EE 463 Mini Project 1

Ömer Alperen Katı
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I. ANTENNA DESIGN

Using HFSS Antenna Toolkit in ACT Extensions window, a wire dipole antenna with an approximate center frequency of 2.4 GHz is synthesized. $|S_{11}|$ plot of the wire dipole antenna can be seen in Fig. 1.
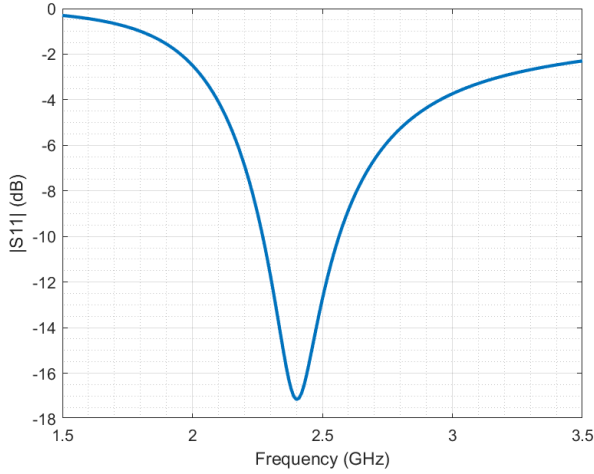

Fig. 1: $|S_{11}|$ plot of the wire dipole antenna.

The model of the wire dipole antenna can be seen in Fig. 2. Its dipole length, wire radius, and port gap are 5.56 cm, 0.094 cm and 0.094 cm, respectively.

Fig. 2: Wire dipole antenna

II. ARRAY DESIGN

Once the wire dipole antenna is designed, it is copied and pasted into the model. A design variable named "lambda" is created, its value is set to "c0/(2.4*1e9)" since the dipole antenna is operating at 2.4 GHz. Then, using "lambda", a new variable named "$distance\_between\_cells$" is created, and its value is set to "6*lambda/5", that is 12.49 cm. After that, center positions of the components of the copied

antennas are shifted in the direction of negative x. The resulting array can be seen in Fig. 3.
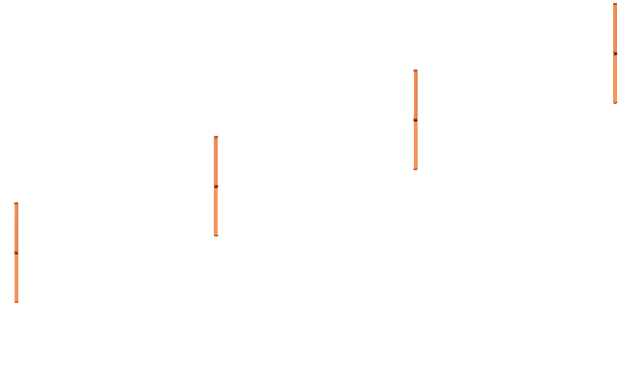

Fig. 3: The array model of wire dipole antennas.

The array model is simulated, and $|S_{11}|$ plots of the antennas can be seen in Fig. 4. One can conclude that since the separation between the antennas is 6*lambda/5, that is greater than lambda/2, there is no coupling affecting their $|S_{11}|$ parameter.
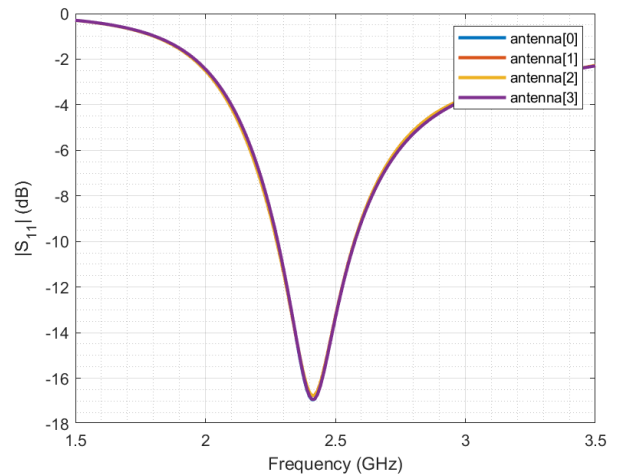

Fig. 4: $|S_{11}|$ plots of the antennas in the array.

III. RADIATION PATTERNS

3D radiation patterns for the manual array and array created with setup can be seen in Fig. 5(a) and 5(b).

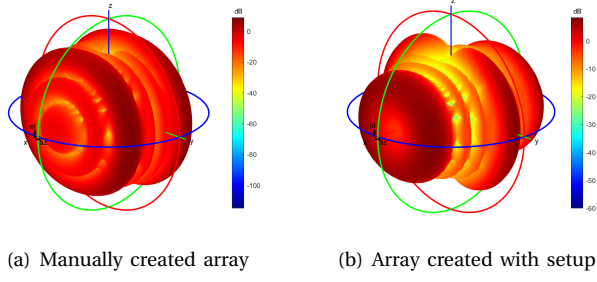(a) Manually created array   (b) Array created with setup

Fig. 5: 3D Radiation Patterns

2D stacked radiation patterns for the manual array and array created with setup can be seen in Fig. 6 and 7.
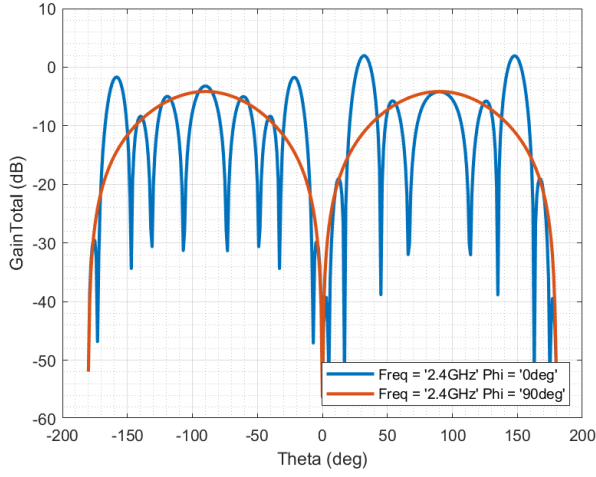

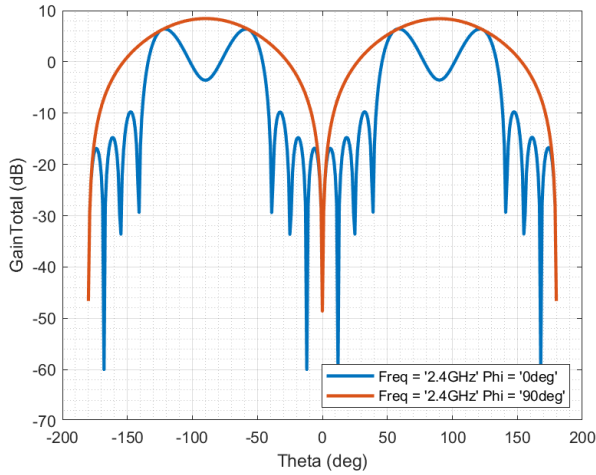Fig. 6: 2D stacked radiation pattern for the manual array.

Fig. 7: 2D stacked radiation pattern for the array created with setup.

In those radiation patterns for both models, grating lobes can be observed since the separation between the wire dipole antennas is greater than λ.