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DIELECTRIC RESONATOR STRUCTURE IN ULTRA WIDE BAND REGION FOR WIRELESS SYSTEMS

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ABSTRACT

This paper presents a dielectric radiator which is capable of radiating in Ultra Wide Band (UWB) region. This structure can be easily implemented in wireless systems which can be used for medical purposes and many other fields which are using UWB frequency range. The performances and characteristics of the miniaturized UWB radiator are proposed to study experimentally. The design parameters for achieving optimal operation of the radiator and the required frequency for UWB application will also be analyzed extensively in order to understand its operations.

KEY WORD: *Dielectric Resonator, Ultra Wide Band (UWB) frequency range, Stacking, Notching, Patching.*

I. INTRODUCTION

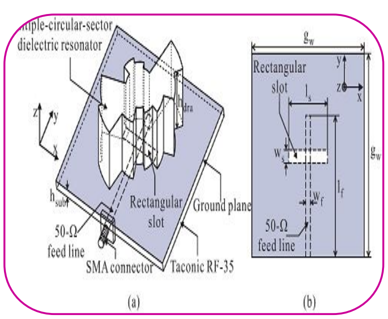
Ultra Wideband (UWB) wireless communications has been rapidly evolving as a potential wireless technology. Radiators in UWB range have consequently drawn more and more attention from both academia and industries worldwide. A competent UWB radiating structure should be capable of operating over an ultra-wide bandwidth; at the same time, a small and compact structure size is highly desired, due to the integration requirement of entire UWB medical systems. [1] Another key requirement of UWB structure is the good time domain behavior, i.e. a good impulse response with minimal distortion. [2] These requirements are fulfilled by the incorporation of a Dielectric Resonators. Recently there has been noteworthy interest in the development of novel low cost lightweight people imaging, baggage scanning and medical imaging techniques using UWB signals as the basis.

This paper focuses on the radiating structure of proper shape and size, which is capable of radiating in UWB region and thus finds its applicability in the wireless medical systems and estimates the performance for such applications.

Section I gives introduction about the implementation, section II gives design and construction of the UWB radiator, section III and IV presents simulation results and conclusion and findings of this research work.

II. DESIGN AND CONSTRUCTION

Dielectric radiator is rectangular in shape as it offer more design flexibility since two of the three of its dimensions canbe varied independently for a fixed resonant frequency and known dielectric constant of the material, allowinggreater degree of freedom. Thus by choosing proper dimensions of the radiator, the mode degeneracy problem can be avoided and, in addition, the bandwidth can be optimized. [4].



Further, Bandwidth enhancementtechniques such as notching and patching of the dielectric substance has been employedtorealizelowprofile DRAsandobtain muchwiderbandwidth. Figure 1 shows the 3D image of dielectric radiator. Its dimension has been presented in Table I.

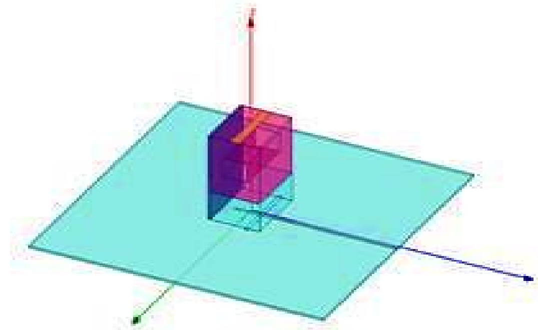


Figure 1.3DViewof UWB Dielectric Radiator

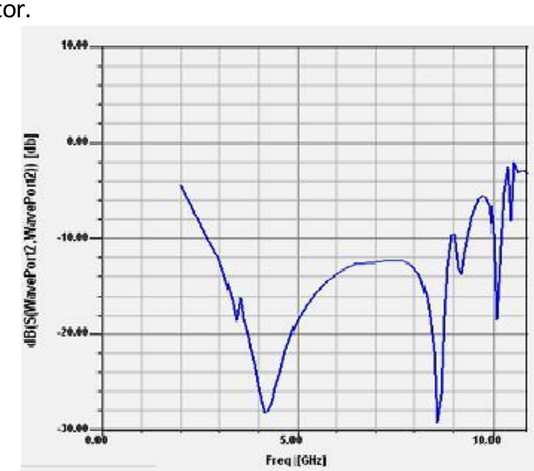
Table I. Design Parameters for the Proposed UWB Radiator

Parameter	Dimensions (in
Substrate (εr = 3.38)	120 x 120 x0.813
Ground Plane	120 x120
Slot	28 x 1.7
Microstrip feed	1.7 x 67
DRA (base) (εr = 35.5)	26x 20 x 10.5
DRA (mount)(εr = 15)	26 x 20 x 31.5
Notch in DRA (mount)	26 x 10 x 7
Patch	26 x 4
Pec (side wall)	26 x 1x 31.5

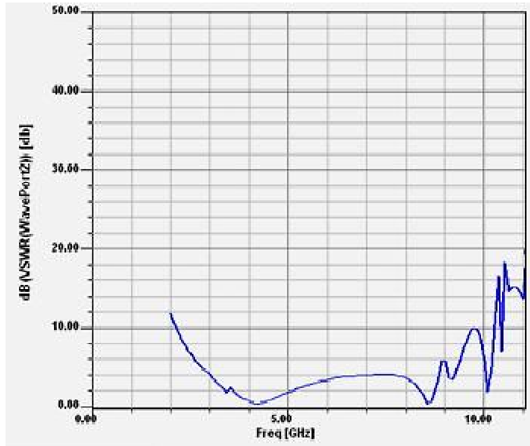
III. SIMULATIONS

This section gives the simulation results obtained using HFSSv10 (High Frequency Structure Simulator) software,with the dimensions given in TableI.

The S_{11} Vs Frequency plot of UW Bradiator is shownin Figure2 (a).This graph shows that ther adiator is well matched at frequency of 4.16 GHz and having return loss of-28.28d Band 8.56GHz having return loss of-29.05dB. It has-10dB band width in the frequency range of 2.69GHz-9.36GHz which is very close to the UWBb and.This shows that this design is well suited for the communication system that works in UW Brange. Figure2 (b)shows VSWRVs frequency curve of the radiator, obtained result is in accordance with the-10dB band width of the UWB radiator.



(a)



(b)

Figure 2(a)S11vs.Frequency Plot of UWB radiator(ReturnLossCurve);(b)VSWRvs.Frequency Plot of UWB radiator

IV. CONLCUSION

Fromour observations, we conclude that the proposed Dielectric Resonatoris an effective UWB radiator structure for performance in the Ultra-Wide Band frequency range. The UWB radiator is operational in the communication band width and thus can be implemented for various wireless system applications like navigation technology, by proper matching at the desired frequency.The gain of UWBDRA in the-10dB is found to be 5.1.The multi-frequency configurability ofthe UWB radiator in the entire band width can be obtained with a universal filter;this possibility will explored in future aspects of our research.

REFERENCES

[1] Cooper, M., et al., "Investigation of Dielectric Resonator Antennas for L-band Communications," Symposium on Antenna Technology and Applied Electromagnetics ANTEM96, Montreal, Canada, Aug. 1996, pp. 167-170.
[2] Al Salameh, M.S., Y.M.M. Antar, and G. Seguin, "Coplanar-Waveguide-Fed Slot-Coupled RDRA," IEEE Transactions on Antennas & Propagation, Vol. 50, No. 10, Oct. 2002, pp. 1,415-1,419.
[3] Luk, K.M., et al, "Technique for Improving Coupling between Microstrip Line and Dielectric Resonator Antenna," IEEE Letters, Vol. 35, No. 5, March 1999, pp. 357-358.
[4] Buerkle, A., K. Sarabandi and H. Mosallaei "A Novel Approach to Enhance Bandwidth of Miniaturized Dielectric Resonator Antennas," IEEE Antennas & propagation Symposium Digest AP-S 2004, Monterey, CA, Vol. 2, pp. 1,359-1362.
[5] Y. M. Antar and Z. Fan, "Theoretical investigation of aperture-coupled rectangular dielectric resonator antenna," Proc. Inst. Elect. Eng. On Microwaves, Antennas and Propagation, vol. 143, no. 2, pp. 113–118, Apr, 1996.
[6] J. Shin, A. Kishk, and A. Glisson, "Analysis of rectangular dielectric resonator antennas excited through a slot over a finite ground plane," in Proc. Antennas and Propagation Soc. Int. Symp., vol. 4, 2000, pp. 2076–2079.
[7] F. Croq and A. Papiernik,"Large bandwidth aperture coupled microstrip antenna," Electron. Lett., vol. 26, no. 16, pp. 1293–1294, 1990.
[8] A. Petosa, A. Ittipiboon, Y. M. M. Antar, D. Roscoe, and M. Cuhaci,"Recent advances in dielectric-resonator antenna technology," IEEE Antennas Propag. Mag., vol. 40, pp. 35–48, 1998

[9] Wilson, J. M., Ultra Wideband Technology Update at Spring 2003 IDF, Developer Update Magazine, Intel Corporation, (January 2003).