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A Wideband E-Shaped Microstrip Patch Antenna for Wireless Communications

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ABSTRACT: Microstrip patch antenna have been well known for its adva**ntages such as light weight,low** fabrication cost,mechanically roubst when mounted on rigid surfaces and capability of dual and triple ferquency operations. however, narrow bandwidth came as the major disadvantage for this type of antenna. This paper presents the design of e-shaped microstrip single patch antenna with wide band operating frequency for wire less operation. the performance of the designd antenna was analyzed in terms of bandwidth, gain, return loss, VSWR,and radiation pattern.the design was optimized to meet the best possible results. Substrate used was C-foam PF-2which has similar dielectric constant of air. The results show the wide band antenna is able to operate from8.34GHZto13.86GHZfrequency band with optimum frequency at 8.73GHZ

KEYWORDS: E-shaped micro strip antenna,wide band,substrate,C-foam PF-2,VSWR

I. INTRODUCTION

A microstrip patch antenna consists of a dielectric substrate, with a ground plane on the otherside. due to its advantages suchas low weight ,low profile planar configuration, low fabrication costs and capability to integrate with microwave integrated circuits technology ,the microstrip patch antenna is very well suited for application such as wireless communications system,GPS,cellular phones, papers, radar systems, and satellite communications systems.

The development of small-integrated antennas palys a significant role in the progress of the rapidly expanding military and commercial communications applications.wide band wireless connection promises to make interactive voice,data,and video services available any time and anywhere. The technology to support these applicationshas been made possible by recent advances in high-density RFand micro wavecircuit packaging.as system requirements for faster data transmission in lighter compact designs drive the technology area,higher frequency design solutions with larger density layouts require integration of microwave devices,circuitry,and radiating elements that offer light weight,small size,and optimum performance.

Over the past two decades,microstrip patch antenna has received considerable attention for use in personal communication systems and synthetic aperture radar applications due to its compact ness among other advantages. Untensive research has been carried out to develop new techniques to overcome the micro strip patch antenna drawbacks,the most restrictive being narrow band.
The band width enhancement and its return loss improvement without increasing antenna size and production process is important to apply this antenna to the modern mobile communication systems and need to be carried out.
Many applications in communications and radars require circular or dual linear polarization ,and the flexibility affored by microstripantenna technology has led to a wide variety of designs and techniques to fill this need .in recent years the demand for compact mobile tele phone hand sets grown. Hand sets with size of a pocket have begun appearing in the market and ,as the demand for increased electronic mobility grows,the need for small hand setys will most likely increase. A small antenna size is required as one of the important factors in portable mobile communication systems.

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The microstrip patch antennas(MPA)is widely being used because of its low volume and thin profile characteristics.the size of MPAis basically determined by its resonance length and width.the reduction of the patch size can be achived by using patch substrateb material with very high permittivity and smallsubstrate height.but in case, the low radiation efficiency will reduce the antenna gain.

Un this study, a novel e-shaped patch antenna optimized for simplicity in design and feeding is proposed.it has characteristic which well meet GPSsystem application.parametrs of the antenna such as return loss,impedence bandwidth,radiation patterns and gains are discussed in this paper.

II. DESIGN

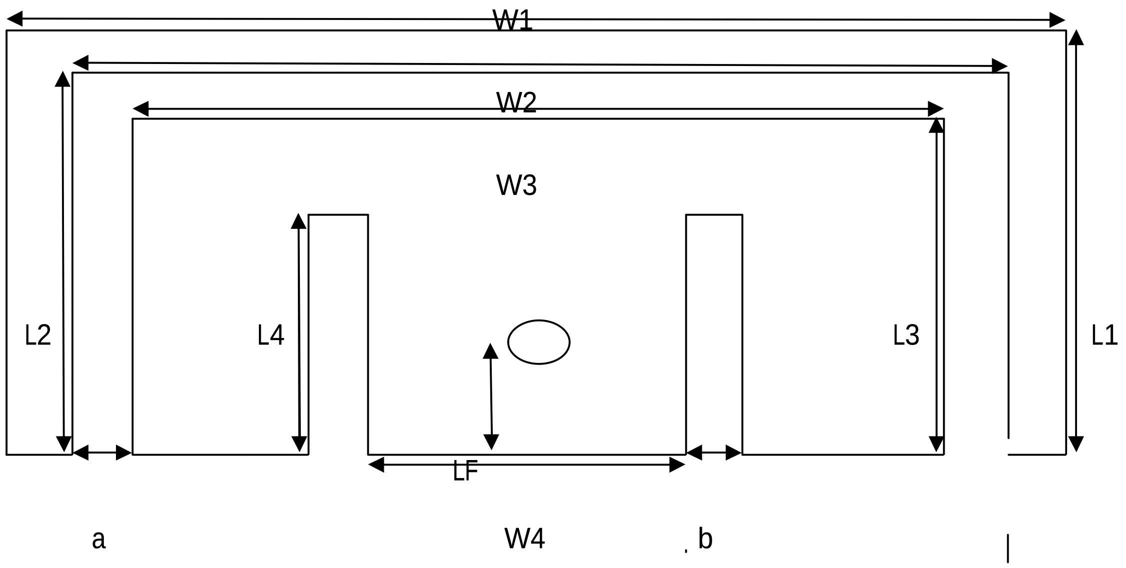

Fig 1:DESIGN GEOMETRY OF E-SHAPED PATCH ANTENNA

Table 1:Defualt microstrip patch antenna specifications

Parameter	Dimensions (mm)
W1	21.7
W2	17.7
W3	15.7
W4	5.2
L1	13.2
L2	10.9
L3	10.9

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L4	8.4
a	1.0
b	1.0
LF	1.8

III. RESULTS

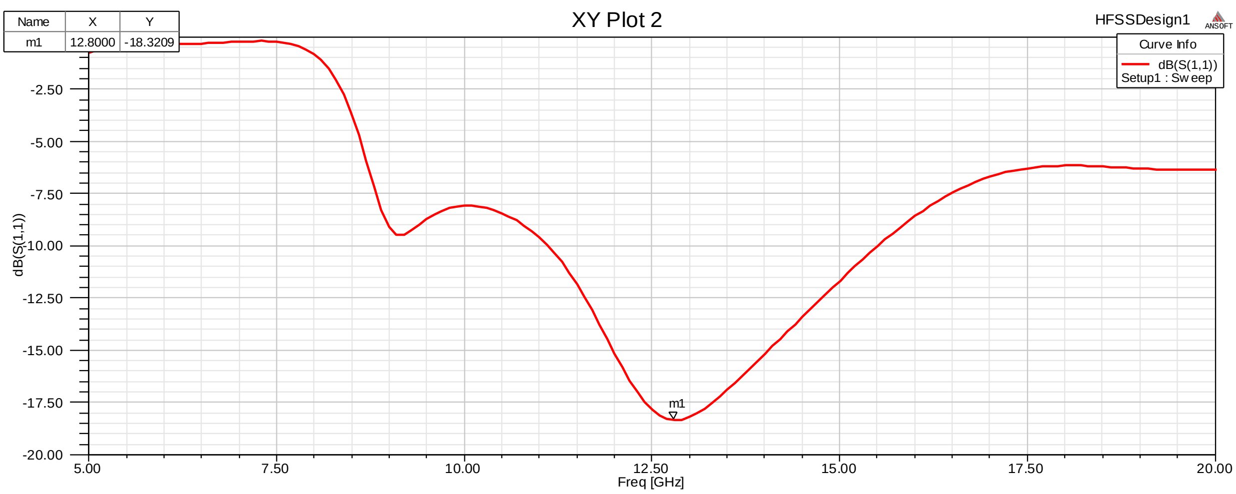

Fig 2 : S11 for air and foam substract

At 12.8Ghz the return loss is 18.32dB as shown in fig2

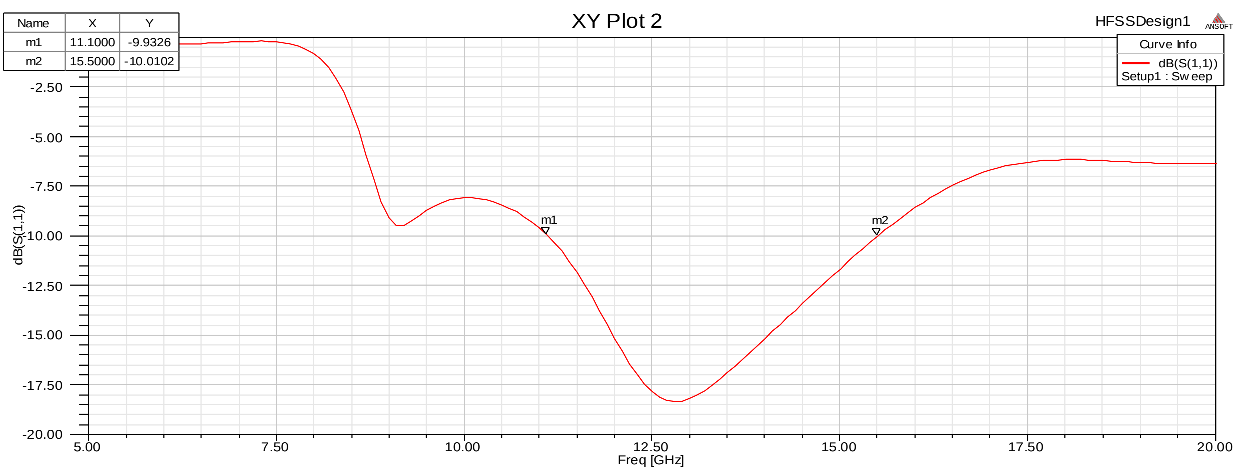

Fig3 : S11 for various size of W2 substract

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From Fig3 the Bandwidth is given by 15.5-11.1=4.4Ghz

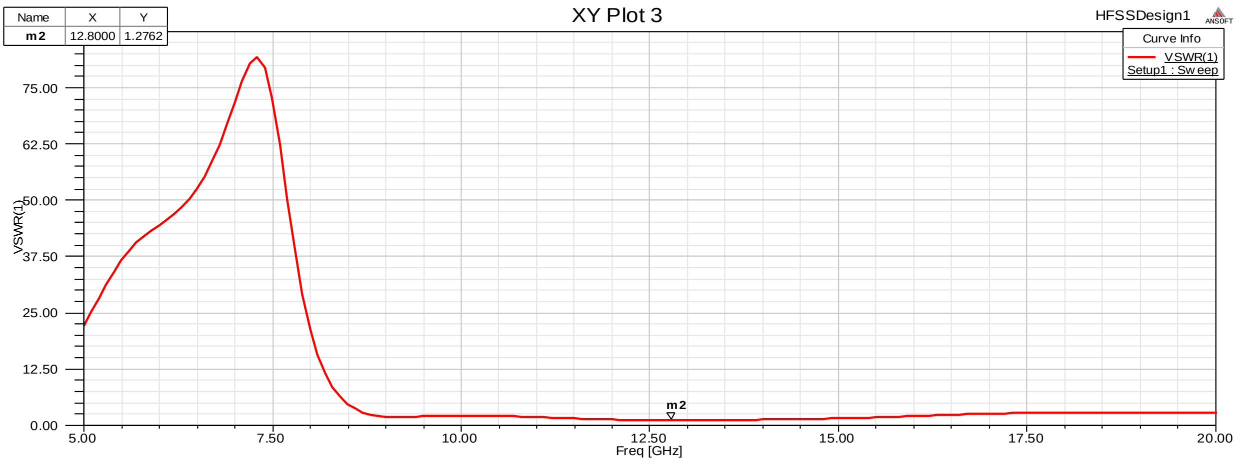

Fig4 : S11 for various size of WC substract

From fig4 VSWR is recognized as 1.2762 which gives better results

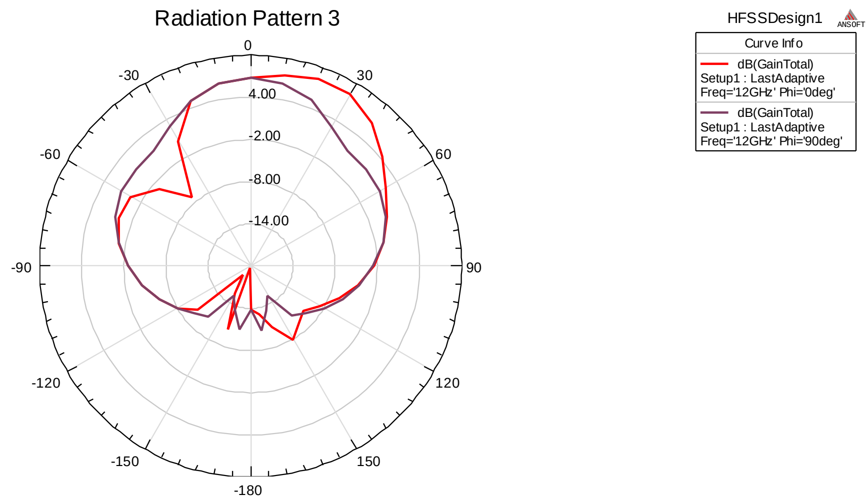

Fig5 : Radiation Pattern at 12Ghz 6.8

IV.CONCLUSION

In this paper, an E-shaped, wideband microstrip Patch anteena using C-Foam PF-2 has been similated, optimized and analyzed using HFSS2013 software. A Parametric study is presented with the results showing that the anteena can be operated at 8.34 GHz up to 13.86 GHz frequency bank. This results is an improvement when compared to the original

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specification which saw the bandwidth is expanded from 4.99 GHz to 5.72 GHz other parameters such as gain, S11 and VSWR also have been improved.

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