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A Review on Slot Loaded Micro strip Patch Antenna for Wireless Communication Applications

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***Abstract*— In this fast changing world in remote correspondence, double or multiband receiving wire has been assuming a key part for wireless service requirements. Wireless Local Area Network (WLAN) and Worldwide Interoperability for Microwave Access (WiMAX) has been broadly connected in cell phones, for example, handheld computers and smartphones. These two methods have been generally considered as a practical, adaptable, solid and high speed information network arrangement, empowering client versatility. This paper introduces a writing overview of double band rectangular patch reception apparatus for WLAN and WiMAX application with variety of substrate, feed strategies and spaces. According to the context of this paper, discuss the basics of microstrip antenna, various feeding techniques, design model and antenna parameters with their merits and demerits.**

***Keywords*— Microstrip Patch Antenna (MPA), Microstrip feed, Patch, Printed Antenna.**

INTRODUCTION

Antenna is one of the critical components in any wireless communication system. The word 'antenna' is derived from Latin word 'antenna.' Since the first demonstration of wireless technology by Heinrich Hertz and its first application in practical radio communication by Guglielmo Marconi, the antenna has been a key building block in the construction of every wireless communication system. IEEE defines an antenna as "a part of a transmitting or receiving system that is designed to radiate or receive electromagnetic waves." Antennae could be broadly classified as wire antennae, aperture antennae, printed antennae, array antennae, reflector antennae and lens antennae.

A. Wire Antenna

This is the basic type of an antenna, widely used on top of the buildings, automobiles, ships and spacecrafts. These antennae are made into different shapes such as a straight wire (dipole), loop and helix.

B. Aperture Antenna

These antennae are in the form of a slot or aperture in a metal plate and commonly used at higher frequencies (3-30 GHz). Typical examples are slotted waveguide antennae and horn antennae. These antennae are very useful for aircraft and spacecraft applications, because they can be conveniently flush mounted on the surface of the aircraft or spacecraft. In practice, these antennae are covered with a dielectric material to protect them from hazardous environmental conditions.

C. Printed Antenna

By definition, a printed antenna is one that is fabricated using standard photolithography technique. The most common version of printed antenna is microstrip antenna, which consists of a metallic patch above a ground plane. The shape and size of patch determine the frequency of operation of the antenna and its performance. These antennae are more popular because of their low cost and ease of fabrication, and easy integration with circuit components. Printed antennae are inexpensive to fabricate using modern printed circuit technology, and are conformal to planar and non-planar surfaces. These antennae can be easily mounted on the surface of aircrafts, spacecrafts, satellites, missiles and even on handheld mobile devices.

D. Array Antenna

In an array antenna, several radiators separated from each other are geometrically arranged to give desired radiation characteristics that are not possible to achieve with a single independent radiating element. The arrangement of array elements is such that radiation from individual elements adds up to give the maximum radiation in a particular direction or directions, and minimum radiation in other directions. In practice, individual radiators are arranged in linear or planar grid depending on the application.

E. Reflector Antenna

These antennae are specifically used in applications requiring communication over long distances, such as outer space exploration and satellite communication. They are built with large diameters in order to achieve the high gain required to transmit or receive signals over very long distances. The reflector antenna usually uses a smaller antenna as the feed

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F. Lens Antenna

In these antennae, lenses are used to collimate the incident divergent energy to prevent it from spreading in undesired directions. By choosing the appropriate material and setting the geometrical configuration of lenses, they can transform various forms of divergent energy into plane

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waves. Lens antennae are classified according to the material from which they are constructed or their geometrical shapes.

G. Microstrip Antenna

Microstrip antenna is one of the most popular types of printed antenna. It plays a very significant role in today's world of wireless communication systems. Microstrip antennae are very simple in construction using a conventional microstrip fabrication technique. Microstrip patch antenna consists of a radiating patch on one side of a dielectric substrate (FR4) that has a ground plane (Cu) on the other side as shown in Figure 1.

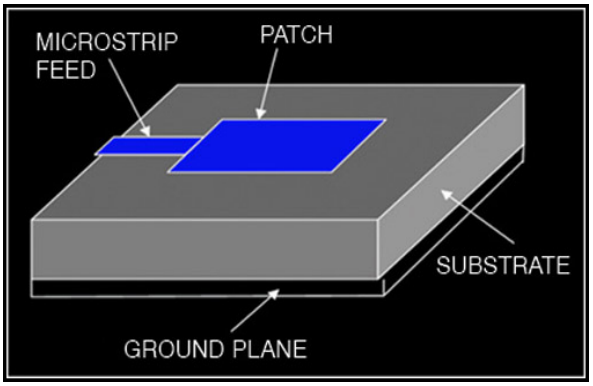

Figure 1: Physical Geometery of Microstrip Antenna.

MICROSTRIP PATCH ANTENNA

The study on microstrip patch antennas has gained an incredible ground in the late years. Thought about with the conventional antennas, microstrip patch antennas have more advantages and better prospects. In this time of cutting edge systems we require high information rate and size of gadgets are getting littler step by step. In this advancement two vital standards are Wi-Fi (WLAN) and Wi-MAX. For success of all these wireless applications we need efficient and small antenna as wireless is getting an ever increasing amount imperative in our life. This being the situation, versatile reception apparatus innovation has developed alongside versatile and cell advancements. Microstrip Antenna (MSA) have qualities like ease and low profile which turns out to be well suited for WLAN/Wi MAX application frameworks.

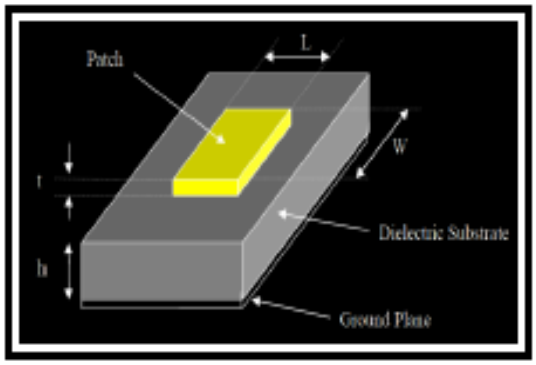

Figure 2: Structure of Microstrip Patch Antenna.

A Microstrip patch reception apparatus comprises of a transmitting patch on one side of a dielectric substrate which has a ground plane on the other side and outline of MSA appeared in Figure 2. The patch is for the most part made of directing material, for example, copper or gold and can take any conceivable shape appeared in Figure 3.

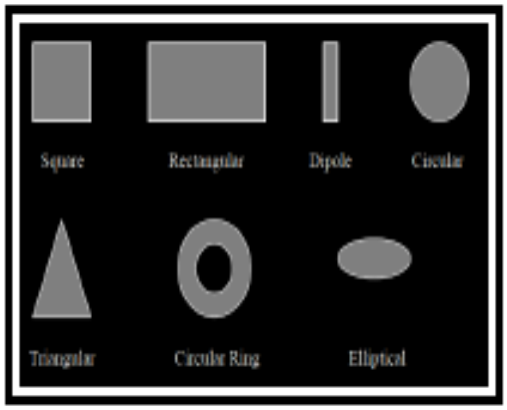

Figure 3: Shapes of Microstrip Patch Elements.

The transmitting patch and the food lines are generally photograph scratched on the dielectric substrate. The EM waves bordering off the top patch into the substrate and are emanated out into the air after reflecting off the ground plane. For better reception apparatus execution, a thick dielectric substrate having a low dielectric steady is alluring since this gives better proficiency, bigger data transfer capacity and better radiation.

LITERATURE REVIEW

Microstrip patch radio wire has various great circumstances like minimal effort, conservative size, clear structure and comparability with joined equipment. It has enormous applications in military, radar frameworks or structures versatile interchanges, Global Positioning System (GPS), remote identifying et cetera. Considering the degree of this paper review on various techniques for diminutiveness by pin and opening stacking on microstrip receiving wire are displayed. A microstrip radio wire combined with a singular shorting post at true blue position and size is found to give reducing by and large locale with reverence to a common patch receiving wire. Also, the negligible indirect entranced patch receiving wires can be proficient by space stacking on patch. The pile of the spaces or openings in the radiating patch can bring about meandering of the empowered patch surface current Paths besides, achieve bringing down of the full repeat of the gathering mechanical assembly, Which identifies with a diminished radio wire size for such a gathering device, stood out from a routine circularly hypnotized microstrip radio wire at the same working repeat.

The idea of microstrip receiving wire with directing patch on a ground plane isolated by dielectric substrate was undeveloped until the transformation in electronic circuit scaling down and expansive scale mix in 1970. After that numerous scientist have portrayed the radiation starting from the earliest stage by a dielectric substrate for various

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arrangements. The early work of Munson on miniaturized scale strip reception apparatuses for use as a position of safety flush mounted receiving wires on rockets and rockets demonstrated this was a down to earth idea for use in numerous radio wire framework issues. Different scientific investigation models were created for this radio wire and its applications were stretched out to numerous different fields. The small scale strip reception apparatuses are the present day receiving wire designer's decision. In this area, the microstrip radio wire writing study is talked about. A twofold L-opening microstrip patch recieving wire [1] exhibit with CPW nourish innovation has been proposed for microwave access and remote neighborhood applications. This paper results in smaller recieving wire with great omnidirectional radiation qualities for proposed working frequencies. It can be watched that the crest addition can be higher than 3dBi at 3.5 GHz. A microstrip patch radio wire [2] for double band WLAN application is proposed. In the paper a double band L-molded Microstrip patch reception apparatus is imprinted on a FR-4 substrate for WLAN frameworks, and accomplishes a recurrence range from 5.0GHz to 6.0 GHz with most extreme addition of 8.4 and 7.1 dB in lower and higher recurrence groups individually. A microstrip opening reception apparatus [3] bolstered by a microstrip line has been proposed in this paper. In this transmission capacity of recieving wire has been made strides. This reception apparatus was exhibited for WLAN and satellite application.

A Broadband patch reception apparatus [4] for WiMAX and WLAN is produced. In this proposed radio wire shows wideband attributes that rely on upon different parameters, for example, U-opening measurements, roundabout test – fed patch. This reception apparatus indicates 36.2% impedance data transmission with more than 90% radio wire effectiveness and is suitable for 2.3/2.5GHz WiMAX and 2.4 GHz WLAN application. A double Wideband printed antenna[5] is proposed for WLAN/WiMAX application. A microstrip feedline for excitation and a trapezoidal director upheld plane utilized for band widening. The deliberate 10dB transmission capacity for return misfortune is from 2.01 to 4.27 GHz and 5.06 to 6.79 GHz , covering all the 2.4/5.2/5.8 GHz WLAN groups and 2.5/3.5/5.5 GHz WiMAX groups. This paper [6] has been proposed for portraying different sustaining methods. In this a roundabout enraptured patch radio wire of shape like letter set „I" on FR4 substrate for BLUETOOTH applications has been researched. This paper depicts a decent impedance coordinating condition between the line and the patch with no extra coordinating components. A reduced rectangular patch reception apparatus [7] has been exhibited for Wi-MAX and WLAN application. This reception apparatus has minimal, savvy, basic structure and suitable for all recurrence groups of Wi-MAX and WLAN applications.

ANTENNA PARAMETERS

Different parameter such as VSWR, Return Loss, Antenna Gain, Directivity, Antenna Efficiency and Bandwidth is analyzed.

(a) Gain The gain of an antenna is defined as the ratio of the intensity, in a given direction, to the radiation intensity that would be obtained if the power accepted by the antenna were radiated isotropically. Formula for gain is $G=4\pi.U(\theta,\Phi)$ /Pin, where, $U(\theta,\Phi)$ is a intensity in a given direction, Pin is the input power.

(b) Radiation pattern The radiation pattern is defined as a mathematical function or a graphical representation of the radiation properties of the antenna as a function of space coordinates.

(c) Antenna efficiency It is a ratio of total power radiated by an antenna to the input power of an antenna.

(d) VSWR Voltage standing wave ratio is defined as VSWR=Vmax/Vmin.It should lie between 1 and 2.

(e) Return loss Return loss is the reflection of signal power from the insertion of a device in a transmission line. Hence the RL is a parameter similar to the VSWR to indicate how well the matching between the transmitter and antenna has taken place. The RL is given as by as: $RL=-20 \log_{10} (\Gamma)$ dB For perfect matching between the transmitter and the antenna, $\Gamma = 0$ and $RL = \infty$ which means no power would be reflected back, whereas a $\Gamma = 1$ has a $RL = 0$ dB, which implies that all incident power is reflected. For practical applications, a VSWR of 2 is acceptable, since this corresponds to a RL of -9.54 dB.

CONCLUSION

A hypothetical overview on microstrip patch radio wire is introduced in this paper. After investigation of different examination papers it reasoned that lower gain and low power handling limit can be overcome through an exhibit setup and opened patch. A few attributes of sustaining method and different reception apparatus parameters are talked about. Specific microstrip patch reception apparatus can be intended for every application and distinctive benefits are contrasted and ordinary microwave antenna or receiving wire.

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