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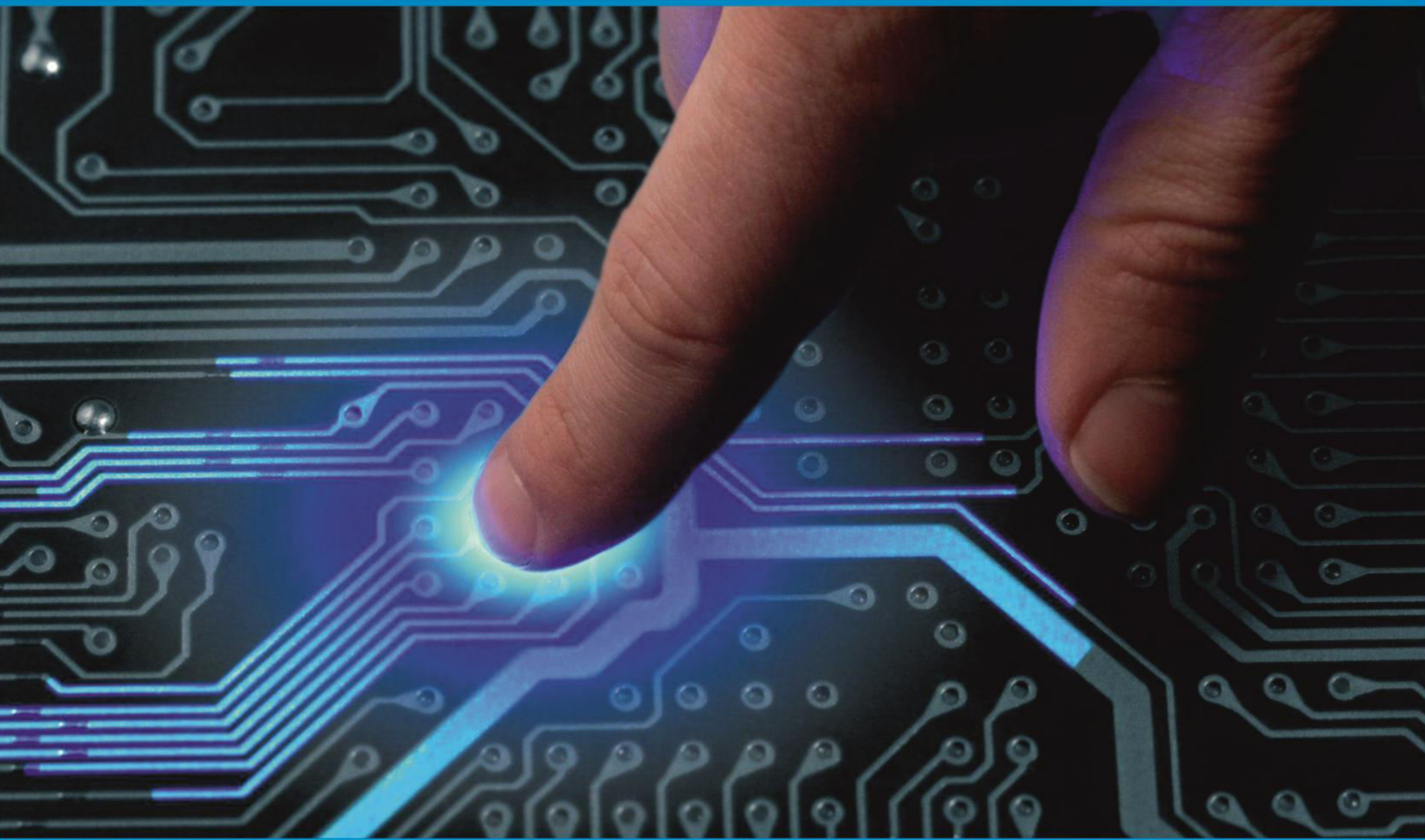

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Review of Ultra-wideband (UWB) Microstrip Antenna with Notched and Slot Structures

Bhoopendra Kumar Rajak[1], Prof. Nitesh Kumar[2]

M.Tech Scholar, Dept. of ECE., Sagar Institute of Research Technology & Science, Bhopal, India[1]

Assistant Professor, Dept. of ECE., Sagar Institute of Research Technology & Science, Bhopal, India[2]

ABSTRACT: With the rapid development of wireless communication technology and wireless multimedia services, ultra-wideband (UWB) technology has attracted more and more attention. Because of its advantages of high speed, low power consumption, high confidentiality, and strong anti-interference ability, UWB has a very broad potential application and considerable expected commercial value. Microstrip Patch Antenna (MPA) is array design is very emerging research area for 5th generation communication application. An antenna array is a set of multiple connected antennas which work together as a single antenna, to transmit or receive radio waves. Microstrip patch is very low weight, low profile and result oriented antenna pattern. Previously MIMO pattern was very common geometry for 4G wireless application. This paper review and know about the challenges of microstrip patch antenna for future uses under 5G networks.

KEYWORDS: Antenna, array, MIMO, MPA, 5G.

I. INTRODUCTION

Ultra-wideband is a technology for transmitting information across a wide bandwidth (>500 MHz). This allows for the transmission of a large amount of signal energy without interfering with conventional narrowband and carrier wave transmission in the same frequency band. Regulatory limits in many countries allow for this efficient use of radio bandwidth, and enable high-data-rate personal area network (PAN) wireless connectivity, longer-range low-data-rate applications, and radar and imaging systems, transparently with existing communications systems. Ultra-wideband was formerly known as pulse radio, but the FCC and the International Telecommunication Union Radio communication Sector (ITU-R) currently define UWB as an antenna transmission for which emitted signal bandwidth exceeds the lesser of 500 MHz or 20% of the arithmetic center frequency.[5] Thus, pulse-based systems—where each transmitted pulse occupies the UWB bandwidth (or an aggregate of at least 500 MHz of narrow-band carrier; for example, orthogonal frequency-division multiplexing (OFDM))—can access the UWB spectrum under the rules..

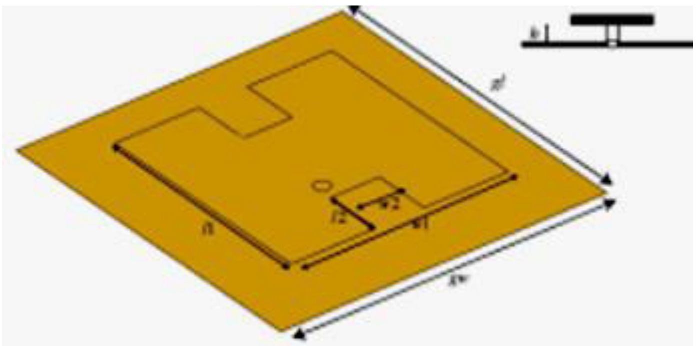

Figure 1: UWB Microstrip Antenna

5G is the fifth era of cell versatile correspondences. It succeeds the 4G (LTE/WiMax), 3G (UMTS) and 2G(GSM) structures. 5G execution targets high data rate, lessened inaction, imperativeness saving, cost decline, higher system

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limit, and colossal contraption organize A fix antenna is made by scratching metal on one side of dielectric substrate where as in actuality side there is relentless metal layer of the substrate which outlines a ground plane [1].

II. LITERATURE SURVEY

Y. Wang, et al.,[2019] A novel design technique, which combines mushroom-shaped electromagnetic-band gap (EBG) structures and a slot together, is proposed for ultra-wideband (UWB) band-notched antenna. The implementation of the slot can not only create its own notched band, but also enhance the filtering performance at the other notched band generated by EBG structures. The simulated results demonstrate that the proposed antenna exhibits a good wideband radiation performance from 2.64 to 12.9 GHz along with two separated notched bands at WLAN (4.8-5.9 GHz) and X-band downlink satellite communication band (7.1-7.8 GHz). As a result, the proposed design is a promising candidate for modern UWB antennas.[1]

T. Sun, et al.,[2019] This work presents a compact miniaturized ultra-wideband(UWB) antenna with band-notched Function, which is experimentally researched for multiple-input-multiple-output (MIMO). Two selfsame monopoles are arranged symmetrically, which constitute the UWB-MIMO antenna. The monopole of the antenna is modified from a micro-strip off-center-fed patch. The modified ground plane which is excavated three open rectangular slots and the antenna monopole become the antenna radiator which achieves the desired ultra-wideband. The center part of the ground plane can achieve high isolation phenomena by propagating through the restraining surface current.[2]

M. Usman et al.,[2019] In this work the design of a low profile flexible antenna for Ultra-Wideband (UWB) wireless communication systems along with the capability of rejecting interfering narrow-band Wi-MAX signal is presented. Polyimide based flexible, ultrathin and lightweight substrate is used to design the micro-strip antenna. An elliptical geometry is used as a radiating element along with a tapered Co-planar Waveguide (CPW) feeding technique to enhance the impedance bandwidth of the proposed antenna. The notch is achieved by using C shaped slot at the upper half of elliptical radiating patch and this slot is used to reject the Wi-MAX band. The antenna covers whole UWB spectrum (3.1-10.6GHz) except the intentionally mitigated WiMAX (3.3-3.7GHz) band.[3]

R. Dhara, et al.,[2018] A compact tri-band circularly polarized (CP) micro strip patch antenna has been designed here where the antenna designed consists of a single G-shaped patch with CPW (Co-planar Waveguide) -fed ground. This configuration has been considered for bandwidth enhancement. Two semicircular-shaped notch has been etched from the lower periphery of CPW ground to increase the ARBW. In order to further increase the axial ratio bandwidth (ARBW) by a significant amount, a spring shaped notch at a particular position on the upper periphery of the CPW ground has been etched.[4]

S. C. Deshmukh, et al.,[2018] Printed modified hexagonal slot ultra-wideband micro strip-fed antenna with dual band rejection characteristics is presented. The antenna comprises U-shape radiating patch on one side of substrate and ground plane with modified hexagonal slot on other side of substrate with compact size of 28×28 mm^2 . By inserting symmetrical L-form parasitic ends at the upper edge at the modified hexagonal slot and C-shape parasitic stubs at the both arms of the patch to obtain the desired stop band characteristics for WiMAX and WLAN respectively. The designed antenna is operate in between 3.02~ 15GHz with a dual stop band from 3.15~4.06GHz (for Worldwide Interoperability for Microwave Access) and 5.13~6.2GHz (for Wireless Local Area Network). To mitigate the possible interference in between UWB and these narrow bands (Worldwide Interoperability for Microwave Access and Wireless Local Area Networkbands) will help. [5]

K. Pattnaik, et al.,[2017] In this work a new form of Ultra Wide Band (UWB) antenna with band rejection characteristic is proposed. The proposed antenna is the combination of a rectangular and a triangular patch with a half ground plane with a slot in it. A complementary Split Ring Resonator (CSRR) which acts as an anisotropic filter structure is slotted along the feed of the antenna in order to achieve certain band notch characteristics. The antenna is designed on a 26.4 mm × 28.05 mm FR4 EPOXY substrate of thickness 1.5 mm.[6]

R. Mishra, et al.,[2017] UWB is an emerging technology and has numerous applications in different fields in this digital era. As it is know that the range of UWB exist are 3.1GHz-10.6 GHz but some narrow band applications also exist in this range and causes interference to Ultra Wideband applications. In this proposed work a novel UWB antenna is integrated with W shape notch to reduce interference which mainly occurs at 5 GHz due to WLAN (IEEE 802.11a) and it also cover U-NII band (5.15-5.85 GHz). The proposed antenna is designed using FR-4 substrate, size of proposed antenna is 25×20 mm2 which makes it very compact and thickness is 1.6mm and fed through micro strip line to achieve better impedance matching.[7]

H. S. Mewara, et al.,[2017] Bandwidth enhancement of an ultra-wide band swastika slot loaded antenna with band notch characteristic is presented. The antenna consists of an exciting rectangular patch on the front side and a partial ground plane on the backside of the substrate. A swastika shape is etched on patch, by inserting corner slots to the swastika shape, notched frequency band is improved. The simulated impedance is defined by VSWR <; 2 of 11.00 GHz operating over a frequency range 3.71-14.71 GHz with a single notched band of WLAN (5.27-6.22 GHz). Simulated Average gain of about 4 dBi is observed over the whole UWB band except at WLAN band notch.[8]

G. Varshney et al.,[2016] Here it is are presenting a simple Dielectric Resonator Antenna (DRA) fed by micro-strip patch with significant improvement in bandwidth and radiation characteristics for Wireless and radar applications. Simply a patch antenna is designed with triple band characteristics. To enhance the bandwidth, nearby resonant bands of antenna have been shifted close to each other and merged. A detailed study has been carried out to find the different radiation characteristics of antenna by using micro-strip patch antenna and dielectric resonator with slots. Slots have been notched out from optimum position on patch to change the field distribution on patch to improve radiation properties of antenna.[9]

A. Das et al.,[2016] A compact microstrip fed ultra-wideband(UWB) antenna with dual band notched characteristics is presented. The antenna comprises of an elliptical UWB patch antenna with partial arc shaped ground plane fed by micro-strip transmission line. Two open-ended quarter-wavelength straight slots are etched in the patch to generate the two notched band. The UWB antenna covers a wide impedance bandwidth ranges from 2.86GHz-14.9Ghz with two band notched properties in the Wimax (3.1GHz-4.8GHz) X-band satellite link(9.6GHz-11.2GHz). The proposed antenna has a compact dimension of 32×38 mm^2 and nearby stable radiation patterns are obtained in the operating band.[10]

III. MICROSTRIP ANTENNA ARRAY CHALLENGES

An overview on microstip reception apparatus is done at first to assess the development of the exploration action on the point along the most recent 40 years. The early long periods of the microstrip innovation and particularly of microstrip antennas are examined in detail. The quick advancement of the innovative work exercises that occurred over the most recent 30 years is depicted with regards to the related advances and zones of utilization. At long last, the current circumstance of the microstip antenna field and patterns of conceivable future development are inspected.

Table 1: Conventional Antenna Dimensions

PARAMETERS	DESCRIPTION	SIZE
L	Length of substrate	10mm
W	Width of substrate	10mm
Lf	Length of feed line	4mm
Wf	Width of feed line	1mm
A	Major axis of elliptical slot	4.150mm
B	Minor axis of elliptical slot	2.075mm
R	Radius of sector patch	1.5mm

In Regardless, inherently MPA have flimsy information move limit so to update transmission limit various techniques are secured. Today Specific contraptions support a couple of utilizations which require higher information transmission, for instance, mobile phones these days are getting progressively slim and increasingly splendid yet various application maintained by them require higher exchange speed, so microstrip antenna used for playing out this errand should give increasingly broad transmission limit and their size should be moderate with the objective that it should include less space while keeping the range of device as meager as could be normal considering the present situation.

The varying assortment gathering mechanical assembly is arranged by following spatial, point and polarization good assortment thoughts. The better than average assortment antenna contain exuding patch, substrate and ground. The best transport, radiating patch involve 4 gathering contraption segments which are spatially disengaged with a detachment of under 2.5mm and each antenna segments has an edge balance of 90 degree with both even and vertical polarization with the base conductor, defected ground structure(DGS) which has perfect electric property.

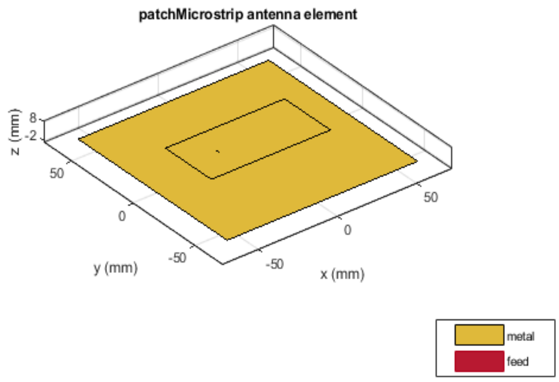

Figure 2: Element of microstirp antenna

The inside layer is the FR_4 substrate which is made with the dielectric steady of 4.6, incident deviation of 0.01 and thickness of 1.6mm. The made arranged assortment antenna works at 5.263GHz with the appearance loss of about 20dB with the information move limit of 2GHz and separation and decoupling of 15dB. The recreated gain and tolerable assortment at center repeat are 0.532dBi and 5.793dBi. The voltage standing wave ratio(VSWR) is 1:1.21 at 5.2GHz repeat. The radiation plan with respect to E and H field are destitute down using the diversion gadget. The gathering mechanical assembly is suitable for remote advantageous contraptions supporting WLAN with insignificant size of 30×28×1.6mm. The fundamental region includes a short introduction about the WLAN measures and average assortment thoughts are given with the composing survey. The subsequent portion involve plot strategy of the different assortment antenna starting from single segment arrangement is explained and the eventual outcomes of the better than average assortment gathering mechanical assembly are discussed.

IV. CONCLUSION

Theoretical study on microstrip patch antenna has done in this paper. While laying out the antenna the things which we have to consider is substrate which we will use, empowering create, dielectric reliable of the substrate and its height and width. Therefore it is clear from literature review; antenna array is emerging design for advance communication due to its higher bandwidth and good gain. So it is believed that, this little size antenna will continue profiting for future years in 5G communication.

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