

# DESIGNING OF TWO ELEMENT PARTIALLY HEXAGON ANTENNA WITH IMPROVED ISOLATION

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**Abstract:** In the recent years the development in communication systems requires the development of low cost, minimal weight, low profile antennas that are capable of maintaining high performance over a wide spectrum of frequencies. In this thesis, the 2X1 Hexagonal shape designs of a Micro strip patch antenna have been analyzed and studied. The designed having resonant frequencies 2.4 GHz for wireless communication standards. The proposed patch antenna is designed and simulated on CST microwave studio simulation software and it is designed to operate in 2.4 GHz. The good return loss, isolation, ECC and bandwidth of 50 MHz found.

**Keyword:** MPA, MIMO, ECC, VSWR, FR4.

## 1.1 INTRODUCTION

An Antenna is one of the essential parts for microwave communication. Since it help both transmitting and receiving the information. Antenna is a transducer which converts the voltage and current on a transmission line into an electromagnetic field which consists of an electric and magnetic field travelling right angles at each other. Micro strip patch antenna is a small size antenna and it can be printed directly on a circuit board. Micro strip patch antennas due to their many attractive features have drawn attention of industries for an ultimate solution for wireless communication [1]. It is analyze that the patch is generally square, rectangular, circular, triangular, and elliptical or some other common shape. The most commonly employed micro strip patch antenna is a rectangular patch. The rectangular patch antenna is a one wavelength long section of rectangular microstrip transmission line. When the air in the antenna substrate the length of the rectangular microstrip antenna is approximate one half of a free space wavelength. The antenna consists of a dielectric as its substrate the length of the antenna decreases as

the relative dielectric constant of the substrate increases the proper miniaturized antenna will improve the transmission and reception [1].

Antennas play a very important role in the field of wireless communication. Few of them are Parabolic Reflector, Patch Antennas, Slot Antennas, and Folded Dipole Antennas. Each type of antenna is good in their own properties and usage. It is said that the antennas are backbone in the wireless communication without which the world could have not reached at this age of technology [2]. Patch antennas play a very significant role in today's world of wireless communication. A Microstrip patch antenna is very simple in the designing & using a conventional Microstrip fabrication technique. The most commonly used Microstrip patch antennas are rectangular and circular patch antennas. Some important phenomena like dual characteristics, circular polarizations, dual frequency operation, frequency agility, broad bandwidth, feed line flexibility, beam scanning can be easily obtained from these patch antennas [2].

## 1.2 DESIGN OF ANTENNA

Name	/	Value	Description
fl		2.7	Feed Length
fl1		9.9	Feed Length 1
fw		2.4752595669756	Feed width
fw1		1.0475346012994	Feed Width 1
gh		.07	Ground Height
gl		50	Ground Length
gw		45	Ground width
r		24.000816166112	Cut Radius
sh		1.524	Substrate Height
sl		50	Substrate Length
sw		50	Substrate Width

Table 1.2 Dimension of Design

The front view of proposed antenna is given in figure 1 and back side is represented in figure 2. The antenna design geometry is given in figure 3 where first full hexagon structure is designed and then cut of hexagon is created.

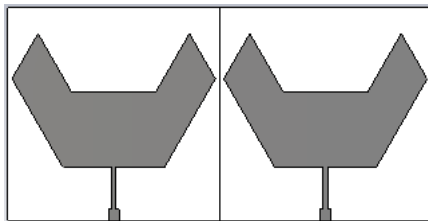


Figure 1 Front View of designed antenna

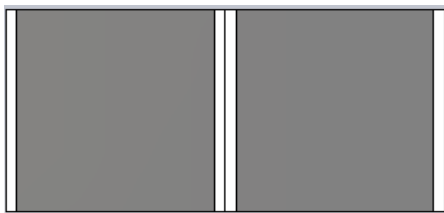
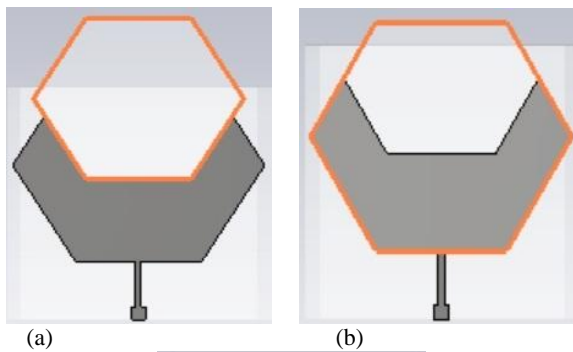
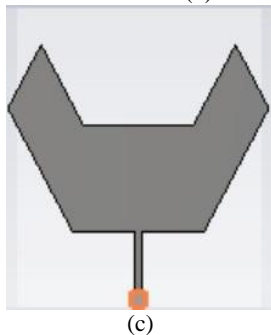


Figure 2 Back View of designed antenna



(a)

(b)



(c)

Figure 3. Complete design geometry

### 1.3 RESULT AND DISCUSSION

The design antenna produced return loss of -14 db with -19 db of isolation. As the both antenna

element is symmetrical so  $S_{11}=S_{22}$  and  $S_{21}=S_{12}$ . The bandwidth obtained as 50 MHz. The ECC found less than 0.5 between antennas. The s-parameter graph and bandwidth graph, ECC and Surface current presented in figure 4, 5, 6 and 7.

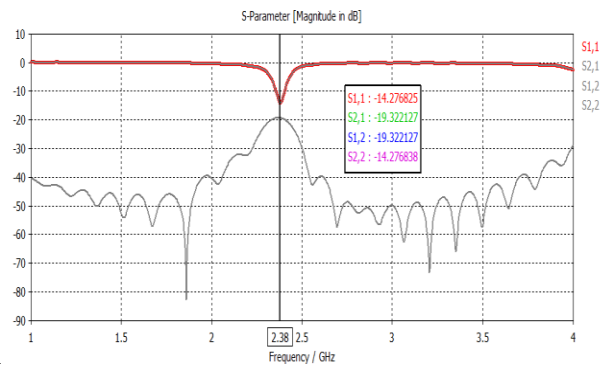


Figure 4. S-Parameter of design antenna

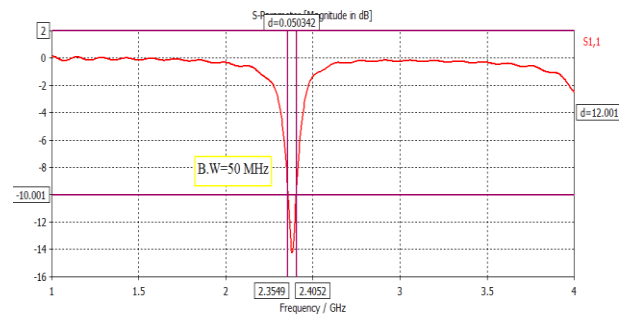


Figure 5 Bandwidth of design antenna

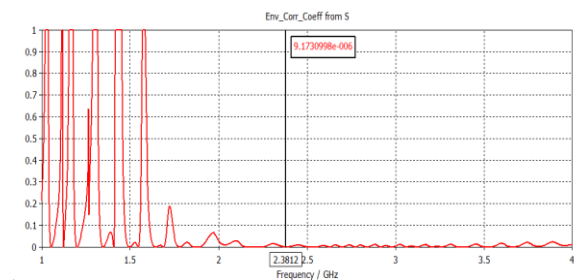


Figure 6 ECC of design antenna

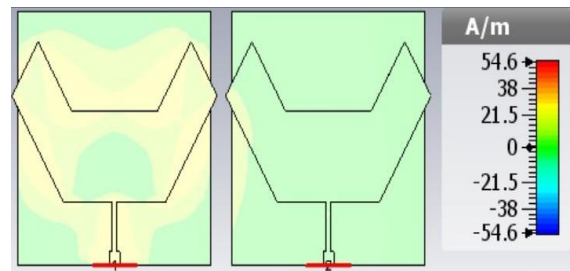


Figure 7 Surface current

### 1.4 CONCLUSION

A Hexagon cut micro strip patch antenna is designed with full ground simulated using the CST Studio Suite software. The antenna is designed for frequency 2.4 GHz with FR-4 substrate ( $\epsilon_r = 4.3$ ),  $h = 1.524$  mm. The return loss produced below -10 dB in band with isolation less than -15 dB.

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