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REVIEW PAPER ON BROADBAND ANTENNA FOR MODERN WIRELESS COMMUNICATION

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ABSTRACT

In this Review Paper on Broadband - Antenna is presented. There are many researchers who have contributed to the field of broadband antenna techniques in early days. Over the period of time researchers have contributed much on increasing the broadband and broadband of wireless system that should be effective for modern communication. Research and development in this field have been reported by many researchers in the past few decades on the basis of different techniques. In this review and survey of broadband Antenna is presented. This Antenna has versatile features sustain compactness, high bandwidth, high gain, least loss, multiple polarization and flexible installation with number of system.

INTRODUCTION

In today's technology wireless communication broadband antenna with versatile features is highly required, so that raising the demand of Broadband band Antenna. But in day to day technologies demand is change and enhance with more enhancement in features of device, so that further modification is also required for Broadband band Antenna, I N RECENT years, rapid progress in communication technology needs antennas having light weight, low profile, superior performance, and multiband operation. Micro-strip patch antennas can accomplish these requirements. Wideband and multiband antennas are preferred to avoid using multiple antennas for different operating frequencies. However, designing an antenna that simultaneously covers Bluetooth, Wi-MAX, and WLAN bands is a challenging task. Recently, various types of designs have been proposed to obtain multiband antennas. Different planar monopole antennas achieve multiband operation using complementary split-ring resonators [1],branch strip and hook-shape strips [2], branch strips and rectangular slit in the ground plane [3], circular arc-shaped strip and straight strips [4], and U-shaped strips [5]. Planar inverted-F antennas (PIFAs) [6]–[8] also provide multiband performance by modifying the radiating elements by introducing slots that create multi-resonant paths and hence multiple frequency bands.The coplanar inverted-F antenna [9] has multiband performance using open arms and ground slots. A compact inverted-F antenna is also reported in [10]. however, it has a high level of cross polarization For This reason, studies to achieve Broadband band Antenna operations of Micro-strip Antennas have greatly demanded. Surveyed almost all the possible work done in Broadband band Antenna in Past 4 decades.

REVIEW OF LITERATURE

Review of literature reveals that research into the Broadband band Antenna is as follows.

Tuning techniques: In [2001] Tuning techniques for planar inverted-F antenna User terminals of modern mobile communication systems require efficient, low profile antennas, capable of broadband and multi-band operation. In that respect, planar inverted-F antenna (PIFA) designs have emerged that explore the trade-off between the height above the ground-plane and the achievable effective bandwidth. Further possible bandwidth Enhancements are studied, as is multi-band operation by switching and tuning the resonant frequency of the PIFA, even as maintaining a low height from the ground plane

Appropriate patch shape and dimension of patch Techniques:- Many researchers change the shape and dimension of the patch to achieved appropriate results.

A compact and broadband microstrip stacked patch antenna :-

A compact and broadband micro strip stacked patch antenna with circular polarization (CP) for a mobile 2.45-GHz passive radio frequency identification (RFID) reader is presented. This type of proposed antenna consists of two

stacked patches fed with an S-shaped impedance-matching network (IMN), The peak gain is optimized in the frequency range from 2.31 to 2.56 GHz of larger than 6 dBi, and it achieves 6. 32 dBi in the center frequency 2.45 GHz. The voltage standing wave ratio (VSWR) <2 impedance bandwidth is larger than 15.1%.

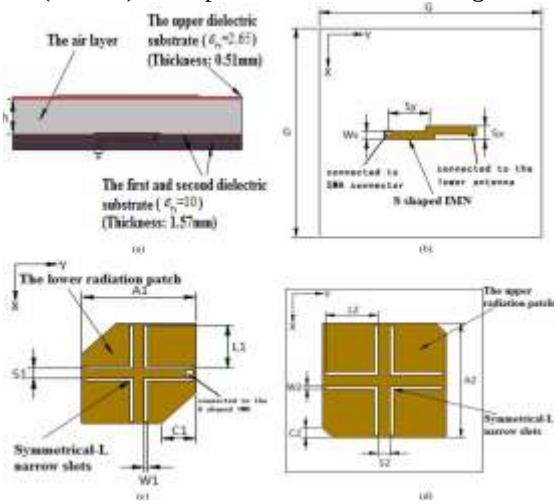

Fig. 1; (a)-(d) Geometry of the proposed compact tenna antennas with an circular polarization.

Fig.2 implemented compact antenna

In [2002], dual-band PIFA with multi-resonators to generate three resonance frequencies used in mobile phone devices is presented. A high frequency structure simulator is used to verify the antenna; the antenna operates at the GSM-900 and DCS-1800 bands. Measurements done in real-life conditions to test how the plastic case and user handing influence the performance of the device demonstrate that the bandwidths are larger than Those in similar devices reported in the previous literature

Novel broadband planer antenna techniques:-

In novel broadband planar antenna is composed of a pair of folded dipoles which are coupling fed by L –shaped microstrip line. In this type of antenna achieves 53% of bandwidth for return loss > 15 db, this antenna covering the frequency range 1.65-2.85 GHZ for 2G/3G/LTE applications.

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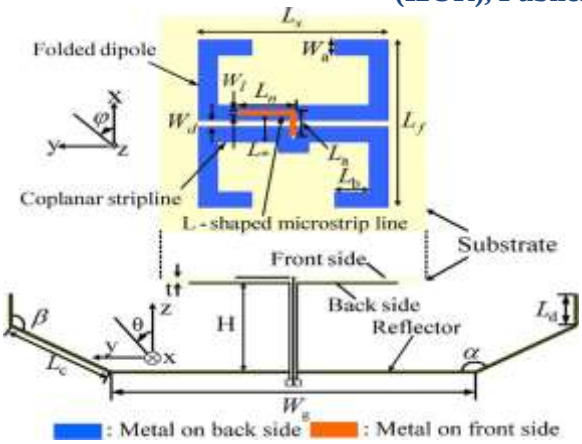

Fig 3. Configuration of a broadband planar antenna

In [2008], A Tuneable PIFA-Based Antenna for Personal Communication Handsets is studied using Varactor diode , The antenna exists broadband at following frequency bands: DCS (1710-1880 MHz), PCS (1880-1990 MHz), UMTS (1900-2170 MHz), Wi Bro (2300-2390 MHz), WLAN (5.2 and 5.8 GHz), Bluetooth (2400-2480 MHz), and ISM band (2500-2700 MHz). In [2008], Broadband Flat-Plate Inverted-F Antenna for Wi-Fi/Wi-MAX Operation is presented. The antenna is complexly structured and can operate as an internal laptop antenna over multiple Wi-Fi and WiMAX frequency bands.

In [2013] Compact Multi-Band PIFAs on a Semi-Populated Mobile Handset With Tuneable Isolation In this communication, miniaturized two-antenna systems composed of printed inverted-F antennas (PIFAs) are developed for a semi-populated mobile phone handset. The PIFAs are loaded with a series combination of an inductor and a varactor to simultaneously achieve miniaturization and tenability. The compact 32 mm-long PIFAs demonstrate tuning range of more than 240 MHz covering personal telecommunication bands from LTE-band13 to GSM900 MHz.

In [2013] A Solar Cell Stacked Multi-Slot Quad-Band PIFA for GSM, WLAN and WiMAX Networks This letter presents a novel low-profile quad-band solar PIFA which has the potential to be employed in self-powered low-power GSM 1800, 2.4 GHz band WLAN and 2.3/3.3/5.8 GHz band WiMAX networks. The multi-slot loaded radiating PIFA element consisting of W-L shaped slots stacked with a polycrystalline silicon (poly-Si) solar cell operating as a parasitic patch element enables the proposed solar PIFA to operate at the centre frequency bands of 1.8, 2.4, 3.4, and 5.8 GHz with measured impedance bandwidths of 16.7%, 9.16%, 7.65%, and 3.45%, respectively.

In [2013],Method of Decoupling and Independently Tuning the Second Mode of a Microstrip-Fed Slot Antenna Using Series Inductive Loading In this letter, a systematic method of decoupling and tuning the second mode of a half-wavelength microstrip-fed slot antenna is presented. This is achieved by introducing a series lumped inductive load at the center of the top edge of a printed slot. At this location, the first (λ/2) mode has a current null, microstrip-fed inverted-F antenna to target common cellular and wireless bands (GSM-900, PCS, UMTS-2100, WLAN-2.4 GHz). The broadband antenna is found by measurement to exhibit better than -6 dB | S11| from 880-985 and 1810-2510 MHz, with radiation efficiencies between 84%-96%.

In [2014], Han Jiang Liu et.al, a compact multi-broadband planar antenna is proposed for wireless handsets. The proposed antenna covers multiple broad frequency bands, including the 900-MHz band with a bandwidth of 29% (790-1061 MHz), the 2-GHz band with a bandwidth of 51% (1650-2775 MHz), and the 3.5/5-GHz band with a bandwidth of 68% (3132-6382 MHz). The multi-broadband antenna consists of a folded monopole coupling to an S-shaped strip for the 900-MHz band, a C-shaped monopole coupling with a C-shaped strip for the 2-GHz band, and a trapezoidal monopole with an inverted-F monopole for the 3.5/5-GHz band.

In [2014], A Novel Compact Dual-Band LTE Antenna-System for MIMO Operation

In this communication, we present a novel compact dual-band antenna-system for LTE multi-input and multi-output (MIMO) mobile handsets. The radiators consist of 3D Inverted-F- Antennas (IFAs) folded on the non-metalized part of the Printed Circuit Board (PCB) and operating in the LTE 700 MHz band. A parasitic radiating element is also attached to the IFAs to operate in the LTE 2.5-2.7 GHz band. Two antennas are placed on a realistic PCB (100 × 40 mm2) for MIMO operation. Various antenna configurations are tested when moving their position on the PCB. Based on the highest port-to-port isolation criterion, two configurations are adopted and their performances are compared. Both simulated and measured results are shown to illustrate the MIMO capabilities of the proposed structures.

In [2014], Small-Size Stacked Inverted-F Antenna With Two Hybrid Shorting Strips for the LTE/WWAN Tablet Device The stacked inverted-F antenna with two hybrid shorting strips placed close to the antenna's feeding strip can provide two wide operating bands to cover long-term evolution/wireless wide-area network operation (698-960/1710-2690 MHz) in the tablet device. The antenna's lower and higher bands are, respectively, contributed by the longer and shorter arms of the antenna.

In [2014] Slow-Wave Quad-Band Printed Inverted-F Antenna (IFA) Quad-band slow-wave (SW) printed inverted-F antennas (IFA) for 0.9 GHz, 1.57 GHz, 1.8 GHz, and 2.45 GHz are proposed. Multi-band behaviour is achieved by combining L-loaded printed-IFA and two printed radiators. Each of the four radiators has a small effect on the performance of the other radiators. Compact printed-IFA antennas are realized using SW structures such as saw-tooth, meander lines, first fractal iteration and high impedance wire (HIW). A size reduction of 40% is achieved.

In [2015] A Broadband Slot Antenna for GPS/WiMAX/WLAN Systems, The design of a four-band slot antenna for the global positioning system (GPS), worldwide interoperability for microwave access (WiMAX), and wireless area network (WLAN) is presented. The broadband slot antenna is studied and designed using computer simulation. Measured results show that the antenna can be designed to cover the frequency bands from 1.575 to 1.665 GHz for the GPS system, 2.4–2.545 GHz for the IEEE 802.11b&g WLAN systems, 3.27–3.97 GHz for the WiMAX system, and 5.17–5.93 GHz for the IEEE 802.11a WLAN system.

Broadband psi (ψ)- sahped microstrip antenna technique :-

In this technique a ψ-shaped microstrip antenna is increased a bandwidth of the E-shaped microstrip antenna by cutting an additional pair of slots on the other edges of the E-shaped patch. The ψ-shaped patch gives a 60% bandwidth at a center frequency around a 5500MHz. its maximum gain is more than 10dBi, which is reduced to less than 4 dBi towards the higher frequency of the bandwidth. In this technique, the broadband responses of the E- shaped patches and the ψ shaped patches are studied.

proximity-fed design of the ψ- shaped microstrip antenna .its BW is more than 4000 (>65%).its gain variation is only 2.5dBi.

broadband proximity –fed design of the ψ shaped microstrip antenna its frequency is 1000MHz and measured BW is 524 MHz its peak gain is very close to 10 dBi.

In 2014, Agarwal,K. ; Nasimuddin ; et.al. Triple-band compact circularly polarised stacked microstrip antenna over reactive impedance meta-surface for GPS applications.The design utilises the concept of combining multi-stacked patches with RIS as imaginary-impedance metamaterial-ground-plane for selective frequency reduction of lower bands with improvement in antenna radiation properties for multi-band applications. The circularly polarised (CP) radiation with compact antenna size is achieved for triple-band GPS frequencies of L1 (1.575 GHz), L2 (1.227 GHz) and L5 (1.176 GHz)

In 2014 Wei Liu ; Zhi Ning Chen ; et.al, Metamaterial-Based Low-Profile Broadband Mushroom Antenna A metamaterial-based broadband low-profile mushroom antenna is presented. The proposed antenna is formed using an array of mushroom cells and a ground plane, and fed by a microstrip line through a slot cut onto the ground plane. Across the bandwidth, the antenna efficiency is greater than 76%, and cross-polarization levels are less than -20 dB.

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CONCLUSION

From Review of broadband planner inverted F-antenna concludes that broadband antenna is demanded in modern applications such as portable devices like mobile handset, vehicles, navigation, Wi-MAX, IEEE 802.11 Wireless system, Satellite Communication System, Ultra, WLAN and GSM etc. Compactness and broadband techniques of antennas have been reviewed from past decades and discuss different technology. Some techniques shown in table 2, shows different technology used in past decades such as changing in shape and dimensions of patch and Ground plane, EBG Structure, Negative permeability and permittivity Meander's Ground plane technique, additional meta-material parasitic patches, via hole, high and low dielectric materials, meta material, different types of structures like inverted PLL U Type, Thick and thin substrate, Shorting pins and posts technique, Inverted shape patch L type, U –shape, H-Shape, Folded Shape, slotting technique, parasitic patches, inverted U-shaped or folded patch, stack type geometry , transmission line matching network has studied, Microstrip Antenna preferred modern wireless communication due to compactness and broadband features it also provides triple, dual band, multi band, multiples polarization from Single antenna and research is continuous going on. From survey of all techniques, it is concluded that more modification and improvements is required in micro-strip antenna. Further discussion and invention is required for portable and handheld devices like laptop, mobiles etc, in professional and industrial application,

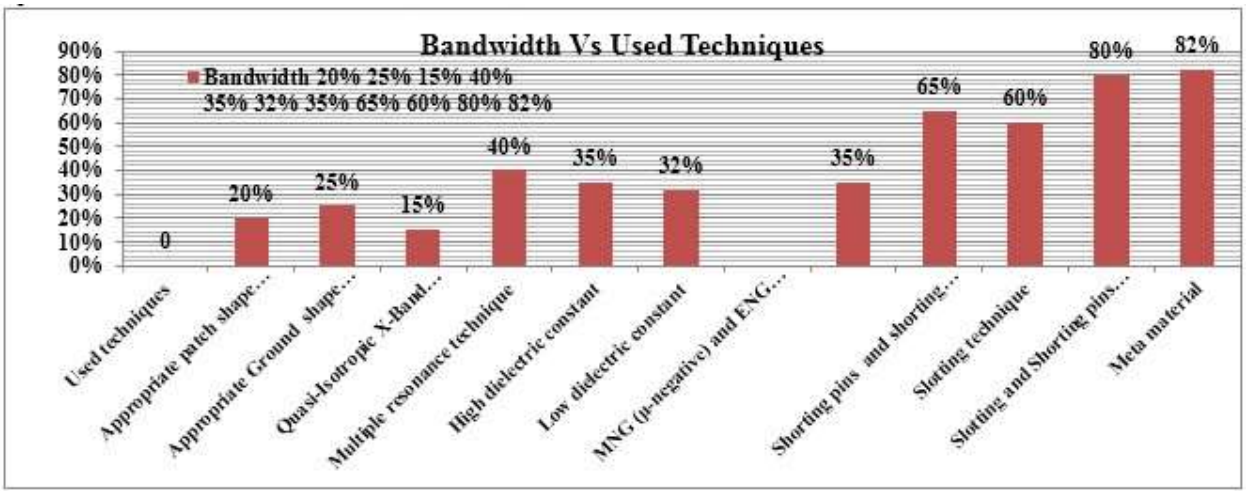

Fig 1 Bandwidth Vs Used Technique

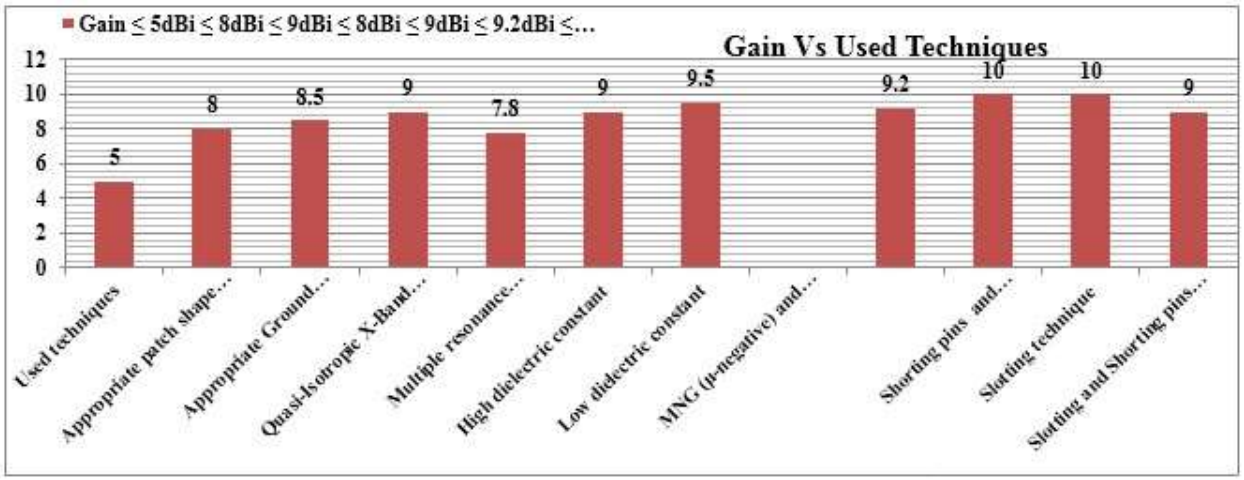

Fig 2 Gain Vs Used Technique

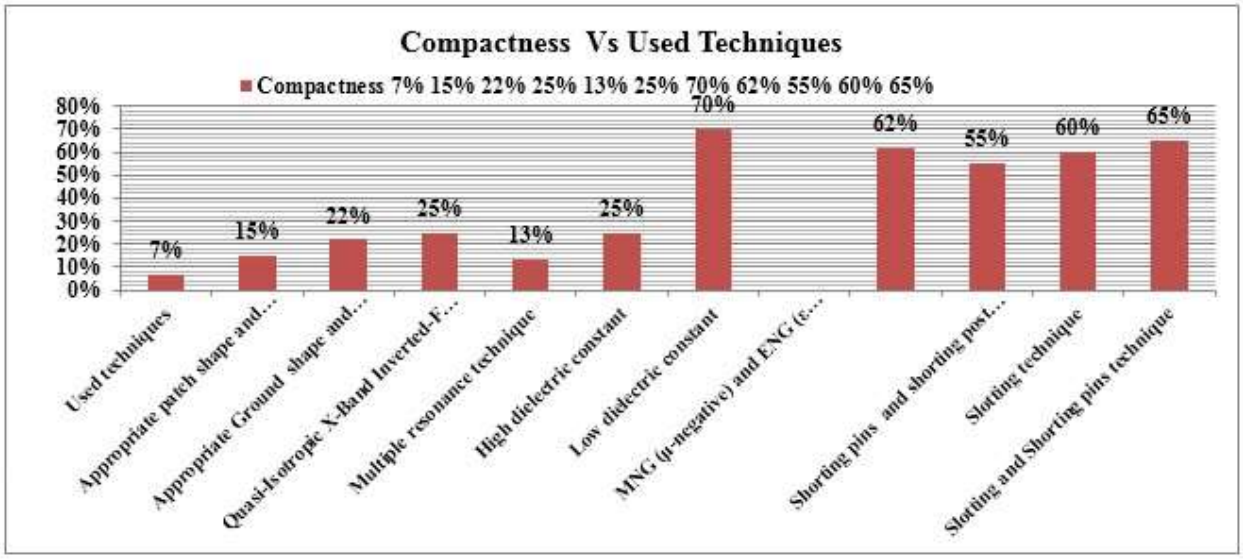

Fig 3 Compactness Vs Used Technique

Table 1 SURVEY TABLE OF DIFFERENT TECHNIQUES

Parameter	Technique- 1	Technique- 2	Technique -3	Technique -4	Technique -5
Technique	A Compact broadband microstrip stacked patch antenna with circular polarization.	Novel broadband planar antenna	Low profile and high – gain yagi wire- patch antenna	Broadband pasi (Ψ) – shaped microstrip antenna	Dual – layer broadband compact UHF RFID tag antenna.
Frequency	2.31-2.56 GHz	1.65 – 2.85 GHz	5 .6 GHz	5500 MHz	860-960 MHz
Bandwidth (MHZ)	15%	> 53%	_	60%	140 MHz
Area (mm 2)	58 X 58 X 11 mm3	_	_	_	56 x 26 x 3.2 mm
Gain	6 dBi	9 dbi	14.8db	> 10 dBi	_

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