A RIGID MULTIPLE INPUT MULTIPLE OUTPUT ANTENNA FOR AIR TRAFFIC CONTROL.

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ABSTRACT

*In This project,we want provide guidance flying an aircraft to reduce the collisions of air craft by increasing the aircraft that flew without any collisions at the same time with the help of a antenna of multiple input multiple output having a L-strip providing band notched characteristics of rigid size 648mm2.To maintain the rigidness of the antenna two radiating elements share rectangular plane of ground of size 4.5mm*36mm,then the ground plane is extended by T-shape horizontal strip of size 12.5mm*7mm and vertical strip of size 1mm*18.5mm with impedance bandwidth of 16.9GHz of isolation better than -10dB.The ECC less than 0.7.The feeding technique of the MIMO antenna is microstrip feeding of line with size 5.64mm*1.2mm.By using the software of Computer Simulation Technology*

Keyword: - *Key word1*: *Air traffic control, Key word2: Rigid MIMO antenna, Key word3: , Key word4: Computer simulation technology.*

1.INTRODUCTION

Ultra-Wide Band(UWB) Technology is an ultra-low power, short range wireless technology that can be used to transmit data and capture accurate location and directional information.UWB Technology operates over a wide frequency range from 3.1GHz to 10.6GHz and has channel bandwidths over 500MHz. It uses a pulse pattern based radio technology that sends out short pulses with widths of a few nanoseconds. Because of the wide spectrum available to the technology, pulsed data can be sent very quickly.

Ultra-wideband (UWB, ultra wideband, ultra-wide band and ultraband) is a radio technology that can use a very low energy level for short-range, high-bandwidth communications over a large portion of the radio spectrum.UWB has traditional applications in non-cooperative radar imaging. Most recent applications target sensor data collection, precision locating and tracking applications.UWB support started to appear in high-end smart phones. A significant difference between conventional radio transmissions and UWB is that conventional systems transmit information by varying the power level, frequency, and/or phase of a sinusoidal wave. UWB transmissions transmit information by generating radio energy at specific time intervals and occupying a large bandwidth, thus enabling or time modulation. The information can also be modulated on UWB signals (pulses) by encoding the polarity of the pulse, its amplitude and/or by using orthogonal pulses.

CHARACTERISTICS OF UWB

Ultra-wideband is a technology for transmitting information across a wide bandwidth (>500 MHz). This allows for the transmission of a large amount of signal energy without interfering with conventional *narrowband and carrier wave transmission in the same frequency band. Regulatory limits in many countries allow for this efficient use of radio bandwidth, and enable high-data-rate personal area network (PAN) wireless connectivity, longer-range low-data-rate applications, and radar and imaging systems, coexisting transparently with existing communications systems.*

Ultra-wideband was formerly known as pulse radio, but the FCC and the International Telecommunication Union Radiocommunication Sector (ITU-R) currently define UWB as an antenna transmission for which emitted signal bandwidth exceeds the lesser of 500 MHz or 20% of the arithmetic center frequency. Thus, pulse-based systems—where each transmitted pulse occupies the UWB bandwidth (or an aggregate of at least 500 MHz of narrow-band carrier; for example, orthogonal frequency-division multiplexing (OFDM))—can access the UWB spectrum under the rules.

Wireless technologies such as 802.11b and short-range Bluetooth radios eventually could be replaced by UWB products that would have a throughput capacity 1,000 times greater than 802.11b (11M bit/sec).

Antenna

A extended transmission line is called an antenna.when both positive and negative particles accelerate and deaccelerate the at a point and produces electrical signals horizontally which will automatically produces magnetic waves also this is the basic principle of antenna .i.e .converting of electrical signals into EM waves

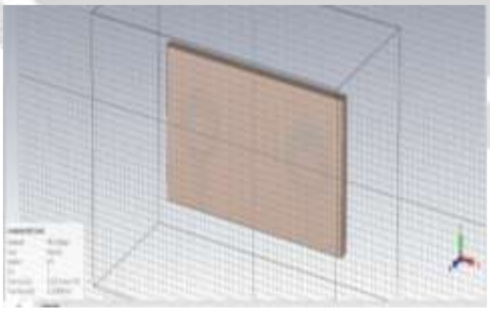
MIMO ANTENNA

The antenna that acquires multiple antennas at both sender and receiver side for increasing data speed and reducing the errors.

2. ANTENNA DESIGN AND CONFIGURATIONS

SUBSTRATE:

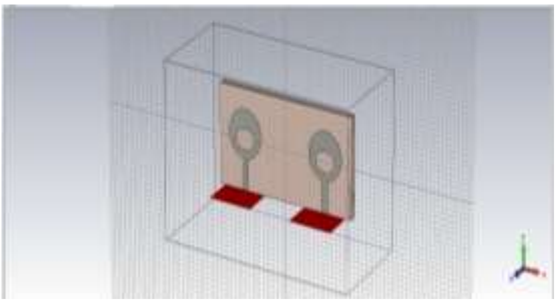
Lot of work has been done on different substrates .Substrates use in microstrip patch antenna varies from 2.2≤Ɛ≤12.Lower the permittivity of dielectric material larger the size of the antenna but it achieves better efficiency and larger bandwidth. The Ɛr is limited by radio frequency or microwave circuit connected to antennas. When substrate of higher dielectric constants were used than the performance result degrades.The substrate used here is FR4 lossy material of dimensions 18*36mm2



GROUND:

Defected ground structures are the most popular techniques,especially when it comes to mutual coupling reduction between broadband and ultra-wideband MIMO antenna elements. Several review papers are available on DGSs in the existing literature to showcase its importance while MIMO antenna designing.Actually, DGS

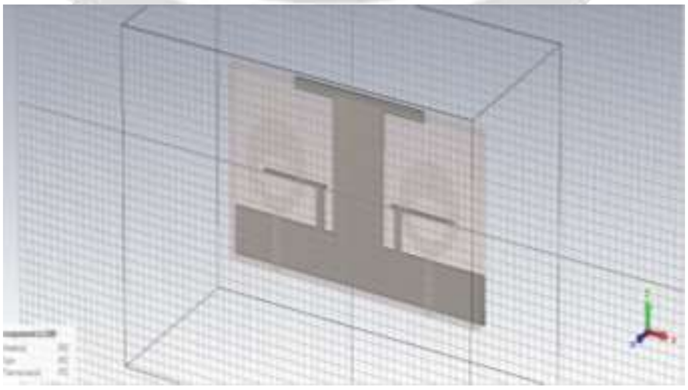
is a defect in a ground plane, which intensely disturbs the surface current distribution. As a result, the impedance of the transmission line will change. It acts as a band stop filter and suppresses the coupled fields between the adjacent antenna elements of the MIMO antenna by decreasing the current on the ground plane .The evolution process of the ground plane for the proposed modified Sierpinski carpet fractal MIMO antenna . The simulated S-parameters of the MIMO antenna for different ground configurations. As antenna elements are symmetrical, so S22 and S12 are similar to S11 and S21 respectively.



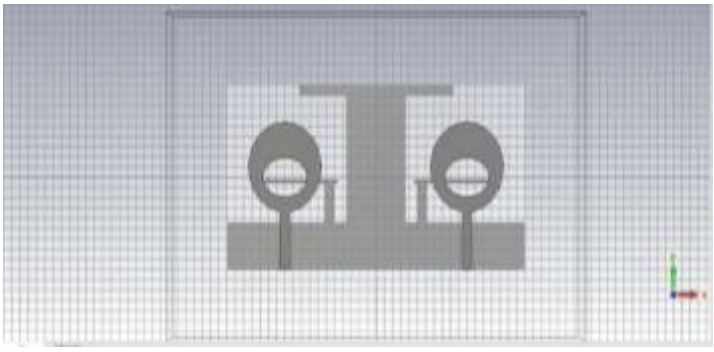
PATCH:

A patch antenna is a type of antenna with a low profile, which can be mounted on a surface. It consists of a planar rectangular, circular, triangular, or any geometrical sheet or "patch" of metal, mounted over a larger sheet of FR4 lossy called a substrate..Here we used the PEC material as the patch.

S.NO	PARAMETER	DIMENSION (mm)
1	Wg	36mm
2	Lp1	3.8mm
3	Wp1	5.3mm
4	Wf	1.2mm
5	Lf	5.64mm
6	r	4.4mm
7	Lg1	12.5mm
8	Wg1	7mm
9	Wg2	18.5mm
10	Lg2	1mm
11	Lg	4.5mm
12	Wg3	1mm
13	Lg3	4mm
14	Wg4	9mm
15	Lg4	0.2mm
16	Wg5	1.65mm



FINALISED DESIGN:

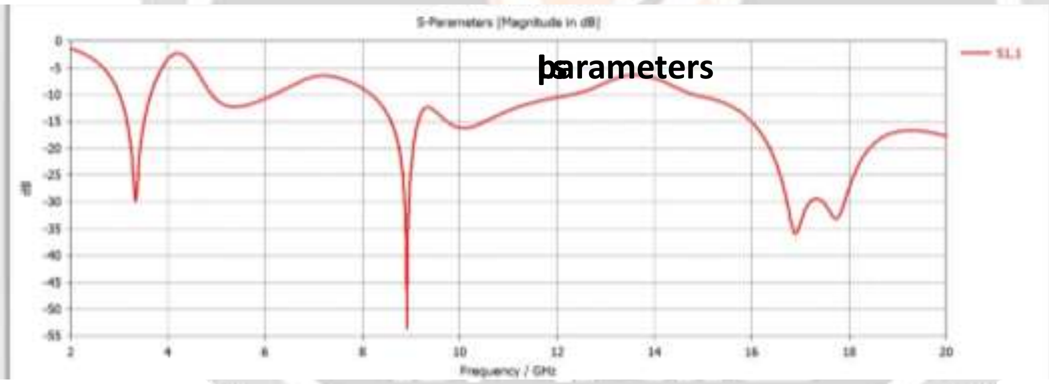


RESULTS

S-PARAMETERS

Scattering parameters describes the input-output relationships between ports in an electrical system. Specifically at high frequency it becomes essential to describe a given network in terms of waves rather than voltage or current. Thus in S-parameters we use power waves. For a two port network, s-parameters can be defined as

S11:



***S21**:*

In RF design, we cant use other parameters for analysis such as Z,Y,H parameters as we can't do short circuit and open circuit analysis as it is not feasible.

***S11** is the input port voltage reflection coefficient*

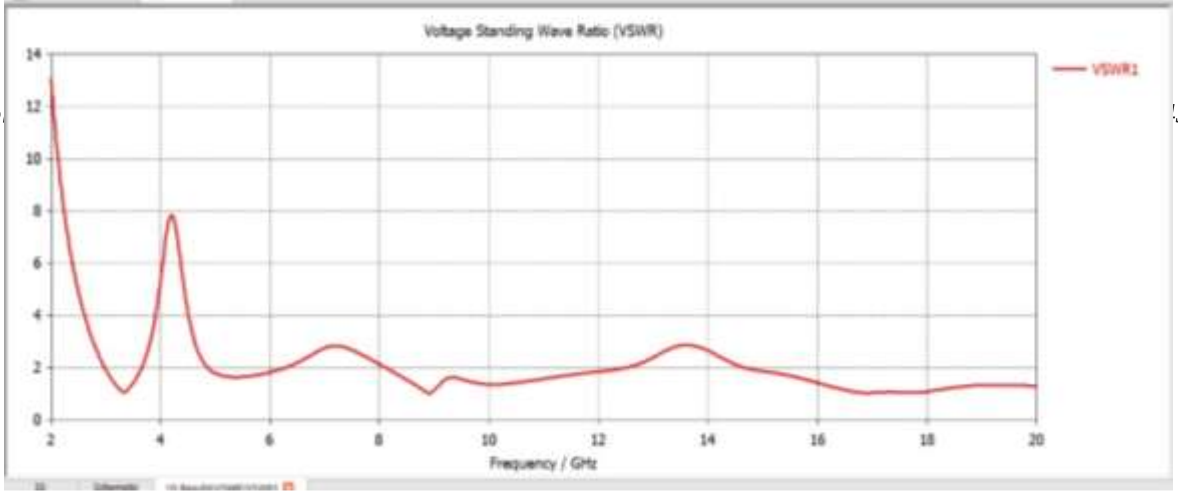
***S12** is the reverse voltage gain*

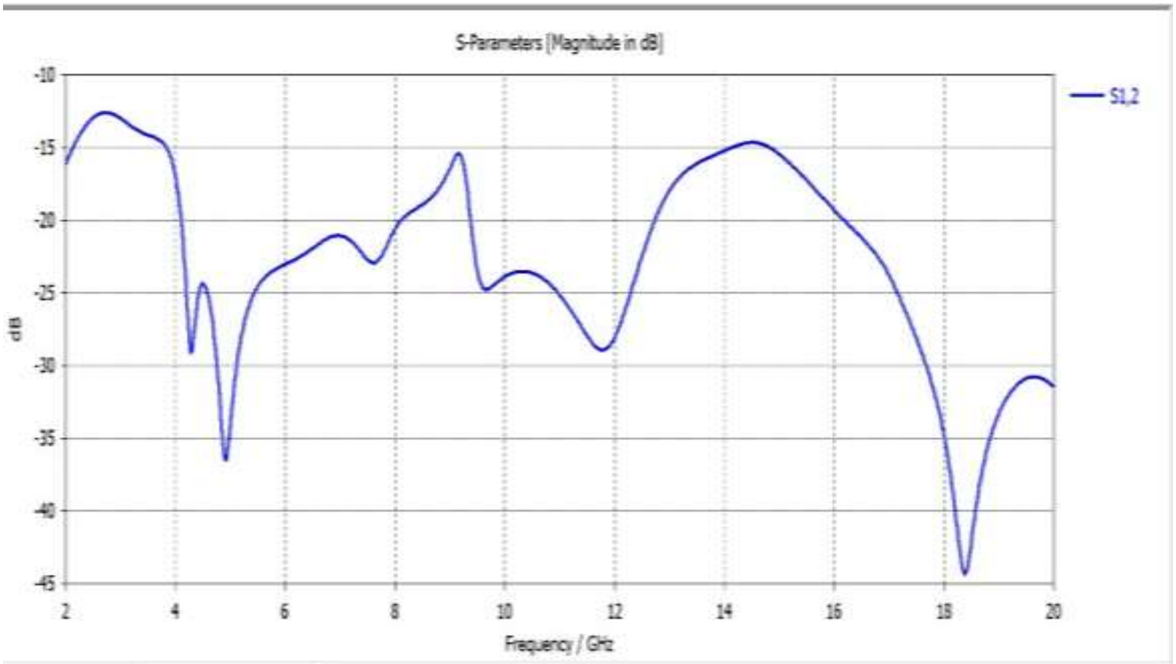
***S21** is the forward voltage gain*

***S22** is the output port voltage reflection coefficient*

The S-parameter matrix can be used to determine reflection coefficients and transmission gains from both sides of a two port network. This concept can further be used to determine s-parameters of a multi port network.

S21 :





VSWR :

VSWR stands for Voltage Standing Wave Ratio, and is also referred to as Standing Wave Ratio (SWR). VSWR is a function of the reflection coefficient, which describes the power reflected from the antenna. If the reflection coefficient is given by s11 or reflection coefficient or return loss, then the VSWR is defined by the following formula:

$$VSWR = \frac{1+|\Gamma|}{1-|\Gamma|}$$

The VSWR is always a real and positive number for antennas. The smaller the VSWR is, the better the antenna is matched to the transmission line and the more power is delivered to the antenna. The minimum VSWR is 1.0. In this case, no power is reflected from the antenna, which is ideal.

Often antennas must satisfy a bandwidth requirement that is given in terms of VSWR. For instance, an antenna might claim to operate from 100-200 MHz with VSWR<3. This implies that the VSWR is less than 3.0 over the specified frequency range.This VSWR specifications also imples that the reflection coefficient is less than 0.5 (i.e., reflection coefficient<0.5) over the quoted frequency range.

FAR-FIELDS

The field, which is far from the antenna, is called as far-field. It is also called as radiation field, as the radiation effect is high in this area. Many of the antenna parameters along with the antenna directivity and the radiation pattern of the antenna are considered in this region only.

The field distribution can be quantifying in terms of field intensity is referred to as field pattern. That means, the radiated power from the antenna when plotted, is expressed in terms of electric field, E (v/m). Hence, it is known as field pattern. If it is quantified in terms of power (W), then it is known as power pattern.

The graphical distribution of radiated field or power will be as a function of

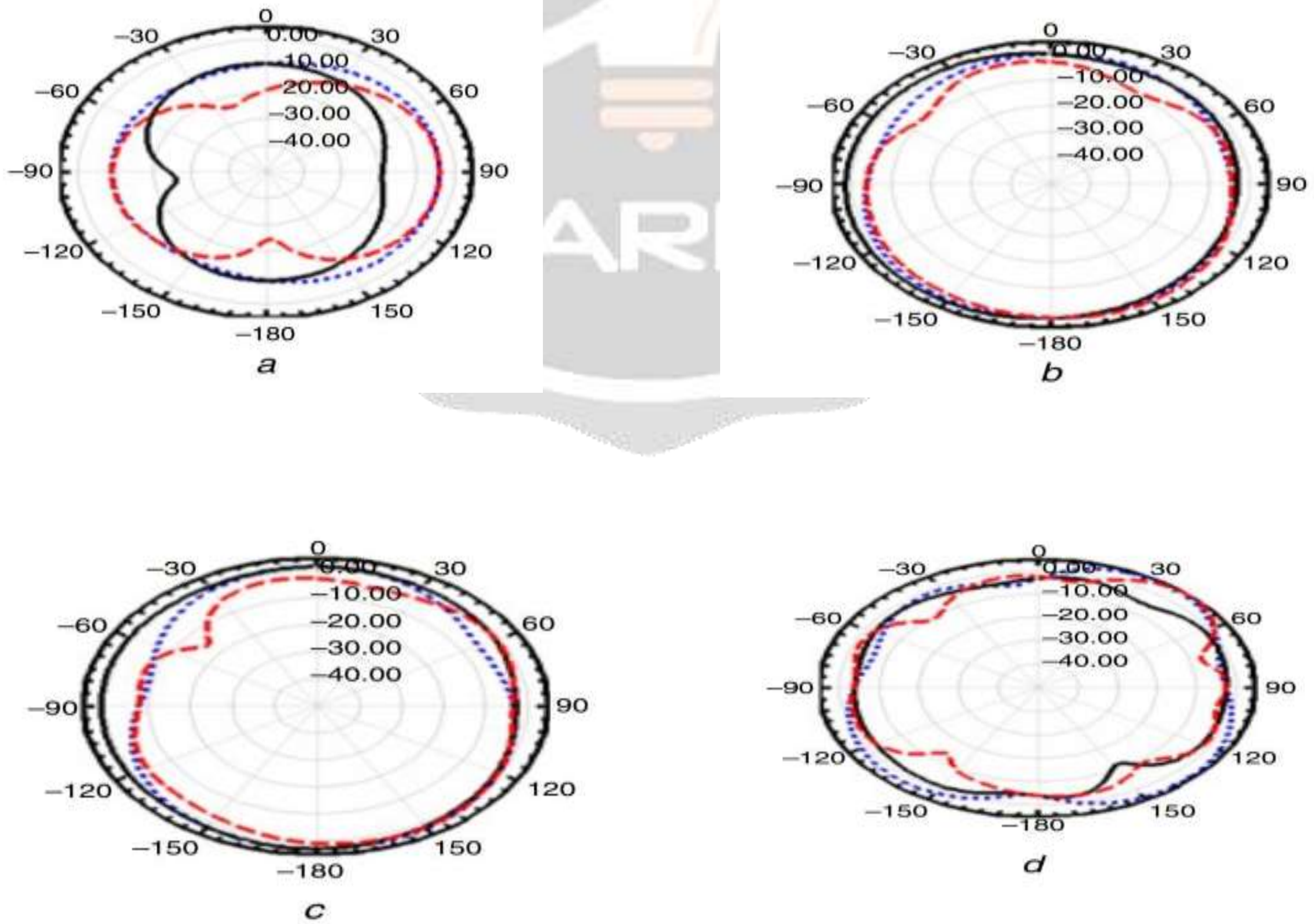
- *spatial angles (θ, Ø) for far-field.*
- *spatial angles (θ, Ø) and radial distance(r) for near-field.*

The field pattern can be classified as −

- *Reactive near-field region and Radiating near-field region – both termed as nearfield.*
- *Radiating far-field region – simply called as far-field.*

The field, which is very near to the antenna is reactive near field or non-radiative field where the radiation is not pre-dominant. The region next to it can be termed as radiating near field or Fresnel's field as the radiation predominates and the angular field distribution.

The region next to it is radiating far-field region. In this region, field distribution is independent of the distance from antenna. The effective radiation pattern is observed in this region.



a.4.1 GHZ

b.7.1 GHZ

c.10 GHZ

d.16 GHZ

***Conclusion**:*

We have proposed the multiple input and output antenna having the L strip for band notch characterstticts with good impedance bandwidth of around 16.9 GHz and resonant frequency at 8.4 GHz for Air traffic control with rigid structure of 648 mm2 with good isolation of -10 Db.

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