Research Article

Fabrication Of Ultra-Wideband Antenna Array

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Abstract— In the realm of communication structures today, one of the key platforms of study is wireless technology. The learning of messaging schemes is inadequate without an understanding of fabrication of antennas and its operation. ultra-wide band antennas are generally utilized because of their ultra-wide range of frequency, less energy broadcast level, safe, protected, and consistent message results in current communication devices over traditional antenna. Trio Ultra-Wideband antennae are considered for designing. Solo pentagonal patch antenna is the first designed antenna. Twofold pentagon patches with each consuming distinct feed designed to refuge the bandwidth of occurrence from 6.25 GHz to 39.5 GHz is the second proposed UWB antenna. The UWB ability of antenna is accomplished with the support of collection of pentagonal antennae. The virtual outcomes provide loss of energy reflected lesser than -10dBi over the complete series. The twofold pentagon squares but with a mutual feed considered to cover the range of frequencies of 8 GHz to 12.5 GHZ is the third proposed antenna. The loss of power in the signal returned is lesser than -15.2 dBi compared to the whole series attainment of -41 dBi at 10.6 GHz and 12.5 GHz is conquered.

Keywords— Antennae, Array of Antenna, Multiple Occurrence, Solo and Twofold Feed, Ultra-Wideband Antenna.

1. INTRODUCTION

Electric power is converted into radio waves and vice versa with an electronic device such as an antenna. We can find applications of antenna everywhere around us. A single antenna is required that can cover multiband frequencies in the age of next generation networks. It is likely to style applications demanding different frequencies with the development of microstrip antenna. These microstrip antenna can be operated in chorus with only one antenna, which pointedly diminishes the size also. A UWB antenna is an antenna capable of conveying as well receiving signal over the specified range of frequencies. UWB is quickly budding as a high data rate radio information technology. An antenna moreover shows a very vital part in UWB schemes, as is the situation in traditional radio information systems. Nevertheless, there persists many challenging situations in designing a UWB antenna compared to fine band one.

2. EXISTING WORKS

Pentagonal microstrip patch gives improved performance in comparison with rectangular patch antenna [1]. It also supports both linear and circular polarization. UWB spread is well-defined as the release via an antenna for which the discharged signal bandwidth surpasses the slighter of 500 MHz or 20% of the center rate of recurrence [2]. Small size antennas that are pale mass with less outline, elasticity, and brilliant denial share in the spreading band are preferred from a designer's point of view [3]. Also, the size of the antenna changes in accordance with the operating standards/ frequencies changes, which must be resolved for the sake of movability of devices. The main idea behind UWB radio systems is that they spread signal pulsations of noticeably short duration, as compared to outdated communication schemes. The role that UWB antennas play in all of this is that they must be able to spread these pulsations as precisely and capably as possible. The UWB technology has a great potential in future in the field of short-range data and voice transmissions.

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3. PROPOSED SYSTEM

Aimed at this design, there are few parameters that must be satisfied. Antenna bandwidth, gain, and the radiation pattern of the antenna are those parameters. Antenna bandwidth is the first parameter that must be considered for our design. The bandwidth is basically the range of frequencies that the antenna is designed to emit. The bandwidth for which an antenna is designed is exceedingly small in narrowband systems, as there is just a single frequency for which the antenna should radiate. In this case, this design can radiate signals over the frequency range between 6.3 GHz and 40 GHz. Overall gain (i.e. throughout the bandwidth) is the second parameter that must be considered for our design. The gain should be high enough to allow the signal to propagate efficiently. If the gain of an antenna is exceptionally low, then the signals will fade away after travelling a short distance. So, we have achieved gain of -10 dBi over the bandwidth and achieving the peak of -35 dBi for dual feed array antenna and -39 dBi for the single feed antenna array.

4. IMPLEMENTATION OF ANTENNA DESIGN

The proposed geometry of the UWB antenna for wide range wireless applications is represented in Fig 1. The antenna was made using FR4 as substratum with the dielectric constant = 4.2 and the substratum thickness of 1.7 mm. Ansoft HFSS 13 is the package used to prototype and mimic the anticipated antenna, which accomplishes 3D full-wave electromagnetic field reproduction and provides the analysis of various parameters of the antenna. The HFSS is an engineering standard tool for simulating the antenna with respect to real time environment.

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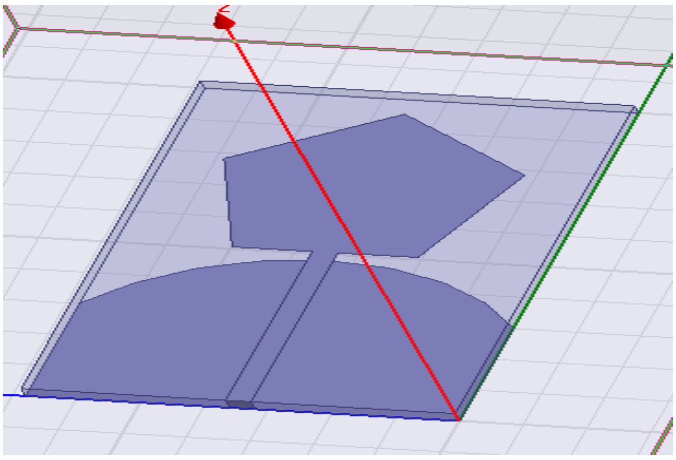

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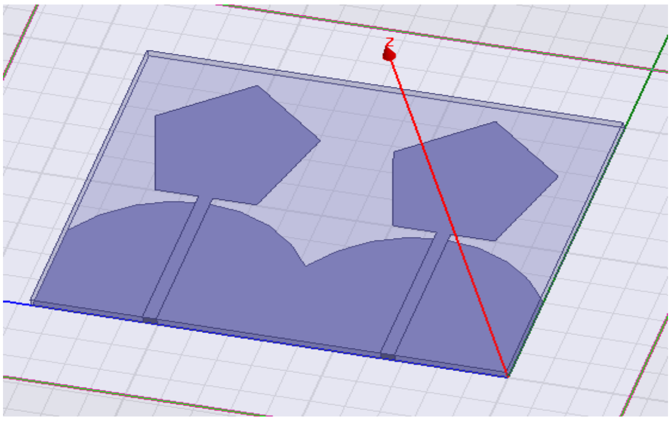

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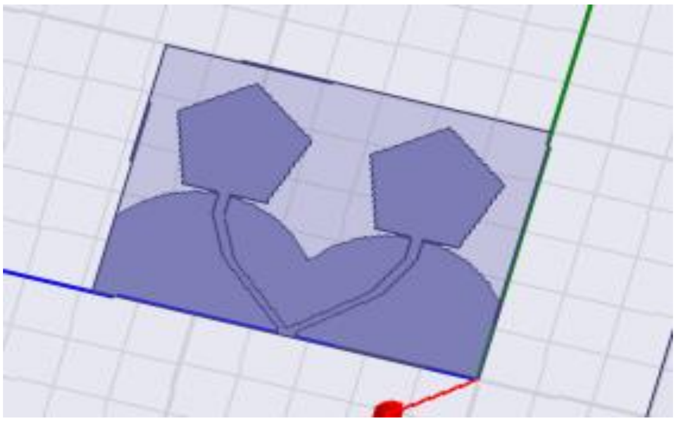
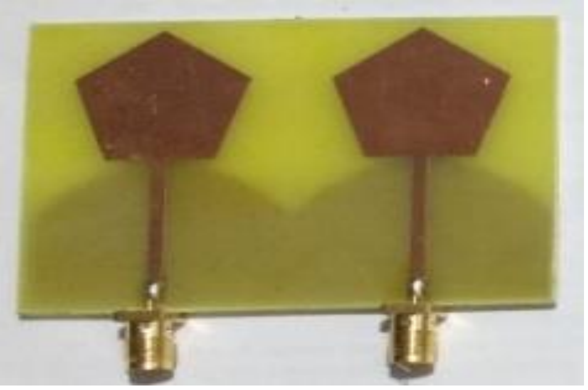


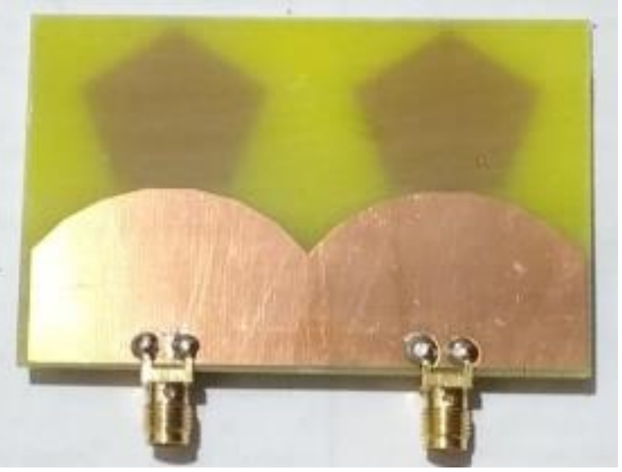
(c)

Fig.1 shows the simulated designs (a) Single Pentagonal Patch, (b) Separate feed Pentagonal Antenna Array, (c) Single feed Pentagonal Antenna Array.

5. FABRICATED ANTENNAE



(a)



(b)

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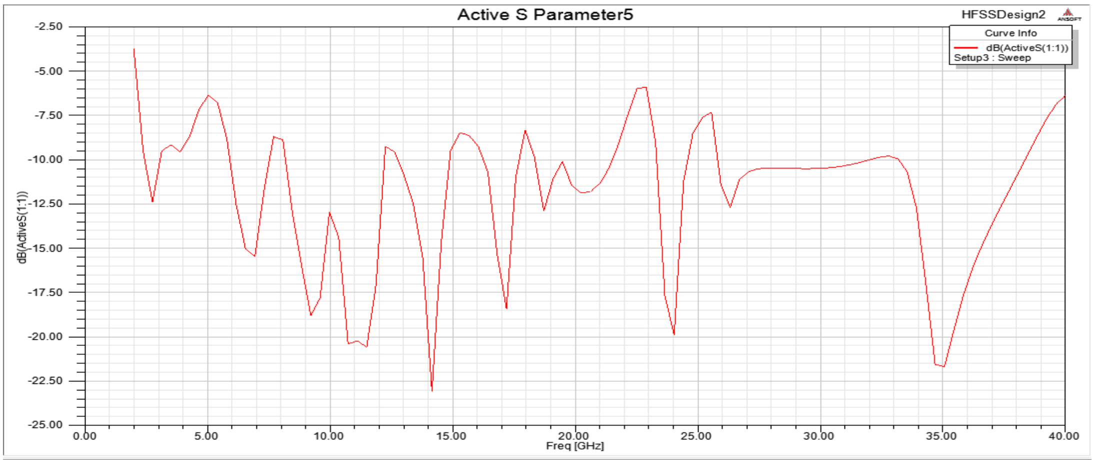
Fig.2 shows the fabricated antenna designs (a) Separate feed Pentagonal Antenna Array Patch (b) Common Ground Plane, (c) Single feed Pentagonal Antenna Array Patch.

The fabrication of this antenna is done using masking and etching the unmasked area using FeCl3 solution. The masking was done by printing the design using carbon and then transferring the mask on to the copper board.

.6. RESULTS



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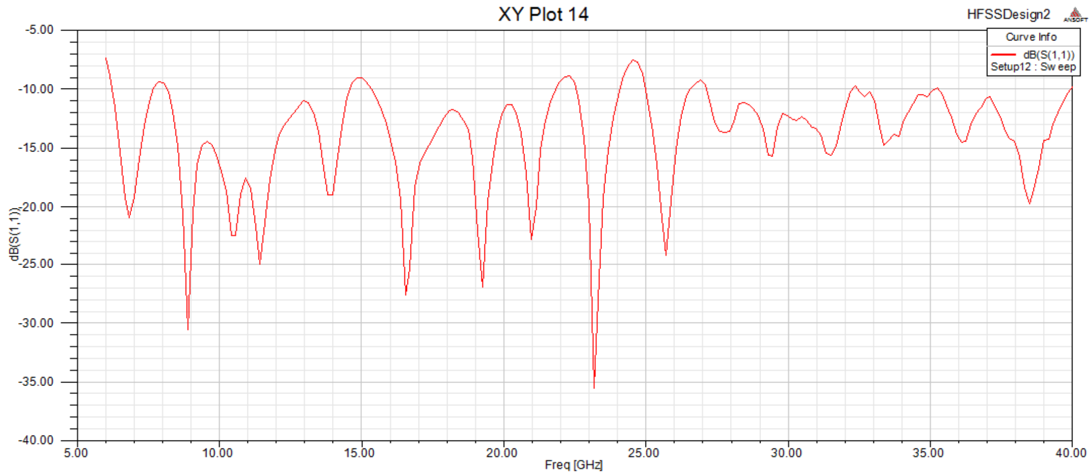

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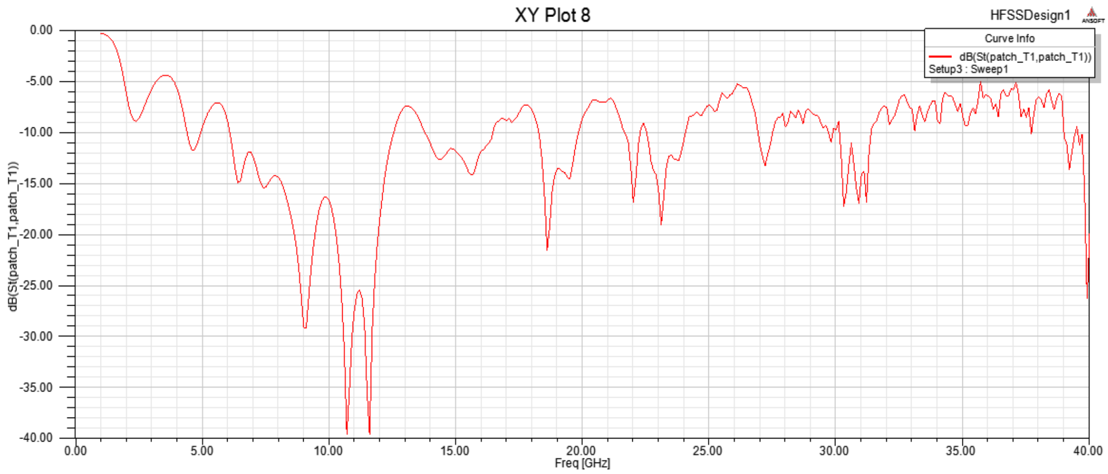


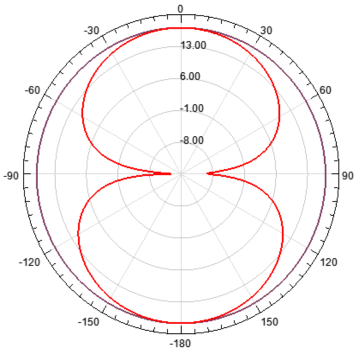
(c)

Fig.3 shows the simulated S11 graph for the antenna (a) Single Pentagonal Patch, (b) Separate feed Pentagonal Antenna Array, (c) Single feed Pentagonal Display Antenna device.

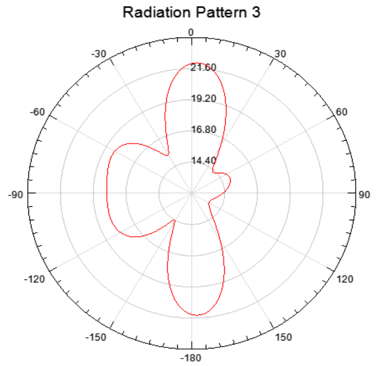
The routine of projected antenna is branded by its return loss. The anticipated antenna is giving return loss of -10 dB as shown in fig. 3.

It is observed that the gain across the whole bandwidth of 6-40GHz in the Dual feed pentagon microstrip array antenna is higher than that of Single pentagon microstrip antenna. That is, the maximum gain achieved in Fig. 3

(a) is -23.5dB but in Fig. 3 (b) is -35dB. This shows that the surge in array is directly proportional to the intensification in gain of the antenna. Whereas in Single feed dual patch pentagon microstrip antenna the bandwidth is decreased to 8-12.5GHz with relatively much higher gain of -39dB.



(a)



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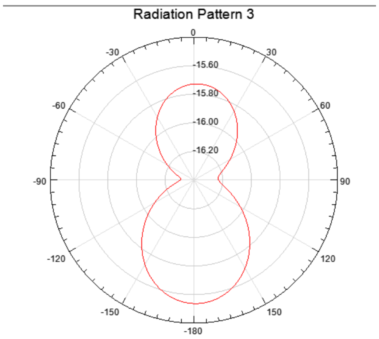

(c)

Fig.4. shows the simulated 2D Radiation Pattern (a) Single Pentagonal Patch
(b) Separate feed Pentagonal Antenna Array, (c) Single feed Pentagonal Antenna Array

The emission of energy pattern arrangement of single pentagon is more uniform then the array of pentagon antenna with separate feed as shown in fig 4 (a) and (b). Again, the emission design pattern of single feed pentagon array antenna is similar to the pattern of single pentagon antenna. So, the radiation of antenna gets distributed if we are using different feeds.

7. CONCLUSION

The ultra-wideband antennas were simulated in 3 different fashions namely, Single pentagon microstrip antenna, Dual feed pentagon microstrip antenna array and Single feed dual patch pentagon microstrip antenna. It was investigated that the gain of an ultra-wideband antenna can be increased by adding arrays without affecting the bandwidth which is from 6GHz to 40GHz. The peak gain was increased from 23.5dB to 35dB. Also, investigations were carried by increasing the array but giving a single feed, the bandwidth got narrowed down to 8GHz to 12.5GHz bandwidth. The gain achieved was boosted to 39dB. The gain and directivity can be varied using parametric analysis like changing the ground plane, feed point and type of feed. The directivity and gain can be improved using array of the same design and by reducing the ground plane [5]. But after certain number of elements in an array the radiation gain will start decreasing due to the resonating affect. Also, the ground can be reduced to a certain ratio. After that it will degrade the radiation gain.

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