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DESIGN OF COMP
ACT RECTANGULAR DIELECTRIC RESONATOR ANTENNA FOR WIRELESS COMMUNICATIONS

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ABSTRACT

In this work, a small and very thin rectangular dielectric resonator antenna is presented. A strip connected to a probe is used as feed mechanism. Moreover, a strip is placed in the other side of the excitation (back side) in order to excite a new resonance. The proposed antenna exhibits good performances, compact dimensions (0.9 x 8 x 7 mm^3), very wide band (43%) and a maximum gain of about 11.17 dBi. The performance of the dielectric resonator antenna is simulated on Ansoft HFSS and CST microwave studio.

Keywords: *Thin DRA, Parasite Strip, Wide Band*

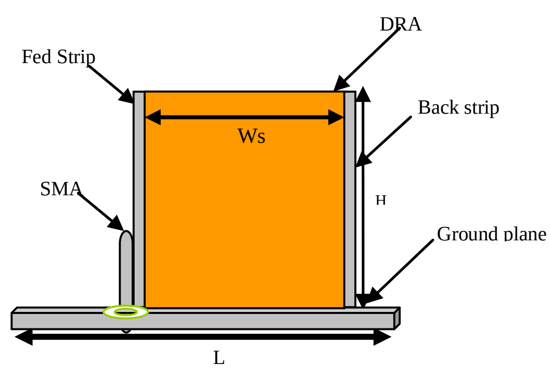
1. INTRODUCTION

The world is in constant changing and the demand of small size antennas with wide band and good performances is increasing, which encouraged the researchers to do an intensive work to design antennas with these characteristics. One technological solution which meets this demand is the dielectric resonator antenna (DRA). Because they present very attractive features such as low dissipation loss, high radiation efficiency, light weight and low profile, since the use of dielectric resonator as an antenna was originally proposed in 1983 [1]. Using the advantage of DR structure flexibility the researchers had done significant efforts for DRA's to achieve compact size with wide bandwidth [2–8], because to integrate easily antennas in the wireless devices, the antennas size must be small as possible. In the literature we can find others works which were carried out to develop compact DRA's for mobile handsets and wireless communications [9-16].

In this letter, a very thin and small dielectric resonator antenna (DRA) is presented. The antenna is fed by a simple network technique, named the strip-fed method (probe + conducting strip) [17-20]. In addition, a strip is placed in the other side of the excitation (back side), which excites a new resonance and enhances the bandwidth [21-22].

2. ANTENNA DESIGN

Figure 1 shows the cross-sectional, back and top views of the studied antenna. The Alumina with a dielectric constant of εr = 9.8 is used as dielectric resonator material. The DRA is mounted on a 30 x 30 mm2 ground plane. The dimensions of the DRA are: H= 7 mm, Ws= 8 mm and W= 0.9 mm. The fed and back strips have the same dimensions, and the optimal ones are: S= 0.9 mm, H= 7 mm and t= 0.05 mm.



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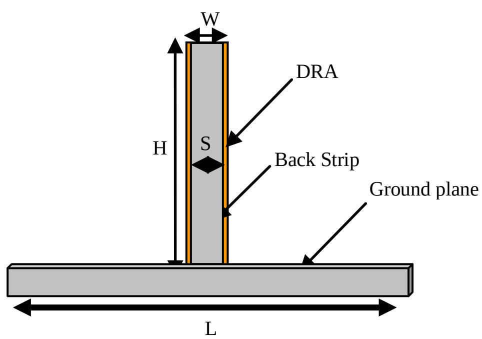

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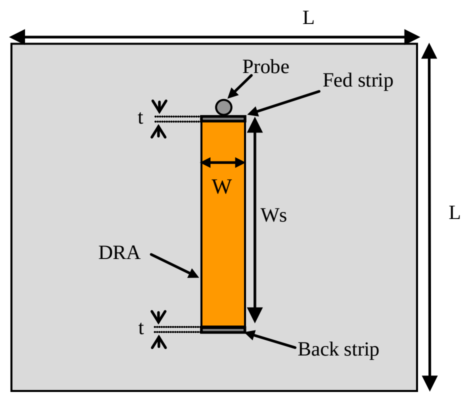

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Figure1. Configuration Of The Studied Antenna.

3. RESULTS

Figure 2 shows the reflection coefficient of the studied rectangular DRA, obtained from the simulation using the CST and HFSS commercial softwares. The antenna is operating at 7.19 and 9.96 GHz frequencies. The simulated matching frequency band of the proposed antenna for -10 dB reflection coefficient is from 6.80 GHz to 10.53 GHz corresponding to a total bandwidth of about 43%. We can observe that the result is verified for the two simulators (HFSS based on finite element method and CST on finite integration method).

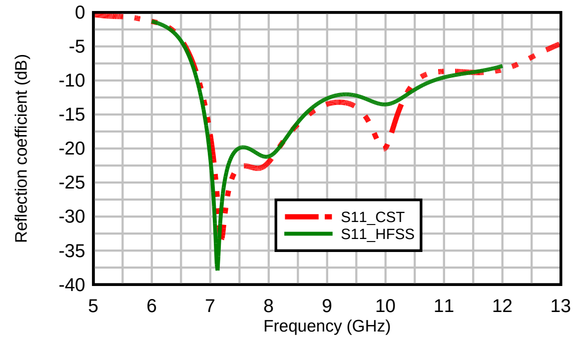

Figure2. The Reflection Coefficient Of The Studied Antenna.

The E and H planes at 7.19 GHz and 9.96 GHz are presented in Fig. 3. The H-plane pattern is symmetrical, but the E-plane pattern is not symmetrical like in the H-plane.

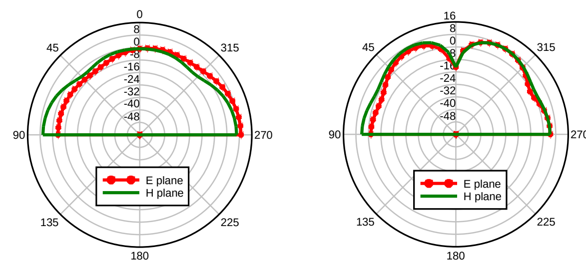

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Figure3. The Simulated Radiation Patterns Of The Proposed Antenna At 7.19 Ghz (A) And 9.96 Ghz (B).

Figure 4 shows the gain of the proposed antenna computed using CST Microwave Studio, as it is illustrated below the gain is high, particularly at the first resonance frequency 7.19 GHz (11.17 dBi).

Figure 5 shows the simulated VSWR of the proposed antenna using Ansoft HFSS and CST Microwave Studio. It is clearly that the VSWR is less than 1.8 along the matching band (6.80-10.53 GHz).

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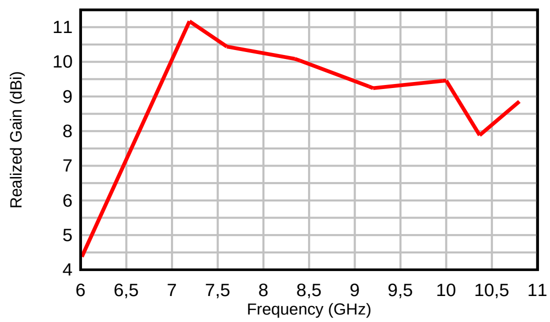

Figure4. The Simulated Realized Gain Of The Proposed Antenna.

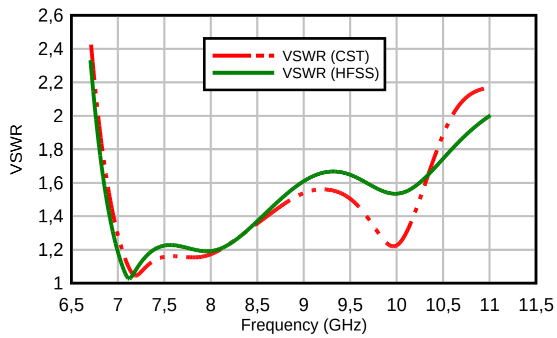

Figure5. The Simulated VSWR Of Studied Antenna.

4. CONCLUSION

A novel thin and very small dielectric resonator antenna with wide bandwidth was presented. The proposed antenna has a large bandwidth (6.80-10.53 GHz) of about 43%. A good agreement is obtained between the results of the two simulators HFSS and CST. The maximum radiation gain obtained is 11.17 dBi at 7.19 GHz.

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Patch Antenna for Radiolocation Applications

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