

A Cylindrical Dielectric Resonator Antenna with Meander slot for WBAN

L. Nageswara Rao, I. Govardhani

Abstract: In this paper, a substantial deliberated dielectric resonator with meander space is intended to procure dual recurrence attainment. An investigated architecture is sustainable for WBAN applications. A double recurrence cylindrical resonator arrangement along meander opening space inclined with microstrip feed is prescribed to deliver desired recurrence performance. An outlining structure involves cylindrical dielectric arrangement and meander opening space. A meander space resonator originates from the ground plane. Through adapted prototype variables, the cylindrical resonator performs at the subsidiary frequency (2.36 GHz) as well as the opening frame functions at lowering channel (915 MHz), while utilizing the FR 4-substrat and Both resonators have two discrete radiation descriptions. Referencing the ultimate goal of accomplishing the quality of the prescribed display, for example acceptable parameters, reflection coefficient and transmission range. The modeled framework demonstrates that the reflection coefficient <-10 dB and can be exhibited throughout the functioning ranges with enormous impedance and enhanced radiation illustration. The organized reception apparatus arrangement has little in estimate, less weight, lessened cost and satisfactory isolation. The intended model is sensible for WBAN applications.

Index Terms: Meander space, dielectric resonator antenna (DRA), double band and miniaturization.

I. INTRODUCTION

The Dielectric resonator radio cables (DRA) [1] are in great demand owing to the rapid progression of distant correspondence to apps in the body area network owing to low spread back, large dielectric constant, durable, sleek design, straightforward excitability, minimal volume also wider impedance bandwidth. Twofold band reception apparatus accepts a basic piece of remote organization necessities and is used to vanquish the demand of twofold repeat task. The Remote neighborhood design is used as a piece of various particular contraptions over an immense range. To illustration, a peculiar sorts of DRAs, rectangular, triangular and circular forms [2]-[3] were portrayed in the published work. Cylindrical resonator having desirable features over the rectangular and other resonators. The space opening radio wire has been broadly considered since the most recent century due to its inborn advantages being anything easy to made, simplicity of excitation, low profile, high power dealing with capacity, greater stability to bended surfaces, and simplicity of collusion to circuitry. It is

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L. Nageswara Rao^{1*}, ¹Research Scholar, Department of ECE, K L E F, Vaddeswaram, Guntur, India.

^{*}Assistant Professor, Department of ECE, CVR College of Engineering, Ibrahimpatnam, Hyderabad, India. Email: lavurinagesh@gmail.com.

Dr. I. Govardhani, Professor, Department of ECE, K L E F, Vaddeswaram, Guntur, India. Email: govardhani_ec@kluniversity.

outstanding that the opening space resonator has its identical frame in wires or strips. So the example and impedances of these structures can be reused to finish up the example and impedances of the individual openings. This article is aimed to acquire a significant configuration with double recurrence features for WBAN systems. The outlining model involves cylindrical dielectric arrangement and meander opening space resonator and these emanating elements are firmly balanced together and demonstrate at subsidiary and essential recurrences consequently. Across the past few years, an advancement of the body region devices (WBAN) described one of the fundamental worries in the message and correspondence extend. The prerequisite for body territory systems apparatuses has extended to noteworthiness. Isolated medium for transmissions contracting bands of the outlined surroundings should be great impression once arranging progressed WBAN arrangement. Correspondences from bound construct stations to handsets situated in light of the body have been dissected extensively. Other than correspondence applications Microwaves decides the place in Industry, Science and Medical situation [10]. WBAN isn't pertinent for correspondence in healing center and furthermore in home applications. The 915 MHz band, ISM band frequencies are utilized for medical applications for short and long separation correspondence and wearable reception apparatuses in security situations. Along these lines, a microstrip slanted line is inspected to exchange the vitality starting with one point then onto the next point proficiently and moreover coordinated toward safeguarding the key separation in refinement the openings. An encouraged slanted line sufficiently settled with the intended components. The microstrip inclined line [1], [9] will have more adaptability also minimization than the line of co axial encouraged feed. Microstrip feed recognition is easier to create and straightforward to produce. Intended arrangement is simulated and synthesized with HFSS. The structured system engraved the beam divert in a comparative setup empowers a feed settlement which could be laid to obviously complete a propagation channel the other hand close-by completed the intermittent framework. To describe the perception, a substantial deliberated double band resonator with meander opening space [2] is intended for WBAN. The intended prototype comprises cylindrical resonator and meander opening space functioning the subsidiary channel (2.36 GHz) also essential range (915 MHz). The composed gathering approach has low weight little volume, less and agreeable seclusion. An intended display is sensible for WBAN applications.

II. ANTENNA CONFIGURATION

An intended cross breed dielectric resonator [4], [5], [6], [8] arrangement is as exhibited in Figure 1. A double recurrence cylindrical resonator configuration along meander opening space slanted [9] is prescribed to deliver desired band exercise. An outlining layout involves cylindrical dielectric arrangement and meander opening space resonator and these emanating elements are firmly balanced together and demonstrate at subsidiary and essential recurrences consequently. The ground plane is originated with a meander opening space. The feed is laid onto the substrate in the center section. An implied arrangement does have the configuration about $38 \times 34 \times 10.2 \text{ mm}^3$. Compatibility of double - band roundabout fix receiving wire is arranged on different factors, for example, sustaining point, the distance across of a roundabout fix as well as opening space length. Additionally, reception apparatus Pursuance expands the outline and substrate measurements. The round element is fundamental part of WBAN configuration. Recommended composition originates a FR4 substrate with 1.6 mm thickness.

Fig. 1, characterizes the WBAN system's anticipated dual recurrence arrangement. The CDRA has a radius of 10 mm, a height of 8.5 mm and a dielectric equivalent of $\epsilon_d = 38$ as described in Fig. 1. The circular slot is etched on CDRA with a radius of 3 mm. The midpoint of dielectric resonator is counterbalanced with separations of $S_1 = 16 \text{ mm}$. The parameters of $W_f = 0.3 \text{ cm}$ and $L_f = 2.15 \text{ cm}$ are the intensity of inclined line.

An empirical resonant recurrence of the DRA is predicted [11] with the preceding equation and corresponding to 2.36 GHz is sensible to ISM range.

$$f_r = \frac{c}{2\pi R} \left(\frac{1.6 + 0.513x + 1.392x^2 - 0.575x^3 + 0.088x^4}{\epsilon_d^{0.42}} \right)$$

Here $x = R/2h_d$; c is the velocity; radius R , height h_d and permittivity ϵ_d .

However, another meander opening space resonator [8] is laid on ground plane to generate 915 MHz band. Fig. 1 exhibits the arrangement of meander opening space segment. The basic empowered band is a direct result of the meander opening space. It will be impressive that a minimal size design can be accomplished by contemplating the substrate. A computing HFSS is often used to implement a particular end objective.

The meander slot is involves twelve rectangular spaces with distinct length and settled width $W_s=2 \text{ mm}$ as exhibited in Fig. 1. The counter balanced separation distance of slots are $S_2 = 0.5 \text{ mm}$, $S_3=1.5 \text{ mm}$. The geometry of rectangular apertures considered as L_1, L_3, L_5, L_7, L_9 and L_{11} is demonstrated as 2 mm, $L_2=3 \text{ mm}$, L_4, L_6, L_8 and L_{10} is considered as 4 mm and $L_{12}=10 \text{ mm}$. Through configuring the arrangement performance requirements, the necessary band (915 MHz) and the subsidiary band (2.36 GHz) are used with a cylindrical configuration and meander space components.

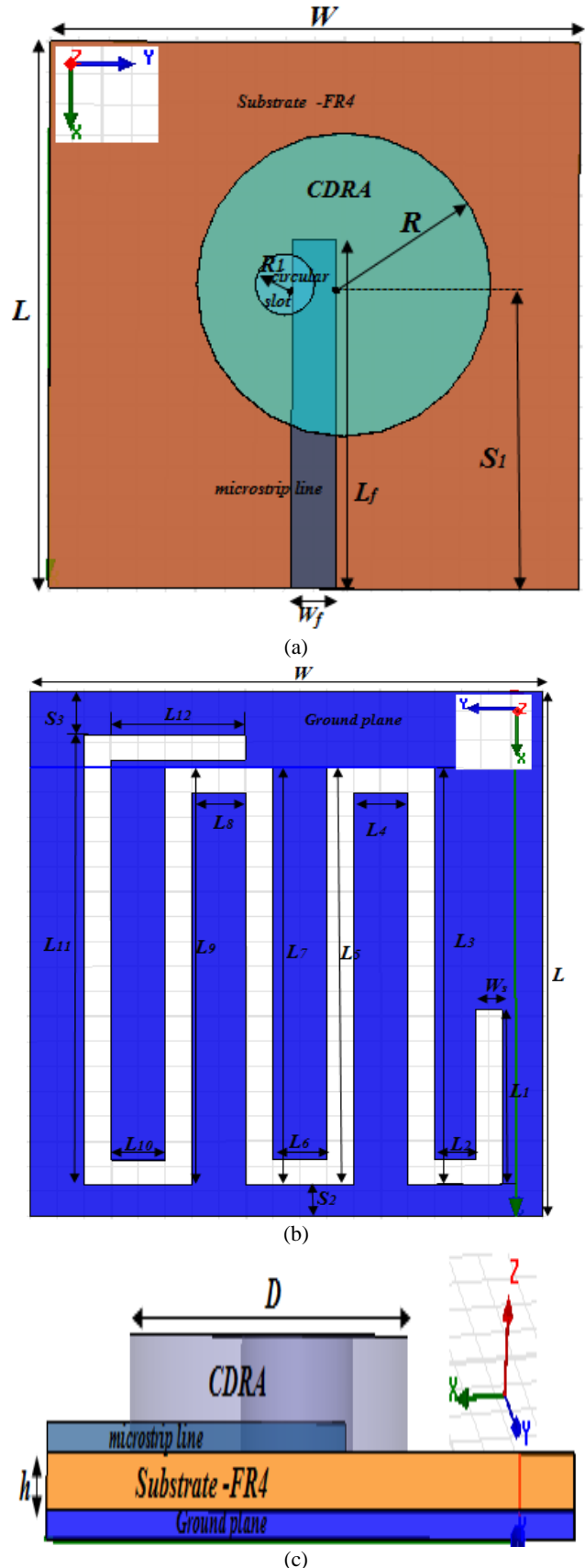


Fig. 1. Designed Hybrid DRA with opening space: (a) Top view; (b) Bottom view; (c) Side view

III. SIMULATED RESULTS AND DISCUSSIONS

Fig. 2, reveals the stated DRA's return loss. The primary band is attributable with meander slot as well as DRA is creates other band. As depicted in Fig. 2, the suggested model return loss is exhibited at two unique frequencies 915 MHz and 2.36 GHz. The essential space (915 MHz) and subsidiary range (2.36 GHz) are reinforced by the meander aperture and DRA correspondingly. It is watched return adversity at 915 MHz and 2.36 GHz as - 31 dB and - 27 dB correspondingly. Therefore, a recreated fundamental band achieves transmission limits of 3.7 % (890 - 925 MHz) and auxiliary space accomplishes transmission cutoff points of 4.8 %. The wind opening space reverberates on account of a resonator and there are no oscillations without round and hollow course of action.

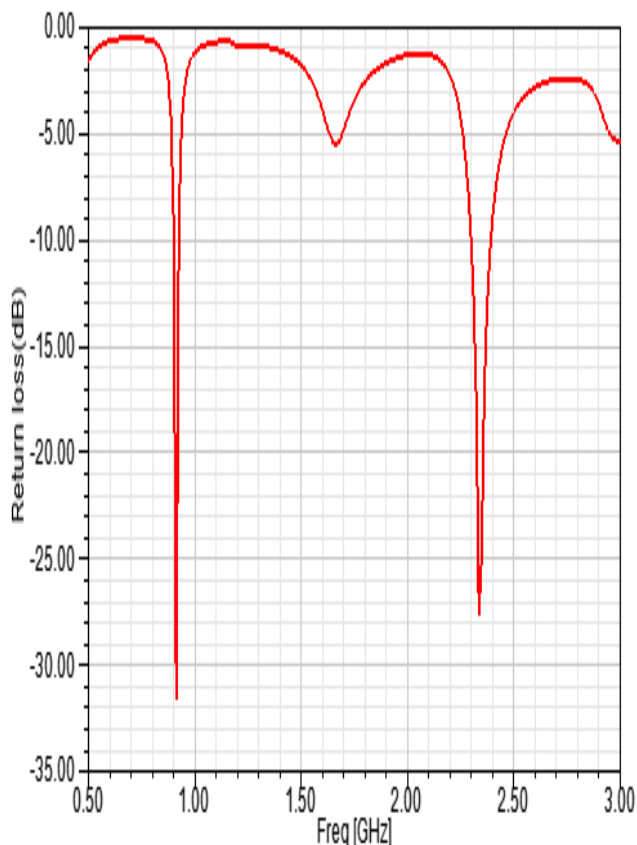
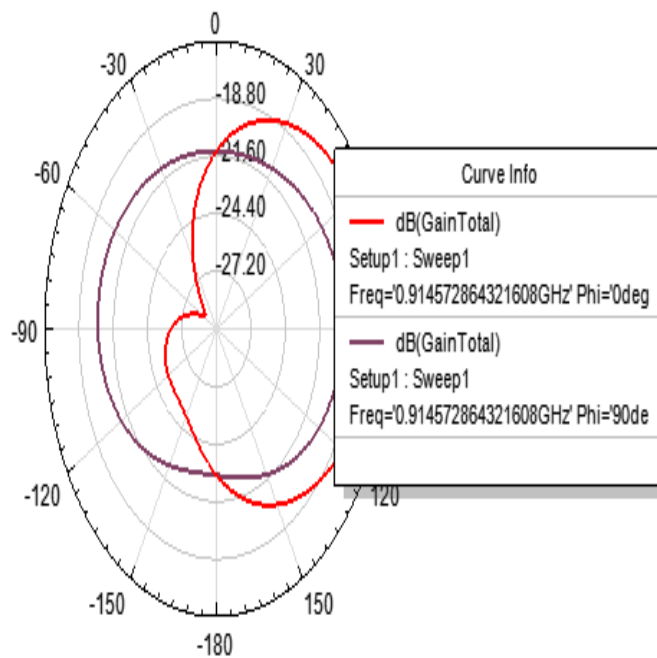
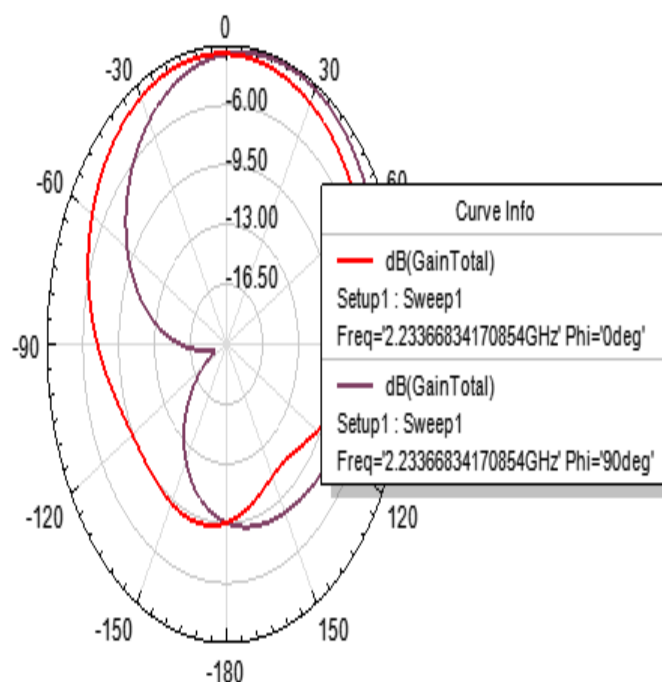


Fig. 2. Simulated return loss characteristics at 915 MHz and 2.36 GHz

An intended structure radiation characteristics are demonstrated in Fig. 3. The recommended configuration radiates the most incredible towards the best bearing at 2.36 GHz and aperture transmitting the patterns at 915 MHz in bidirectional. A radio wire's electromagnetic incidents provide data outlining how the broadcasting equipment assembles the resilience it emits. Recurrences of 915 MHz and ISM are sensible for WBAN correspondence. All obtaining equipment's, if 100 percent capable radiate comparable vitality imperatives for adjusted proposition control little regard to configuration shape.



(a)

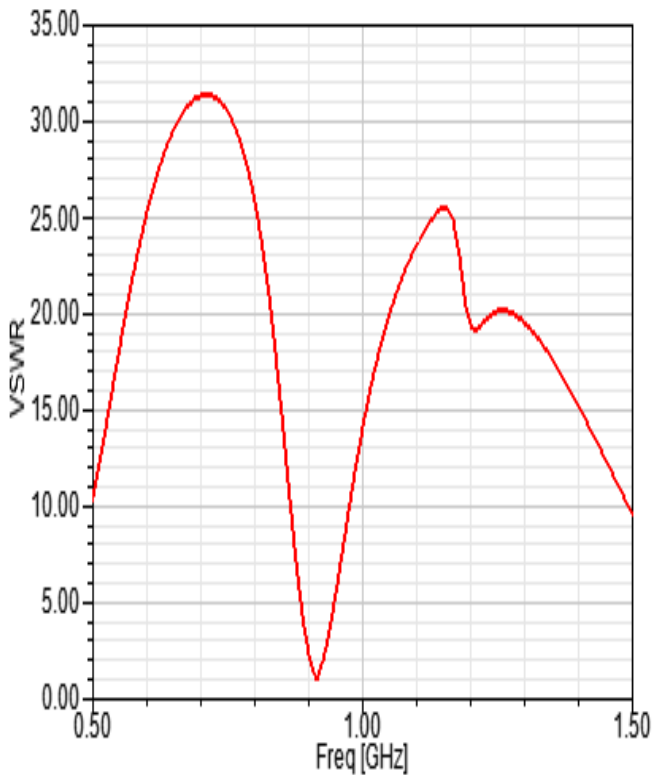


(b)

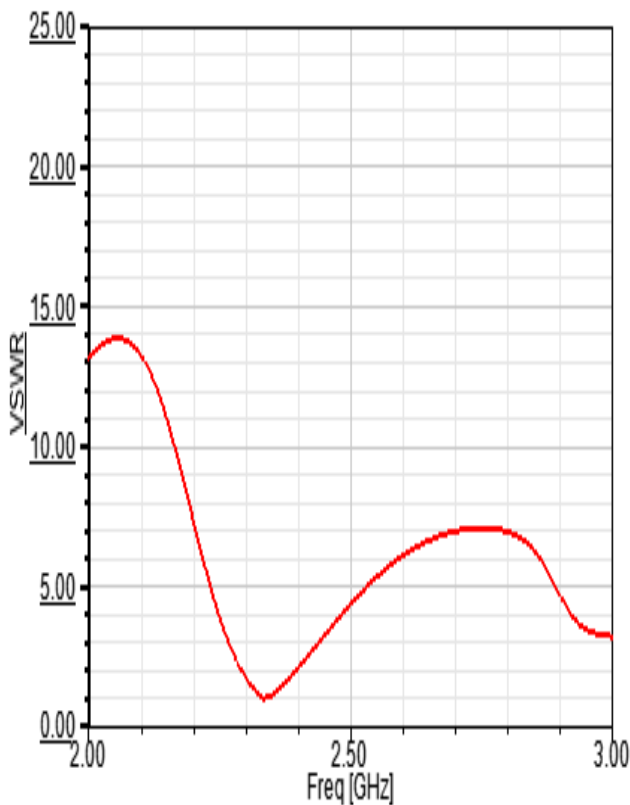
Fig. 3. Simulated radiation characteristics at: (a) 915 MHz; (b) 2.36 GHz

Fig. 4, exhibits the VSWR of the intended configuration. Estimating the ultimate situation of SWR is 1 and coordinating excellent impedance. An intended arrangement has the VSWR esteem as 1.33 and 1.05 at 2.36 GHz and 915 MHz subsequently. The VSWR illustrates how carefully the terminal signal impedance of a radio wire is facilitated to the slanted line's significant impedance.

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(a)



(b)

Fig. 4. Simulated VSWR at 915 MHz and 2.36 GHz

IV. CONCLUSION

A substantial deliberated dielectric resonator with meander space is intended to procure dual recurrence exercise. A parametric report is done to look into the getting wire demonstrate parameters. The essential space (915 MHz) and

subsidiary range (2.36 GHz) configuration reinforced with the meander aperture and DRA subsequently. The suggested system is simulated and a return loss of -31 dB, -27 dB at 915 MHz and 2.36 GHz at the end is observed. The desired system takes a small amount of volume and basic shape. The intended model is appropriate for WBAN systems.

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AUTHORS PROFILE



L Nageswara Rao is currently pursuing the Ph.D. degree with the Department of ECE, K L E F, Guntur, India. He is also Assistant Professor with the Department of ECE, CVR College of Engineering, Ibrahimpatnam, Hyderabad, India. He has authored over 15 research papers in international/national journals. His research interests include dielectric resonator antenna.



Govardhani Immadi received M. Tech degree in Electronics and communication engineering from the Acharya nagarjuna University as a University topper in 2009. She received Ph. D degree from K L University, Guntur, India. She is currently Professor with Department of ECE, K L E F, Guntur, India. She has authored or co-authored many research papers in international/national journals. Her research interests include micro strip antennas, electrically small antennas and dielectric resonator antenna.