OPEN ACCESS
International
Journal
Of Modern Engineering Research (IJMER)

Different ShapedPatch Array Antenna with Liquid Crystal Substrate (LCS)

[1]Mamdoh Barnawi, [2]Adnan Affandi, [3]Abdullah M. Dobaie
[1,2,3]*Electrical And Computer Engineering Department King Abdul Aziz University*

ABSTRACT: *This paper is mainly dealing with three different types of patch antennas which are list in fig(1), fig (2) and fig (3) respectively. These proposed antennas are design on liquid crystal substrate liquid crystal substrate. Enhancement factor to improve these proposed antenna performances are introduced. The selected operated frequencies is covering the rang between (1-45) GHz. The objective of these proposed antenna designs are to provide antenna dual band width as well as high gain. All the designs will be implemented on liquid crystal substrate of dielectric constant εr=2.2 and thickness of 0.175 mm. These antennas are narrow and dual band. The gain this work is satisfied our results.*

I. INTRODUCTION

Micro strip patch antenna consists of a radiating patch on one side of a dielectric substrate, which has a ground plane on the other side. A Micro strip patch antenna is a narrowband, wide-beam antenna fabricated by etching the antenna element pattern in metal trace bonded to an insulating dielectric substrate with a continuous metal layer bonded to the opposite side of the substrate which forms a ground plane.

PatchAntenna Model.
Fig (1) to (2) show the proposed patch antenna on the liquid crystal more detail on these antennas will be discussed in section (3).

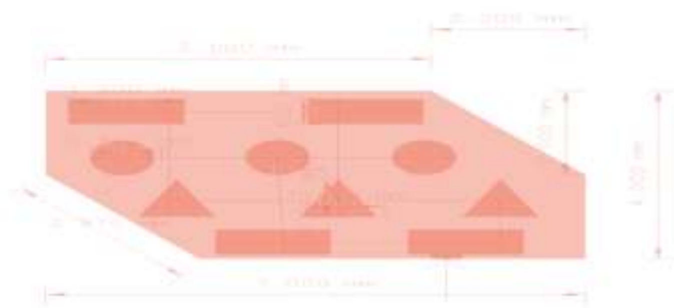
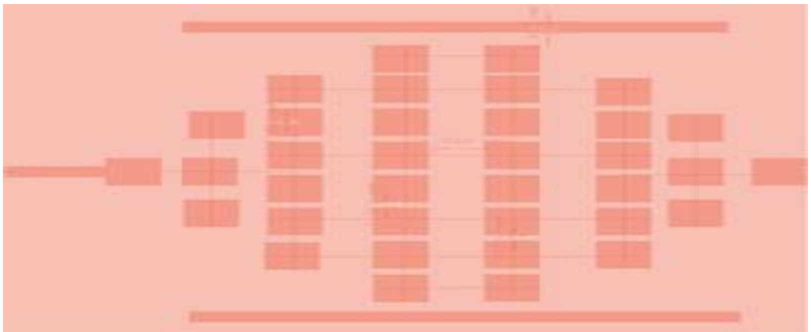


Fig (1) Irregular crystal shapedpatch module



(2) Rectangular shapedcrystal patch module

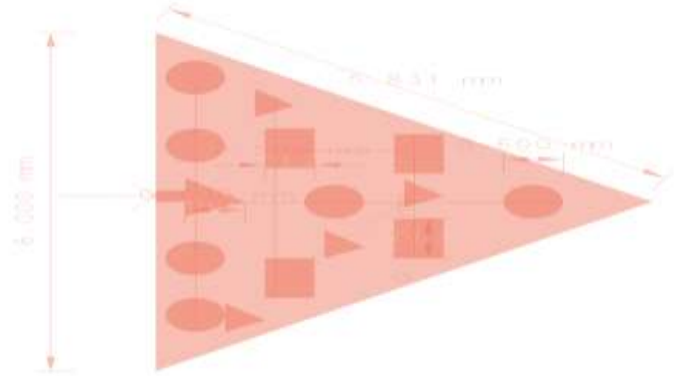


Fig (3) Triangle shaped crystal patch module

1. Antenna Design Constrictions

Figure (1) and (3) show the irregular shaped patch antenna array which made of small Rectangular, Disc andTriangular shape aredesigned on liquid crystal substrate shown in.The dielectric constant (Єr) is 3 while the loss tangent (δ) is 0.003.the resonant length L" of the proposed patch 2 andthewidth (W) should be larger than L so that large bandwidth can be obtained. Here we have taken width (W) as 1.5 times of length (L). Height of the dielectric substrate should be in between 0.003 λ0 and 0.05λ0. We have taken 0.02 times of λ0. As 50Ω feed is used normally, feed point is taken where 50Ω resistance occurs. Substrate shown in figure (4).

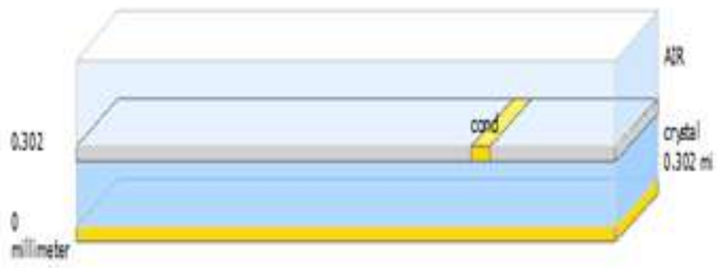


Fig 4 Antenna substrate

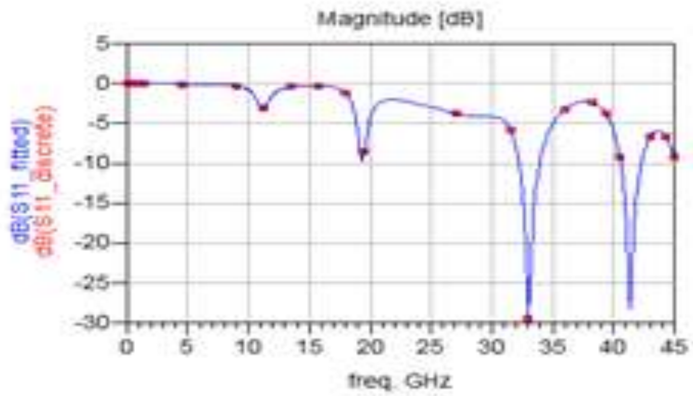


Fig 5 the returns loss of fig 1

Fig 6 radiation pattern of fig 1

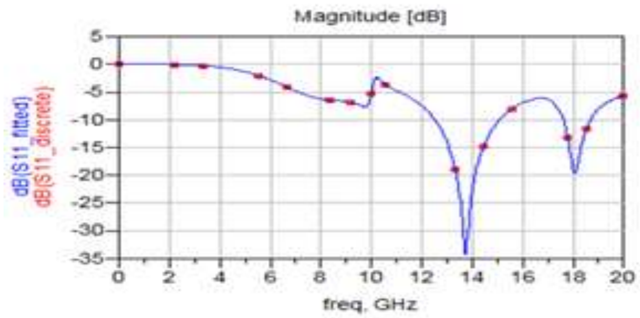


Fig 7the return loss of fig 2

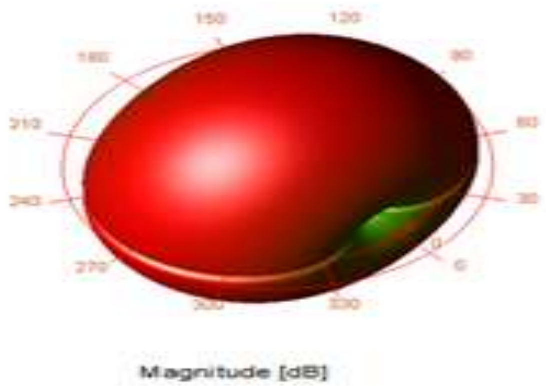


Fig 8 radiation pattern of fig 2

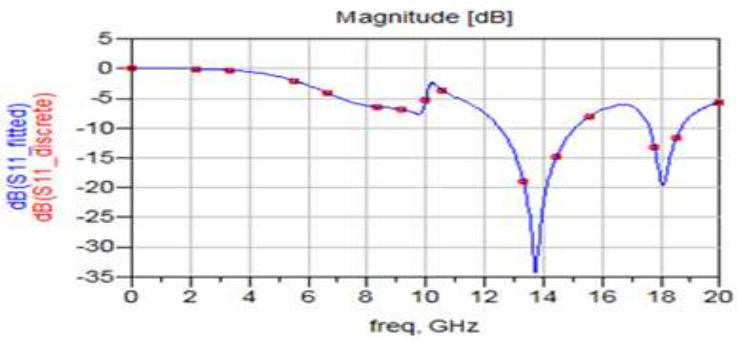


Fig 7the return loss of fig 2

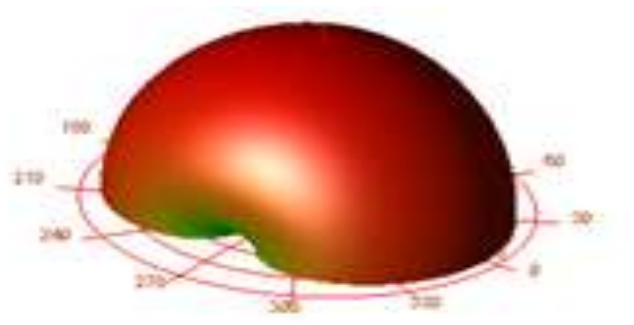


Fig 10 radiation pattern of fig 3

3.1 Design Arrhythmic Patch Array Antenna in liquid Crystal Substrate:

Figure 1 represents the scattered array patch array antenna of different shapes on arrhythmic shaped of liquid crystal substrate with operating frequency of 15 GHz. It is clear from the figure 5 the return loss of this proposed patch array antenna. It obvious from this frequency response one can see that a dual frequency of the operation can be observed at 15 GHz and 32.5 GHz respectively. Also dual bandwidth of 0.7 GHz at 15 GHz and 1.5 GHz at 32.5 GHz respectively are obtained.Figure 6 shows the 3-D radiation pattern of the proposed patch array antenna of different shapes and size on the arrhythmic liquid crystal. It is obvious that this generated 3D radiation shows a linear polarization radiation pattern.

33.2 Design Circular Polarized Patch Array antenna on liquid Crystal Substrate with Enhancement Factors:

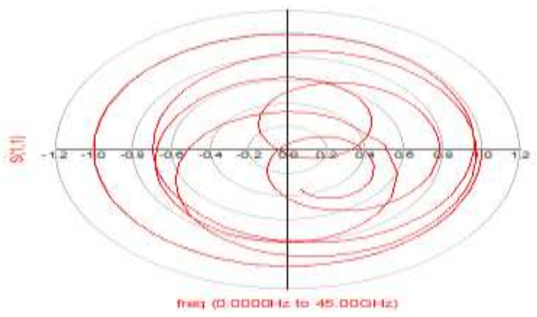
Figure 2 represent the layout of patch array antenna on circular liquid crystal substrate. This liquid crystal has 0.003 tangents. Enhancement factors. Design frequency was selected at 13.85 GHz.
Figure 7 shows the return loss of this proposed patch array antenna. It is obvious from this frequency response that a dual operation is generated at both 12.2 GHz with bandwidth of 2.8 and at 17.1 GHz with bandwidth of 0.8 GHz achieved respectively.Figure 8 shows the 3D radiation pattern of this patch array antenna. It is clear that the proposed patch array antenna provide radiation perfect pattern on which indicates that 3D circular pattern has been achieved. Axial ratio of almost of one achieved 0 dB.

3.3 Design Triangular Polarized Patch Array Antenna of Different Shapes on liquid Crystal:

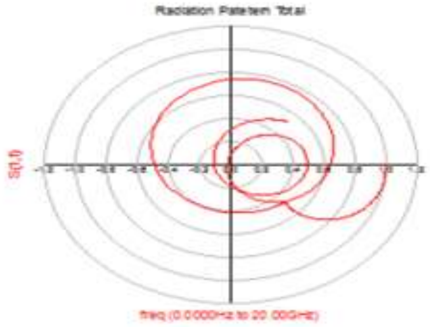
Figure 3 represents the scattered phase array patch antenna of different shapes on triangular shaped of liquid crystal substrate. Dual frequency operations are observed at 13.83 GHz and 18 GHz respectively. The obtained dual bandwidths are14 GHz at 1 GHz and 31 GHz at 2 GHz respectively. This is in full agreement with the designed objective of this patch array see figure 3.61.Figure 9 shows the 3D radiation pattern of the proposed patch antenna array of different shapes and size on the triangular liquid crystal. It is obvious that this generated 3D radiations shows a perfect circular polarization radiation pattern .this indicates that a perfect 03D radiation pattern has been achieved ie axial ratio0.0 dB can be obtained.

II. SIMULATION ANALYSIS

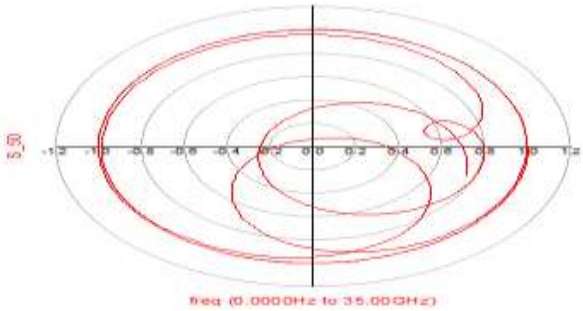
The designed antenna is simulated using ADS software.



Radiation Pattern of irregular shaped patch antenna



Radiation Pattern of rectangularshaped patch antenna



Radiation Pattern of Triangularshaped patch antenna

III. RESULTS & CONCLUSIONS

The objective of design and simulate of the proposed the three types of patch antenna array have been achievedsuccessfully. The return losses of the three proposed antenna provide a dual band width operation. Also high gain has been obtained as achieved. The advantage of using liquid crystal substrate over the existing substrate is well known fact.see Table 1 summarized of the parameters of selected LCD patch antenna shape. Improvement both the gain and directivity that have been achieved.

	Gain obtained	Return Loss (dB)	Center frequency	Bandwidth
Design 1	12.8 dB	-30	30 GHz	4 GHz
Design 2	10.2 dB	-35	13.2 GHz	3.2 GHz
Design 3	9.8 dB	-20	15 GHz	3GHz

Table1

REFERENCE

[1]. S. M. Shum and K. M. Luk, “Stacked annular-ring dielectric resonatorantenna excited by axi-symmetric coaxial probe,” IEEE Trans. AntennasPropag., vol. 43, pp. 889–892, Aug. 1995.
[2]. A. G. Walsh, S. D. Young, and S. A. Long, “An investigation ofstacked and embedded cylindrical dielectric resonator antennas,” IEEEAntennas Wireless Propag.Lett., vol. 5, pp. 130–133, 2006.
[3]. A. Petosa, N. Simons, R. Siushansiana, A. Ittipiboon, and M. Cuhaci,“Design and analysis of multisegment dielectric resonator antennas,”IEEE Trans. Antennas Propag., vol. 48, pp. 738–742, May 2000.
[4]. Y. Coulibaly, T. A. Denidni, and H. Boutayeb, “Broadband microstrip-fed dielectric resonator antenna for x-band applications,”IEEE Antennas Wireless Propag. Lett., vol. 7, pp. 341–345, 2008.
[5]. X. L. Liang, T. A. Denidni, and L. N. Zhang, “Wideband L-shaped dielectricresonator antenna with a conformal inverted-trapezoidal patchfeed,” IEEE Trans. Antennas Propag., vol. 57, pp. 272–274, 2009.
[6]. X. L. Liang and T. A. Denidni, “H-shaped dielectric resonator antennafor wideband applications,” IEEE AntennasWirelessPropag. Lett., vol.7, pp. 163–166, 2008.
[7]. T. A. Denidni, Q. J. Rao, and A. R. Sebak, “Broadband L-shaped dielectricresonator antenna,” IEEE AntennasWirelessPropag. Lett., vol.4, pp. 453–454, 2005.
[8]. R. K. Mongia and A. Ittipiboon, “Theoretical and experimental investigationson rectangular dielectric resonator antennas,” IEEE Trans. AntennasPropag., vol. 45, no. 9, pp. 1348–1356, Sep. 1997.
[9]. K. M. Luk and K. W. Leung, Dielectric Resonator Antennas. Hertfordshire,U.K.: Research Studies Press, 2003.