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Research Paper

Design of Optimized Frequency Tunable Micro Strip Patch Antenna

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Abstract *The Sophisticated wireless communications system requires larger bandwidth, huge gain and nominal size micro strip patch that is able to provide more desirable achievement done with board area of spectrum. In this method nominate the architecture of micro strip antennas under the corporate feed techniques and series feed techniques for excitation and match the results with series feed and corporate feed technique. Dielectric constant for substrates should be low because of maximum radiation. This micro strip patch array antenna is designed initially by utilizing high frequency structure simulator(HFSS). Patch length and width are determined by utilizing relative permittivity of substrate is 2.2andsubstrate height (h=1.588mm) and centre frequency specification are impedance, return loss and gain are calculated by using HFSS. The micro strip patch has been intended from 9 to11 GHz.*

Key Words: *microstrip antenna, corporate feeding, series feeding, HFSS*

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I. INTRODUCTION

In telecommunication, a microstrip antenna (also known as a printed antenna) usually means an antenna fabricated using photolithographic techniques on a printed circuit board (PCB). It is a kind of internal antenna. They are mostly used at microwave frequencies. An individual microstrip antenna consists of a patch of metal foil of various shapes (a patch antenna) on the surface of a PCB (printed circuit board), with a metal foil ground plane on the other side of the board. Most microstrip antennas consist of multiple patches in a two-dimensional array. The antenna is usually connected to the transmitter or receiver through foil microstrip transmission lines. The radio frequency current is applied (or in receiving antennas the received signal is produced) between the antenna and ground plane. Microstrip antennas have become very popular in recent decades due to their thin planar profile which can be incorporated into the surfaces of consumer products, aircraft and missiles; their ease of fabrication using printed circuit techniques; the ease of integrating the antenna on the same board with the rest of the circuit, and the possibility of adding active devices such as microwave integrated circuits to the antenna itself to make active antennas Patch antenna

A microstrip antenna array for a satellite television receiver. The most common type of microstrip antenna is commonly known as patch antenna. Antennas using patches as constitutive elements in an array are also possible. A patch antenna is a narrowband, wide-beam antenna fabricated by etching the antenna element pattern in metal trace bonded to an insulating dielectric substrate, such as a printed circuit board, with a continuous metal layer bonded to the opposite side of the substrate which forms a ground plane. Common microstrip antenna shapes are square, rectangular, circular and elliptical, but any continuous shape is possible. Some patch antennas do not use a dielectric substrate and instead are made of a metal patch mounted above a ground plane using dielectric spacers; the resulting structure is less rugged but has a wider bandwidth. Because such antennas have a very low profile, are mechanically rugged and can be shaped to conform to the curving skin of a vehicle, they are often mounted on the exterior of aircraft and spacecraft, or are incorporated into mobile radio communications devices.

II. EXISTING SYSTEM

The antenna system used for any radio communication platform is one of the critical and least understood parts of the system. The antenna system is the interface between the radio system and the external environment. Wireless communication systems require antennas at the transmitter and receiver to operate

properly. The design and deployment of antennas can make or break a wireless system, and many poorly performing systems can be traced to improperly installed or placed antennas .
In this system we are going to construct an antenna which is designed using corporate feeding technique which is best suitable for low return loss and high gain compared to other techniques like series feeding technique and microstrip line feeding technique.

In corporate feeding technique patches are placed parallel to each other and feeding is given individually where as in series feeding technique feeding is given serially on patch after the other hence, corporate feeding technique is more efficient than series feeding technique.

III. PROPOSED SYSTEM

The Micro strip Patch Antenna is a single-layer design which consists generally of four parts (patch, ground plane, substrate, and the feeding part). Patch antenna can be classified as single – element resonant antenna. Once the frequency is given, everything (such as radiation pattern input impedance, etc.) is fixed.

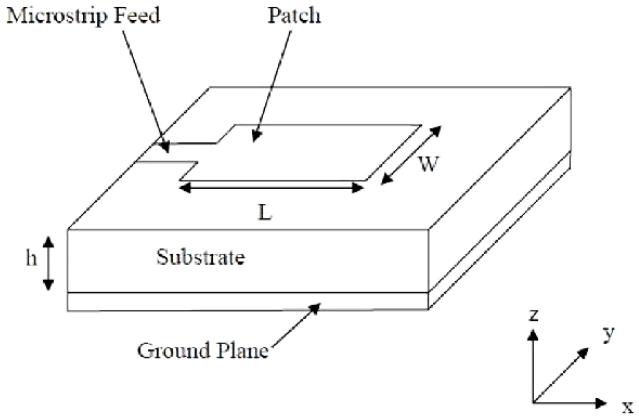


Fig : block diagram of microstrip patch antenna

SUBSTARTE :

Different dielectric substrate frequently used in microstrip patch antenna to enhance overall efficiency of antenna. Various substrates like foam, duroid, benzocyclobutane, roger 4350, epoxy, FR4, Duroid 6010 are in use to achieve better gain and bandwidth. A dielectric substrate is a insulator which is a main constituent of the microstrip structure, where a thicker substrate is considered because it has direct proportionality with bandwidth whereas dielectric constant is inversely proportional to bandwidth as lower the relative permittivity better the fringing is achieved. Another factor that impact directly is loss tangent it shows inverse relation with efficiency the dilemma is here is that substrate with lower loss tangent is costlier. A clear pros and cons are discussed here of different substrates for judicious selection. A substrate gives mechanical strength to the antenna.

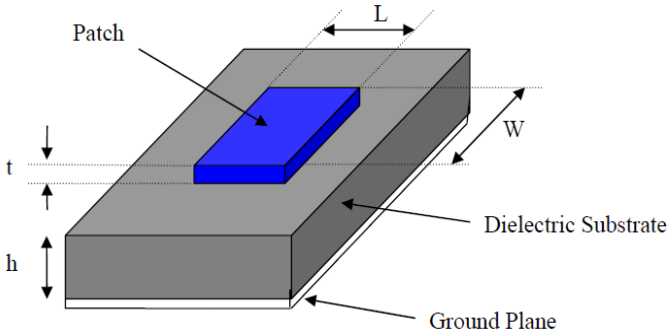


Fig : substrate of an antenna

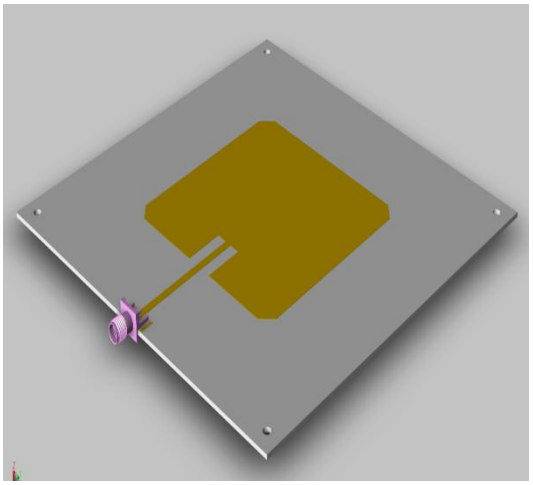
***GROUND PLANE*:**

An antenna ground plane is not to be confused with an electrical ground. A typical mobile CB antenna does not transmit horizontally, it radiates in a downward pattern. A metal surface (the larger and flatter, the better) is required underneath the CB antenna to launch the signal out into the atmosphere. Without an adequate ground plane surface, the signal will not travel out into the atmosphere which results in limited transmission range. Damage to your CB radio may also occur if you do not have a proper ground plane because

this generally causes a high SWR and the signal may back feed into the transceiver, causing internal harm to your radio.

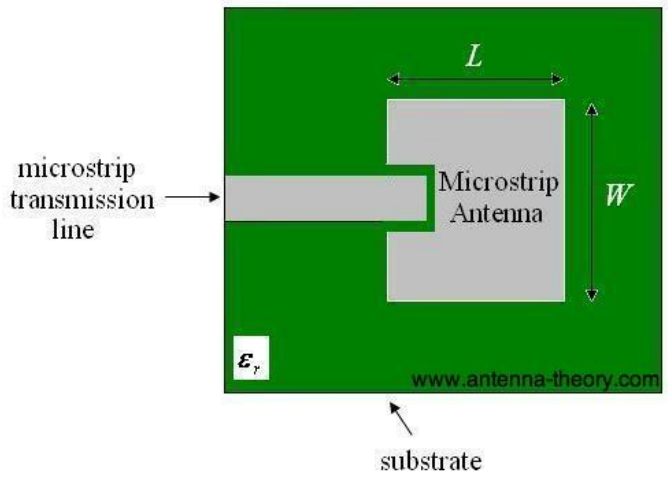
PATCH:

A metal patch mounted at a ground level with a di-electric material in-between constitutes a Micro strip or Patch Antenna. These are very low size antennas having low radiation. Micro strip antenna consists of a very thin metallic strip placed on a ground plane with a di-electric material in-between. The radiating element and feed lines are placed by the process of photo-etching on the di-electric material. Usually, the patch or micro-strip is choosen to be square, circular or rectangular in shape for the ease of analysis and fabrication.



FEED LINES:

The rectangle, the circle, the equi triangle and the annular-ring are common shapes. Four feeding methods are shown in figure. They are: coaxial probe feed, microstrip line feed, aperture-coupled feed and proximity feed. Electromagnetic energy is first guided or coupled to the region under the patch, which acts like a resonant cavity with open circuits on the sides. Some of the energy leaks out of the cavity and radiates into space, resulting in an antenna.



Corporate feeding technique:

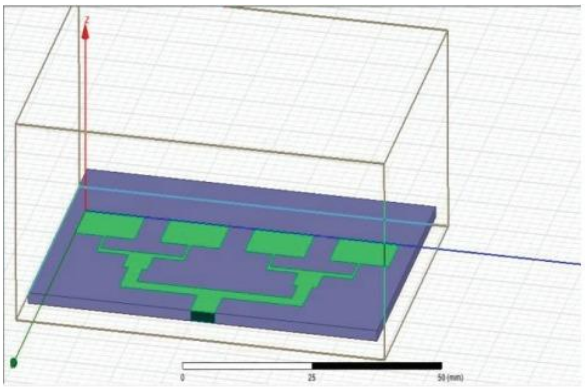


Fig. 6. Microstrip Array Antenna Using Corporate Feed

In this technique all the patches are fed separately and At a time . hence gain is high in this method compared to other methods.

Series feeding technique :

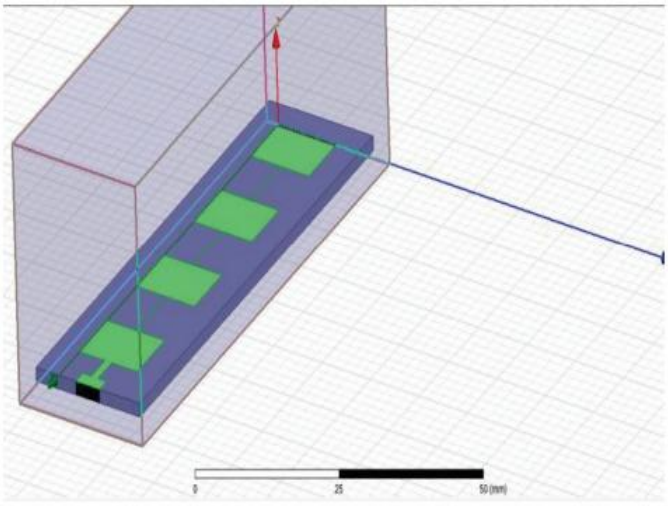


Fig. 5. Microstrip Array Antenna Using Series Feed Technique

In this method feeding of every patch is done one after the other . hence it takes lot of time for every patch to be fed. It is low efficient compared to corporate feeding technique.

EXPECTED OUTPUT :

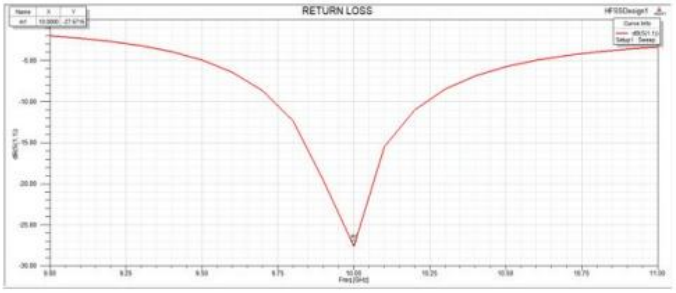


Fig. 13. Return Loss Graph For Microstrip Patch Antenna

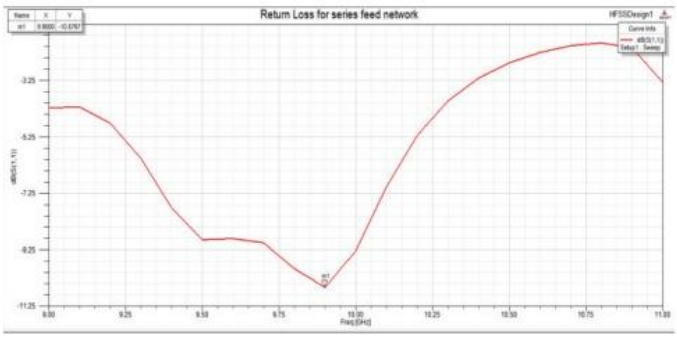


Fig. 14. Return Loss Graph For Series Feed Network

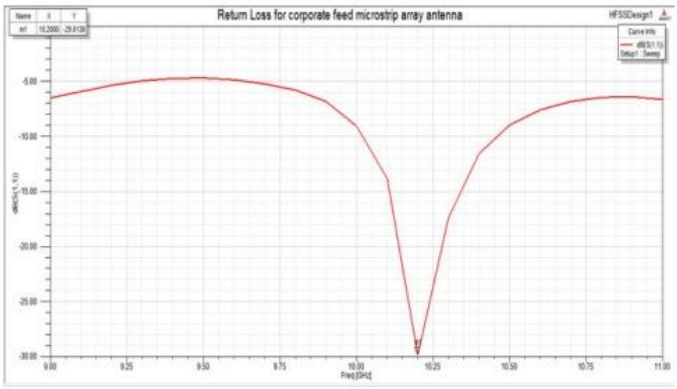


Fig. 15. Return Loss Graph For Corporate Feed Network

FUTURE SCOPE :

➢ In future large dish operating as above said frequency may get replaced by a small patch antenna . Method To do this single patch design will not be helpful. Instead of this, of patches will be required. That can be of linear type or rectangular type. The best optimum design is to be selected. First a single antenna was prepared and optimized for the highest possible gain and resonating at desired frequency.

IV. CONCLUSION :

• The project has proposes to the design of single microstrip patch antennas, microstrip patch array antennas utilizing series feed techniques and corporate feed techniques is proposed. This design has been elated using HFSS and getting very high gain and good VSWR and great return loss.

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