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Study on Slotted Microstrip Patch Antenna

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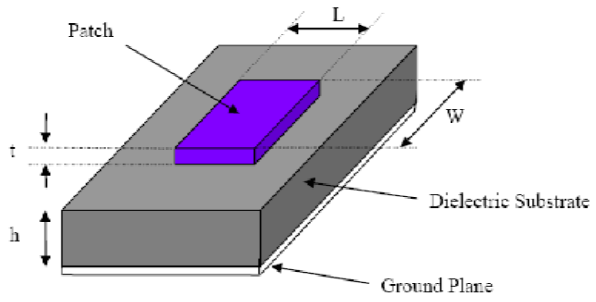
ABSTRACT

In communication system antenna provide a perfect interface between the system and free space in order to transfer signal between transmitter and receiver. The microstrip patch antenna is one of the interface types which are widely used in wireless transreceivers since it has very low profile. Microstrip patch antenna is used play major role in day to day life. They have several drawbacks such as low efficiency, low bandwidth, and low gain and can only be used in microwave frequency. Thus to improve them different slots are introduced. Varieties of shapes of slots are available which make microstrip patch antenna suitable for high frequency applications.

Keywords-- microstrip antenna, bandwidth, efficiency.

I. INTRODUCTION

conventional microstrip patch antenna have a conducting printed patch on grounded microwave substrate and have the attractive features of low profile, low weight, easy fabrication and conformability to mounting hosts. However microstrip antennas inherently have a narrow bandwidth and bandwidth enhancement is usually demanded for practical applications. In addition application in present day mobile communication system usually demanded for practical application in present day mobile communication system usually require smaller antenna size in order to meet the miniaturization requirement of mobile units. Thus size reduction and bandwidth enhancement are becoming major design considerations for practical applications of microstrip antenna. By the above features of microstrip patch antenna there is complexity in tuning. Thus to improve them different slots are introduced.



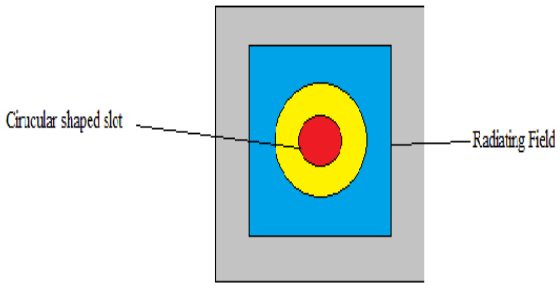
MICROSTRIP PATCH ANTENNA

L= Length of microstrip patch antenna.
W=width of microstrip patch antenna.
t=thickness of patch.
h=height of dielectric substrate.

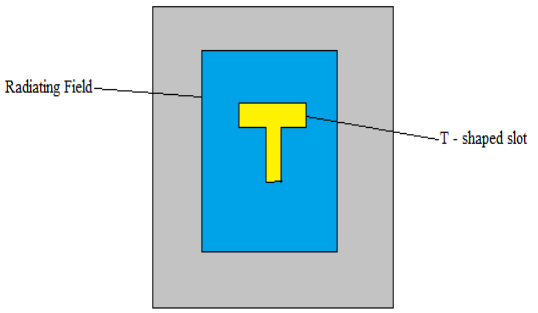
II. SLOTTED MICROSTRIP PATCH ANTENNA

It overcomes some of the drawbacks of microstrip patch antenna like:
1-Bandwidth of microstrip patch antenna is increased by introduction of slots.
2-VSWR is improved.
3- Low less in matching.
4-Substrate thickness decrease, size reduced.
5-Gain increases.
6- Low axial ratio.
7-Efficiency increases.
8-Can be used at more than one frequency.

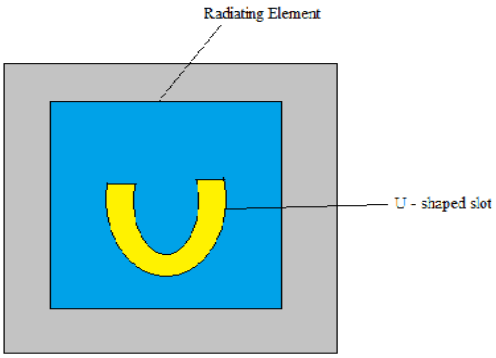
III. DIFFERENT TYPES OF SLOTS



CIRCULAR SLOT



T SHAPE SLOT



U SHAPED SLOT

IV. DIFFERENT MICROSTRIP PATCH ANTENNA AND MICROSTRIP PATCH SLOTTED ANTENNA

	MPA	MPSA
1. Profile	thin	thin
2. Fabrication	very easy	easy
3.Polarization	both linear and circular	both linear and Circular
4. Dual frequency operation	possible	possible
5. shape	any shape	mostly rectangular & circular Shape
6. Spurious Radiation	exist	exist
7. Bandwidth	2-50%	5-30%

V. ANALYSIS OF DIFFERENT TYPES OF SLOTS

E SLOT: Frequency range 8.59 GHz to 13.99 GHz ,gain 8.33 dB (foam) ,7.33 dB (air) ,VSWR 0.217 ,bandwidth enhanced by 30%.

H SLOT: Frequency range 2.4 GHz, gain obtained is 8.93 dB, VSWR 1.50. VSWR reduced and gain improved.

S SLOT: Frequency range 2.6 GHz, gain 8.1 dB (theoretical), and 8.2(stimulated) maximum efficiency 91.75 (theoretical),92.04 (stimulated). Improved gain and better efficiency. S shape depends upon length, width and height of notch.

L SLOT: frequency range 6.987 GHz. VSWR is less than 2. Bandwidth improved .Enlarge impedance bandwidth.

U SLOT: Bandwidth is increased, frequency 5.76 GHz and 6.48 GHz. Loading of slot result in size reduction. Gain and bandwidth improved.

V SLOT: improved impedance bandwidth. Bandwidth high as 54%.Suitable gain and bandwidth.

VI. APPLICATIONS OF MICROSTRIP PATCH ANTENNA

The microstrip slotted antenna is widely used in UWB application in the range of 3.1 GHz -10.6 GHz, 3.4 GHz-4.8 GHz and 6 GHz- 8.5 GHz. The USB spectrum widely used in various medical application and short for carrying very huge amount of data per sec but the transmitting power is restricted by FCC and other licensing authorities of in each and every country. The transmitting power is about 0.5 mW and less than that so it will come up to 230 feet or less than that net coverage is very small area only. Another one wider use of microstrip slotted antenna in ISM band application. There are more than ten frequencies comes under ISM band such as 6.78 MHz, 13.58 MHz, 27.12 MHz, 2.45 GHz, 5.8 GHz, 24.125 GHz, and 61.25 GHz. These ranges are widely used in industry, scientific, medical security, WLAN, Bluetooth and rfid applications. Some of the applications are discussed below:

MOBILE AND SATELLITE COMMUNICATION APPLICATION:

Mobile communication requires small, low cost, low profile antennas. Microstrip patch antenna meets all requirements and various type of microstrip antenna have been designed for use in mobile communication systems, in case of satellite communication circularly polarized radiation pattern are required.

GLOBAL POSITIONING SYSTEM APPLICATION: now a days microstrip patch antennas with substrate having high permittivity sintered material are used for

global positioning system. Million of GPS receivers are used by general population for land vehicles and aircraft to find their position accurately.

VII. RADIO FREQUENCY IDENTIFICATION

RFID uses in different areas like mobile communication. Rfid system generally uses frequencies between 30 Hz and 5.8 GHz depending on its applications.

VIII. WORLDWIDE INTEROPERABILITY FOR MICROWAVE ACCESS (WIMAX)

The IEEE 802.16 standard is known as wimax , it can reach up to 30 mile radius theoretically and data rate 70 mbps .microstrip patch antenna generate 3 resonant mode at 2.7, 3.3, and 5.3 GHz and can therefore used in wimax communication equipment.

IX. CONCLUSION

A theoretical survey on slotted microstrip patch antenna is presented. Some effect of disadvantage can be minimized. Increasing gain, bandwidth and lowering VSWR for making patch antenna for application specific is achieved by introducing slots in geometry of patch antenna. As compared to conventional microstrip antenna gain is improved, VSWR is reduced so thereby overall efficiency of antenna increases. Different slots shaped are compared and it is found that bandwidth of conventional microstrip antenna can be enhanced from 4.81% (100 MHz) to 28.71% (610 MHz), 28.89% (630 MHz) and 9.13% (110 MHz) respectively using U, E and H patch over the substrate. The E shaped patch antenna has the highest bandwidth followed by U shaped patch antenna and H shaped patch antenna. Microstrip slotted antennas are high efficient for wireless communications

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