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Review of Bandwidth Enhancement of a Microstrip patch antenna with a different shape for WLAN communication

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Abstract:
MicrostripStrip patch antenna is an important concern in any communication network either it is wired or wireless network. Wireless Communication is an important role in any type of communication. Microstrip patch antenna is generally used because of light weight low cost and easily installed in any type of communication system. Here we are discussed about the different type of antenna for different application and also impedance matching technique by using different type of slotting.. Moreover in microstrip patch antenna which is self- organizing, to enhance the bandwidth as well as gain.

Keywords—*Shorting pin, WLAN,* coaxial *feed, U shape slot dual band, MOM* Software.

I. Introduction

The discovery of patch antenna has been introduced by several authors, but in year 1960s the first microstrip patch antenna was introduce by Greig, Engleman, Deschamps and Lewi. After that in year 1970s many researcher come and started to various design of mathematical analyses for designing of microstrip patch antennas. Then onwards many different authors started investigations on microstrip patch antennas (MSAs) like James Hall and David M. Pozar and there are also some others introduced a lot.[1] Throughout the years, many authors have proposed the microstript patch antenna for enhancing bandwidths or multiple-frequency operation in a single element.[2] Though, most of these innovations bear disadvantages related to the size, height or overall volume of the single element and the betterment in bandwidth suffers usually from a degradation of the other characteristics. During the course of development of this work, we have gone through many international papers and publications which helped in understanding the concepts of the microstrip patch antenna [6].The following section discusses some of the more important papers which were referred during the course of this work.

2.Literature Review

2.1 Bandwidth Enhancement of a monopolar patch antenna with V-shaped slot for car to car and WLAN communication[1]

Hang Wong. etc,In this paper the antenna is designed by using V shaped slot for car to car and WLAN communication has a wider bandwidth by using total 6 shorting pin. By using shorting pin of different radius, author effectively adjusted the resistance and the reactance of the antenna for both TM10, TM20 mode. Using this technique the antenna has an impedance bandwidth of 32.20% from 4.82 to 6.67 GHz. [1]

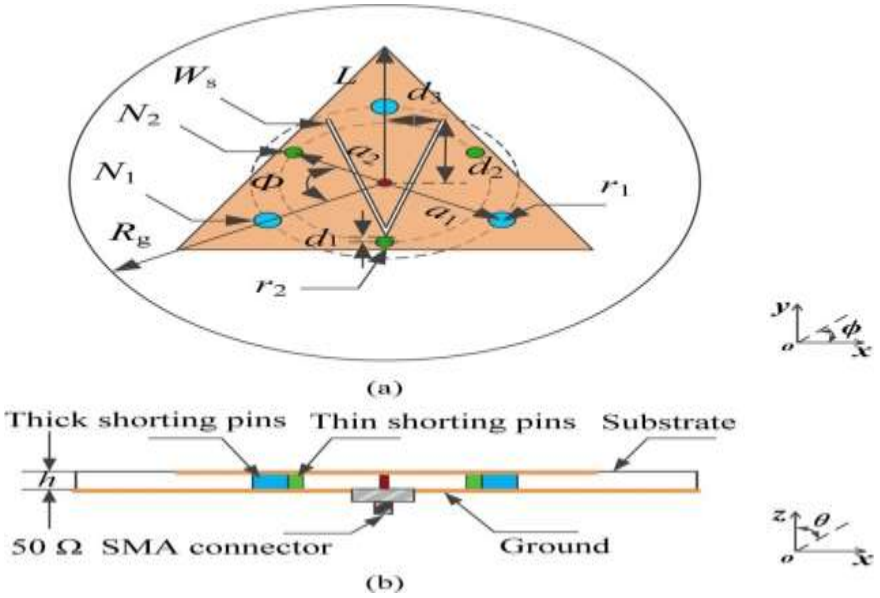

Figure 2.1 Monopolar patch antenna with V-slot for car to car and WLAN communication

2.2. High Gain Wide-Band U-Shaped Patch Antennas With Modified Ground Planes[2]

Kaushik Mandal et.al**,** proposed the design and simulation of six printed microstrip antennas. The proposed design here provides incredible increment of bandwidth and gain simultaneously using U shaped patch and modified ground plane with an extremely thin substrate. The effects of ground plane's dimension and shape on impedance bandwidth are studied in this paper. For a high gain and wide band U-shaped patch antenna has a two arms for poly tetra fluro ethylene (PTFE) substrate was introduced. Another antenna with inverted U-shaped slot is presented for a circular or square shaped ground plane just under the U-shaped patch. In this paper the effect of shape and size of the ground plane on impedance bandwidth is studied. Maximum impedance bandwidth of about 86.79% (4.5–11.4 GHz) is obtained on circular shaped ground plane whose diameter is 36 mm. The highest gain achieved is 4.1 dBi. The simulated results are confirmed experimentally.[2]

2.3 Dual-and multiband U-slot patch antennas[3]

Kai-Fong Lee, et.al, has presented this paper for U-slot microstrip patch antenna for bandwidth enhancement. It is firmly observed that the U- shape antenna can be better for impedance bandwidth in surplus of 30% in the thickness of air substrate thickness of about excess of 20% for 0.08λ microwave dielectric substrate of an antennas with the same thickness. The U-slot was also used for planar microwave frequency antennas to introduce a notch for minimum interference. The main purpose for U-slot was to enhance the bandwidth rather than to developed the band notch.[3]

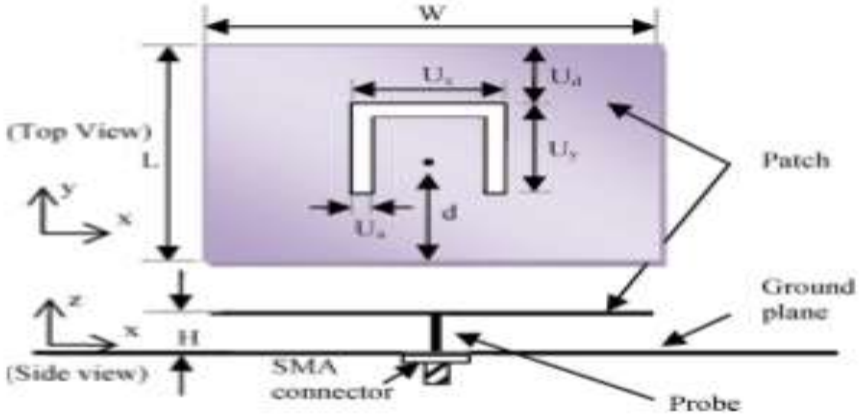

Figure 2.2 Dual-and multiband U-slot patch antennas

2.4 Slotted Rectangular Microstrip Antenna for Bandwidth Enhancement[4]

Jia-Yi Sze et. al, in the proposed work with loading of a dual of right-angle slots and a new adapted U-shaped slot in a microstrip patch antenna for bandwidth enhancement of proposed antennas is presented.

The essential sizes of the right-angle shape and custom-made U-shaped slot for bandwidth enhancement with good radiation characteristics have been determined practically. In this survey the obtained bandwidth is as large as of about 2.4 times that of a other unslotted rectangular microstrip antenna.[4]

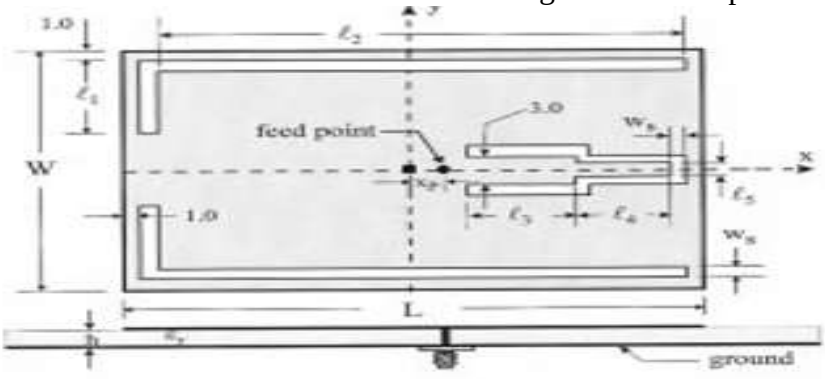

Figure 2.3 Slotted Rectangular Microstrip Antenna for Bandwidth Enhancement

2.5 Mukesh Ku Khandelwal, SantanuDwari, Kanaujia BK, Sachin Kumar @(AEU 2014) [5] proposed and analysed a new microstrip patch antenna (MPA) for Ku band applications by using the concept of defect ground structure. Defect ground structure was considered for impedance bandwidth enhancement. Defect ground structure is notably preferred to suppress the Cross Polarization level to a larger extent. Microstrip patch antenna was designed with a circular slot is integrated in the ground plane with operating frequency 10 GHz. 50 Ω Microstrip line is used to feed the proposed structure. The open ended Microstrip line is to be considered as a tuning stub for the proposed structure. This tuning stub is used to control the return loss level of proposed structure by controlling the reflection coefficient. Ansoft HFSS v.12 software is used to analyse the structure whish is based on finite element method (FEM).

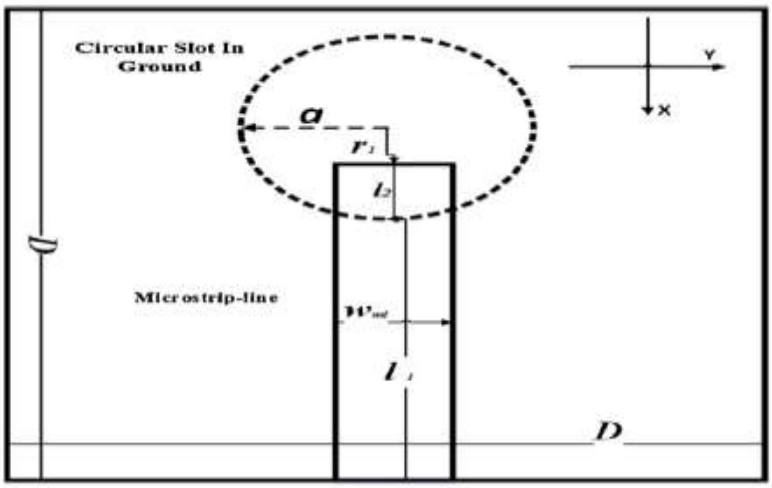

Figure 2.4 Design of proposed structure [4]

In this paper [5] we investigated that an enhanced impedance bandwidth of 56%was achieved with lower and higher frequencies 9.8 GHz to 17.55 GHz respectively. Two resonances at frequencies 10.8 GHz and 16.35 GHz were achieved, which covers Ku band as well as partially X band. The return loss levels achieved at these two resonance frequencies were -30 dB and -23 dB respectively as shown figure (2.2).

The VSWR was less than 2. The concept of Defect ground structure was used to suppress the cross polarization level. The cross polarization suppression for the designed antenna was less than -35 dB in H-plane and less than -25 dB in E-plane for the entire operating band. Cross polarisation suppression leads to the minimum isolation between Co-polar and Cross polarization level was about 20 dBi H-plane and 15 dB in E-plane.Due to above characteristics the proposed structure is used for "Ku" band and "X" band applications.

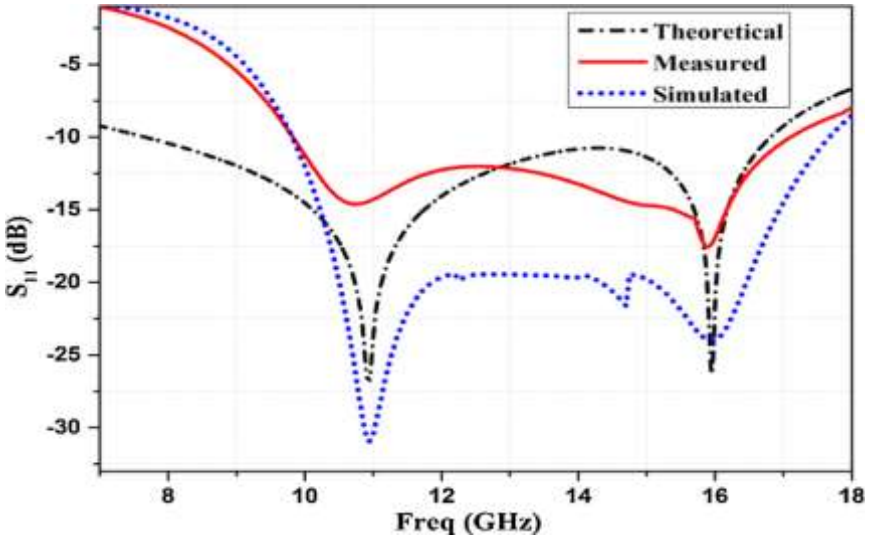

Figure 2.5 Simulated and measured S11 variation vs. Frequency of the antenna

Table 2.1. Literature Survey

Author	**Publication /year**	**methodology**	**Fr (GHz)**	**B/W (operating frequency range)**	**Gain**	**Retun Loss**
Hang Wong,etal	IEEE / 2016	V-shaped slot, coaxial centre fed probe, shorting pins, substrate FR4	5.65	65.2% (4.82 GHz – 6.67 GHz)	6.5 dBi	-15 dB
Kaushik Mandal,etal	IEEE / 2013	U shaped patch antennas, modified ground planes, PTFE substrate	5.4	86.79 %(4.5 GHz – 11.4 GHz)	4.1 dBi	-10 dB
Kai Fong Lee,etal	IEEE / 2008	U slot patch antenna, L probe feeding, multiband	5.5, 6.2	7.6%,5.5%, 8.9%(measured)(4.80-5.18,5.	8 dBi	-18 dBi

		operation		63-5.95,6.25-6.83)		
Jia YI Sze,etal	IEEE/2000	Modified slotted U shape patch,	1.8	4.3-4.6%	2.2-2.7 dBi	-10 dBi

3. Conclusion:

In this review, discussed Various papers and various techniques using different substrate and simulation technique and from the survey we have concluded that impedance bandwidth achieved nearly 66% which is very less. The achieved gain is also less so by using some technique like stub matching, impedance matching and by a via hole we will improve the bandwidth of proposed microstrip patch antenna.

4. References

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