International Journal of Recent Technology and Engineering (IJRTE)
ISSN: 2277-3878 (Online), Volume-8, Issue-1, May 2019

Ultra Wide Band Defected Ground Pentagonal Slotted Textile Antenna

Rajesh Kumar, D. C. Dhubkarya

Abstract*: This paper proposed an Ultra Wide Band textile antenna with defected ground plane for remote on-body correspondence. In this antenna jeans have been utilized as a substrate which permittivity is 1.7 and patch has been made by copper tape. The benefits of jeans are long wearing, simple consideration attire, and cost effective. This anticipated antenna provides directivity of 3.471 dBi at 6.73 GHz and 3.725 dBi at 7.61 GHz. In this paper the analysis has been focused on reflection coefficient, radiation pattern, directivity and polar plot.

***Index Terms*: CST, Gain, Radiation Pattern, Textile Antenna, Ultra Wide Band.**

I. INTRODUCTION

In now day's the remote system has transformed into a bit of human life. By far most of the electrical & electronics gadgets are using the remote structure. A radio wire is a crucial part of the remote framework. There are such enormous quantities of structures that uses gathering contraption, for instance, remote controlled TV, cell phones, satellite correspondences, rocket, radars, remote phones and remote PC frameworks. Well ordered new remote gadgets are introducing which extending solicitations of receiving wires. Augmentation in the satellite correspondence and use of accepting wires in the aircraft and transport has moreover extended the solicitations a place of antenna that can give a strong association [1-3]. The introduction of the Ultra Wide Band for business applications by the FCC in 2002 [4] has enacted wide research excitement for recognizing UWB gathering devices for remote correspondences [5]. High data rate transmission capacities are charming UWB incorporates over customary remote correspondence methodologies [9]. Even more starting late, UWB application has been extended into the WBAN space as a result of its potential in engaging worn correspondences [6-8]. In such characteristic settings, the properties of the organized getting wire, the comfort offered to customers, and the avoidance of on-body detuning is fundamental in further promising a trustworthy correspondence interface [9-12].

Revised Manuscript Received on 30 May 2019.
***** Correspondence Author
Rajesh Kumar*, ECE Departmet, Sachdeva Institute of Technology, Mathura (affiliated to AKTU Lucknow), India.
D. C. Dhubkarya, ECE Department, Bundelkhand Institute of Engineering & Technology, Jhansi, India.

II. ANTENNA DESIGN PROCEDURE

This paper presents the design of proposed antenna geometry and analyzed with CST simulation software. The antenna geometry consists of conducting patch, dielectric substrate material (Jeans) and a partial conducting patch used as ground plane. Microstrip line feed technique is used to excite the antenna. Following material and their values are considered for creation of the desired Ultra Wide Band Textile antenna. Many dielectrics may be used for this design, but the only easy available flexible material is jeans with ε_r = 1.7. The parameters of anticipated antenna are provided in table below. The thickness of the dielectric available is 1 mm.

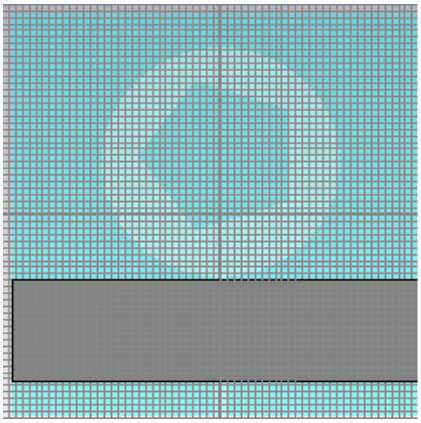
Table I: Designed Parameters of Presented Antenna

Ground	Material used	Copper
	Length(mm)	61
	Width(mm)	15.5
Substrate	Material used	Jeans
	Length(mm)	61
	Width(mm)	61
Patch	Material used	Copper
	Radius of outer Circle (mm)	17
	Pentagonal slot radius (mm)	12

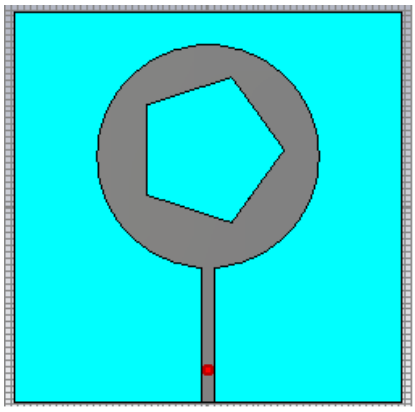
III. RESULTS AND DISCUSSIONS

Usually, larger ground planes allow better radiation performance, but a trade-off must be made against the final size of the antenna permitted. In addition, larger areas of flexible material price more to produce. There are a number of techniques to feed a signal to a textile antenna.

Fig.1 shows Ultra Wide (UWB) Band pentagonal slotted structure which is designed with the help of CST software. Fig. 2 shows return loss of desired UWB textile antenna that gives broad bandwidth of 128.91% from 2.309 GHz to 10.679 GHz. The 3-D design is plotted in Fig. 3 and it demonstrates the deliberate directivity of 3.471 dBi at 6.73 GHz and 3.725 dBi at 7.61 GHz.



(a)



(b)

Fig.1. Structure of Anticipated Textile Antenna
(a) Defected Ground, (b) Pentagonal Slotted Patch

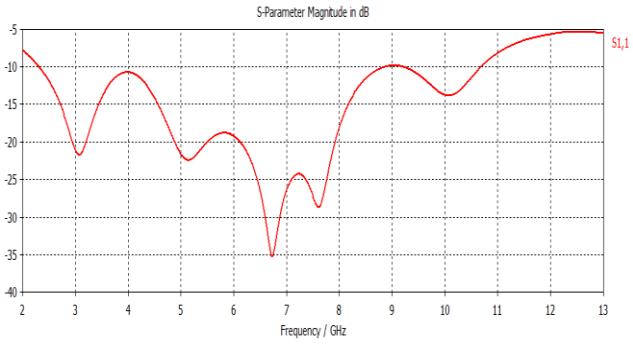
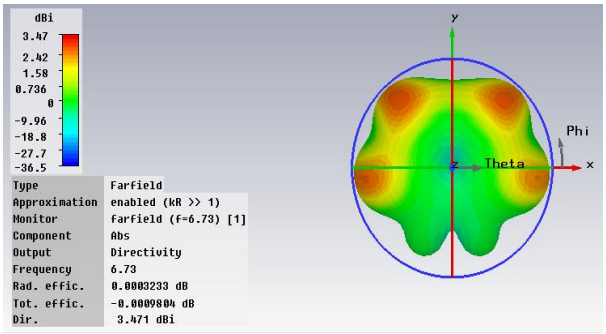
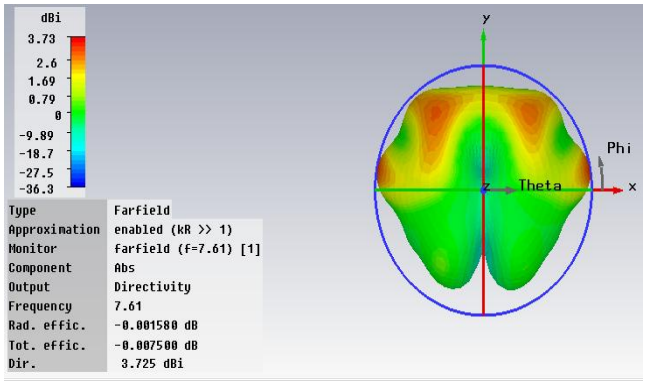


Fig.2. S_{11} Parameter of Proposed Antenna



(a)



(b)

Fig.3. 3-D Radiation pattern
(a) at 6.73 GHz, (b) at 7.61 GHz

The smith diagram is the round plot of the attributes of microwave parts. The Smith Chart is the most utilized device for microwave designers to imagine complex-esteemed amounts and ascertain the mapping between them. Fig. 4 demonstrates the smith diagram of foreseen UWB Antenna.

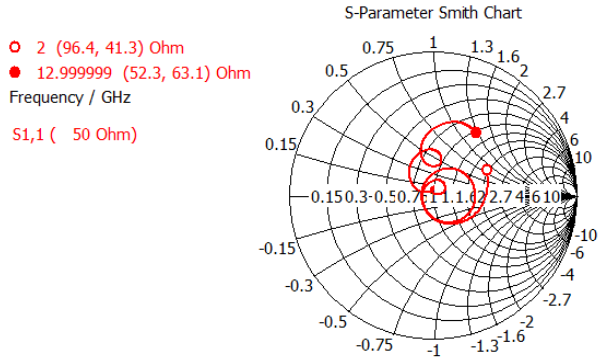


Fig.4. Smith Chart of the Proposed Antenna

IV. CONCLUSION

The compact, Ultra Wide Band pentagonal cut textile antenna has been studied. The anticipated flexible antenna performs adequately from 2.309 GHz to 10.679 GHz which gives 128.91% bandwidth. The anticipated design exhibits excellent performance at 6.73 GHz and 7.61 GHz resonant frequencies.

This anticipated antenna provides directivity of 3.471dBi at 6.73 GHz and 3.725 dBi at 7.61 GHz which is best appropriate for various remote Communications.

ACKNOWLEDGMENT

The first author would like to express his appreciations towards his guide and co-author, Dr. D. C Dhubkraya, Department of Electronics and Communication Engineering at Bundelkhand Institute of Engineering & Technology, Jhansi, for his help and useful suggestions.

The first author would also like to thanks his family members for their support all along.

REFERENCES

1. Mai A. R, et al, "Design implementation and performance of UWB antenna" PIER B, Vol. 27, 2011, pp. 307-325.
2. Sushil Kakkar, et al, "Design and Analysis of I-Shaped Fractal Antenna for Emergency Management" IETEJR, Taylor & Francis online, Jan 2018, pp. 104-113.
3. Raj Kumar, et al, "CPW-feed diamond shape fractal antenna for UWB applications" IJE Taylor Francis, Volume 98, Issue 4, 2011.
4. Nacer Chahat, et al, "A Compact Ultra Wide Band Antenna for On Body Applications", IEEE TAP, Vol. 59, 2011, pp. 1123-1131.
5. K. Baskaran, et al, "A Compact Microstrip Antenna for UWB Applications", EJSR, Vol. 67, 2011, pp. 45-51.
6. N. Singh, et al, "Design and performance of wearable UWB Textile Antenna for Medical Applications", MOTL, Willey, Vol. 57, 2015, pp. 1553-1557.
7. Stuti Srivastava, et al., "Duo Triangle Shaped Microstrip Patch Antenna Analysis for WiMAX lower band Application", CIMTA-2013, Procedia Technology Elsevier 10, 2013, pp. 554-563.
8. P. J. Soh, S. J. Boyes, G. A. E. Vandenbosch, Y. Huang, and S. L. Ooi, "On-body Characterization of a Dual-band, All-textile PIFA," Progress in Electromagnetic Research (PIER), vol. 129, 2012, pp. 517–539.
9. Singh R., Singh V.K., Khanna P., "A Compact CPW-Fed Defected Ground Microstrip Antenna for Ku Band Application", Lecture Notes in Electrical Engineering, Vol. 443, 2018, pp. 231-237.
10. Singh N.K, et al, "A Compact Slotted Textile Patch Antenna for Ultra-wide Band Application", Lecture Notes in Electrical Engineering, Vol 443, 2018, pp. 53-59.
11. Sarthak Singhal, et al, "Hexagonal Tree Shaped Ultra–Wideband Fractal Antenna", IETE Journal of Research, Taylor & Francis online, Jan 2016, Pages 335-348.
12. V K Singh, et al, "A wide band Compact Microstrip Antenna for GPS/DCS/PCS/WLAN Applications", ICNAI, Springer, Vol. 243, 2014, pp. 1107-1113.

AUTHORS PROFILE

Rajesh Kumar is working as an Assistant Professor in Electronics & Communication Engineering Department at Sachdeva Institute of Technology, Farah, Mathura, U.P, India since 2004. He received the B.E (Electronics & Communication Engg.) degree from Dr. B. R. Ambedkar University, Agra, India in 2003. He has completed his M.Tech (VLSI Design) from G.B.T.U, Lucknow, India in 2010. and is pursuing Ph.D from AKTU Lucknow, India. His research interest includes Microwave Engineering, Antenna Design and Integrated Circuits. He has more than 12 research papers published in national and international journals/conferences. He has also guided number of M. Tech scholars in their research work. He is a life member of ISIAM and a member of IEEE.

Dr. D. C. Dhubkarya is working as an Associate Professor in the Department of Electronics and Communication Engineering at Bundelkhand Institute of Engineering & Technology, Jhansi, India. He received the B.E (Electronics Engg.) degree from Jiwaji University, Gwalior, India in 1990, M.Tech (Microwave and Radar) degree from I.I.T. Roorkee, India in 2001 and Ph.D (Electronics Engg.) degree from Bundelkhand University Jhansi, India in 2009. He was positioned as Scientist B at C.E.E.R.I., Pilani, Rajasthan, India from 15 Jan.92 to 27 May 96. His research interest includes Microwave Engineering and Antenna Design. He has more than 70 research papers published in national and international journals/conferences and guided number of Doctorate and Master's scholars in their research work. He also has number of books published under his name. He is Life member of ISPA New Delhi, Institute Member of I.S.T.E. New Delhi and Associate Member of I.E.T.E New Delhi,