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Review of Compact Broadband Antenna for Modern Application

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***Abstract*- In this paper review and survey of Compact Broadband Antenna is presented. Compact broad band antenna has versatile features sustain compactness, high bandwidth, high gain, least loss, multiple polarisation and flexible installation with number of system. Recently in modern wireless communication compactness with versatile features is highly recommended, so that raising the demand of Compact Broad 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 compact broadband antenna, In recent years mobile communication systems units required least antenna size in order to meet the miniaturization requirements of mobile units. Thus, size reduction and bandwidth enhancement are becoming major design considerations for modern application. . For this reason, studies to achieve compact and broadband operations of microstrip antennas have greatly demanded. We have surveyed almost all the Possible Work Done in Compact Broadband antenna in Past Decades. In the last 40 years, the Compact Broad band microstrip antenna has been developed for many Communication systems like Mobile System, Radars, Military, Ultra-Wideband Application, Radio Frequency Identifications application, and reader devices, WiMAX, WLAN and GSM etc.**

***Keywords*—** *Compact Broad Band, Shorting Pin, Artificial Ground, Meandered Ground Plane*

I.INTRODUCTION

In general, antenna is a key device for wireless communication, antenna used to transmit and receive the signal, used as transceiver, modern systems needed such type of antenna which has transceiver fuction in single geometry, prefer in monolithic IC Form, microstrip antennas required only half-wavelength structures and are operated in The fundamental resonant mode either TM_{01} or TM_{10}, Many type of design shape like rectangular, Circular, ring, square, tooth paste type, Meander and many more is used to significant progress in The design of compact microstrip antennas with broadband, dual-frequency, multi frequency band, Dual polarized circularly polarized, linear polarized, and gain-efficiency enhanced operations have been reported over the past decade. Compactness is also reported by using stack type of geometry like in two layer, three layer etc. In addition, various Novel broadband microstrip antenna designs with dual-frequency, dual-polarized, and circularly polarized operations have been published in the past decades in open literature and in many books. These recently reported novel designs for compact and broadband microstrip antennas. Many techniques have been reported to reduce the size of microstrip antennas at a fixed operating frequency.

II. REVIEW OF WORK

In this section we presented review of many paper, books and many exists system, Microstrip antenna demanded in application due to compactness and low weight, micro strip antenna fabricated in monolithic IC form like sim of mobile, chip type design only possible by microstrip antenna sothat microstrip is more demand in many application, in past decades antennas in form of aerials for example see in WLL, Old radios, in TV application in CARS, In past decades designing start with general purposes PCB, but in today antenna is design in versatile PCB as per application, as per as application PCB'S is available like high temperature , low temperature application etc, many number of material available for fabrication of antenna such as FR-4, artificial material, uniaxial,, RT Duroid, LTCC,HTCC and ferrite. in basic design of antenna i see antenna consists by parallel two ground plane separate by dielectric material, so as per as geometry configuration many number of technique is possible for generate compactness, from top patch compact is possible by using different type of shape of patch, width of conductive layer, used conductive layer, if we control first aspect of design we control reflection and enhance surface current and possible to used design antenna for

low frequency application, in second aspect we control the used dielectric material used for spreading the patch and ground plane. In survey we find geometry design by thick substrate, thin substrate or combination of both, in third aspect possible by controlling the characteristic of ground plane, as per as theory ground is effective role to generate impedance matching of design antenna and controlling reflection of geometry, some papers work on shape of ground plane like in [5] , in this paper the antenna's ground plane was meandered by inserting several meandering slits at its edges. It has been experimentally observed [5], we found that meandering's ground plane is more effective compare to meandering patch because the meandering slits in the antenna's ground plane can effectively reduce the quality factor of the microstrip structure geometry, and significantly simultaneously improve compactness and impedance bandwidth of antenna compare to the conventional microstrip antenna. Compact microstrip antennas have recently received much attention due to the growing demand of small antennas for personal communications equipment like laptop mobile i-pad etc. after this technique many work on substrate materials For achieving microstrip antennas with a reduced size at a fixed operating frequency, the use of a high-permittivity substrate like HTCC, Si, Ceramics etc. high-permittivity substrate is an effective method; in today's technology stub matching method also preferred, either used shorting stub or open circuit stubs, Recently, it has been demonstrated that loading the microstrip patch with a shorting pin can also effectively reduce the required patch size for a fixed operating frequency [1–8].

Compactness is also possible by using thin dielectric substrate like RT Duroid, Other aspect also consider in previous work, Compact designs also done by combining a shorting-pin loading with the patch-meandering method techniques [6]. Meandering method to generate is describe in [9], in this ground plane configured by Meandering shape and obtained lowering of the antenna's fundamental resonant frequency.

In addition, the impedance bandwidth ratio and efficiency of antenna can be enhanced, which is a great advantage of this type of ground-meandering method over the patch-meandering one.

Experimental results for a constructed prototype will be presented and discussed. As further compact design depicts by planar inverted-L (PIL) patch used in geometry [10-11].

This kind of PIL patch antenna is quarter-wavelength antenna, but with similar broadside radiation characteristics to the conventional half-wavelength microstrip antenna. Obtain Antenna size reduction by using a PIL patch antenna in place of the conventional microstrip antenna at a fixed operating frequency. The technique inverted U-shaped or folded patch, square patch used in past decades to consist compact microstrip antenna. By using an inverted patch, enhance the surface current in a patch of microstrip antenna and reduce reflection thus the antenna's fundamental resonant frequency shift towards lower frequency edge [12]. This technique leads to a large antenna size reduction for a fixed operating frequency. The advancement in modern wireless communication systems has increased significantly the demand for compact broad band microstrip antennas, capable to be implanted in portable, handheld devices such RFID handheld reader, laptop, mobiles, i-paid recently, demands of these devices with compact size and hence antennas mandatory smaller and light weight especially at the low microwave frequency range application. In past decades the microstrip antennas designed in compact size but lower gain and lower bandwidth. For transportable and handheld application, gain and bandwidth of the antenna is not so essential. on the other hand antenna have some gain with optimum bandwidth restraint. For millimetre wave applications, but if easily possible to design all such type of antenna with high gain and wide bandwidth then technology become faster and highly reliable. The microstrip antennas available on various substrate materials such as FR-4, artificial material, uniaxial,, RT Duroid, LTCC,HTCC and ferrite are analyzed and designed for reconfigurable ,dual, broadband and Multiband applications. The small size microstrip antennas can be designed using artificial materials. Various shaped radiators like rectangular, circular, triangular etc for compact broad band antenna and circular polarization radiation used in recent communication system. The circularly polarized microstrip antennas with different feeding system like coaxial, aperture coupled, proximate microstrip feeding is used in past decades. The microstrip antennas are also considered as a sensor for detection of materials properties. Consequently, antennas for these systems are commonly implemented on in-package solutions. The integration of antenna-in-package is enclosed by using wire bonding or flip-chip bonding interconnections.

Lastly, the 3D electromagnetic software-tools, like IE3D,HFSS,CST,MICROWAVE OFFICE, is used to demonstrated designing of antenna and its properties The survey of microstrip antennas is useful for students, researchers and microstrip antenna design engineers. **M**onopole antennas are versatile used since they provide a vertical polarization and axial radiation pattern. on the other hand, the profile of a conventional monopole antenna that has a quarter wavelengths is too high for devices or applications [1], such antenna has a very narrow bandwidth of about 1.5% for a profile of. Delaveaud *et al.* proposed a monopolar patch

antenna [2] that was shorted with two wires. The antenna [2] has a very miniature size and a low profile. However, the bandwidth of the antenna [2] is only 3%. The wire-shorted monopole patch antenna [2] works in the lowest mode that is produced by the shorting wire and the parallel patch [3]. The narrow bandwidths of the antennas [1],[2] limit the applications in modern communication systems. The bandwidth enhancement for patch antennas were demonstrated [4]–[11] with and without shorting wires. All these antennas have a profile of about (or even higher); even so, it is too thick for some applications such as the installation to an aircraft. in addition, these antennas accept an air substrate and their structures are not simple to be fabricated. In 2009, Al-Zoubi *et al.* [12] presented circular patch-ring antenna fabricated on a FR-4 PCB. The antenna in [12] adopts the ring type configuration with shorted concentrically with a set of conductive vias .This antenna has a compact size and low profile gives a wide impedance bandwidth of 12.8%. This type of antenna can produce a monopole radiation pattern with wideband impedance bandwidth characteristics. As per survey current and voltage analysis of the modes in the microstrip patch antenna done using a cavity model and transmission line model. The cavity model is little bit complex in analysis but not only distinguishes noticeably each resonating mode in the antenna, but also gives a design instruction for the patch antenna. The mode is a disturbed mode of the mode in the circular patch antenna without wires shorted [13]. Shown results show that the antenna yields an impedance bandwidth of 18% and a maximum gain of 6 dBi [13]. Finally, the microstrip antennas should be design for millimetre-wave applications with compactness, broadness as per as impedance bandwidth, high gain and high efficiency is highly needed in emerging wireless systems that operate at millimetre wave frequencies for high data rate transceivers for wireless personal area networks (WPAN), preferred compact mechanical robust integrated antennas and easily interface with system.

Table 1 Survey table

Used techniques	Bandwidth	Gain	compactness
Appropriate patch shape	≤10%	≤ 6dBi	≤5%
Appropriate Ground shape	≤20%	≤ 7.5dBi	≤10%
Meander's Ground plane technique	≤ 40%	≤ 9dBi	≤20%
Thick substrate	≤ 30%	≤ 7dBi	≤10%
Thin substrate	≤ 35	≤ 9dBi	≤25%
Shorting pins technique	≤ 60%	≤ 9dBi	≤60%
Slotting technique	≤ 60%	≤ 10dBi	≤55%
Slotting and Shorting pins technique	≤ 80%	≤ 10dBi	≤60%

III.CONCLUSION

From the review of Compact Broad band antenna we concluded that Compact Broad band antenna versatile used in modern applications such as Radars, Satellite Communication System, Ultra-Wideband Application, WiMAX, WLAN and GSM etc. We have reviewed compactness and broadband technique of antenna from origin and discuss development and come across Different technologies are used for implementing the for designing , table -1 shown different used technology used in past decades, Appropriate patch shape, Appropriate Ground shape, Meander's Ground plane technique, Thick and thin substrate, Shorting pins technique. Inverted shape patch L type, U –shape, C-Shape, Folded Shape, shorting pin, shorting post, slotting technique, inverted U-shaped or folded patch, stack patch, many number of impedance matching network used etc, is used, from review of all technique we concluded that more modification and enhancement required in compactness, broadness, gain, efficiency, so further discussion and invention is required for portable and hanhelded devices like laptop, mobiles etc, in professional and industrial application, In recent years communication systems require smaller antenna size in order to meet the compactness requirements for mobile system. as a result, size reduction and bandwidth enhancement are appropriate major design considerations for modern application. For this reason, studies to achieve compact and broadband operations of microstrip antennas have greatly demanded.

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