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A Review on Bandwidth Enhancement in Microstrip Antenna

Ritu Goyal[1*], Y K Jain[2]

[1]Mewar University Gangrar, Rajasthan, India
[2]Ex. Scientist, CEERI, Pilani, India

Corresponding Author: ritunoddy@gmail.com, Tel.: +91-9467770634

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***Abstract*—** Now days antenna designers are paying more attention on microstrip patch antennas, due to its numerous blessings in field of communication, inclusive of high reliability, light weight, ease of fabrication etc. but despite of its extreme benefits, patch antennas additionally experience some drawbacks viz low gain and narrow bandwidth. These drawbacks may be overcome by looking after a few parameters within the layout of antennas. there are various designing factors affecting the radiating traits of antenna together with patch dimensions, feeding techniques, substrate used in production of antenna etc. The paper is targeted on various bandwidth enhancement strategies. The paper accommodates of a short examine in feeding techniques, parasitic patch elements, advent of slots, twin feed, shorting pin, air hole, defective ground and so forth that enhances the bandwidth of antenna.

***Keywords*—** Technology, Electronics, Optoelectronics, Photonics, Telecommunications, Signals. Circuits, Systems, Applications.

I. INTRODUCTION

Primary barriers to implement patch antennas in modern broadband communication system applications are their narrow bandwidth. The microstrip antennas are often realized with bandwidth of the order of 1% to 5%. Bandwidth enhancement technique is one of the areas of research in the field of microstrip antennas. Basically the bandwidth is defined more concisely as a percentage (f/ f0) × 100%, where f and f0 respectively represent the width of the range of acceptable frequencies and the resonant frequency of the antenna. The parameters such as radiation efficiency, return loss, and voltage standing wave ratio (VSWR) [15] are often used to define the bandwidth of a microstrip antenna.

For broadband antenna design the following considerations are necessary to enhance bandwidth in antenna geometry.
- Larger substrate thickness or lower permittivity of the dielectric to obtain low Q.
- Feed impedance must be matched

II. LITERATURE REVIEW

[1] Exhibits a Bandwidth improvement of Rectangular microstrip fix receiving wire (RMPA) utilizing Defected ground structure (DGS). A basic RMPA is planned which works at 2.4 GHz frequency. This receiving wire is considered as reference radio wire. This reception apparatus has data transmission of 67 MHz. In this RMPA DGS system is coordinated. U shape DGS is embedded in a straightforward RMPA. Because of DGS, Bandwidth is enhanced contrasted with before receiving wire. Later this U shape DGS is adjusted to E shape DGS. Later this E shape DGS is adjusted to Double E shape DGS lastly into Psi shape DGS. The data transmission of straightforward RMPA was 67 MHz which got enhanced to 302 MHz at 2.4 GHz recurrence of with Psi shape DGS. The data transfer capacity got is appropriate for various utilizations of WLAN. Ansoft HFSS programming is utilized for recreation of the planned structure.

[2] Patch antennas dependably locate a superior match in embedded applications as a result of their simplicity of manufacture, little size and so forth. Here author proposed a method for improving the bandwidth of the patch antenna by optimizing the position of feed offset. It is found that in rectangular microstrip patch antenna operating at 5.8GHz ,the bandwidth is enhanced by 54 percent from 260 MHz to 400 MHz but a slight lower gain is reported. While the return loss remains nearly same at -17.5 dB and -17 dB respectively. Gain and directivity are slightly reduced from 7.18dB and 7.23dB to 5.17 dB and 5.24 dB.

[3] Shows the importance of BPF in wireless communication systems and gave a brief idea to design BPF using microstrip parallel coupled line structure. The layout operates at centre

frequency of 2.45 GHz with a bandwidth of 250MHz and impedance adjusted to 50ohm.The simulated results shows a good performance with insertion loss of below 4.3dB and return loss of more than -19.29dB in its pass band and during stop band return loss is less than -41.0dB.

[4] Proposed a differential-fed microstrip fix radio wire (MPA) with transmission capacity improvement under the operation of TM10 and TM30. At first, a rectangular differential-sustained MPA is hypothetically researched in order to show that the greater part of the undesired modes between the TM10 and TM30 modes are smothered or evacuated out adequately. At that point, by symmetrically presenting two sets of shorting pins, the resounding recurrence of TM10 mode is dynamically turned up. From that point forward, with the assistance of two long spaces, the full recurrence of TM30 mode is diminished with slight impact on that of TM10 mode. Moreover, a short opening is embedded at the focal point of the fix to wipe out the parasitic inductances of the shorting pins and test bolsters. With this course of action, these two radiative thunderous modes are moved in vicinity to each other for wideband radio wire. At long last, the proposed differential-nourished MPA is manufactured and measured. Trial comes about delineate that the impedance transfer speed (|Sdd11|<-10 dB) of the receiving wire has picked up a gigantic addition up to around 13% (1.88-2.14 GHz), while staying under the radar property with the tallness of 0.029 free-space wavelength. Furthermore, the receiving wire has accomplished a steady increase shifted from 5.8 to 7.0 db over the working band

[5] Investigated that receiving antennas are essential segments of Wireless Capsule Endoscope (WCE) because of its non-intrusive nature contrast with the conventional endoscopy. The primary difficulties of these receiving wires incorporate information rate of the telemetry framework, scaling down the container, engendering productivity of the reception apparatus in the region of human body. The author proposed, a smaller than expected Ultra-wideband (UWB) radio wire and assessed for WCE applications. The proposed reception apparatus comprises of opened round transmitting patch having a saw tooth incomplete ground plane with 50 Ohm microstrip sustain line. The substrate of the proposed receiving wire is picked as Roger R03010. The data transfer capacity improvement is accomplished by appropriate determination of measurements and places of openings on the emanating patch and presenting a saw tooth halfway ground plane. The in-body exhibitions of the reception apparatus are examined inside a homogeneous human muscle layer. The receiving wire can accomplish an impedance data transfer capacity of 1.84 GHz from 4.6554 GHz to 6.4953 GHz for return loss under −10 dB with Omni-directional example. Greatest force of 44.2051 mw can be set as contribution to the proposed radio wire keeping in mind the end goal to conform to the IEEE C95.1-2005 security guidelines.

[6] tries to present a developing enthusiasm for the ridge gap waveguide (RGW) innovation as a controlling structure for high-frequency applications. The working bandwidth of the RGW is controlled by the stop band of the surface encompassing the ridge. Bandwidth is increased by the unit cell within the sight of the ridge. Adjustments of the cell filling shape and the edge structure are done to upgrade the RGW data transmission. Author presented another RGW in light of blended manufacture innovation. The proposed design presents versatile and direct structure with enhanced transmission capacity while keeping the a impedance same. The proposed structure is manufactured and measured and found to be in good agreement with each other.

[7]projected the low profile zeroth-order resonant antennas with monopole-like position radiation within the horizontal direction with vertical polarization. It is composed of a rotationally bilaterally symmetrical mushroom structure as well as multiple metal patches and vias, a microstrip loop outside the patches, and a feed line connected to the outer loop. For comparison, a standard mushroom antenna with an equivalent size is additionally simulated. It is found that the information measure of the projected antenna is increased compare to standard mushroom antennas while not vital degradation of gain.

[8]An X-band microstrip reception apparatus that is antenna for transmission capacity enhancement displayed by an author. The proposed radio wire is involved circular and rectangular openings encouraged by a 50 ohm microstrip line. It is outlined on 40 mm × 40 mm printed circuit board utilizing FR4 substrate material. Industrially accessible high recurrence electromagnetic solver HFSS in view of the FEM is considered. The impedance transmission capacity (VSWR≤2) of the proposed receiving wire is found to be 2.10 GHz (9.75 to 11.85 GHz). 1.85 dB is the average gain whereas the highest gain is 2.3 dB. The proposed radio wire shows stable Omni-directional radiation design

[9] illustrates the design of a gap coupled modified square fractal microstrip patch antenna which has been designed to overcome the limitation of narrow bandwidth. The proposed design has an impedance bandwidth of 85.42% at the resonant frequency of 1.844 GHz. This antenna can be simultaneously used for Bluetooth, WLAN and WiMAX applications. The simulation of the proposed design is done through IE3D.

[10] A Novel Triangular UWB microstrip antenna which offers an ultra-wide bandwidth (UWB) greater than 8 GHz is proposed by author. The design includes partially truncated ground plane (defected ground).The slits are inserted in the

triangular radiating patch, and different substrate materials are used in order to obtain band-notched UWB. The simulation experiments have been carried out using the IE3D.

[11] proposed an antenna design having a combination of dual U-slot and multiple layers to get multiple bands and wide bandwidth. Also proposed a multiband triple-layer probe fed double U-slot microstrip patch antenna for wireless applications. Parameters of antenna structure with double U-slot is studied by varying feed position. The proposed antenna is fabricated and tested. The simulation and experimental results are presented. The proposed antenna provides triple bands at 1.6GHz, 1.9GHz and 3.8GHz and a bandwidth of 600MHz for a substrate thickness of 1.6mm and 1.8GHz, 2.2GHz and 4.8GHz and a bandwidth of 800MHz for a substrate of 0.6mm thickness.

[12] presented multiple L slot antenna for WIMAX and WLAN applications. The coplanar waveguide encouraged microstrip antenna includes four rectangular patch array each implanted on three L slots and a Plus slot either on the fix or on the ground plane or on both the fix and the ground plane. The proposed antenna brings about decrease in weight. Proposed reception apparatus is simulated utilizing IE3D and results are compared by looking at the gain, return loss, directivity, band width and VSWR with the designed antenna. [13] displayed an E-formed coaxial feed microstrip antenna. The proposed receiving wire is intended to work between 5.725 to 5.85 GHz frequency bands. The Ansoft's HFSS programming has been utilized for outlining the proposed radio wire. The FR4 epoxy dielectric material of relative permittivity 4.4 and loss tangent of 0.0013 with the thickness of 1.6 mm is utilized as a substrate of the proposed reception apparatus. Elite qualities and great return loss values for 5.725-5.85 GHz frequency band have been acquired for the proposed antenna.

[14] proposed an antenna system with the combination of sensing and communication tasks to be integrated into cognitive radio front-ends. Sensing task is performed by the use of ultra-wideband quasi-omni directional antenna. While the communication task is ensured by utilising a narrowband antenna. Both antennas were designed on the same layer of FR4 substrate, for assembling cost limitation. Therefore, the isolation between them must be taken into account. The deliberate common coupling of not as much as - 18dB is accomplished over the entire impedance transmission bandwidth. The proposed detecting receiving wire covers a wide range frequency bands extending from 2 to 5.5GHz. While the correspondence receiving antenna works at 2.8GHz, and by adding inductors to the antenna, the resonant frequency can be tuned from 2.6 to 2.7GHz. The entire reception antenna framework was outlined, created, and tested. Measurement and simulation demonstrates the practicality of the proposed structure for intellectual radio applications.

III. DISCUSSION AND CONCLUSION

Lot of methods have been discussed regarding the enhancement of bandwidth in microstrip antenna. The RGW technology is advantageous for bandwidth enhancement and offers Low loss and low dispersion but the major disadvantage is difficulty in fabrication because the fabrication process requires high precision. Another technology discussed is DGS technology in which defected ground is proposed. The result shows the large increment in bandwidth. A differential fed technology in which undesired modes are removed gives not only increased bandwidth but also high increment in gain and that too, a stable gain. A novel combined antenna system for cognitive radio front-ends is also a good approach, Space and manufacturing cost constraints are kept in view. This technology covers the spectra of IEEE 802.11ac and 802.11n (2.5/5 GHz), UMTS2000 (2.12.2 GHz), and WiMax (2.3-2.5/3.4-3.5 GHz) systems, and is a good candidate to be integrated into the RF front-ends for cognitive radio systems .All the technologies discussed are simulated using simulation software like HFSS,IE3D. But if MIMO(Multiple Input Multiple Output) has been associated using diversity technique then results would have been better.

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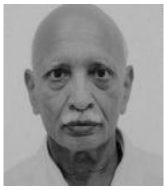
Authors Profile

Mrs. Ritu Goyal is currently pursuing Ph.D from Mewar University, Rajasthan and currently working as Head in Department of Electronic and Communication Engineering, Hindu College of Engineering, Sonepat, India since 2011. She has published more than 10 research papers in reputed international journals and conferences including IEEE and it is also available online. Her main research work focuses on Antenna and wave propagation and microwave. She has 16 years of teaching experience.



Dr. Y.K. Jain, served as Professor at BRCM Behal in ECE department from Feb 2008 to April 2008 and Principal of BMIET, Sonepat from May 2008 to Jan 2013 after retirement from Central Electronics Engineering Research Institute Pilani as Scientist-G , where he was involved in setting up of Thick- Film laboratory and developed Thick- Film Technology for manufacturing HMCs for SPACE for the first time in India. He transferred thick- film process technology to three Indian industries for manufacturing HMCs for telecommunication and industrial applications. HMCs developed at CEERI were used in SROSS- I, SROSS- II, INSAT-II A,B,C & D Satellites. He worked on more than 24 sponsored projects from ISRO, Defense, MIT ,DST and industries He has about 65 papers, 10 patents and 29 technical reports. He invented a new thick film component called VTR. He visited USA, UK and Germany under various programmes . .He headed HMC group and worked on packaging of ISFET sensors, microelectrodes for sensors, design & development of Pt. heater for sensors, development of thick film sensors and applications of LTCC technologyHe has been awarded ISHM Best paper award, NRDC Independence Day Award, A.N. Chatterjee Memorial Award and various Institutional Awards He has guided about ten M. Tech Electronics and seven Ph.D students, three students have been awarded Ph. D degree . He is Fellow member IETE, life member of IMAPS and Semiconductor Society of India.