Analysis of Planar Dipole antenna with Arlor material of different Di-electrics

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ABSTRACT

The characteristics of planar dipole antenna at 1GHZ are analyzed for different materials having different dielectric constants and here the port is at the middle of two planar monopole together gives the planar dipole antenna and the various antenna parameters like gain, return loss, radiation patterns, directivity operating freq etc are compared for the taken dielectric substrates and illustrated in this paper and the dielectrics are in the increasing order to understand the variations in the results.

Keywords: Di-electric substrates, Planar Dipole, low Operating Frequency

1. INTRODUCTION

In order to design the antenna we take the dielectric substrates Arlor Diclad 880 (tm), Arlor AD 320A(tm), Arlor AD 430 (tm) and Arlor AR 1000(tm) having dielectric constants 2.2, 3.2, 4.3 and 10 respectively which are operating at frequencies 1.0930, 1.0377, 0.9925 and 0.8467 this antenna will be analyzed and the results are compared for return loss, gain, radiation pattern, peak realized gain, peak realized directivity, radiation efficiency. Here the designed antenna having two arms of planar dipole having 0.25cm antenna width, and a dipole length of 5.625cm and a lumped port of 0.25x0.25cm is given for excitation. Here the substrate dimensions are 15cm x20cm x62mil. The designed antenna analyzes with different di-electric substrates and results are analyzed and illustrated in this paper.

2. ANTENNA DESIGN

The design of proposed antenna is presented in the following figure [1]. This antenna design having compactness.

3. SIMULATION RESULTS

A. Return loss

The designed antenna is analyzed with different di-electric materials and the comparative results were shown in the following figure [2]. Here if we observe the figure we can see that as di-electric constant increases the return loss decreases up to third material but for the di-electric constant 10 the return loss again increases, but we observe that the operating frequency of the antenna gradually decreases when the di-electric constant increases and these values are listed in the table [1].
B. Gain in 2D
The below figure[3] shows the comparative analysis of 2D gain here all the four materials having almost same 2D gain.

![Figure 3](image3)

**Figure [3]** Gain in 2D curves a) ARLOR DICLAD b) ARLOR AD 320A c) ARLOR AD 430 d) ARLOR AR 1000

C. Radiation Pattern
The below figure [4] illustrates radiation pattern curves for the proposed antenna for different dielectric materials.

![Figure 4](image4)

**Figure [4]** Radiation pattern a) ARLOR DICLAD b) ARLOR AD 320A c) ARLOR AD 430 d) ARLOR AR 1000

D. Gain in 3D
The figure[5] shows the comparative analysis for proposed antenna for taken dielectrics here the 3D gain values are 2.2852, 2.2147, 2.2016 and 2.1381 respectively for ARLOR DICLAD, ARLOR AD 320A, ARLOR AD 430 and ARLOR AR 1000.

![Figure 5](image5)

**Figure [5]** Gain in 3D curves a) ARLOR DICLAD b) ARLOR AD 320A c) ARLOR AD 430 d) ARLOR AR 1000

E. Gain from Top view
For easy understanding the gain curves are shown in top view in the figure [6].
From the above table [1], we can see that the ARLORL materials with the increasing order of dielectric constant are used for simulation and the operating frequency lowers each time when we give high dielectric material.

## Table [2]. Antenna parameters

<table>
<thead>
<tr>
<th>Quantity</th>
<th>ARLOR DICLAD (tm)</th>
<th>ARLOR AD 320A (tm)</th>
<th>ARLOR AD 430 (tm)</th>
<th>ARLOR AR 1000 (tm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max U</td>
<td>0.133643(W/sr)</td>
<td>0.132572(W/sr)</td>
<td>0.132023(W/sr)</td>
<td>0.129397(W/sr)</td>
</tr>
<tr>
<td>Peak Directivity</td>
<td>1.68343</td>
<td>1.6737</td>
<td>1.66675</td>
<td>1.64875</td>
</tr>
<tr>
<td>Peak Gain</td>
<td>1.69248</td>
<td>1.67089</td>
<td>1.66021</td>
<td>1.63611</td>
</tr>
<tr>
<td>Peak Realized Gain</td>
<td>1.67945</td>
<td>1.66599</td>
<td>1.65909</td>
<td>1.62609</td>
</tr>
<tr>
<td>Radiated Power</td>
<td>0.997634(W)</td>
<td>0.995389(W)</td>
<td>0.995401(W)</td>
<td>0.986259(W)</td>
</tr>
<tr>
<td>Accepted Power</td>
<td>0.9923(W)</td>
<td>0.997066(W)</td>
<td>0.999323(W)</td>
<td>0.993879(W)</td>
</tr>
<tr>
<td>Incident Power</td>
<td>1(W)</td>
<td>1(W)</td>
<td>1(W)</td>
<td>1(W)</td>
</tr>
<tr>
<td>Radiation Efficiency</td>
<td>1.00537</td>
<td>0.998318</td>
<td>0.996075</td>
<td>0.992333</td>
</tr>
<tr>
<td>Front to Back Ratio</td>
<td>1.00314</td>
<td>1.0026</td>
<td>1.00332</td>
<td>1.00502</td>
</tr>
</tbody>
</table>

The above table [2] gives the detailed analysis of antenna parameters from the table we can see that the values tends to decrease with the increase of dielectric constant. From table [1] to table [2] the return loss better for ARLOR AD 430 but remaining antenna parameters are good for ARLOR DICLAD.

## CONCLUSION

From the simulation by Arlor material having different dielectric constant we can see that the increase in dielectric value up to certain level will make antenna more reliable and better in performance and the operating frequencies will tend to decrease as a matter the arlor ad 430 gives better results.

## References

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