Design and Implementation of Rectangular Microstrip Patch Antennas for Biomedical Applications

M.Anto Bennet, Himaya. R, Deepa. K, Divya.V, Aarthi.V

Abstract: In this work we use microstrip patch antenna. This antenna's are employed in several medical, military applications. In medical it is used in body implant applications to cure tumors, cardio vascular disorders and ulcers. This antenna's plays an important role in the place of telemetry. This antenna's have a good efficiency in transmission and reception. In this work the main objectives are to reduce size of the antenna, frequency and to increase the gain. We operate this antenna in 2.45GHz.This frequency will not cause any damage to the internal and external skin when it is implanted. This antenna will provide greater safety for the patients. This antenna's are designed with an input impendence of 50 Ohms.This antenna has been developed with a gain of 7dB.

I. INTRODUCTION

Conversation is an essential device for connecting one another. communiqué is a crucial part of existence and additionally essential in enterprise, schooling and another state of affairs where humans connect each other. Records dissemination, the primary goal of verbal exchange is carried out by radio, TV and cellular telephones called radio structures of telecommunication. The a hit design of this radio system relies upon on an element referred to as an antenna that's the part through which radio frequency strength is coupled from the transmitter to the outdoor medium and in reverse to the receiver from the outside medium. The current enhancement in facts technology and Wi-Fi network conversation which include having a horrific signal when the receiver is simply too some distance from the transmitter has created many possibilities for boosting the overall performance and efficiency of existing signal transmission and processing systems.

Revised Manuscript Received on March 25, 2019.

M.ANTO BENNET, Professor, Department of Electronics and Communication Engineering, Vel tech

HIMAYA. R, UG student, Department of Electronics and Communication Engineering, Vel tech

DEEPA. K, UG student, Department of Electronics and Communication Engineering, Vel tech

DIVYA.V, UG student, Department of Electronics and Communication Engineering, Vel tech

AARTHI.V, UG student, Department of Electronics and Communication Engineering, Vel tech

The antenna is described, a method of radiating or receiving radio waves. it is an association of electrical conductors made to efficaciously do radiate and get hold of electromagnetic waves in desired instructions. It's also to be an interface and a guiding shape between a transmission line and area; that is, it acts as matching structures among assets of electromagnetic energy and area. The antenna is defined as, approach of radiating or receiving radio waves. Its miles an association of electrical conductors made to do radiate and receive electromagnetic waves in desired instructions. It's also to be an interface and a guiding shape among a transmission line and area; that is, it acts as matching systems between the sources of electromagnetic electricity and space. All of the digital communications systems include a transmitter, a receiver, and a Communications medium.

II. LITERATURE SURVEY:

A small-sized antenna with three huge in operation bands to cover the long term Evolution/wireless huge space community (LTE/WWAN) operation in the 698 ~ 960-, 1710 ~ 2690-, and 3400 ~3800-MHz bands is supplied. The antenna has a planar flat shape and is easy to fabricate on one floor of a thin FR4 substrate of length 10×40 5×0.8mm3. The antenna is common thru inclusive of a number one department named branch 1, an inductively coupled strip and a 2d department named branch 2, a simple department strip to a coupled-fed shorted strip antenna the main component, and the two branches are configured with the principle element to attain a compact antenna form. The three large bands may be without trouble adjusted and covers the LTE/WWAN operation which incorporates industrial LTE bands and WWAN bands (698 ~ 960 and 1710 ~ 2690 MHz) and the LTE three.5-GHz band (3400 ~ 3800 MH)[1]. New designs for a compact reconfigurable antenna are delivered for cell conversation devices. The uniqueness of the antenna designs are, they allow diverse organizations in their working frequency bands to be decided on electronically. Particularly, each corporation of frequency bands, or mode, can be made to serve numerous special communication structures simultaneously. These structures may also consist of various mixtures of networks like GSM, DCS, computer systems, UMTS, Bluetooth, and Wi-Fi nearby-location network (LAN).

Thereby electronically deciding on special antenna modes, a variety of communique structures may be with no trouble served via the use of most effective one antenna. One advantage is that via the top notch modes, the overall antenna amount can be reused, and the overall antenna may be made compact and small. In those designs, the selection of the extraordinary modes is finished by using i) switching precise feeding locations of the antenna (switched feed) and ii) switching or breaking of the antenna's connection to the floor (switched ground). This art work demonstrates the 2 designs. For the primary format it allows techniques like GSM, DCS, computer systems, and UMTS and for the second layout, the antenna makes use of a switched-floor technique, which covers GSM, DCS, computers, UMTS and Bluetooth, and moreover 2.four GHz Wi-Fi LAN. The designs are checked when best switches and additionally various sensible energetic switches based on a few configurations like PIN diodes, GaAs situation impact transistor, and MEMs configurations. The designs are examined through numerical simulations and dimension of an experimental prototype. The outcomes affirm suitable typical performance of the each multiband reconfigurable antenna designs [2]. A (CPW) coplanar waveguide fed monopole antenna is proposed, which is composed of a rectangular monopole patch it really is slightly notched at the lowest, a T-fashioned CPW ground inside the notch, and a tapered coplanar waveguide floor out of the notch. The simulated and experimental consequences show that the antenna achieves a divisional ohmic resistance records measure of 164% for S11 -10 dB, that is of concerning pair of three times of the conventional one. The parametric research and measured radiation developments are presented. The consequences show that the antenna exhibits proper developments and is appropriate for packages like transportable cellular ultra wideband (UWB) packages [3]. The circular disc monopole (CDM) antenna has been pronounced to yield a huge-impedance bandwidth. Experiments were carried out on a round disc monopole that has twice the diameter of the recommended disc with comparable results. New configurations are proposed which include elliptical, rectangular, rectangular, and hexagonal disc monopole antennas. A clean additive is proposed to predict the frequency similar to the lower fringe of the bandwidth for every and every configuration. The(EDM) elliptical disc monopole, with elasticity ratio of one.1 yields the maximum bandwidth from 1.21 GHz to more than 13 GHz for voltage standing wave ratio (VSWR)<2 [4].We present a unique revealed antenna for extremely wide-Band packages. in spite of its form which resembles a "traditional" bow-tie, the proposed antenna has a awesome radiation mechanism, which is based on magnetic currents excited in well designed slots. This in turn lets in to preserve accurate antenna general overall performance while a plane reflector is placed beneath the antenna. The planar reflector offers upward push to excessive the front-to-lower back ratio and directivity over a band extending from 4.8 to six.1 GHz [five]. A multi-functioning round wide-slot antenna with small length is proposed and investigated for reconfigurable ultra-wideband (UWB) communiqué applications. The antenna may be utilized in lots of strategies as a twin band-notched UWB antenna, a unmarried band-notched UWB antenna, a UWB antenna, or at the same time as a multi-band antenna. The band-notched characteristic is achieved through the usage of a SIR (stepped impedance resonator) and an arc-shaped parasitic element (ASPE), even as the multi-characteristic design is realized with the resource of incorporating four switches into the SIR and ASPE. Simulation effects show that the proposed antenna is with a huge impedance bandwidth and multi-characteristic switchable houses and suitable for UWB and cognitive radio conversation packages [6 -10].

III. PROPOSED SYSTEM

Microstrip antenna is becoming beneficial due to their mild weight and coffee value, they may be maximum use microwave frequencies, and can be revealed without delay onto a circuit board. The maximum microstrip patch antenna typically includes 12 a steel foil “patch” on floor on pinnacle of board, with a metallic foil ground plane on the opposite facet of the board, and the patch is typically made of any viable shape consisting of rectangular, square, round and elliptical. Usually we continually use inset feed and coaxial feed techniques, as it is simple to understand and obtain input in shape. The patch antenna is a low profile antenna, because structure, it has proper radiation potential, we can see that the radiation of microstrip antenna is as a result of the threshold of the open facet of the patch. Because the length of the radiation patch is ready half of wavelength, the electric subject is opposite in vertical aspect of open facet, however the electric field is distributed in the equal course horizontal thing shown in fig 1&2.

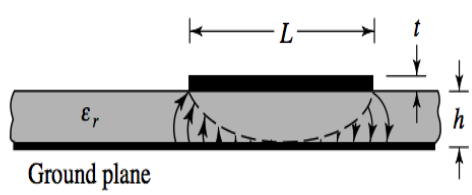


Fig. No: 1Side view of Microsrip antenna

Retrieval Number: F1034376S19/19©BEIESP

Published By:
Blue Eyes Intelligence Engineering
& Sciences Publication

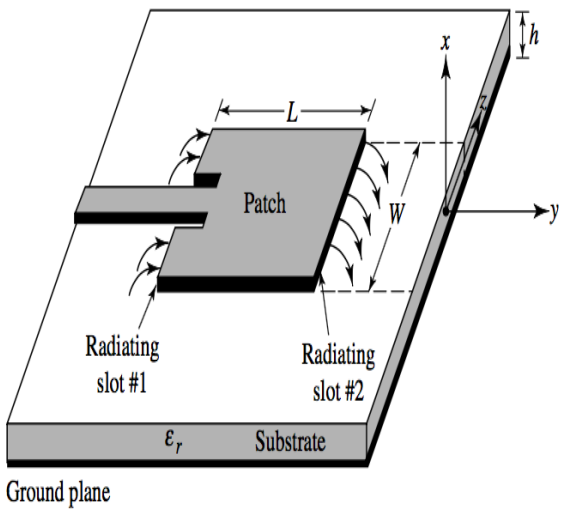


Fig. No2: Microstrip Antenna

This type of microstrip antenna is straightforward to fabricate, due to the easy 2-dimensional physical geometry parent 1. Rectangular antenna is implemented in ultra high Frequency (300 MHz --- 3 GHz), because the dimensions of antenna results thewavelength at the resonant frequency.Forthe most important E plane, the scale of the patch alongside its period was prolonged on every give up by using a distance ΔL that is function of the effective dielectric consistent shown in fig 3.

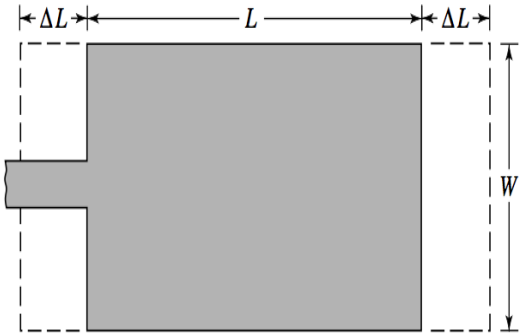


Fig.3: Rectangular patch antenna without gap

RECTANGULAR PATCH ANTENNAS WITH GAP:

This type of microstrip antenna is similar like the rectangular patch antenna, but there has a gap between patch and feed shown in fig 4.

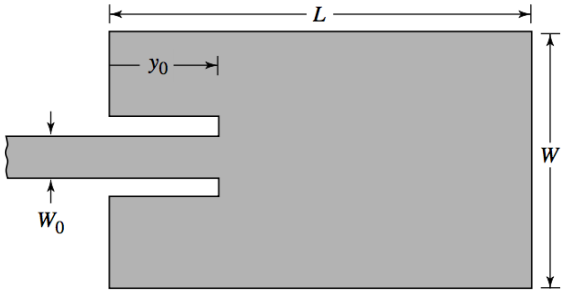


Fig 4: Rectangular patch antenna with gap

REQUIRMENTS OF MICROSTRIP ANTENNA:

In this work the antenna can works under ISM: 27 MHz, 434 MHz, 915 MHz and 2450 MHz, in order to design the antenna, we should choice the best operating frequency according to three aspects: precise location, antenna's size, specific absorption rate.

SPECIFIC ABSORPTION RATE:

Follow the theory of SAR, we are going to calculate and compare the valuein ISM frequency. Assume that the *E*is 1[V/m], and use the formula 2.15

	27Mhz	434Mhz	915Mhz	2450Mhz
Skin	3.64E-04	7.64E-04	8.82E-04	3.64E-03
Normal breast tissue	2.28E-04	4.46E-05	3.80E-04	4.35E-04
Tumor	7.31E-04	1.08E-03	1.39E-03	3.75E-03

Retrieval Number: F1034376S19/19©BEIESP

Published By:
Blue Eyes Intelligence Engineering
& Sciences Publication

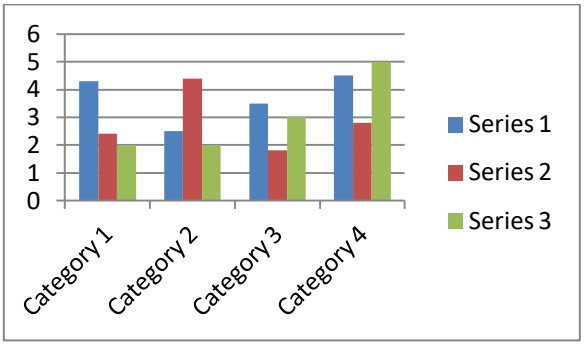


Fig 5:SAR of tissues in different frequency

From the above fig 5, it shows clear that when increase the frequency, the SAR value is higher. In work, only the tissue absorbs more microwaves, the antenna can detect easier, the result will be more obvious.

PRECEISE LOCATION:

On the other hand, the higher the frequency, the shorter the propagation range can be. The wavelength of high frequency is short, and its directivity angle is narrow, the location can be precise. At least the frequency 2450 MHz is chosen for the antenna frequency.

ANTENNA SIZE CHART:

The table 1 shows the dimension of antenna in different frequency

TABLE: 1 Antenna Dimension

Antenna	27Mhz	434Mhz	915Mhz	2415Mhz
Inset fed antenna	$3.4m \times 2.6m$	$210mm \times 165mm$	$100mm \times 78mm$	$37mm \times 28.8mm$
Circular antenna	$R = 1.5m$	$R = 95.7mm$	$R = 45mm$	$R = 16.6mm$
Rectangular antenna	$3.4m \times 2.6m$	$210mm \times 165mm$	$100mm \times 78mm$	$37mm \times 28.8mm$
U slot antenna	$2.9m \times 2.3m$	$208mm \times 153mm$	$95mm \times 74mm$	$35mm \times 26mm$

Because of low frequency will have large size of antenna, in this case the antenna should be design small, light and easy to use. From all above 3 aspects, the frequency 2450 MHz will be used to design microstrip antenna.

IV.EXPIREMENTAL RESULTS

Thismicrostrip patch antenna consists of three major parts, namely Substrate, Patch and Radiation Area shown in fig 6-8.

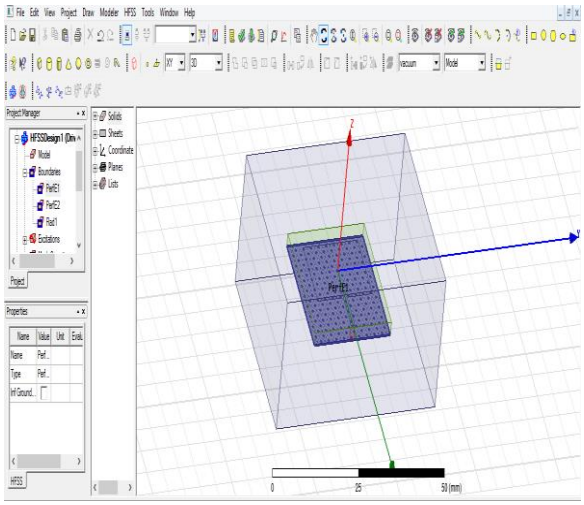
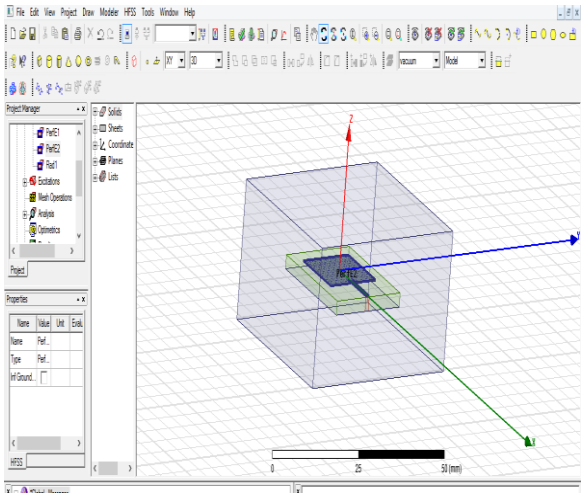


Fig.6SUBSTRATE:



:**Fig.No:7 PATCH**

Retrieval Number: F1034376S19/19©BEIESP

Published By:
Blue Eyes Intelligence Engineering
& Sciences Publication

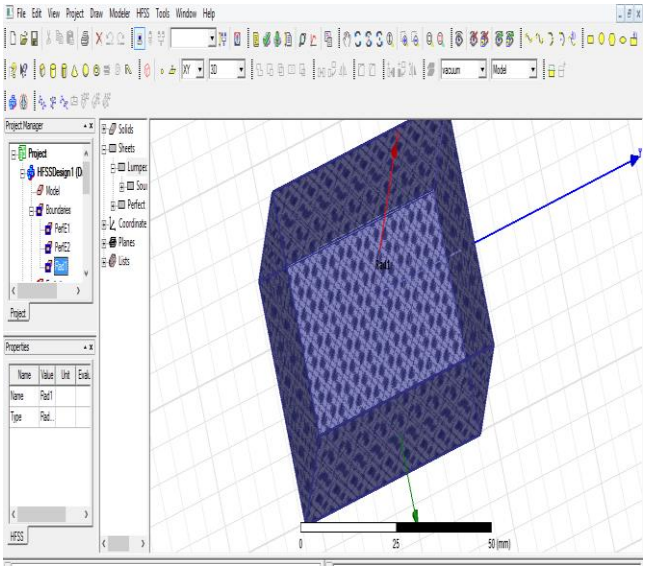


Fig.No: 8RADIATION AREA

EXPERIMENTAL RESULTS:

VSWR

An indication regarding the amount of mismatch between an antenna and the feed line connecting to it is called the VSWR which stands for voltage standing wave ratio. The range of values for VSWR may vary from 1 to ∞. For antenna applications a VSWR value under 2 is considered suitable. Thisantenna can be described as having a good match. So when an antenna is said to be poorly matched, very often it means that the VSWR value exceeds 2 for a frequency of interest shown in fig 9. To calculate VSWR, Should calculate the reflection coefficient first, it is denoted as

$$\Gamma = (ZL - ZS)/(ZL + ZS)$$

Where ZL-load impedance

ZS-source impedance

Therefore $\mathbf{VSWR = (1 + \Gamma)/(1 - \Gamma)}$.

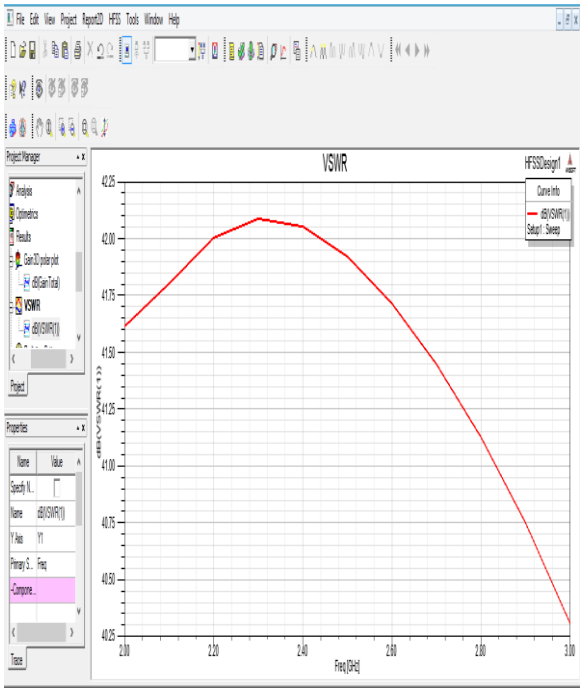


Fig.9; VSWR

GAIN:

The term gain in antenna describes how much power is transmitted in the direction of the radiation in peak to that of a source. Antenna gain is more commore than directivity in a he antenna specification because it takes into account the actual losses that occur. An antenna gain can also be used as a function of angle; in this case it can be used to plot the radiation pattern. The definition of formula of antenna gain is antenna efficiency plus directivity, which is measured in decibels. This may be different from antenna transmission power, which can be measured in watts and refers to the input power level limit of the specific antenna. Antenna gain produce amplification, in which it focuses the actual strength of an incoming or transmitted signal shown in fig 10.

Gain formula is given as:**G=E.D**

E= Efficiency, D=Directivity.

Retrieval Number: F1034376S19/19©BEIESP

Published By:
Blue Eyes Intelligence Engineering
& Sciences Publication

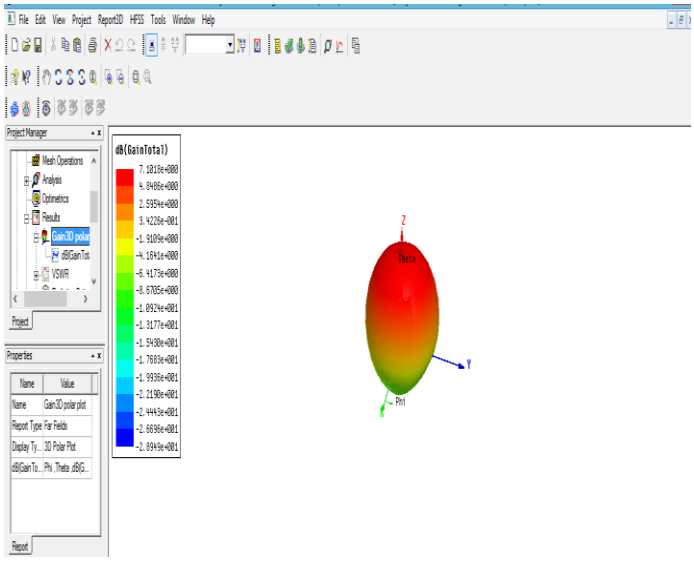


Fig.:10 GAIN

RADIATION PATTERN:

In the style of antenna the term radiation diagram or far-field pattern refers to the directional dependence of the radio waves strength from the antenna or alternative supply. Particularly in the sides of fiber opics, lasers and integrated circuits the term radiation pattern may also be used as a synonym for the very near field pattern and resonant field pattern. This refers to the dependence of the electromagnetic field in the near-field positionally, or Fresnel region of the source. The near-field pattern is most typically outlined over a flat plane placed ahead of the supply, or over a cylindrical or a spherical surface introduction it shown in fig 11.

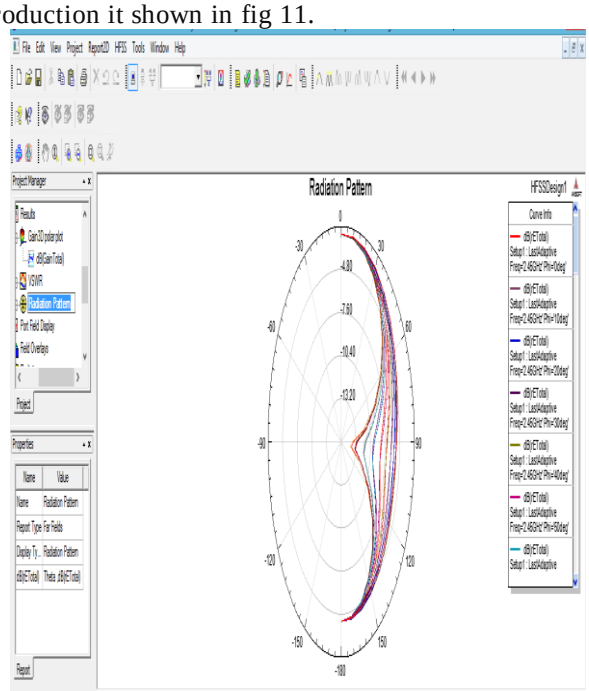


Fig:11 RADIATION PATTERN

V. CONCLUSION

Work have designed and developed a microstrip antenna for detect the different tissues. Different four antennas are simulated with basic structure of microstrip rectangular patch antenna with gap which operating at 2.45GHZ is verified to prefer the most suitable one, and it has been manufactured, in order to test the effect of detection. The result that we have tested with different tissues is feasible, it shows that the value has big different between tissue binside and without any other tissue. From the result of simulation and experiment test we can get conclusion that in this work the rectangular patch antenna with gap is able to differentiate the tissues with different electrical properties.

REFERENCES:

1. K. L. Wong and T. W.Weng, "Small-size triple-wideband LTE/WWAN pill device antenna," IEEE Antennas Wireless Propag.
2. Lett., vol. 12, pp.1516-1519, 2013. 2. A.C. K. Mak, C. R. Rowell, R. D. Murch and C. L.
3. Mak, "Reconfigurable multiband antenna styles for wireless communication devices," IEEETrans.
4. Antennas Propagation, vol. 55, no. 7, pp. 1919-1928, Jul. 2007. 3. C. Deng, Y. Xie, and P.
5. Li, "CPW-fed planate written monopole antenna with electric resistanceinformation measure increased, IEEE Antennas Wireless Propagation, Lett, vol.
6. 8, pp. 1394–1397, 2009. 4. N. P. Agrsawall, G. Kumar, and K. P. Ray, "Wide-band planar monopole antennas," IEEE Trans. Antennas Propag., vol. 46, no. 2, pp. 294–295. 5. M. Midrio, S. Boscolo, F. Sacchetto, M. Pascolini, F. M. Pigozzo, and A. D.
7. Capobianco, "A novel UWB bow-tie antenna style with high F/B quantitative relation and directionality," in Proc.
8. 38th Eur. Microw. Conf., Amsterdam,The Netherlands, 2008, pp. 393–396. 6. M. Preethi, G. Shobana, P. ThangaNandhini, M. Sheriff and M. AntoBennet "Design of Tl Shape Rectangular Patch Antenna for Global Positioning System (GPS) Applications", Middle-East Journal of Scientific Research, Volume 24 ,408-413, May 2016. 7. S. Sankaranarayan, Dr.M. AntoBennet, G. Vishaka, R. Vimala, S. Ashwini "Design of Dual Band Pattern Diversity Antenna with RFSR", Advances in Natural and Applied Sciences, Volume 10 (Issue06):182-188, May 2016 . 8. Sankaranarayan S., AntoBennet M., Vishaka G., Vimala R., Ashwini S., Kaushik Krishna R and Jayaprakash "Design of Tunable Dual-band Antennas for a Carrier Aggregation Systems", International Journal recent scientific Research, Volume 07 (Issue04):9974-9978, April 2016 9. R.KaushikKrishna,G.SankarBabu, Dr.M.AntoBennet, G.Vishaka,J.JelcinRenis, B.S.JayaVignesh,M.Dinesh Kumar "DESIGN OF KOCH FRACTAL WITH OCTAGONAL SHAPED SUBSTRATE ANTENNA FOR SUPERWIDEBAND APPLICATION", International Journal of Applied Engineering Research, Volume 10, Number 87 (2015) pp. 44-47, December 2015. 10. Sankara Narayanan S., Vaishally K., SathyaSubbuLakshmiS., H ariPriya E and AntoBennet M "Doable Rate of Spectrum Sharing Cognitive Radio Multiple-Antennas Channels Using Water Filling Power Allocation

Retrieval Number: F1034376S19/19©BEIESP

Published By:
Blue Eyes Intelligence Engineering
& Sciences Publication

9. Algorithm", International Journal recent research project, Volume 07 (Issue04):9867-9871, April 2016.
10. Rajesh, M., and J. M. Gnanasekar. "Path Observation Based Physical Routing Protocol for Wireless Ad Hoc Networks." Wireless Personal Communications 97.1 (2017): 1267-1289.
11. Rajesh, M., and J. M. Gnanasekar. "Sector Routing Protocol (SRP) in Ad-hoc Networks." Control Network and Complex Systems 5.7 (2015): 1-4.
12. Rajesh, M. "A Review on Excellence Analysis of Relationship Spur Advance in Wireless Ad Hoc Networks." International Journal of Pure and Applied Mathematics 118.9 (2018): 407-412.
13. Rajesh, M., et al. "SENSITIVE DATA SECURITY IN CLOUD COMPUTING AID OF DIFFERENT ENCRYPTION TECHNIQUES." Journal of Advanced Research in Dynamical and Control Systems 18.
14. Rajesh, M. "A signature based information security system for vitality proficient information accumulation in wireless sensor systems." International Journal of Pure and Applied Mathematics 118.9 (2018): 367-387.
15. Rajesh, M., K. Balasubramaniaswamy, and S. Aravindh. "MEBCK from Web using NLP Techniques." Computer Engineering and Intelligent Systems 6.8: 24-26.

Published By:
Blue Eyes Intelligence Engineering
& Sciences Publication