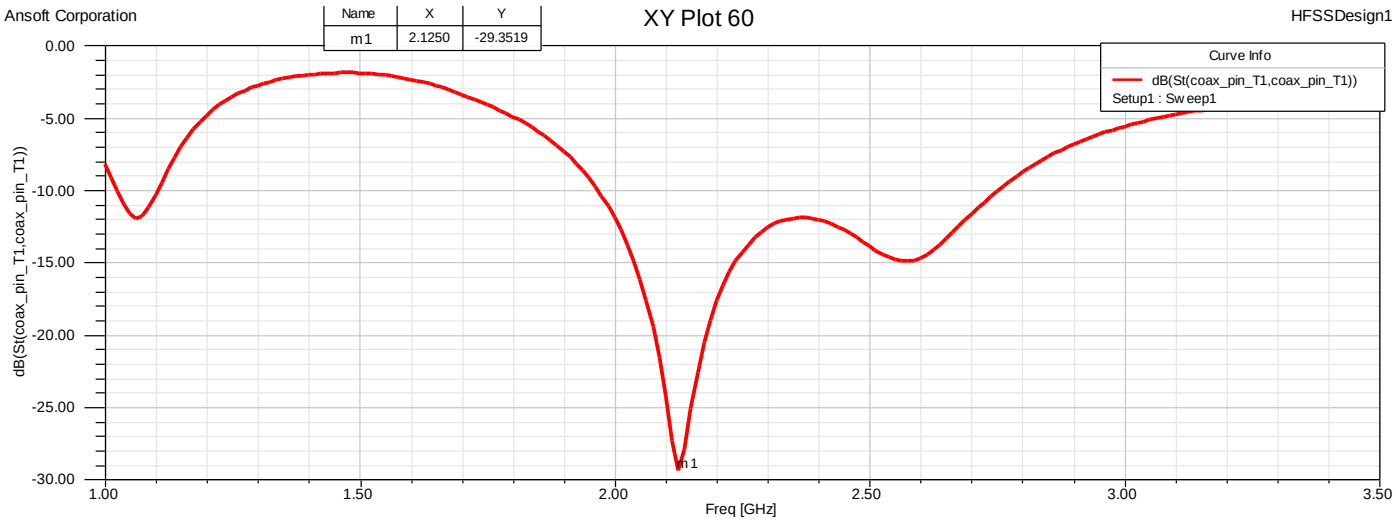

Fig 4.Return loss of stacking micro strip antenna

Here, above fig.4 shows that S_{11} parameter of the antenna. It is shows that the return loss is -29.3519 at 2.1250Ghz frequency .The negative return loss here depicts that the antenna have not many losses during the transmission.

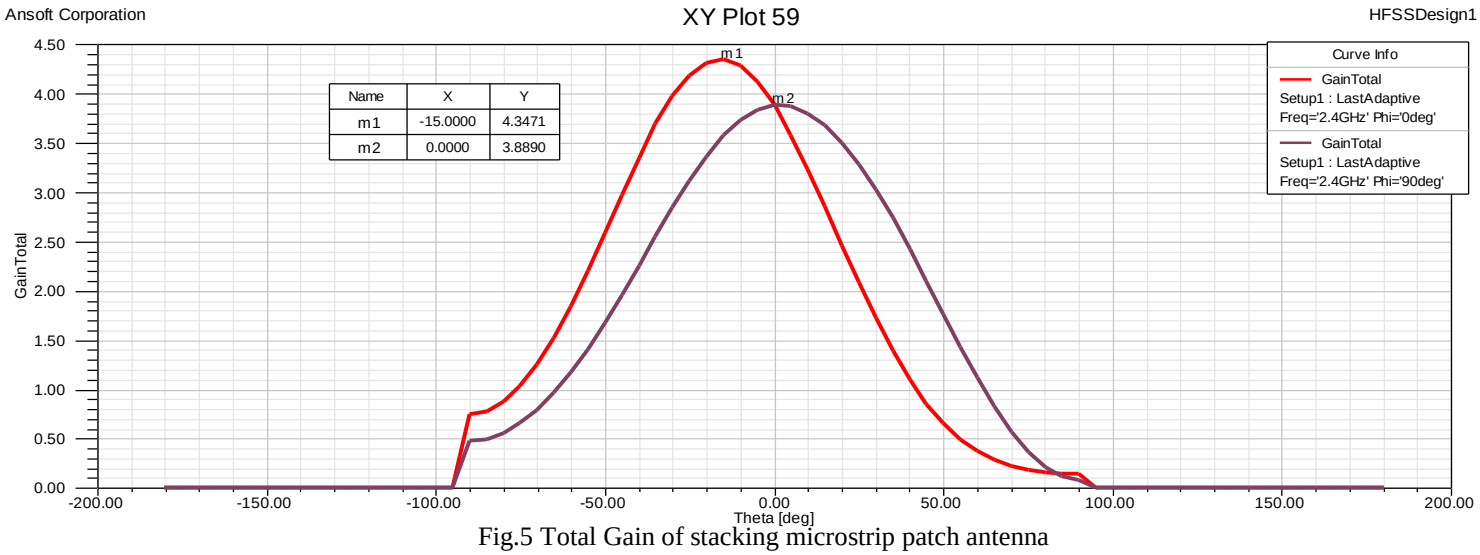

Fig.5 Total Gain of stacking microstrip patch antenna

The Graph Represented total Gain, We analyzed that the maximum Gain is obtained 4.3471db at -15.000 Theta.

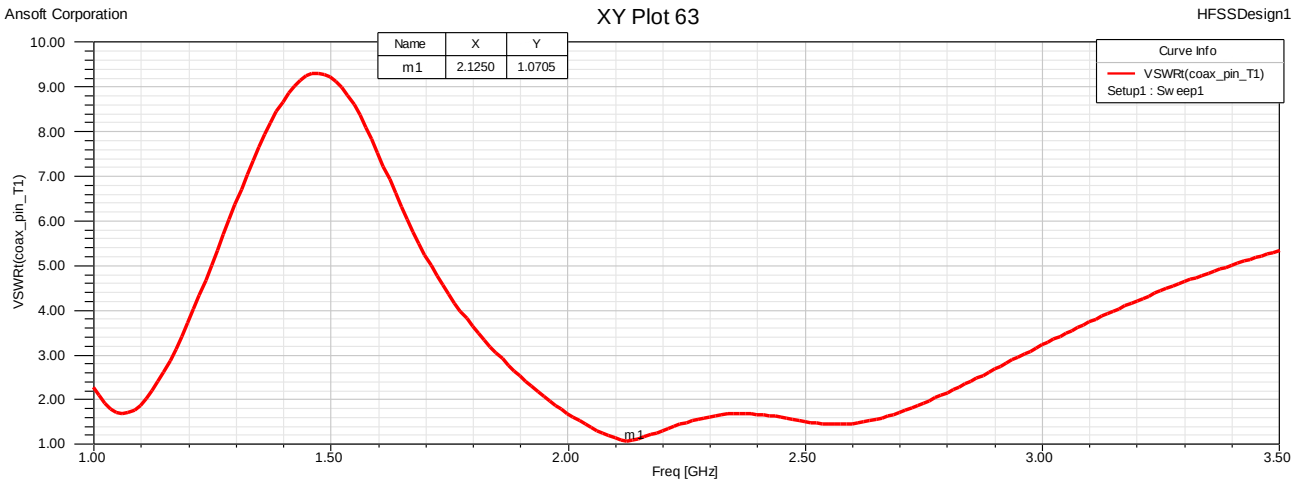

Fig.6 VSWR of stacking microstrip patch antenna

The VSWR of the design shows that frequency band under observation. The value of observation is1.0705db at 2.1250 GHz frequency.

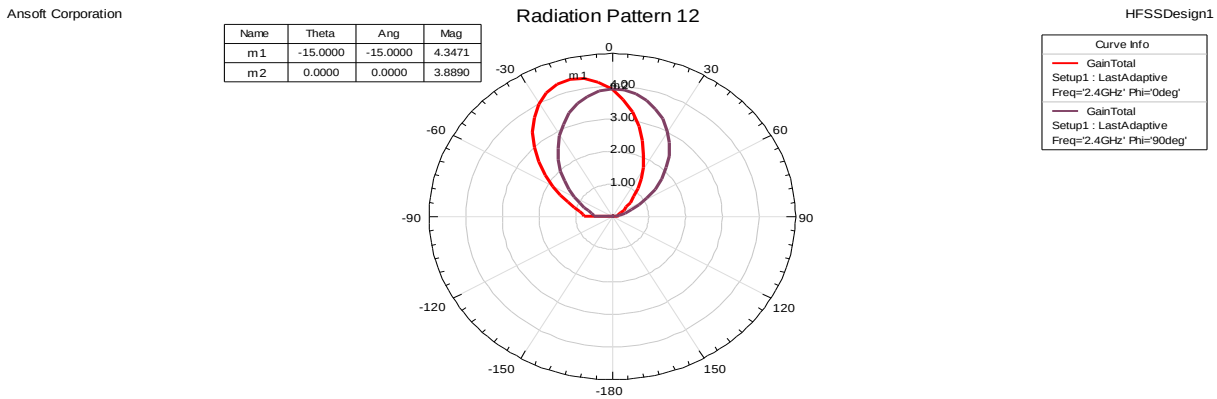

Fig.7 Radiation pattern of stacking microstrip patch antenna

The Graph Represented Radiation pattern, we analyzed that the maximum magnitude is obtained 4.3471db at -15.000 Theta.

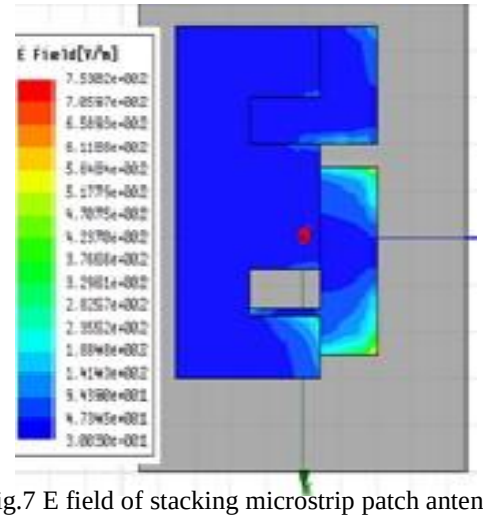

Fig.7 E field of stacking microstrip patch antenna antenna

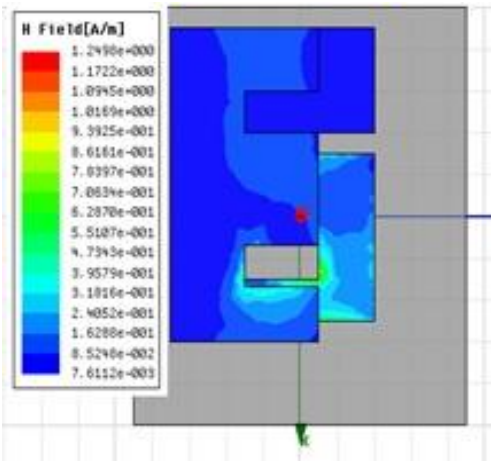

Fig.8 H field of stacking microstrip patch

COMPARE PROPOSED RESULT ANALYSIS WITH EXISTING RESULT

Parameter	Proposed result	Existing result 1 [2]	Existing result 2[3]
Frequency (Ghz)	2.1250	2.82-3.23	5.30
Return loss (db)	-29.3519	-18.00	-22.00
Bandwidth (Mhz)	800 Mhz	410 Mhz	500 Mhz
VSWR (db)	1.0705	-	-
Gain(db)	4.3471	-	3.81

CONCLUSION

In this paper, stacking microstrip antenna using Roger RT substrate has been design, simulate, optimize and analyzed using ANSOFT HFSS. The performance of the design antenna was analyzed and compare with existing result in terms of bandwidth, gain, return loss, VSWR. Here the Optimized stacking result improve compare to the existing result and Bandwidth of antenna improvement is good compare to other existing result.

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