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A REVIEW OF LITERATURE ON DIFFERENT CPW FEED BASED PATCH ANTENNA

Vishal Gohane[1], Dr. Arvind Kourav [2] Prof. Nehul Mathur[3]
M.Tech Scholar[1], Professor[2], Assistant Professor[3]
[1,2,3]Department of Electronics and Communication *(ECE)*
[1,2,3]Bhopal Institute of Technology *(BIT), Bhopal, (M.P.), INDIA*
gohanevishal11@gmail.com[1] mathurnehul@gmail.com[2]

***Abstract*— A numerical modeling based on the solution of coupled integral equations is used for the characterization of CPW-fed aperture-coupled microstrip antennas. Various shapes of excitation slots, such as open stubs, slot loops, and capacitively and inductively coupled slots, are investigated in terms of return loss and front-to-back radiated power ratio. It is shown that a centered CPW open stub gives a minimum of back radiation while allowing for easy matching. The slot-loop excitation seems to be a convenient feeding mechanism that also allows the insertion of active devices.**

Keywords* - Square Patch, Multi- Band , Wide-Band (WB), Wi-Fi , Wi-Max and Ultra-Wideband (UWB) *etc.

I. INTRODUCTION

Signals may be sent and received using antennas, which are often referred to as transceivers. Consequently, the speed of the transmit and receive processes is of relevance, particularly when communication technologies are rapidly evolving. As a result of an increase in the number of people using the network, the rapid advancement of communication equipment, both permanent and portable, necessitated a switch to higher data rates. Thus, they required a wide bandwidth (BW) to support all wireless services, including mobile and cellular. With low-profile antennas, it is feasible to minimise the complexity and manufacturing cost of wide-band or ultra-wideband (UWB) antennas [1].

An overview of UWB antennas for wireless communication applications is presented in this article. A comprehensive assessment of the subject's accomplishments over the preceding decade is provided for the benefit of readers in the field, with a focus on the crucial gaps that remain unfilled and indicate the need for further investigation into new approaches to answering these potential research issues. Researchers have provided insights into how loading may impact and increase the bandwidth of wide-band and UWB antennas, as well as how it can reduce the size of the devices while preserving their antenna properties.

Antenna design concepts, techniques, and characteristics must be addressed and understood prior to beginning work on wide-band and UWB antennas. Microstrip antennas may also be improved by using various design strategies, structures and forms, analyses, and feeding methods. As a researcher, the microstrip patch antenna is the best option because of its numerous benefits, including its low cost, its light weight, and its ease of manufacture. A number of studies have enhanced the performance and efficiency of patch antennas. Return loss, gain, directivity, and bandwidth are all factors that may be improved [2, 3].

A. Motivation

One GHz is typically considered to be the upper limit of pure microwave frequencies. High-frequency and broad-band signal repeaters need a new set of skills and methods. Due to the nature of high-frequency designs, it is impossible to handle them in the same manner as reduced electronic circuits, in which all signals must be considered as waves. New standards and tools for electronic design are required to supplement the traditional ones. Second, broad band surgery comes with its own set of difficulties and a bevvy of perplexing issues. The bandwidth of traditional radio systems is just a few percent of the fundamental frequency (CF). It is possible to have a wide range of antenna characteristics with a narrow bandwidth. Although the CF has a very wide bandwidth, emerging technologies like UWB may be able to employ a bandwidth even greater. With so many antenna factors to regulate, it is difficult to create antennas that have acceptable performance fluctuations across such a large bandwidth.

There are several well-known strategies for narrow band circuits utilised in conventional RF systems, but building wideband systems and circuits requires a fresh approach. Often, when talking about high-frequency bandwidth, the terms "relative bandwidth" or "fractional bandwidth" is used, this refers to the ratio of bandwidth to the CF frequency.

II. DESIGN AND SIMULATION RESULTS

Srinivasu, et.al. (2021), This research focuses on the FR4 system fractal pattern wideband transmitter. Structures for microwave frequency transmitters are also investigated in the study. The produced architecture has an S11-10 dB from 1.70 to 12.83 GHz range or an SWR of 1.9 between 1.71 and 12.83 GHz range for the 44341.6-mm3 flexible substrate. At 10.1 GHz, the antenna gain is at its highest point. They are 97 percent and 7.25 decibels in percentage and decibel numbers, respectively. The produced transmitter S11 is very close to the calculated one in terms of results. At 3.5 GHz, 5 GHz, 7.5 GHz, and 10 GHz, the array antenna or ground wave action of this antenna should be seen in 3-D and 2-D graphs. In this article, several earth and patching alterations are studied. This radio segment is used to construct a wide band based on prior experience in the range of 1.71 GHz to 12 GHz [1].

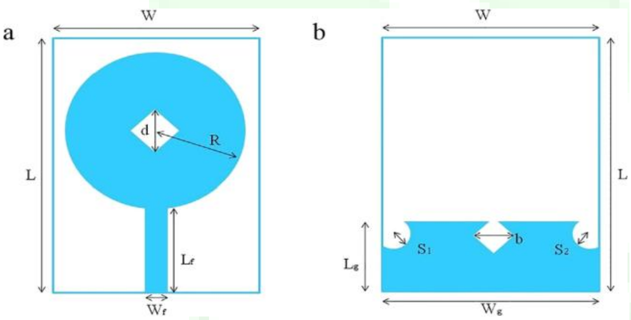

Fig. 1. The diamond slotted antenna

Srivastava, et.al. (2020). This study evaluated the ability of a UWB antenna to serve a dual band slot. It was possible to reject bands by using an etching slot method. A half-wavelength slot in the patch was used to extract the Wi-MAX band's notch frequencies. An L-shaped notch in the 5–6 GHz frequency region was created by cutting two quarter-wavelength slits into the floor plane. This study looked at the link between notch frequencies and slot length. Consistent emission patterns may be seen over the whole UWB band using the recommended antenna. It was possible to get the same conclusions from both modelling and measurement. As a consequence, this antenna may be used for a wide range of UWB applications [2] .

Ultra-wideband Dual Band Antenna

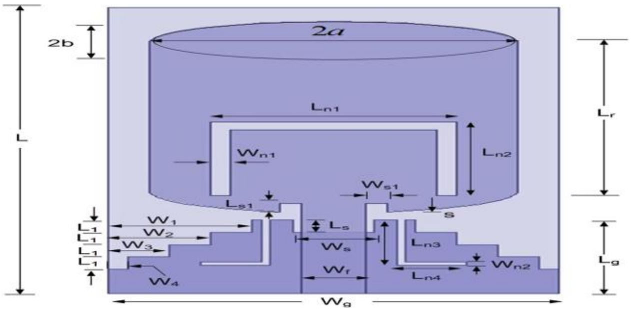

Fig. 2 Schematic of band notched UWB antenna

Kundu, et.al. (2021). We have developed a new printed antenna that has an open rectangular split-ring slot on the leaf-shaped patch and two circular split-ring resonances on the rear of the substrate, opposite the feed line, that can cover commercial UWB frequencies from 3.1–10.6 GHz and eliminate Wi MAX and WLAN interferences with very sharp triple frequency notches. Creating notch bands with a sharp roll off is a key accomplishment in making optimal use of the precious spectrum. At 5.5GHz, the antenna is combined with a reflecting type FSS that increases antenna gain to a maximum of six decibels (dBi). The antenna-FSS composite structure has an average pass band radiation efficiency of 87 percent and four frequency stop bands in the impedance range of 2.52–10.66 GHz. Antenna-FSS construction performance is tested experimentally near a GPR test bed. Aside from a little limitation in the lower band edge frequency for a half-inch thick test bed, the antenna bandwidth, its transfer function (S21), and group delay responses remain unpretentious in the operational band [3] .

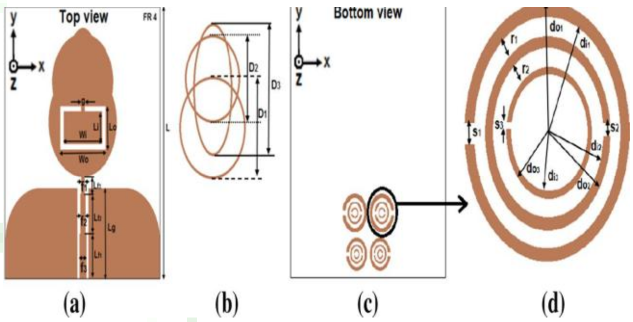

Fig. 3 Schematic of triple notched leaf shaped antenna

Guo, L., et.al (2018) In this article, a small planar UWB antenna is developed and tested. The antenna has a return loss bandwidth of 1.5 GHz to 10.4 GHz and good radiation characteristics. In terms of electrical size, the suggested design has an electrical size of 0.19 0: 32 at 1.5GHz, which corresponds to a modest physical dimension of 37.4 x 64 mm. Antenna performance may be better understood by looking at the key design parameters. UWB applications seem to be a good fit for the suggested antenna [4]

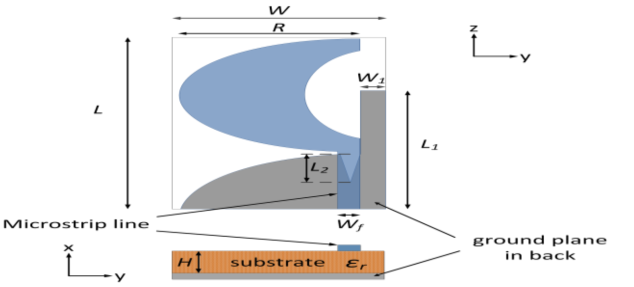

Fig.4 Geometry of the miniaturized planar UWB antenna.

Subramanian, S, et.al. (2018) A chest framework has a diameter of 60 mm and three layers: a skin layer, a fatty tissue layer, and a secretory system surface. The cancerous growth is implanted into the endocrine layers of the epidermis at a range of lengths and places. The SAR1g is used to detect the tumour using the UWB antenna. With the use of a MOSUMMA antenna, a breast model devoid of cancer may be replicated. The antenna and breast model have a spacing of 10 mm. In all, the breast model's SAR1g value is 37.959W/kg and 6.5007W/kg. In comparison to the skin, fat, and glandular tissue layers, the tumour has a high relative permittivity. The SAR1g value of the tumour is higher than that of the other layers because of its permittivity. Local and average values of SAR1g (relative permittivity of 50 and conductivity [4 S/m]), not only at every level but also for the breast model, are influenced by the introduction of tumours of different sizes in different parts of the breast tissue and at various locations in the glandular tissue layer. To put it another way, the local and average SAR1g values of the total breast model are 4027.2 and 175.93 W/kg, respectively, when the tumour is inserted at (0, 0, 45) mm co-ordinates in the glandular tissue layer. A SAR1g value greater than 37.959 W/Kg and 6.5007 W/kg across the entire breast model can almost always be used to identify a tumour in the breast model [5].

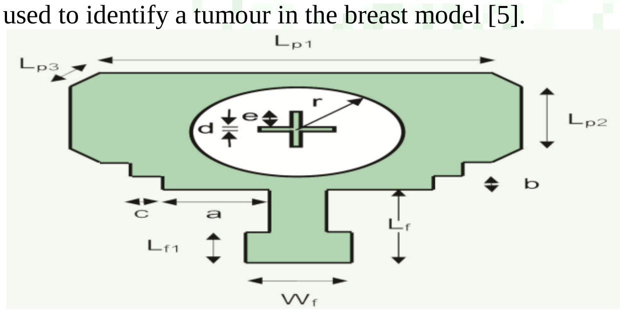

Fig. 5: A modified octagonal shape UWB monopole microstrip antenna (MOSUMMA).

ur Rehman, S., et.al. (2017) Here we describe a novel approach to UWB antenna design and characterization using several rejected bands. Meander-shaped defective ground structure (DGS) slots are used to create band notches in the ground plane for the proposed construction. Band rejection at certain frequencies may be achieved using an antenna with a simple and repeatable configuration. It is used to properly extract the physical complex poles and their residues from the singularity expansion method (SEM) antenna model using a pre-designed filtering system. It is used to measure the bore sight impulse response of the proposed notched-band UWB antenna in order to find the band-notches and extract the complex poles and residues at operational bands between the reject-bands with high precision. These new findings show that band-notches can be found by measuring the bore sight impulse response of the antenna. notched UWB antennas may now be characterized using just one set of parameters in both the frequency and time domains. Fabrication and testing of the notched UWB antenna have been completed and documented [6].

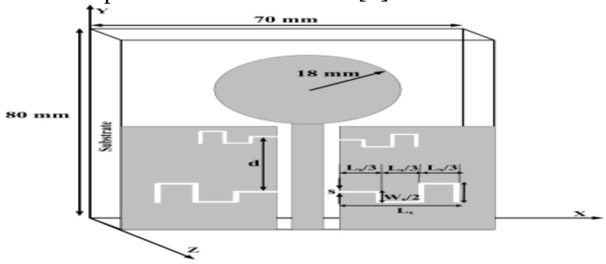

Fig. 6. Geometry of the proposed UWB antenna with dual band rejection
meander shaped DGS slots.

Dhar, et.al (2016*)* An UWB active MIMO antenna design is given in this paper. A 50 x 90 x 76 mm3 substrate is used for the antenna's design. With this approach, instead of constructing an amplifier and antenna with 50 interfaces, the entire system performance is improved. The lowest achieved gain of the combined MIMO antenna system is 14.17 dBi, and the ECC is less than 0.33. Over the whole operational band, the integrated antenna displays a radiation efficiency of more than 60%. Design techniques are provided with simulation and measurement results that are in close accord. MIMO antenna performance may be improved with such a code sign technique, while onerous computational analysis and antenna shape optimization can be reduced [7].

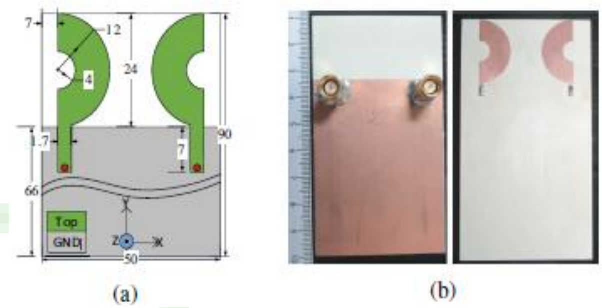

Fig 7.(a) two element UWB MIMO antenna model (b) UWB semi-ring MIMO antenna fabricated prototype (c) Simulated and measured UWB antenna S-parameters.

III. ANTENNA TECHNOLOGIES

Radio pioneers were forced to use resonant circuits to feed their antennas since they lacked the ability to create continuous waves. Diffused sinusoidal impulses are generated by such resonant circuits. The transmission may be thought of as a series of impulses travelling across space and time. It is only natural that a large frequency band around the impulse centre frequency would be used when such a pulse transmission is conveyed in the frequency domain. It was known to physicists a century ago, however, that

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electromagnetic waves propagate through media. The relationship between frequency, phase velocity, and wavelength has long been known. When this information was learned, it quickly led to the notion of wavelength or frequency-selective communication channels between 37H [1] and 374H [3,] the path to today's narrowband systems. Since then, a slew of new resonant antenna designs, including the patch antenna, have been unveiled. Directivity, gain, and other similar parameters.

IV. ANTENNA PRINCIPLES AND PRINTED CIRCUIT BOARD INTEGRATION

In free space, a wavelength originating from a single point source will travel in all directions at the same speed. In the far-field areas of 384H [1], 385H [7], the radiation from the antenna shows plane wave qualities when seen from a distance. 2.8, where 0 is the free-space temperature coefficient and 0 is the free-space conductivity, gives the velocity (c) in free-space. Free-space impedance is defined by the ratio of magnetic and electrical characteristics.

Multi- Band and Resonance Antenna Systems

It is possible to combine an unlimited number of antenna components to create an antenna array. This category differs from the preceding parasitic coupling approach in that it uses an arbitrary number of radiating antenna elements or antenna components in multi resonant structures. Electrical interconnects may be used to feed the structure directly, or taper feeding can be used. Switches, power dividers, or T multiplexing methods may be used to match the impedance of electrical feeding systems. I'm 428H [17] and 429H [18]. As a result, numerous antennas may be employed to improve performance (e.g., mitigating 430H interference). Switching chooses the active radiating antenna element by switching the electrical route as indicated in X431HFig. One of the most essential aspects of a switch is how quickly it can be switched on and how noisy it is. The switch settling time must be rapid enough to provide a matched impedance path during transmission. In addition, it is required that the switching arrangement does not significantly increase noise (432H) [17].

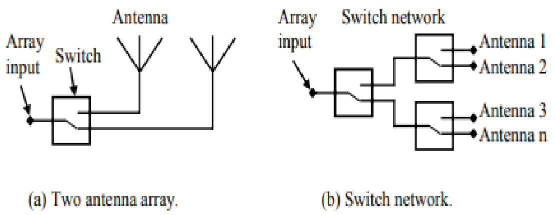
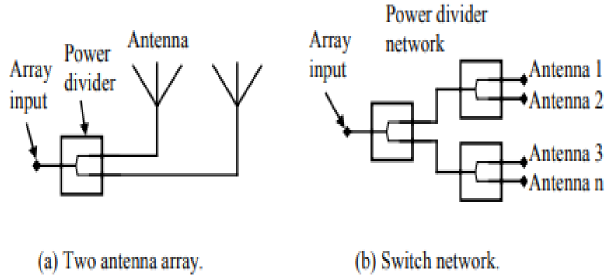


Fig. 8. Switched antenna system: (a) a two antenna array, and (b) a four output port switch network.

X43HFig. 5X shows a well-known approach for physically combining different transmitting antenna arrays: energy amplifiers. There are several uses for 43H [17] array architectures, including linear arrays with concentrated radiation, beam steering, and more. A 3 dB loss in power divider loss is added to each signal that is split evenly by two. It's only natural that the signal received by each of the antennas is much diminished when it's dispersed among so many different radiating components. Furthermore, power dividers need no settling time, in contrast to switched antenna systems.



Sub-arrays produced using energy separators may be used with controls as recommended in Paper I. It is possible to combine any set of subs with a multiplexer 435H [17] by using one or more antenna components in each. There are several ways to integrate multiple narrowband antennas into one wideband antenna system, such as using energy regulators and switches as shown in X436HFig. 6X. 437H [17].

There is no need for the number of switches and power dividers in the system to be symmetrical.

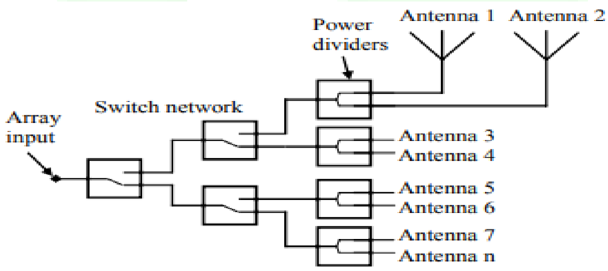


Fig. 9. An antenna array consisting of switches and power dividers.

By using wavelength splitting instead of separators and inverters, a bandwidth and cross-antenna device 438H [18] may be constructed. Since it does not need any settling time, the multiplexing approach has the benefits of both an antenna switch system with 17 elements and a power-divided system; in addition, the signal is frequency-selected for the specified antenna element. It is shown in X439HFig. 7X, the concept of frequency multiplexing. F1B1B2B3B1 are three parallel sub bands of the frequency band F that are de multiplexed into the three parallel sub bands when de multiplexing operations are performed. This is the reverse of what happens when doing multiplexing operations. The power dividers in switched antenna systems do not need any settling time.

With many antennas or sub band components attached, it is possible to create multi-band systems. However, in certain cases, a single wideband antenna for multi-band operation is more desirable than a separate antenna for each frequency. Small notches that block unwanted

bands are created using the X48HFig 10X frequency notching procedures to split the large frequency band into two or more narrow sub-bands 49H [21] in order to avoid interference. For a single notch, half-wavelength resonant structures are often utilised, resulting in a high VSWR. Notching may be added to circular and elliptical dipoles, for example, by cutting the half-wavelength into triangular or elliptical sections. [21] A slot antenna technology, 451H, may also be used to accomplish narrowband notching [22].
Stubs for spectrum correction may be connected to an electromagnetic field to restrict the spectrum and modulate the array. 452H [23]. A multi-band dipole antenna is possible using U-shaped slots. 2. a single rectangular broadband antenna The combination of a 20 monopole antenna and three U-shaped slots results in a frequency band with two band limiting notches. 453H [24]. [25] X45H Fig. 10X depicts two notch antennas 45H [24]. Illustrations show how slits can be cut out of parts of resonant antennas to split or widen the range of frequencies.

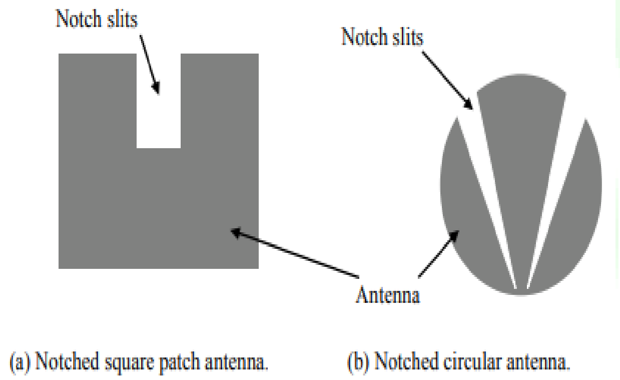


Fig. 10 shows two examples of slotted radiators:

A square patch with a rectangular notch and a round slot antenna with two rectangular notches. Additionally, several antenna systems may be employed in a more classic antenna array format to achieve strong gain throughout the whole 456H frequency range. With a common junction that is matched to 50 or other appropriate input impedances of 457H [17], 458H [18], several antenna elements may be combined to create a wideband multi-band antenna array. As long as there is enough space between parts of the antenna, multi-band solutions can put antennas for different services into one transceiver.

V.CONCLUSION

In this research, A numerical modeling based on the solution of coupled integral equations is used for the characterization of CPW-fed aperture-coupled microstrip antennas. Various shapes of excitation slots, such as open stubs, slot loops, and capacitively and inductively coupled slots, are investigated in terms of return loss and front-to-back radiated power ratio. It is shown that a centered CPW open stub gives a minimum of back radiation while allowing for easy matching. The slot-loop excitation seems to be a convenient feeding mechanism that also allows the insertion of active devices.

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