DESIGN OF MICRO STRIP ANTENNA USING META MATERIALS

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Abstract: Micro strip patch antenna is a low volume antenna; also it has low weight that means it is a low profile antenna. Meta material is an artificial material or it is also known as synthetic material made by humans. A Meta material does not exist in nature hence they are also called as artificial materials [1]. The properties of Meta materials are not defined by the material composition but the properties of these materials are defined by the structure which can be of different shapes like elliptical shape, rectangular shape, triangular shape, and circular or any perpetual shape. Engineers and researcher's can cull congruous the category of the meta-materials, for the categorical applications. MTMs presence has strongly encouraged the improvement in engineering and also in the electromagnetic theory. Meta materials (MTMs) are becoming more utilizable for low volume, low weight antennas, RF & Microwave bands. The structures can be used of any type of conductor i.e. Artificial Magnetic conductor, electromagnetic band gap, frequency selective surface. In this paper importance of the Meta materials (MTMs) in Micro strip patch antennas (MPAs) has been discussed and simulation results were observed. Meta material (MTM) antennas possess various applications and have wide scope in communication engineering and other fields**.**

IndexTerms **- Meta materials, patch antennas, Micro strip antenna, ANSYS, HFSS.**

I. INTRODUCTION

The eager to know or learn something new nature of humans has lead the way to research and innovation of the meta-materials with novel properties, even the properties not caused by God. With all this research the MTMs come into existence [1]. Over the years and decades lot of techniques have been advised and introduced in order to enrich the properties of patch antennas such as gain and return loss. According to the standard approach, the radiator is set on high dielectric substance and the size of antenna can be reduced [2]. But these standard approaches results in to some drawbacks. First problem is that when the permittivity of the medium is high, then the characteristic impedance is quite low which causes difficulties in the impedance matching and also in the high permittivity region due to which the electro motive force remains highly concentrated. So, the meta-materials is an elite research area and it strongly attracts the interest of the electronics engineer. Using meta-materials results into the enhancement in electromagnetic replication functions like high gain ,more efficiency, less loss and satisfy bandwidth requirement that offer elite possibilities of future design of scheme, component [3].

Problem Statement:

The many benefits of micro strip antennas are due to its low weight, low cost and small length, however also MPA's also have a few negative aspects like small gain , restricted band width which might be the 2 important factors. In this mission I've got mentioned approximately how it will increase the performance of the PA's through the use of Meta materials or how the parameters like gain & bandwidth may be improved.

Motivation:

Micro strip Patch Antennas (MPA's) are wide in use in today's technology because of its light weight, ease of manufacturing. It has some advantages and disadvantages. The first phase includes the GPS antenna simulation using ANSYS. For designing this Micro strip antenna is used. But it has disadvantages like low gain, low bandwidth etc., so it is required to improve these parameters. So by studying various literature and come up with a solution of using Meta materials for designing antenna [10]. Meta materials are not natural materials. They don't exist in nature. Hence by using MTM's we can enhance the parameters like gain and bandwidth of antenna. So we have selected our topic as Micro strip antenna simulation using Meta materials ANSYS.

The main objective of this work is micro strip antenna simulation using Meta materials using ANSYS and designing antenna using Meta materials. So by this design it can enhance the antenna parameters like gain, bandwidth etc. [4]. Here first a basic patch antenna is designed at an operating frequency of 2.4GHz and then compare these results with micro strip antenna design using Meta materials [11]. By trying different designs and come up a customized design which will be having better gain and bandwidth when compared with basic patch antenna.

Existing Method:

Micro strip patch antenna is most extensively used in present day technology, especially MPAs has many benefit in frequency variety of 1GHz to 6GHz. In 1953, Micro Strip Antenna (MSA) becomes proposed by way of Deschamps for the primary time. Micro strip antenna (MSAs) is likewise referred to as micro strip patch antenna (MPA) or genuinely it is known a

PA's. A MSA in its simplified shape consists of ground aircraft on one aspect of a material substrate and a radiating patch on the opposite side [6].

Proposed Method:

The benefit of patch antennas may be more desirable via the usage of Meta material as a cowl or substrate and also we will improve the bandwidth and directivity. Micro strip Antenna (MSA) has limited band width. This is the primary restricting component for extensive unfold software. Hence improving the bandwidth of Micro strip Antenna is a vital study nowadays. The peak of substrate is improved and dielectric constant is decreased and by way of the use of Meta material as a cowl we can also boom the bandwidth. Left Handed (LH) meta-material is used for growing directivity. When Left Handed meta-material is used as a slab it's going to start acting like a lens and it's going to consciousness the power. This radiant power is concentrated when poor permeability material (meta-material) reflecting floor is applied to the MPA then advantage increases about 6.91 dBi i.e., because the break up ring resonator(SRR) eliminates the substance surface wave and radiant power is then focused. So the primary problem in this sort of antennas is the floor of substrate wave which can be removed by using the usage of cut up ring resonator. The length of the Micro strip Patch Antennas (MPAs) may be decreased by using meta-materials. A Mushroom Structured Composite with Left Handed (LH) or Right Handed (RH) transmission line MTM is used then; a size of 61.12% may be decreased. Besides, a wideband spectrum also can be obtained by way of lowering the ground aircraft of the antenna. A meta-fabric shape is used for designed a compact Ultra Wide Band (UWB) antenna. More number of unit mobile layouts of meta-material structure is used for enhancement of the bandwidth of a single patch antenna [8].

Micro strip Patch Antenna:

In today's world of the wireless communication, low profile, light weight and low cost antennas are required. The MPAs (Micro strip Patch Antennas) are generally used because of its simple design, easy installation and different shapes. Also MPAs are similar with millimeter wave integrated circuit (MIMC) and microwave. The patch antennas consist of a dielectric substrate material which has floor plane on one side and radiating patch on the other side. This patch is made of the things like gold or copper and it rectify into any variety of shapes like, it can be a rectangular, circular, triangular, elliptical etc.

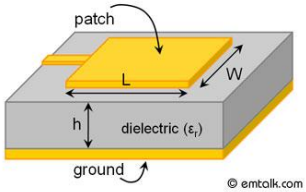

Fig 1: Micro strip Patch Antenna

In 1960, for the first time Deschamps, engleman, and Greig worked on Micro strip Patch Antenna. The layout of rectangular MPA is as shown in Fig.1.1. The micro strip patch antennas have some limitations like limited bandwidth, low gain and less power handling capability. There is the direct connection between all the parameters of antennas as if we try to advance the one parameter it affects the other one. Patch antennas have many applications like Global Positioning System (GPS), mobile systems, satellite communication, Wi-Fi, Wi Max, radar systems, biological imaging, and radio frequency identification [5].

Meta materials:

The word meta-material is derived from Greek words. It is combination of Meta and materials. Meta, it is a Greek word. It indicates something beyond, changed, modified or slightly advances. Meta materials are artificial materials with the uncommon or odd EM properties which do not exist in nature. Betokens Meta materials are the artificial structures designed to have properties not obtainable in nature. The natural materials have positive electrical permittivity, magnetic permeability and index of refraction whereas the meta materials have been termed as negative index material (NIM) / artificial material (AM) / double negative (DN) media material / left handed material (LHM) / backward wave (BW) media- All these parameters have negative values. With these MTMs new kind of microwave components or devices and minimized antennas can be created for wireless communication and also for defense industries. The Meta materials (MTMs) is theoretically first proposed by the Victor Veselago, Rusian physicist in 1968 [8].

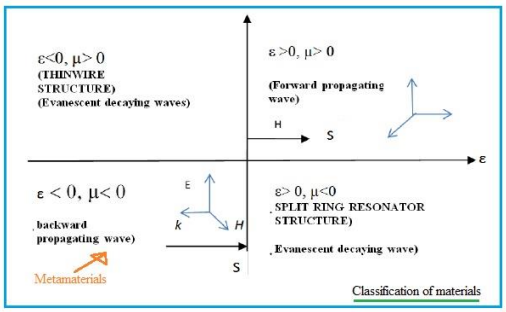

Fig 2: Classification of the Materials

The exposure of Meta materials in antenna theory designing is described as: In regular materials, the properties are derived from the constitute atoms of materials and are distinguished by the chemical structure and atomic structures of the matter but in Meta materials, the properties are derived from the constitute unit cell. Materials are put down on the sub-structure of the

permeability & permittivity. Depending on the values μ (permeability) and ε (permittivity), to which quadrant the material belongs is decided. If Meta materials have real part of (μ) then it belongs to third quadrant.

II. LITERATURE REVIEW

The literature for improving the bandwidth of antenna by design parameters like negative value of μ and ε of SRRs, CRLH and of planar antennas which are used in wireless applications and mobile applications is presented. The selection of substrate and feeding technique suiting the mobile handset designs are explored. Different approaches of fabricating the Meta material implementations are described. PCB antennas details of the design, fabrication, and possible modifications are discussed.

The review of various research papers work related to Basic planar/flat profile Micro strip patch antenna, conformal antenna and its types which is based on wavelength, shape, parameters and applications.

- Based on wavelength short circuit (Quarter wavelength) and open circuit (half wavelength)
- Based on shape and structure like Rectangle, Square, Folded, triangular, Inverted, Circular etc.,
- Based on antenna parameters like Gain, Bandwidth, Frequency, Directivity, Polarization, Beam width etc.,
- Based on the applications like transmitter, receiver, conformal etc.

The literature review is a systematic approach for the survey of MSA, slotted MSA, wide bandwidth and miniaturization MSA, Conformal MSA and array are studied and discussed. In Conformal antenna, review has been done specially for cylindrical surface. The main sources of information for the dissertation are books, journals, dissertations and related material available on the internet. The chapter starts with the discussion of initial stage designing of different types of micro strip antennas are proposed by the different researchers. It is major to have a intense understanding on the existing work regarding micro strip patch antenna (MPA) and conformal antenna. The important sources of our information regarding our research are books, journals and the internet. The different paper related to the micro strip patch antenna, conformal antenna and array antenna are studied and discussed here. In order to start our research work we need to go through the research paper which is already published by other researchers [9].

III. ANTENNAS

Antenna or Radiator:

An antenna is basically a metallic device or structure which converts electrical signals into electromagnetic signals or vice-versa (like transducer).An antenna radiates / couples / concentrates electromagnetic energy in the desired direction. In general, an antenna is a method for radiating or receiving radio waves [12].

Antenna acts as a transducer (i.e., converting electrical energy into electromagnetic energy and vice versa). It may be used as an impedance matching device (i.e., it couples or matches the transmitter and loose space on transmitting facet and matches/couples loose area and the receiver at the receiver aspect). It can be used as temperature sensor. It is used to detect the presence of EM waves. It directs radiated energy in desired direction and suppresses in unwanted directions. Antennas are selected based on their electrical or mechanical properties.

The important characteristics of an antenna may include, Radiation Pattern, Beam Solid Angle, Directivity, Gain, Input impedance, Polarization, Bandwidth, Efficiency, Effective aperture, Beam width, Effective Length, etc,.

Radiation pattern:

Radiation Pattern is defined as a three dimensional vector field which gives the pattern or the direction in which antenna radiates. It is of 2 types: Field Pattern and Power Pattern.

Field pattern:

If RP is measured in terms of field intensity, then it is known as Field Pattern.

Power pattern: If RP is measured in terms of power, such pattern is known as Power Pattern. Radiation Pattern is basically a function of (r, θ, Φ) i.e., (radial distance, spatial angle and phase angle) in the near field region.

Where r - radius
θ - elevation angle
Φ - azimuthal angle

But in the far field region it becomes a function of only (θ, Φ) i.e., spatial angle and phase angle.

Field intensity - E ~ θ, Φ - Far Fied.
- E ~ θ, Φ, r - Near Field.

Power - P ~ θ, Φ - Far Fied.
- P ~ θ, Φ, r - Near Field.

The graph obtained after plotting power or intensity is called radiation pattern.

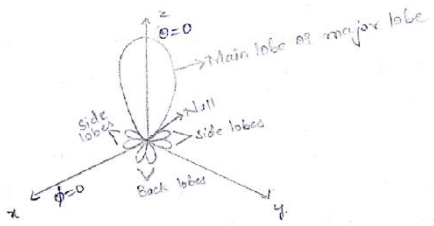

Fig 3: Radiation Pattern

Normalized filed pattern or power pattern is a dimensionless number obtained by dividing field pattern or power pattern by its maximum value.

Radiation pattern has different parts. They are called as lobes. These are classified as major lobe, minor lobe (side lobes or back lobes).

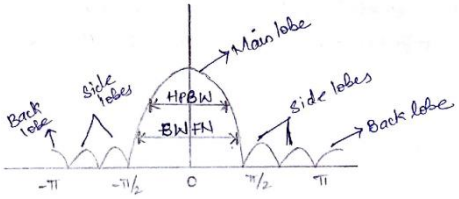

Fig 4: Linear plot of power patterns

Principal patterns:

The performance of an antenna is measured in terms of its principal E plane and H plane patterns.

E - Plane pattern: For any linearly polarized antenna, the plane which contains "electric field vector" in the direction of highest radiation is called E-Plane pattern.

H - Plane pattern: For any linearly polarized antenna, the plane which contains "magnetic field vector" in the direction of highest radiation is called H-Plane pattern.

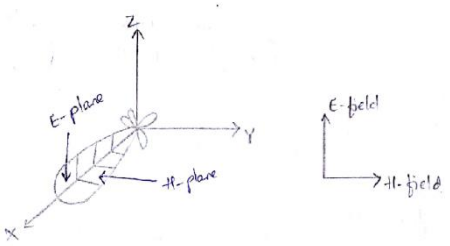

Fig 5: E-plane and H-plane patterns.

Isotropic or Omni-directional Radiator:

An antenna which radiates uniformly in all directions is called Isotropic or Omni-Directional antenna. It is a hypothetical antenna which is assumed to be lossless. For an isotropic radiator placed at the centre of sphere radius 'r', the total power radiated can be given as

W = P * 4*pi* (r^2)

Here, P - Radial poynting vector.

Half Wave Dipole:

A dipole whose length is equal to half of the wavelength is called half wave dipole. It is a metal rod or tubing or thin wire. A half wave dipole antenna is also called Hertz antenna. It is a symmetrical antenna in which two ends are at equal potentials relative to mid point. A Half Wave Dipole has sinusoidal distribution of current. The point at which dipole is fed (i.e., at z=0) is said to have maximum current where as the ends of dipole are said to have minimum current equal to zero (at z=+h and z=-h).

Monopole or Quarter Wave Antenna:

Monopole means single pole. It also called a Quarter Wave Monopole because its length is equal to one fourth of the wavelength of antenna. This antenna is basically a metallic rod or wire placed over ground. The input is fed to one end (not center fed) of antenna which is near to the conducting plane on ground. It is also called "Marconin antenna". The monopole antenna radiates only in the hemi sphere above the ground, hence its power radiated is half of that of dipole, but directivity is twice.

Antenna Arrays:

Antenna arrays can be defined as "a system of similar antennas oriented similarly to get greater directivity in a desired direction".

Need: Arrays are used to increase gain and directivity and to reduce beam width. Antenna array is one of the common methods of combining radiations from a group of antennas.

Array Design Variables:

Array shape, Element spacing, Element excitation amplitude, Element excitation phase, Patterns of array elements are the various array design variables [12].

IV. ANTENNA TYPES

The antenna types that are differentiated depending on the purpose, specifications and particular common operating principles. The resonating antennas consisting of two pole, single pole, large loop and array antenna kinds below type feature as resonant radiators in those resonating antennas the waves of cutting-edge and voltage that jump forth and back among the ends, developing status waves alongside the factors. They can be non-resonant or resonant. The non-resonating types are the travelling wave antennas, the voltage and current waves travel in one path along the radiator elements.

A. Isotropic:

It is a hypothetical radiator that radiates same signal power in all instructions, regularly in comparison to an incandescent mild bulb. In this isotropic antenna a mathematical version is used because the ground of comparison to calculate the advantage or directionality of real radiators.

It looks as if "isotropic antenna" and "Omni-directional antenna" are the equal however, the previous radiates equal energy in all three dimensions, at the same time as the second radiates identical strength in all parallel guidelines, and the strength radiated by means of the antenna changes with elevation attitude, reducing to zero on the antenna axes.

We can design many isotropic antennas using more than one small element, also they are used as reference radiators for testing different antennas and for area strength calculations, and these also are used on satellites which paintings without the satellite being orientated toward a conversation station as backup antennas.

B. Dipole:

It is the commonplace antenna where a huge class of radiatos is based totally. General dipole antenna may be designed the use of conductors generally wires or steel rods arranged similarly, with one aspect of the constant feeding line from the transmitter or receiver connected to each other. In dipole, half-wave dipole is the common antenna which includes two resonant factors just under 1 / 4 wavelength lengthy.

C. Monopole:

It is designed with a single conductor such as a metal, usually arranged on the ground or a non-existing conducting surface known as ground plane. In this monopole antenna feeding from one side of Receiver or Transmitter is connected with conductor, and the another side is to the non existing or artificial ground plane. In this monopole antenna the reflected EM waves from the artificial base plane seem to come from an opposite antenna under the ground, with the single pole and its image making a dipole, so this antenna has a radiation pattern similar to dipole antenna which is same as the pattern of dipole antenna of top half.

D. Array:

Array antennas can be defined as a couple of antennas running as a single antenna. Broadside arrays: These arrays of antennas include more than one identical driven factor, commonly two poles, fed in inclination, radiating a beam vertical to an antenna aircraft. Parasitic arrays: These arrays of antennas have multiple radiators, normally two poles, with one pushed element and other relaxation parasitic factors, which radiates beam alongside the road of the radiators.

E. Loop:

Another type of antennas is Loop antenna. These antennas look like a coil since they are made by looping a cord ot any coil. These antennas interrelate without delay from the electromagnetic component of the wave in the radio spectrum, as opposed to its field powered by electric component, making this category of antennas surprisingly unsusceptible to electrical noise within approximately 1 /4-wavelength of the antenna. Loop antennas may be categorized into: small loops and the opposite huge loops (or full-wave loops).

F. Aperture:

In directional radiators aperture antennas are the principle kind and are selected at microwave frequencies and high frequencies. These antennas contain a small dipole radiator internal a 3-D guiding shape more compared to a wavelength, with in the space to emit the EM waves. They may be used at higher frequency variety by means of changing or tuning the source or feed antenna because the antenna shape itself is non resonant.

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G. Micro strip antenna:

A micro strip antenna additionally called a published antenna normally means an antenna fabricated the use of micro strip techniques on a printed circuit board (PCB) in telecommunication. It is like having an Internal Antenna. These micro strip antennas are in general used at microwave frequencies. The basic micro strip antenna includes a patch of steel foil of diverse shapes a patch antenna at the floor of a PCB (revealed circuit board), on the other facet with a metal foil floor aircraft of the

board. Many of the micro strip antennas include more than one piece in a dimensional array. The radiator is commonly related to the Transmitter or Receiver via opposing micro strip transmission strains. In receiving radiators the received information is produced with the aid of making use of radio frequency modern between ground plane and an antenna. The cause MS antennas have grown to be very used in latest many years is because of their skinny plane profile. It can be integrated into the outside of customer products, missiles and aircraft; because it is straight forward to fabricate the usage of printed circuit strategies; smooth to combine the antenna at the equal board with the rest of the circuit, and the possibility of adding active gadgets to make an active antenna like microwave integrated circuits to the antenna

H. Patch Antenna:

It is the most not unusual type of ms antenna. It is also available to design antennas and the use of conductors as natural elements in an array are also possible. The fabrication of narrowband, huge-beam antenna is finished via blocking the radiator detail pattern in steel hint connected to an insulator or dielectric material, together with a PCB, and bureaucracy a ground plane by uninterrupted steel layer connected to an alternative aspect of the material. Micro strip antenna has many shapes and the commonplace are square, square, round and elliptical, but any non-stop form is feasible. In a few designs of patch antennas instead of dielectric substrate they're made from a steel conductor arranged above a floor aircraft using dielectric spacing, which results a design that is much less rough however much broader range of frequencies has. These radiators have a totally low weight, are automatically rough and can be structured to conform to the curve pores and skin of a automobile, and these antennas are regularly placed at the outdoors of spacecraft and aircraft, are included into mobile radio communication devices. PA can be used in telecommunication.

I. Rectangular Patch:

A square patch/conductor which seems like a slotted micro strip Transmission Line is known as micro strip antenna. It is approximately of 1-1/2 wavelength long is the maximum generally employed antenna. The duration of the antenna decreases because the relative dielectric consistent of the substrate increases, because the antenna is loaded with a dielectric as its substrate. The prolonged electric power results in the growth of "fringing fields" which grow the electric length of the radiator slightly, the resonant length of the antenna is slightly shorter.

J. Specifications:

The affect of dielectric loading on micro strip antenna is on each its radiation sample and impedance bandwidth. The antenna bandwidth decreases, because the dielectric steady of the substrate will increase which will increase the Q factor of the radiator and hence reduces the impedance bandwidth. As introduced by using Lotel in late 1970's this dating did now not immediately observe while the use of the TL version of the radiator, however is plain whilst using the hollow model. It is thought that the emission from a square MSA may be recognized as a pair of identical slots. The pair of identical slots will behave as an array and feature the maximum directivity while the radiator has an air insulator and reduces because the radiator is loaded through material with growing relative insulator steady.

The effect on of dielectric loading on micro strip antenna is on each its radiation pattern and impedance bandwidth. The antenna bandwidth decreases, because the dielectric steady of the substrate will boom in an effort to growth the Q factor of the antenna and consequently decreases the impedance bandwidth. As added via the usage of Lotel in late 1970's this dating did now not immediately take a look at while using the TL model of the radiator, but is visible while the use of the hollow version . It is thought that the radiation from a square micro strip antenna may be understood as a pair of equal slots. Equal slot pair acts as an array and feature the maximum directivity at the same time as the radiator has an air material and decreases due to the fact the radiator is loaded through cloth with growing respective dielectric consistent.

V. ANSYS HFSS

ANSYS is a 3D EM simulation software used to design and simulation of EM waves for products such as antenna arrays, high-speed interconnects, connectors, filters, IC packages and PCBs. ANSYS HFSS is used in radar systems, advanced driver assistance systems (ADAS), internet-of-things (IoT), satellites, communication system products and other high-speed RF and digital devices to design the high-frequency with high-speed simulations.

HFSS (High Frequency Structure Simulator) employs versatile solvers and an intuitive GUI to give you unparalleled performance plus deep insight into all your 3D EM problems. HFSS provides a powerful and complete multi physics analysis of electronic products, ensuring their thermal and structural reliability through integration with ANSYS thermal, structural and fluid dynamics tools. ANSYS HFSS is EM tool for R&D and for virtual design prototyping. Design cycle time is reduced by it and product's reliability is boosted and performance is improved beating the competition and capture your market with ANSYS HFSS.

A. Software:

The software used in this paper is ANSYS. It was developed to make detailed analysis and also to look into the finer parts in such studies for all engineering requirements. ANSYS short for Analytical System is used to model and to calculate different parameters of any engineering components be it electrical, mechanical, civil, electronic etc. These parameters might be durability, ruggedness, pliability, temperature variation, electromagnetism, and fluid drift for the computer model systems, electronics or device element. How a product will characteristic with one of a kind specifications is determined with the aid of ANSYS, bypassing any development of experiments or accomplishing accident tests. Like, ANSYS programs can predict what a flyover will keep up following quite a large time period of visitors, and on where to quality operation tincture in a canary to lessen debris, or a way to lay out a glide which makes use of less fabric without protection sacrificial.

Most ANSYS simulations use the ANSYS Workbench software program for overall performance, which is one of the employer's major products. Larger systems are damaged down to small additives by way of ANSYS customers that are every modeled and examined individually. A user starts often evolved by using defining the scale of an item, after which adding weight, stress, temperature and different physical houses. Finally, the ANSYS software program simulates and analyzes movement, fractures, fluid waft, temperature distribution, fatigue, electromagnetic performance and different impact over the years. Software for facts control and backup, educational studies and coaching also are evolved by means of ANSYS. It is offered on an annual subscription basis.

B. ANSYS HFSS features:

EM Solver Technologies, HFSS Interface, Circuit Simulation Extensions, Advanced Finite Antenna Array Simulation, Automatic Adaptive Meshing, Mesh Element Technologies, High-Performance Computing, and Advanced Broadband SPICE Model Generation.

C. Advantages:

- All sorts of CAD geometries (i.E.,3D and 2D) from extraordinary CAD software program's can be imported via ANSYS and may perform simulations, and additionally it has the functionality of making one effortlessly. ANSYS has inbuilt CAD developing software's like Design Modeler and Space Claim which makes the paintings glide even smoother.
- ANSYS can as it should be carry out the advanced engineering simulations and sensible in nature through its touch set of rules versions, time dependent simulations and materials of non linear models.
- ANSYS will combine diverse physics and make it into one platform and performs the analysis.
- ANSYS has developed a product called ANSYS AIM, which is able to perform multi physical simulation.
- ANSYS has its own customization tool called ACT which uses python as a background scripting language and used in creating customized user required features in it.
- ANSYS has the ability to make effective use of various features like the geometrical design, boundary conditions and analyze the products behavior under various conditions.

VI SIMULATION RESULTS AND DISCUSSIONS

i. Basic Patch Antenna Results:

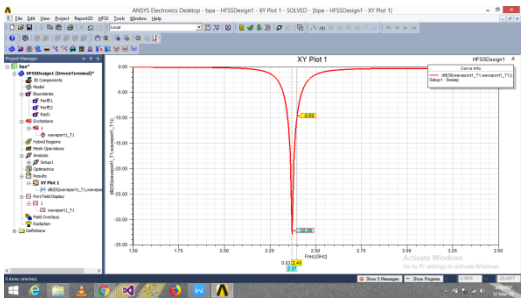


Fig 6: Rectangular Plot.

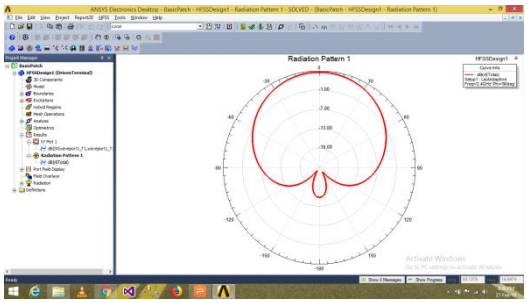
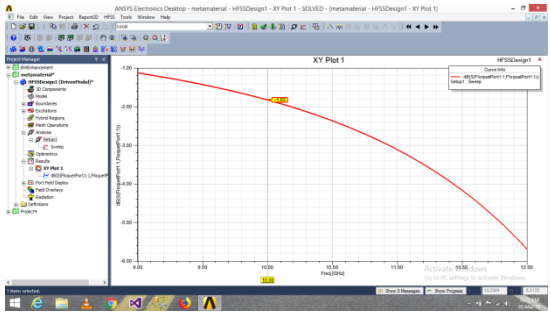


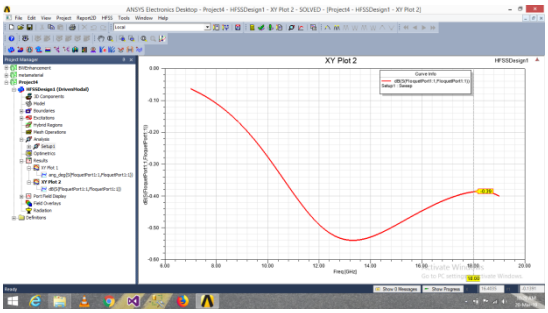
Fig 7: Radiation Pattern.

Discussion: For a basic patch antenna we can see that the return 32dB. It can be seen that the radiation pattern has one main lobe and one minor lobe. The gain of a basic MPA is less. Also the bandwidth is limited.

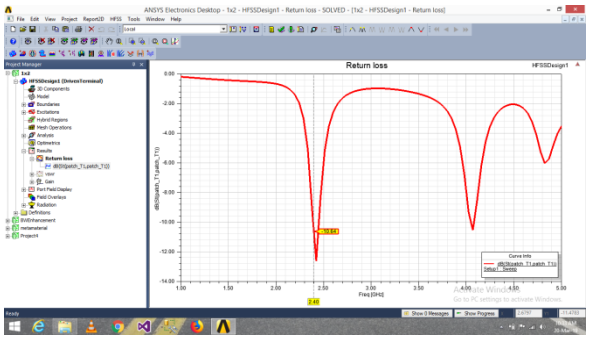
ii. Different Design Results:



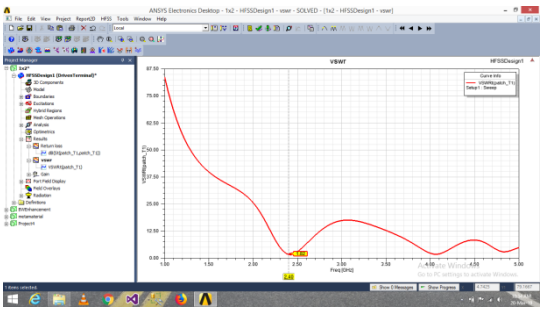
Here from the above figure we can see that the reflection co efficient of a meta material micro strip antenna is 1.83. Also we have seen the parameters for different designs. In below figure reflection coefficient is 0.39. When compared with above result reflection coefficient has reduced.



Below figure shows result of a circular patch. In the below figure we can see the return loss as 10.64dB at 2.4GHz.



Similarly at 2.4GHz we have reflection coefficient as 1.82 .



The results of basic micro strip antenna and Meta material antenna are given in the table below and compared.

Table: Comparison between Basic MPA and MMP antennas

Parameters	**Basic micro strip patch antenna**	**Meta material loaded micro strip patch antenna**	**Comparison (%)**
Operating freq. (GHz)	2.4	2.4	47.54%
Peak Gain	0.46	0.0139	96.97%
Peak Directivity	1.22	0.0169	98.61%
Radiated Power (mW)	80	695.78	88.50%
Radiation Efficiency	0.37	0.82	45.173%
Return Loss	-32.42	-23.12	40.23%
Bandwidth	0.09	1.02	91.18%
VSWR	1.91	1.150	39.79%

VII. CONCLUSION

Micro strip Antenna (MSA) is probably a maximum unconventional subject in a theory of the study of antenna and also in development and creation. In this global age as of now, Micro strip Patch Antenna (MPA) bring many blessings. Quite a few examine goes on to enhance and develop the strength and the information measure of patch antennas. Present answers contribute the troubles of faux transmission and excessive intricacies. These studies did give rise to a brand new answer referred to as higher order materials. MTMs perform a crucial role in the satellite dish layout due to its exciting and wonderful homes. The parameters may be enhanced through the usage of MTMs in patched satellite dish micro strips. A MTM transmission dish design construct by doping the (MTM) framework over the base substance. There are distinct kinds of MTM base materials. Output by input of a patch antenna will increase by way of a value of 1.5dB to 7dB with the supplementation of Meta material systems. Reduction is the first characteristic of Meta material. In all of the designs and simulation results stated here suggests that using Meta materials will approximately results in 50% depletion inside the area of an antenna. Limited bandwidth and gain is the main disadvantage of micro strip patch antenna. Using Meta material we can overcome these problems.

VIII. FUTURE SCOPE

By using Meta materials the parameters like Gain, Bandwidth, Return Loss, Directivity, Reflection Co-efficient, VSWR etc., can be improved. Hence meta materials plays an important role in future designs of antenna for different applications like in cellular communication, satellite communication etc., We don't have perfect designs for meta materials design. We perform trial and error method for improving the parameters of antenna. Hence we don't get a customized and desired design with better gain, bandwidth etc, and so many designs has to designed and simulated. Hence, algorithms need to be developed for auto design of antenna depending on the desired parameters values. Developing these algorithms will be complicate but once developed they can used for various with less time and high accuracy of results.

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