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A Prototype Model to Improve Bandwidth of E shaped Microstrip Patch Antenna

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Abstract—In this communication we have demonstrate a prototype model to improvise bandwidth of E shaped microstrip patch antenna.Microstrip patch antenna is widely used in wireless communication system. Patch antenna has number of advantage over other antenna. It is low volume, thin profile configuration, light weight and easy to integrate with accompanying electronics which can made conformal but, Microstrip patch antenna has several limitations like narrow bandwidth and associated tolerance problem, lower gain. Patch antenna can be designed on simulation software like HFSS. This paper present Design and simulation of E shapedmicrostrip patch antenna and analyzedresult Bandwidth, Gain, Return loss etc has been presented.Derived results showthatE shaped Patch antenna is better for the improvement of Bandwidth of the antenna.

Keywords-*E shaped,,microstrip patch antenna; ansoft HFSS; Band width, Gain*.

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I. INTRODUCTION

A microstrip antenna is used due to many advantages such as, 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 microstrip patch antenna different bandwidth enhancement technique is adopted.In this E shaped patch antenna are used for enhancement of bandwidth and it is better forimprove the parameter of the antenna.

II. 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 εr or by increasing the substrate thickness h. microstrip patch antenna uses microstrip patch with larger width and substrate with lower εrand thicker h.

III. 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 εr and resonant frequency frwhich are given in formula as:

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

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

STEP 2: Equation of effective dielectric constant as:

$$\mathcal{E}_{r_{eff}} = \frac{\varepsilon_r+1}{2} + \frac{\varepsilon_r-1}{2}\left[1+12\frac{h}{w}\right]^{1/2}$$

STEP 3: Equation effective length as:

$$L_{eff} = \frac{c}{2f_0\sqrt{\mathcal{E}_{r_{eff}}}}$$

STEP 4: Equation of the length extension as:

$$\Delta L = 0.412h\ \frac{\left(\mathcal{E}_{r_{eff}}+0.3\right)\left(\frac{w}{h}+0.264\right)}{\left(\mathcal{E}_{r_{eff}}-0.258\right)\left(\frac{w}{h}+0.8\right)}$$

STEP 5: Equation of actual length of patch as:

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

III. ANTENNA CONFIGURATION

The Geometry proposed E shaped microstrip patch antenna presented work in fig.

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Design Specification:

Patch material	Copper
Substrate material	Roger RT duroid 5880
Substrate height	12mm
Substrate dimension	100mm×90mm
Feed point fig 1	(-37,22,0)
Feed point fig 2	(0,-7,0)

V. E Shaped Antenna Design

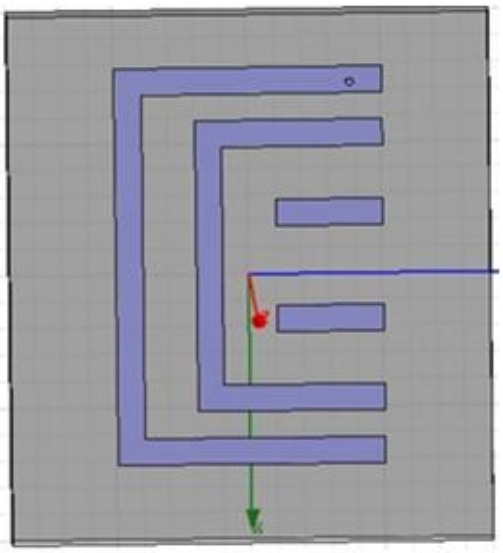

Fig.1 The Geometry of E shaped model (top view)

Above figure shows the geometry of E shaped microstrip patch antenna. In this coaxial feed technique is used. Here above geometry dimension of the substrate 100×90mm^2 over shown in fig.1

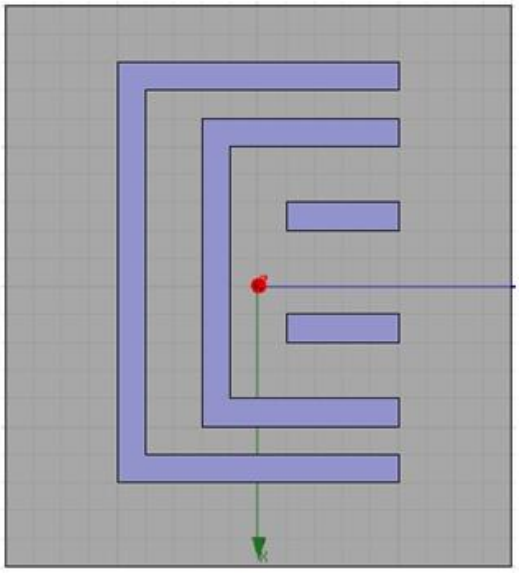

Fig.2 E shaped model Feed (0,-7, 0)

VI. RESULT AND DISCUSSION

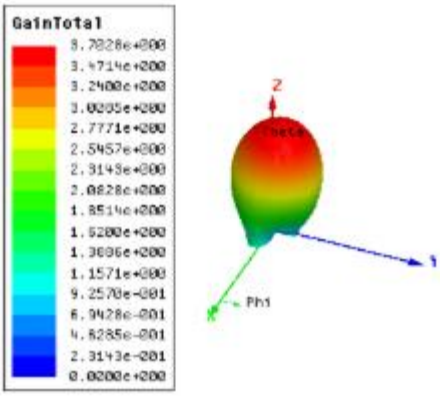

Fig.3 Total Gain polar plot E shaped microstrip patch antenna

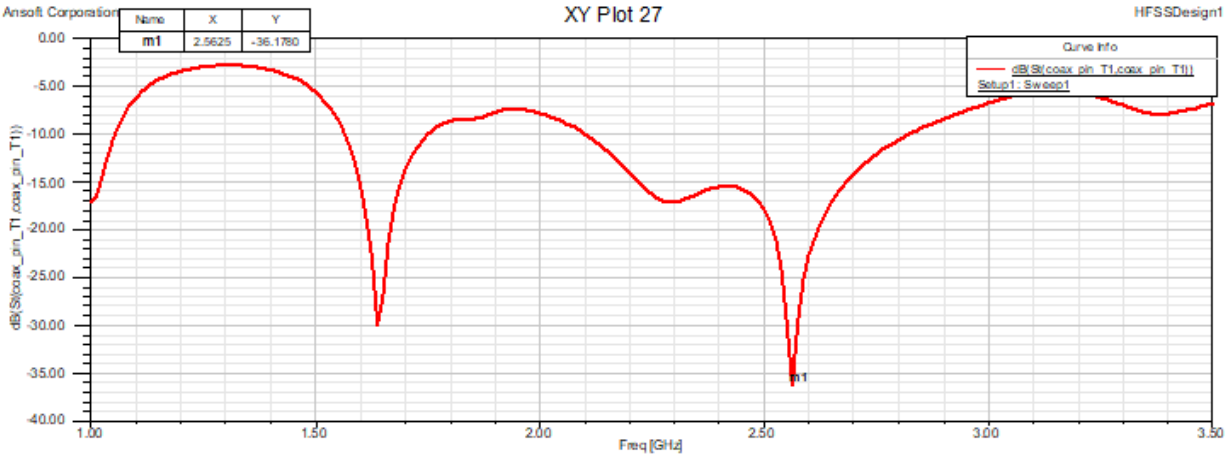

Fig.5 Total Gain of E shaped microstrip patch antenna

The Graph Represented total Gain, We analyzed that the maximum Gain is obtained 4.6378db at 0.000 Theta.

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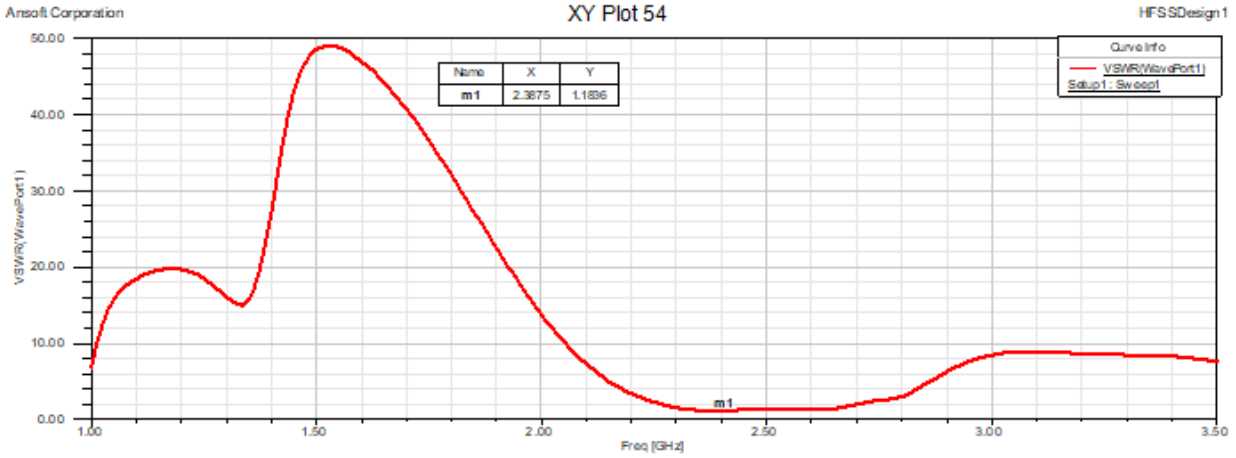

Fig.6 VSWR of E shaped microstrip patch antenna

The VSWR of the design shows that frequency band under observation. The value of observation is1.1836db at 2.3875 GHzfrequency.

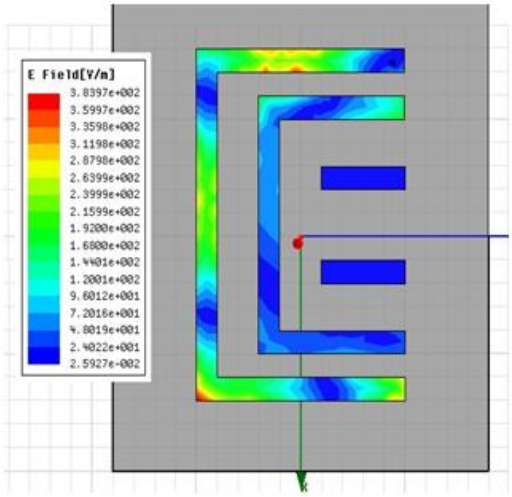

Fig.7 E field of E shaped microstrip patch antenna

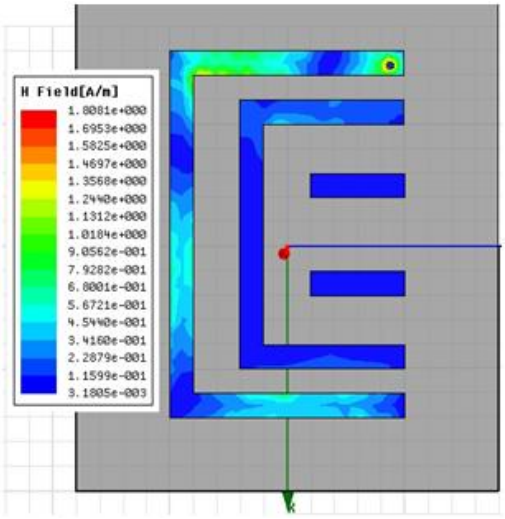

Fig.8 H field of E shaped microstrip patch antenna

CONCLUSION

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

REFERENCE

[1] Rushit D Trivedi, Vedvyas Dwivedi, "A Novel approach for Stacked Patch antenna for large bandwidth applications," Volume 9 Issue 2 version 2 of IOSR Journal of Electrical and Electronics Engineering (IOSR-JEEE) of March-April 2014.

[2] Minhaz G. Vayada, Mohammed G. Vayada, Arti Patel" Design & Simulation of Rectangular Shaped Patch Antenna Used for ISM band using HFSS"*International Journal of Advanced Research in Computer Engineering & Technology (IJARCET) Volume 4 Issue 4, April 2015.*

[3] Md.Saddam Hossain, Md.Masud Rana,Md.Shamim Anower, and Alok Kumar Paul, "Enhancing the Performance of rectangular patch antenna using E Shaped slot technique for 5.75 GHzISM Band Applications", 2016 5th International Conference on Informatics, Electronics and Vision (ICIEV).

[4] Rushit D Trivedi, Amit Tanchak, "Waveguide feed Microstrip patch antenna" Volume 10 Issue 2 version 2 of IOSR Journal of Electronics and Communication Engineering(IOSR-JEEE) of March-April 2015.

[5] Rushit D Trivedi, Vedvyas Dwivedi , "A novel approach to improve the gain and bandwidth of microstrip patch antenna", journal of information, knowledge and research in electronics and communication, ISSN: 0975 – 6779, nov 14 to oct 15, volume – 03, issue – 02

[6] Min Wei, Yuanhua Sun, Xi Wu and Wu Wen, "Gain enhancement for wideband end-fire antenna design with

 ISSN: 2454-4248
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artificial material",Wei et al. SpringerPlus 5:1571 DOI 10.1186/s40064-016-3039-y

[7] Jong-Dae Park, Sung-Won Jang, Byeong-Ho Park, Chan-Hong Park, Myung-Dong Kim, and Hyeon-Kyeong Seong, "A Study on Design of Microstrip Patch Antenna for Mobile Communication Systems",James J. (Jong Hyuk) Park et al. (eds.), Future Information Technology, Application, and Service, LNEE 179, pp. 325–330, DOI: 10.1007/978-94-007-5063-0_44, © Springer Science+Business Media Dordrecht 2012.

[8] G.Jeevagan navukarasu lenin, Ganesh babu.T, Rajkumar.R, Ramanathan.A "Design of an E Shaped Patch Antenna for GPS and IRNSS Application", 2016 International Conference on Advanced Communication Control and Computing Technologies (ICACCCT)